

# Performance Standards

## Vertical Milling Level I

### Material

Mild steel or low carbon steel 1.5" x 2" x 2.6"

### Duty

Setup and operate vertical milling machines. Perform routine milling, and location of hole centers within +/- .005".

### Performance Standard

Given raw material, print, hand, precision, and cutting tools, as well as access to an appropriate vertical milling machine and its accessories, produce a part matching the blueprint specifications using appropriate trade techniques and speeds and feeds. The part specified should require squaring up from the raw state, have at least one milled slot, require the location of at least two drilled and reamed holes within positional tolerance of .014" and have three steps controlled by tolerances of +/- .005".

### Other Evaluation Criteria

1. Finishes are at least 125 Ra microinches.
2. No sharp edges.

*Accuracy Level:* +/- .015 on all fractions, +/- .005 on all decimals unless otherwise specified on the blueprint.  
Finishes Surfaces to be square within .005 over 4". Finished surfaces are to be 125 Ra microinches unless otherwise specified.

### Assessment Equipment and Material

*Workstation:* A common workbench, a vertical mill. Table capacity of approximately 12"X36".

*Material:* A part matching the material requirements of the vertical milling print, material: Mild 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 soft-faced hammers, assorted cutters and cutter adapters fitted to the machine spindle, files, magnetic base for indicators, soft jaws for the vise, drill chuck, drills, reamers, combination drill and countersink or spotting drill, countersink, and edge finder. Coolants and cutting oil.

*Measuring*

*Instruments:* 0-3 Micrometers, combination set, dial indicator, 6" rule, a 6" vernier, dial, or electronic caliper, adjustable parallels, and depth micrometer, and surface finish comparison plates.

Pingages. .123", .124", .125", .126", .127"

Solid square

1/4 - 20 UNC 2B plug gage

Telescopic gage .750

Small hole gage

*Reference:*

Machinery's Handbook.

# Performance Assessment Worksheet

## Vertical Milling Level I

**INSTRUCTIONS:** Rate the candidate's performance for the Milling project according to the sixteen (16) criteria below. The checklist below represents a listing of the only 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/trainee must correct or redo the project.

