

Evaluation Instructions

Machining Level II – CNC Milling

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 Milling

Materials:

CRS or low carbon steel 24.4 x 63.5 x 101.6 (mm)

Duty:

Operate a CNC milling machine.

Performance Standard:

Given a CNC mill create a qualified CNC program, setup and operate the mill, 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 mill with continuous path capability on 2½ axes.

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

Tooling: A 6" milling vise or greater, screws, studs, nuts, washers, and clamps sufficient to secure the vise, or the part to the table. Assorted parallels, ball peen, and composition hammers, assorted cutters and cutter adapters fitted to the machine spindle, files, magnetic base for indicators, soft jaws for the vise and assorted cutters.

Measuring Inst: Required micrometers, combination set, dial indicator, 6" rule, a 6" vernier, dial, or electronic caliper, adjustable parallels, edge finder, appropriate tools for determining squareness, and surface finish comparison standards.

Reference: Machinery's Handbook, operator's manual of the machine tool.

Performance Assessment Worksheet Machining Level II – CNC Milling

INSTRUCTIONS: Rate the candidate’s performance for the *CNC Milling* 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.

Candidate Name

Evaluation Date

Performance Project – CNC Milling			
Evaluation Criteria		Pass	Fail
1. M8 X 6H (2 places) Full thread depth 12.0 ± 1.0 Max: 13.0 Min: 11.0	Pass = within tolerance Fail = exceeds tolerance	<input type="checkbox"/>	<input type="checkbox"/>
2. Height $10.0 +1.0/-0.0$ Max: 11.0 Min: 10.0	Pass = within tolerance Fail = exceeds tolerance	<input type="checkbox"/>	<input type="checkbox"/>
3. Height 24.4 ± 0.2 Max: 24.6 Min: 24.2	Pass = within tolerance Fail = exceeds tolerance	<input type="checkbox"/>	<input type="checkbox"/>
4. Width 40.00 Profile of a surface within a 0.08 tolerance zone and to datum A	Pass = within specified tolerance zone Fail = exceeds specified tolerance zone	<input type="checkbox"/>	<input type="checkbox"/>
5. Width 20.00 Profile of a surface within a 0.08 tolerance zone and to datum A	Pass = within specified tolerance zone Fail = exceeds specified tolerance zone	<input type="checkbox"/>	<input type="checkbox"/>
6. Width 74.88 Profile of a line within a 0.08 tolerance zone to datum A	Pass = within specified tolerance zone Fail = exceeds specified tolerance zone	<input type="checkbox"/>	<input type="checkbox"/>
7. Height 50.00 Profile of a line within a 0.08 tolerance zone to datum A	Pass = within specified tolerance zone Fail = within specified tolerance zone	<input type="checkbox"/>	<input type="checkbox"/>
8. Width 90.0 Profile of a line within a 0.08 tolerance zone to datum A	Pass = within specified tolerance zone Fail = exceeds specified tolerance zone	<input type="checkbox"/>	<input type="checkbox"/>

