Evaluation Instructions
Machining Level II – CNC Turning

General Instructions

1. Make sure that the candidate has his/her own copy of the part print, job instructions and understands the criteria for performance evaluation. Times indicated are guidelines and will not be part of the assessment.

2. Provide access to the tools, equipment and materials as suggested on the next page.

3. Identify each candidate’s work upon completion and permanently mark all parts.

4. Complete the evaluation of the candidate’s project as soon as possible after completion. Be sure to complete the SPONSOR portion of the Performance Affidavit for successful projects.

Monitoring the Performance

1. Make sure that the steel block used to complete the project agrees with the specifications on the part print.

2. Always check to see that the candidate is using the workholding devices and tooling in a safe and secure manner.

3. Check that all personal protection and safety precautions are being employed. Stop any candidate from creating an unsafe condition. A candidate should not be allowed to start, continue, or return to the project until an unsafe condition is resolved. If the unsafe condition is of the candidate’s making, the evaluator or sponsor should require that the candidate completely restart the project after the safety issue has been resolved and appropriate instruction has been given.

Completion of the Performance Evaluation

1. Check to see that the candidate has provided proper cleanup of tools, equipment and work area.

2. Check to see that tools are returned to their proper storage locations.

3. Check to see that equipment is returned to an appropriate condition and setting.

4. Complete the evaluation worksheet and file with your records.

5. Complete the SPONSOR portion of the Performance Affidavit.

6. Send the part, part print and Performance Affidavit to MET-TEC for review.
Performance Standards
CNC Turning

Materials:
CRS or Low Carbon Steel 1.5” Diameter X 6.3”

Duty:
Operate a CNC lathe.

Performance Standard:
Given a CNC lathe create a qualified CNC Program, setup and operate the lathe, change tool values as necessary, replace and qualify tooling as necessary.

Accuracy Level: Match the requirements of the part print. 63 microinch finish

Assessment Equipment and Material:
Workstation: A standard workbench, a CNC turning center of adequate capacity, a three-jaw universal scroll chuck, and a four-jaw independent chuck.

Material: A part matching the material requirements of the CNC turning part print, material: cold rolled steel.

Tooling: Right- and left-hand turning tools capable of turning to a square shoulder, an external threading tool matched to the profile of the thread called out on the turning part print, a drill chuck, center drill, external undercut tools, live center, dead center fitted to the spindle taper, magnetic base for a dial indicator, files, wrenches as necessary.

Measuring Inst: Required micrometers, combination set, thread pitch gages, center gage, pitch micrometer, thread ring gages, dial indicator, 6” rule, a 6” vernier, dial, or electronic caliper, surface finish comparison standards, appropriate taper ring gages and Prussian blue, or taper micrometer, or sine bar and indicator.

Performance Assessment Worksheet

Machining Level II – CNC Turning

**INSTRUCTIONS:** Rate the candidate’s performance for the CNC Turning project according to the criteria below. The checklist below represents a listing of criteria to be evaluated. It is not a sequence of process steps or a process plan for making the part. For each item, check the box under Pass or Fail accordingly.

Remember, NIMS requires that all specifications must be met within the allowable tolerance limits. If the part does not meet all specifications, the candidate must correct the deviation or redo the project.

<table>
<thead>
<tr>
<th>Evaluation Criteria</th>
<th>Measurement Tool</th>
<th>Pass</th>
<th>Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Thread 5/8 – 18 UNF 3A</td>
<td>Pass = within tolerance Fail = exceeds tolerance</td>
<td>![ ]</td>
<td>![ ]</td>
</tr>
<tr>
<td>Pitch diameter:</td>
<td>Max: .5889 Min: .5854</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Ø 0.7500 ± .001 (right side of R.670)</td>
<td>Pass = within tolerance Fail = exceeds tolerance</td>
<td>![ ]</td>
<td>![ ]</td>
</tr>
<tr>
<td>Max: .7510 Min: .7490</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Ø 1.0236 ± .001</td>
<td>Pass = within tolerance Fail = exceeds tolerance</td>
<td>![ ]</td>
<td>![ ]</td>
</tr>
<tr>
<td>Max: 1.0246 Min: 1.0226</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4. Ø 1.1810 ± .001 (Datum A)</td>
<td>Pass = within tolerance Fail = exceeds tolerance</td>
<td>![ ]</td>
<td>![ ]</td>
</tr>
<tr>
<td>Max: 1.1820 Min: 1.1800</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Ø .945 ± .005</td>
<td>Pass = within tolerance Fail = exceeds tolerance</td>
<td>![ ]</td>
<td>![ ]</td>
</tr>
<tr>
<td>Max: .950 Min: .940</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Length 6.22 ± .015</td>
<td>Pass = within tolerance Fail = exceeds tolerance</td>
<td>![ ]</td>
<td>![ ]</td>
</tr>
<tr>
<td>Max: 6.235 Min: 6.205</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Ø .750 ± .005</td>
<td>Pass = within tolerance Fail = exceeds tolerance</td>
<td>![ ]</td>
<td>![ ]</td>
</tr>
<tr>
<td>Max: .755 Min: .745</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
## Performance Project – CNC Turning