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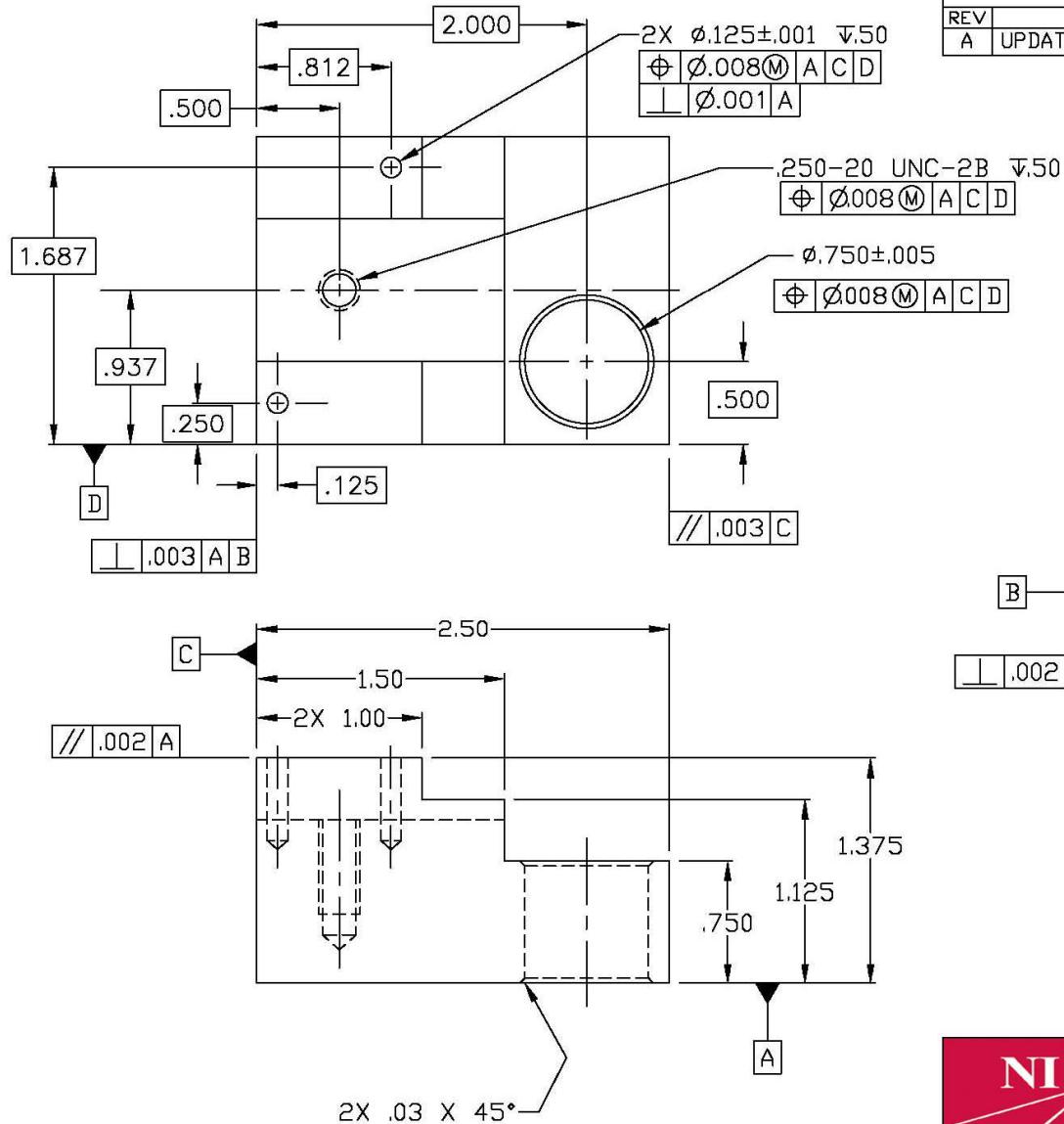
Candidate Name

Evaluation Date

<b>Performance Project – Milling</b>		<b>Pass</b>	<b>Fail</b>
<b>Evaluation Criteria</b>			
1. Lengths $2.50 \pm .015$ , $1.50 \pm .015$ , $1.00 \pm .015$	Pass = within tolerance Fail = out of tolerance	<input type="checkbox"/>	<input type="checkbox"/>
2. Heights $1.375 \pm .005$ , $1.125 \pm .005$ , $.750 \pm .005$ , $1.000 \pm .005$	Pass = within tolerance Fail = out of tolerance	<input type="checkbox"/>	<input type="checkbox"/>
3. Width $1.875 \pm .005$	Pass = within tolerance Fail = out of tolerance	<input type="checkbox"/>	<input type="checkbox"/>
4. All surfaces are $\square$ or $\//$ within specified tolerance zones in the feature control frames to their respective datums	Pass = within tolerance zones Fail = exceeds tolerance zones	<input type="checkbox"/>	<input type="checkbox"/>
5. $\emptyset .750 \pm .005$ bore	Pass = within tolerance Fail = out of tolerance	<input type="checkbox"/>	<input type="checkbox"/>
6. Position of $\emptyset .750$ bore within .008 at MMC to datums A, C and D	Pass = within tolerance Fail = out of tolerance	<input type="checkbox"/>	<input type="checkbox"/>
7. Position of $\emptyset .25$ - 20 UNC-2B thread within .008 to datums A, C, and D	Pass = within tolerance Fail = out of tolerance	<input type="checkbox"/>	<input type="checkbox"/>

