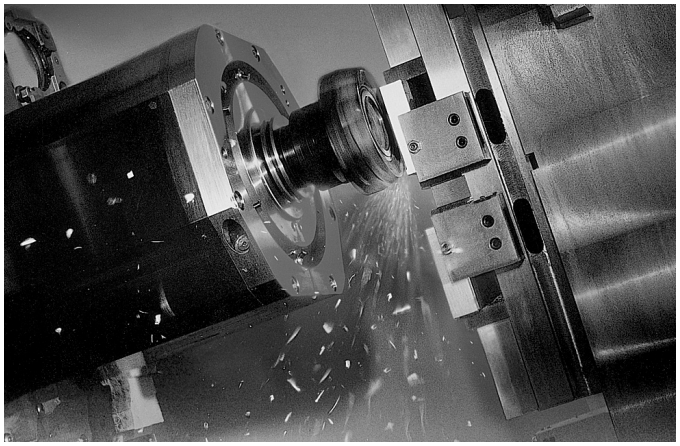


Chapter 5

Layout Work

LEARNING OBJECTIVES

After studying this chapter, students will be able to:

- Explain why layouts are needed.
- Identify common layout tools.
- Use layout tools safely.
- Make basic layouts.
- List safety rules for layout work.

INSTRUCTIONAL MATERIALS

Text: pages 81–90
Test Your Knowledge Questions, page 89
Workbook: pages 33–38
Instructor's Resource: pages 93–100
Guide for Lesson Planning
Research and Development Ideas
Reproducible Masters:
5-1 Typical Layout Problem
5-2 Steps in Making the Layout
5-3 Test Your Knowledge Questions
Color Transparency (Binder/CD only)

GUIDE FOR LESSON PLANNING

The chapter serves as an introduction to basic layout tools and materials as well as making a layout. Prepare for the lesson by having the following equipment available:

- Sections of clean metal to demonstrate layout techniques.
- Layout dye, scribers, hermaphrodite caliper, divider, surface gage, selection of squares, combination set, hammer, and punches.

For a demonstration on precision layout work, have the following equipment available:

- Vernier height gage, right angle plate, parallels, V-blocks, straight edge, Vernier bevel protractor, and surface plate.

Have students read and study the chapter paying attention to the illustrations. Discuss and demonstrate the layout tools they will be using. This should include the following:

- Why layouts are necessary.
- Safe use of layout tools.
- How to prepare metal for layout.
- Proper use of various layout tools.
- Steps in making a simple layout.
- Laying out angles.
- The use of parallels, V-blocks, and angle plate in layout work.
- Proper way to use and care for Vernier type layout tools.
- Care of the surface plate.
- Safety rules to be observed when making layouts.

Technical Terms

Review the terms introduced in the chapter. New terms can be assigned as a quiz, homework, or extra credit. The terms are also listed at the beginning of the chapter.

divider
hardened steel square
layout dye
plain protractor
reference line
scriber
straightedge
surface gage
surface plates
V-blocks

Review Questions

Assign *Test Your Knowledge* questions. Copy and distribute Reproducible Master 5-3 or have students use the questions on page 89 and write their answers on a separate sheet of paper.

Workbook Assignment

Assign Chapter 5 of the ***Machining Fundamentals*** *Workbook.*

Research and Development

Discuss the following topics in class or have students complete projects on their own.

1. Make a display panel showing samples of the various layout fluids used by industry. Use a clear plastic spray to prevent the scribed lines from rusting and the coatings from rubbing off.
2. Prepare a sample of a good layout job. Develop it into a bulletin board display. Use colored twine or yarn running from the sample to printed notations explaining the various aspects that indicate a good layout job.
3. Write a paper on how surface plates are made. Secure literature from the various manufacturers to illustrate the paper. Also include:
   - How surface plate grades are determined.
   - Why cast iron, steel, and granite are used to make them rather than other materials.
   - How to take care of the surface (maintain accuracy, keep it clean, etc.)
4. Prepare a series of overhead projector transparencies, 35 mm slides, or a video to show the correct sequence for producing a good layout job.

TEST YOUR KNOWLEDGE ANSWERS, Page 89

1. Layout dye.
2. To locate and mark out lines, circles, arcs, and points for drilling holes. They show machinist where to machine.
3. scriber
4. divider
5. trammel
6. Lines will rub off and would be too wide.
7. surface plate
8. Evaluate individually. Refer to Section 5.2.
9. V-blocks
10. straightedge
11. center head
12. Vernier protractor
13. prick, center
14. Any three of the following:

    Never carry an open scriber, divider, trammel, or hermaphrodite caliper in your pocket.