<table>
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<th>Evaluation Criteria</th>
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<th>Pass</th>
<th>Fail</th>
</tr>
</thead>
</table>
| 8. R.078 ± .005                                         | Pass = within tolerance  
Max: .083  
Min: .073  
Fail = exceeds tolerance | ☐   | ☐   |
| 9. ∅ .475 ± .005                                        | Pass = within tolerance  
Max: .480  
Min: .470  
Fail = exceeds tolerance | ☐   | ☐   |
| 10. R. 591                                              | Pass = within tolerance  
Max: .596  
Min: .586  
Location of R.591  
3.0504 ± .001  
Max: 3.0514  
Min: 3.0494  
Fail = exceeds tolerance | ☐   | ☐   |
| 11. .15 ± .020 (undercut width)                         | Pass = within tolerance  
Max: .170  
Min: .130  
Fail = exceeds tolerance | ☐   | ☐   |
| 12. Lengths 1.8750 ± .001 and .7000 ± .001              | Pass = within specified tolerance zone  
Fail = exceeds specified tolerance zone | ☐   | ☐   |
| 13. .08 X 45° (2 places)                                | Pass = within tolerance  
Max: .095 X 46°  
Min: .065 X 44°  
Fail = exceeds tolerance | ☐   | ☐   |
| 14. .04 X 45°                                            | Pass = within tolerance  
Max: .055 X 46°  
Min: .025 X 44°  
Fail = exceeds tolerance | ☐   | ☐   |
| 15. Location of R.670: 1.2890 ± .001                     | Pass = within specified tolerance zone  
Max: 1.2900  
Min: 1.2880  
Fail = exceeds specified tolerance zone | ☐   | ☐   |
| 16. Surface finish 63 microinches maximum                | Pass = surface finish 63 microinches or better  
Fail = surface finish exceeds 63 microinches | ☐   | ☐   |
| 17. R.670                                                | Pass = within specified tolerance zone  
Max: .675  
Min: .665  
Fail = exceeds specified tolerance zone | ☐   | ☐   |
| 18. No sharp edges, all outside corner radii are .020/.010| Pass = within the tolerance range  
Fail = sharp edges, exceed the tolerance range | ☐   | ☐   |
## Performance Project – CNC Turning

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<th>Pass</th>
<th>Fail</th>
</tr>
</thead>
<tbody>
<tr>
<td>19. All inside corner radii are .030 maximum</td>
<td>Pass = all inside corner radii .030 or less</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>Fail = corner radii exceed .030</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>20. No burrs</td>
<td>Pass = no burrs</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>Fail = burrs</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>21. Written program correct, final contour cut has to be long hand with no canned cycles</td>
<td>Pass = written program produces the part</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td></td>
<td>Fail = written program cannot produce the part</td>
<td>☐</td>
<td>☐</td>
</tr>
</tbody>
</table>

**END OF CNC TURNING EVALUATION**

*It is important to note that the part must be 100% within the tolerances listed on the print. The criteria listed here are a guide for instructors and supervisors. Not every dimension is included in this guide. Nonetheless, the completed part must be 100% within the specifications of the print. The print takes precedence over this guide when the parts are inspected by the MET-TEC committee. The part print and the Performance Affidavit should be sent along with the part to the MET-TEC for evaluation. Send to NIMS only the completed Performance Affidavit, signed by the MET-TEC members. A copy of the Performance Affidavit should be retained in the candidate’s file documenting completed performance for this credential.*