

Evaluation Instructions

Machining Level II Grinding: Flats and Angles

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

Grinding: Flats and Angles

Materials:

Steel Harden 54-58 Rc – Pre-Milled for Grinding 1.00” x 1.500” x 2.000”

Duty:

Set up and perform the finish surface grinding of flat surfaces at simple angles with respect to one another. Dress the wheel as necessary.

Performance Standard:

Given a block roughed out on a mill, a process plan, part print, hand and precision tools, and choice of a grinding wheels, as well as access to a surface grinder and its accessories, dress the wheel, grind the specified radii and angled surfaces to a finish matching the process plan and the part print specifications using appropriate trade techniques. The part specified will be in the semi-finished state having been roughed out. Finishing the part will require the precision finishing of the specified surfaces of the block to tolerances common to precision grinding for squareness, size, and surface finish characteristics.

Accuracy Level: +/- .0005 on all decimals unless otherwise specified on the part print.
Square within .0001 over 1". Angles to be held within +/-15'. Radii +/- .001

Assessment Equipment and Material:

Workstation: A standard workbench with a precision surface plate, a surface grinder with a suitable magnetic chuck.

Material: A part matching the material requirements of the surface grinding part print, material: Mild steel.

Tooling: A magnetic sine chuck, sine bars, assorted parallels, a suitable angle plate or precision grinding vise, and assorted clamps, composition hammer, assorted grinding wheels suitable for mounting to the spindle, files, magnetic base for indicators, surface gage of sufficient size, and diamond dresser.

Measuring Inst: Required micrometers, combination set, dial test indicator, 6" rule, a 6" vernier, bevel vernier protractor, inspection sine plates and/or sine bars, dial or electronic caliper, gage blocks, adjustable parallels, depth micrometer set, master square or magnetic square, surface condition comparison gages. radius and angle dressers, Optical Comparator.

Performance Assessment Worksheet

Machining Level II - Grinding: Flats and Angles

INSTRUCTIONS: Rate the candidate's performance for the *Grinding: Flats and Angles* 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 – Grinding: Flats and Angles			
Evaluation Criteria		Pass	Fail
1. $.9750 \pm .0005$ Max: .9755 Min: .9745	Pass = within tolerance Fail = exceeds tolerance	<input type="checkbox"/>	<input type="checkbox"/>
2. Slot depth $.187 \pm .001$ Max: .188 Min: .186	Pass = within tolerance Fail = exceeds tolerance	<input type="checkbox"/>	<input type="checkbox"/>
3. $1.8600 \pm .0005$ Max: 1.8605 Min: 1.8595	Pass = within tolerance Fail = exceeds tolerance	<input type="checkbox"/>	<input type="checkbox"/>
4. $1.4750 \pm .0005$ Max: 1.4755 Min: 1.4745	Pass = within tolerance Fail = exceeds tolerance	<input type="checkbox"/>	<input type="checkbox"/>
6. Basic dimension of a .200 full convex radius (no grinding steps) tangent to each side Profile of a surface with a TIR of .001 to datum A and C	Pass = within specified tolerance zone Fail = exceeds specified tolerance zone	<input type="checkbox"/>	<input type="checkbox"/>
7. $.375 \times .375 \pm .001$ (rear) Slot width and depth Max: .376 Min: .374	Pass = within tolerance Fail = exceeds tolerance	<input type="checkbox"/>	<input type="checkbox"/>
8. $.565 \pm .001$ slot width Max: .566 Min: .564	Pass = within tolerance Fail = exceeds tolerance	<input type="checkbox"/>	<input type="checkbox"/>
9. True position of the .565 slot within a tolerance zone of .001 to datum A and C (apply .930 basic dimension)	Pass = within specified tolerance zone Fail = exceeds specified tolerance zone	<input type="checkbox"/>	<input type="checkbox"/>

Performance Project – Grinding: Flats and Angles			
Evaluation Criteria		Pass	Fail
10. 45° basic angularity with a tolerance zone of .003 to datum A and B	Pass = within specified tolerance zone Fail = exceeds specified tolerance zone	<input type="checkbox"/>	<input type="checkbox"/>
11. All unspecified inside radii: .010 maximum	Pass = radii equal to or below .010 Fail = radii exceed .010	<input type="checkbox"/>	<input type="checkbox"/>
12. Flatness of datum A within a .001 tolerance zone	Pass = Within specified tolerance zones Fail = exceeds specified tolerance zones	<input type="checkbox"/>	<input type="checkbox"/>
13. Surface finish: 16 microinch maximum	Pass = 16 microinches or better Fail = over 16 microinches	<input type="checkbox"/>	<input type="checkbox"/>
14. Sharp edges .015 maximum with no sharp edges	Pass = no sharp edges and broken edges .015 or under Fail = sharp edges or broken edges exceeding .015	<input type="checkbox"/>	<input type="checkbox"/>
15. Datum B perpendicular to datum A within a .0002 tolerance zone	Pass = within specified tolerance zone Fail = exceeds specified tolerance zone	<input type="checkbox"/>	<input type="checkbox"/>
16. Datum C perpendicular to datum A and B within a .0003 tolerance zone	Pass = within specified tolerance zone Fail = exceeds specified tolerance zone	<input type="checkbox"/>	<input type="checkbox"/>
17. Top surface parallel to datum A within a .001 tolerance zone	Pass = within specified tolerance zone Fail = exceeds specified tolerance zone	<input type="checkbox"/>	<input type="checkbox"/>
18. Angle length (Y-axis) .250 ± .001 Max: .251 Min: .249	Pass = within specified tolerance Fail = exceeds specified tolerance	<input type="checkbox"/>	<input type="checkbox"/>
19. No milling marks found on ground surfaces	Pass = all ground surfaces Fail = grinding leaves milling marks	<input type="checkbox"/>	<input type="checkbox"/>
END OF GRINDING – FLATS AND ANGLES 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.

