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.

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<table>
<thead>
<tr>
<th>Evaluation Criteria</th>
<th>Measurement Tool</th>
<th>Pass</th>
<th>Fail</th>
</tr>
</thead>
</table>
| 1. Thread 5/8 – 18 UNF 3A  
Pitch diameter:  
Max: .5889  
Min: .5854 | Pass = within tolerance  
Fail = exceeds tolerance | □ | □ |
| 2. ∅ 0.7500 ± .001 (right side of R.670)  
Max: .7510  
Min: .7490 | Pass = within tolerance  
Fail = exceeds tolerance | □ | □ |
| 3. ∅ 1.0236 ± .001  
Max: 1.0246  
Min: 1.0226 | Pass = within tolerance  
Fail = exceeds tolerance | □ | □ |
| 4. ∅ 1.1810 ± .001 (Datum A)  
Max: 1.1820  
Min: 1.1800 | Pass = within tolerance  
Fail = exceeds tolerance | □ | □ |
| 5. ∅ .945 ± .005  
Max: .950  
Min: .940 | Pass = within tolerance  
Fail = exceeds tolerance | □ | □ |
| 6. Length 6.22 ± .015  
Max: 6.235  
Min: 6.205 | Pass = within tolerance  
Fail = exceeds tolerance | □ | □ |
| 7. ∅ .750 ± .005  
Max: .755  
Min: .745 | Pass = within tolerance  
Fail = exceeds tolerance | □ | □ |
<table>
<thead>
<tr>
<th>Evaluation Criteria</th>
<th>Measurement Tool</th>
<th>Pass</th>
<th>Fail</th>
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</thead>
<tbody>
<tr>
<td>8. R.078 ± .005</td>
<td>Pass = within tolerance Fail = exceeds tolerance</td>
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<tr>
<td></td>
<td>Max: .083</td>
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<td></td>
<td>Min: .073</td>
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<td>9. ∅ .475 ± .005</td>
<td>Pass = within tolerance Fail = exceeds tolerance</td>
<td>☐</td>
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<tr>
<td></td>
<td>Max: .480</td>
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<tr>
<td></td>
<td>Min: .470</td>
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<tr>
<td>10. R. .591</td>
<td>Pass = within tolerance Fail = exceeds tolerance</td>
<td>☐</td>
<td>☐</td>
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<tr>
<td></td>
<td>Max: .596</td>
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<tr>
<td></td>
<td>Min: .586</td>
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<tr>
<td></td>
<td>Location of R.591</td>
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<td></td>
<td>3.0504 ± .001</td>
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<td>Max: 3.0514</td>
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<td></td>
<td>Min: 3.0494</td>
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<tr>
<td>11. .15 ± .020 (undercut width)</td>
<td>Pass = within tolerance Fail = exceeds tolerance</td>
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<td></td>
<td>Max: .170</td>
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<td></td>
<td>Min: .130</td>
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<tr>
<td>12. Lengths 1.7720 ± .001 and .7000 ± .001</td>
<td>Pass = within specified tolerance zone Fail = exceeds specified tolerance zone</td>
<td>☐</td>
<td>☐</td>
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<tr>
<td>13. .08 X 45° (2 places)</td>
<td>Pass = within tolerance Fail = exceeds tolerance</td>
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<td></td>
<td>Max: .095 X 46°</td>
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<td></td>
<td>Min: .065 X 44°</td>
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<tr>
<td>14. .04 X 45°</td>
<td>Pass = within tolerance Fail = exceeds tolerance</td>
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<td></td>
<td>Max: .055 X 46°</td>
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<td></td>
<td>Min: .025 X 44°</td>
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<td>15. Location of R,670: 1.2890 ± .001</td>
<td>Pass = within specified tolerance Fail = exceeds specified tolerance</td>
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<td></td>
<td>Max: 1.2900</td>
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<td></td>
<td>Min: 1.2880</td>
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<td>16. Surface finish 63 microinches maximum</td>
<td>Pass = surface finish 63 microinches or better Fail = surface finish exceeds 63 microinches</td>
<td>☐</td>
<td>☐</td>
</tr>
<tr>
<td>17. R.670</td>
<td>Pass = within specified tolerance zone Fail = exceeds specified tolerance zone</td>
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<tr>
<td></td>
<td>Max: .675</td>
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<td></td>
<td>Min: .665</td>
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<tr>
<td>18. No sharp edges, all outside corner radii are .020/.010</td>
<td>Pass = within the tolerance range Fail = sharp edges, exceed the tolerance range</td>
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</tbody>
</table>
## Performance Project – CNC Turning

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

**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.*
Notes:
1. REMOVE ALL BURRS
2. ALL INSIDE CORNER RADIi ARE .030 MAX
3. ALL OUTSIDE CORNER RADIUS ARE .010 - .020
4. CENTER PERMISSIBLE.
5. SURFACE FINISH ALL OVER. 63 ⟨√⟩

MACHINING SKILLS LEVEL II
Job Duty 2.22 & 2.23
CNC Programming and Operation - Turning

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN INCHES
INTERPRET DIMENSIONS AND
TOLERANCES PER ASME Y14M-1994

TOLERANCES
.XXX ± .005  .XXXX ± .0010
.X ± .01  ANGLES ± 1 DEG.

DESIGNER  DK  4/22/02  MATERIAL  COLD ROLL STEEL OR
LOW CARBON STEEL
1.5 DIA. X 6.3 INCHES

DWG CHK  DWG APPD

SCALE 3/4  DWG.#986002  SHEET 1 OF 1