    Always cover sharp points with a cork when the tool is not being used.

    Wear goggles when grinding scriber points.

    Get help when you must move heavy items, such as angle plates or V-blocks.

    Remove all burrs and sharp edges from stock before starting layout work.

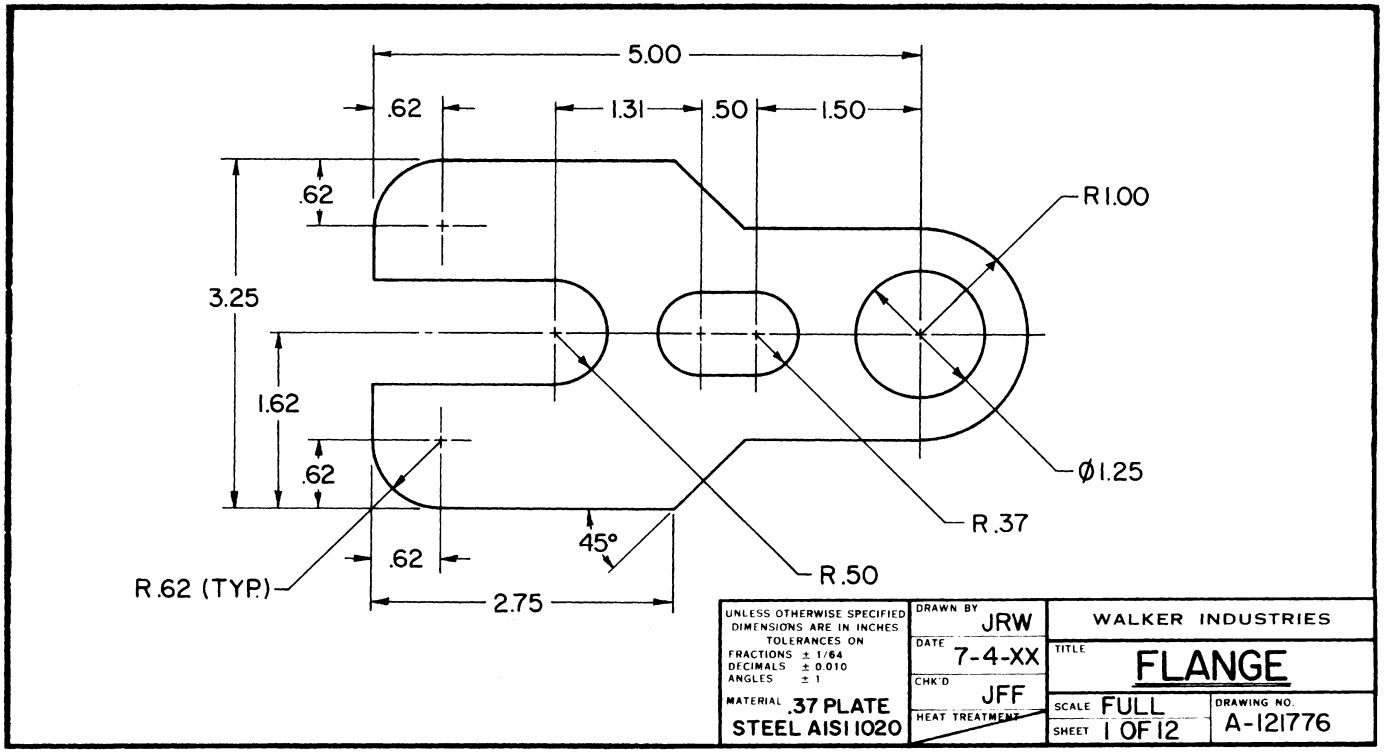
WORKBOOK ANSWERS, Pages 33–38

1. layout dye
2. d. All of the above.
3. b. can be used to locate the center of irregularly shaped stock
4. e. None of the above.
5. a. trammel
6. b. parallel
7. flatness
8. c. plain protractor
9. a. universal bevel
10. b. protractor depth gage
11. a. double square
12. d. All of the above.
13. bevel protractor
14. Any order: never carry an open scriber, divider, trammel, or hermaphrodite caliper

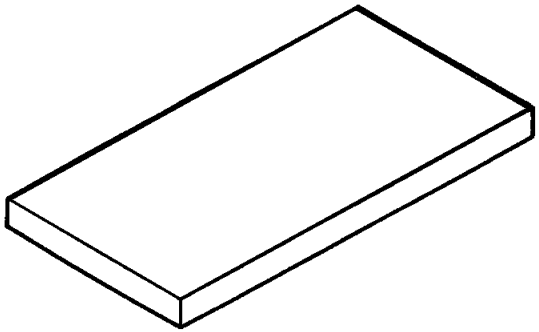
in your pocket; always cover sharp points with a cork when the tool is not being used; wear goggles when grinding scriber points; get help when you must move heavy items, such as angle plates or V-blocks; remove all burrs and sharp edges from stock before starting layout work.