Performance Project – CNC Milling

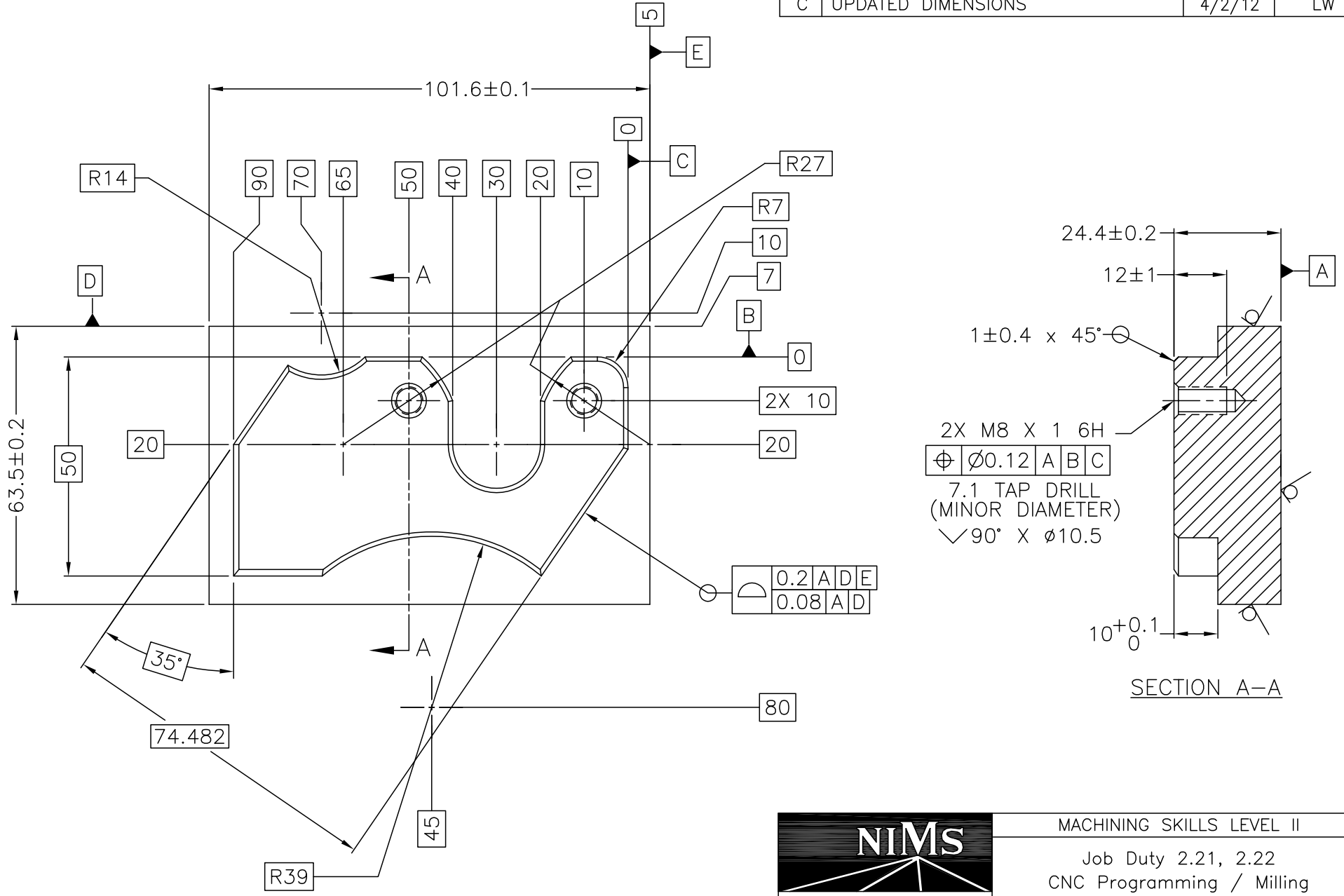
Evaluation Criteria		Pass	Fail
9. Chamfer $1 \pm 0.4 \times 45^\circ$ Max: $1.4 \times 46^\circ$ Min: $0.6 \times 44^\circ$	Pass = within tolerance Fail = exceeds tolerance	<input type="checkbox"/>	<input type="checkbox"/>
10. Location of M8 X 1 6H threaded hole (2 places) True position with a tolerance zone diameter of 0.12 to datum A, B and C	Pass = within specified tolerance zone Fail = exceeds specified tolerance zone	<input type="checkbox"/>	<input type="checkbox"/>
11. 7.0 ± 0.1 (on top) Max: 7.1 Min: 6.9	Pass = within tolerance Fail = exceeds tolerance	<input type="checkbox"/>	<input type="checkbox"/>
12. 5.0 ± 0.1 (on right side) Max: 5.1 Min: 4.9	Pass = within tolerance Fail = exceeds tolerance	<input type="checkbox"/>	<input type="checkbox"/>
13. R7 Profile of a surface with a 0.08 tolerance zone and to datum A	Pass = within specified tolerance zone Fail = exceeds specified tolerance zone	<input type="checkbox"/>	<input type="checkbox"/>
14. R26.9258, R14.1422 and R39.0512 Profile of a surface with a 0.08 tolerance zone and to datum A	Pass = within specified tolerance zone Fail = exceeds specified tolerance zone	<input type="checkbox"/>	<input type="checkbox"/>
15. Surface finish 3.2 micrometers maximum	Pass = surface finish 3.2 micrometers or better Fail = surface finish exceeds 3.2 micrometers	<input type="checkbox"/>	<input type="checkbox"/>
16. Edges are broken and burrs removed 0.4 maximum	Pass = no sharp edges and broken edges at or less than 0.4 Fail = sharp edges and broken edges exceeds 0.4	<input type="checkbox"/>	<input type="checkbox"/>
17. Math work turned in It is obvious that the individual did all the math on their own Easy to follow calculations Work shows an understanding of basic TRIG. Turn in print and all written work		<input type="checkbox"/>	<input type="checkbox"/>
END OF CNC – CNC MILLING 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. SURFACE FINISH TO BE A MAXIMUM OF 3.2 MICROMETERS
2. BREAK ALL EDGES 0.4 MAX.

REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
A	UPDATED DRAWING AND TITLE BLOCK	3/7/05	LW
B	UPDATED DIMENSIONS	4/20/05	LW
C	UPDATED DIMENSIONS	4/2/12	LW



DO NOT SCALE DRAWING

<p>UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN MILLIMETERS INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M-1994</p> <p>TOLERANCES .X ± 0.1 .XX ± 0.08 ANGLES ± 1 DEG.</p>	MACHINING SKILLS LEVEL II		
	Job Duty 2.21, 2.22 CNC Programming / Milling		
DESIGNER	DK	12/17/01	MATERIAL COLD ROLL STEEL OR LOW CARBON STEEL 24.4 X 63.5 X 101.6
DWG CHK			
DWG APPD			
SCALE	5/8	DWG.#98801	SHEET 1 OF 1