<b>Performance Project – Milling</b>		<b>Pass</b>	<b>Fail</b>
<b>Evaluation Criteria</b>			
8. Position of .875 slot within .005 tolerance zone to datums A & B	Pass = within tolerance Fail = out of tolerance	<input type="checkbox"/>	<input type="checkbox"/>
9. Position of 2 x .125" holes within .008 at MMC to datums A, C, & D	Pass = within tolerance Fail = out of tolerance	<input type="checkbox"/>	<input type="checkbox"/>
10. .125 hole diameter $\pm$ .001 (both holes)	Pass = within tolerance Fail = out of tolerance	<input type="checkbox"/>	<input type="checkbox"/>
11. Tap for .25 – 20 x .50 deep min. (No break out at the bottom of the hole)	Pass = within tolerance zones Fail = exceeds tolerance zones	<input type="checkbox"/>	<input type="checkbox"/>
12. .031 deep $\times$ 45° chamfers	Pass = within tolerance Fail = out of tolerance	<input type="checkbox"/>	<input type="checkbox"/>
13. Surface finish, no ground surfaces	Pass = 125 Ra microinches or better Fail = over 125 Ra microinches	<input type="checkbox"/>	<input type="checkbox"/>
14. Sharp edges .015 max. and holes countersunk .031 max.	Pass = no sharp edges, within maximum allowance Fail = sharp edges	<input type="checkbox"/>	<input type="checkbox"/>
<b>END OF MILLING EVALUATION</b>			

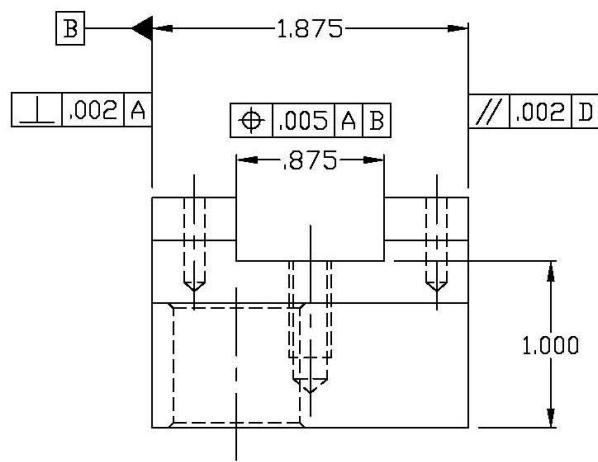
*It is important to note that the part must be 100% within the tolerances listed on the print. The criteria listed here are a guide for instructors and supervisors. Not every dimension is included in this guide. Nonetheless, the completed part must be 100% within the specifications of the print. The 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.*



REVISIONS			
REV	DESCRIPTION	DATE	APPROVED
A	UPDATED DRAWING AND TITLE BLOCK	3/7/05	LW

## Notes:

1. FINISH ALL OVER 125 MICROINCHES MAX
2. BREAK ALL SHARP EDGES .015" MAX
3. COUNTERSINK ALL HOLES .03" MAX UNLESS SHOWN



MACHINING SKILLS LEVEL I

## Job Duty 2.5 & 2.6 Vertical Milling Operation

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES INTERPRET DIMENSIONS AND TOLERANCES PER ASME Y14.5M-1994		DESIGNER	DK	8/1/01	MATERIAL
		DWG CHK			COLD ROLL STEEL OR MILD STEEL
		DWG APPD			
TOLERANCES		SCALE	FULL	DWG. #98301	I
$.X \pm .032$ $.XXX \pm .005$				SHEET 1 OF 1	
$.XX \pm .015$ ANGLES $\pm 1$ DEG.					
FRACTIONS $\pm 1/64$					

**DO NOT SCALE DRAWING**

## **NIMS PROCEDURAL REQUIREMENTS**

1. SUBMIT THIS PRINT AND WORKPIECE ALONG WITH THE PERFORMANCE AFFIDAVIT FOR EVALUATION