15. Trammel
16. Protractor depth gage
17. Universal bevel
18. Evaluate individually.
19. Rule, scribe, square, divider, prick punch, center punch, hammer.
20. Evaluate individually. Refer to Section 5.4.

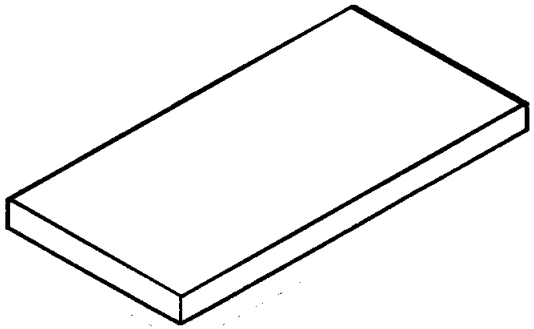
Typical Layout Problem



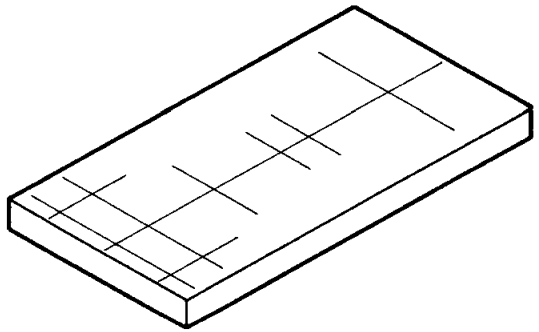
Steps in Making the Layout



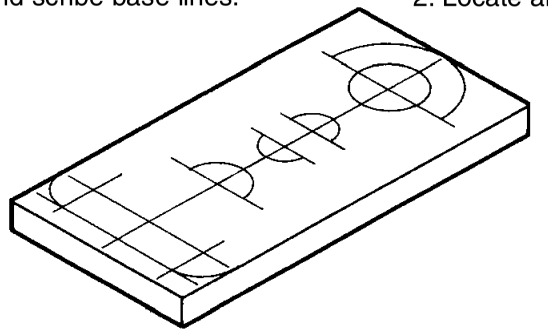
1. Locate and scribe base lines.



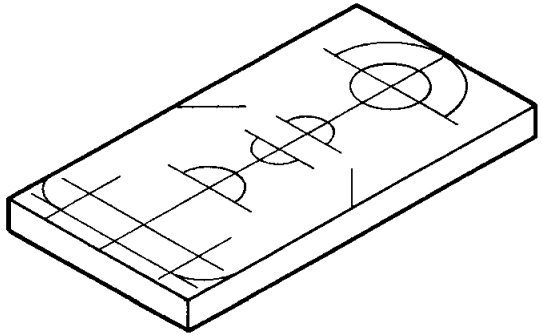
2. Locate all circles and arc centerlines.



3. Scribe in all circles and arcs.



4. Locate and scribe in angular lines.



5. Connect remaining points.

Layout Work

Name: _____ Date: _____ Score: _____

1. What is used to make layout lines easier to see? 1. _____
2. Why are layout lines used? _____

   _____

   _____
3. Straight layout lines are drawn with a _____. 3. _____
4. Circles and arcs are drawn on work with a _____. 4. _____
5. Large circles and arcs are drawn with a _____. 5. _____
6. What is wrong with using a pencil to make layout lines on metal? 6. _____

   _____
7. A _____ _____ is the flat granite or steel surface used for layout and inspection work. 7. _____
8. What layout operations can be performed with a combination set?

   _____

   _____

   _____

   _____
9. Round stock is usually supported on _____ for layout and inspection. 9. _____
10. Long flat surfaces can be checked for trueness with a _____. 10. _____
11. The center of round stock can be found quickly with the _____ and rule of a combination set. 11. _____
12. Angular lines that must be very accurate should be laid out with a _____. 12. _____
13. The _____ punch has a sharper point than the _____ punch. 13. _____
14. List three safety precautions that you should observe when doing layout work.

    _____

    _____

    _____