

# Freehand Lettering Techniques and ASME Standards

**Unit:** Media, Equipment, and Reproduction Methods

**Problem Area:** Hand Lettering

**Lesson:** Freehand Lettering Techniques and ASME Standards

- **Student Learning Objectives.** Instruction in this lesson should result in students achieving the following objectives:

- 1 Explain ASME and ASME standards.**
- 2 Practice freehand lettering techniques.**

- **Resources.** The following resources may be useful in teaching this lesson:

E-unit(s) corresponding to this lesson plan. CAERT, Inc. <http://www.mycaert.com>.

“Basics of Engineering Drawing,” *ednotebook*. Accessed July 31, 2018.  
<http://ednotebook.hostgator.co.in/basics-of-engineering-drawing>.

“Engineering Lettering,” *Union County Vocational-Technical Schools*. Accessed July 31, 2018. <https://www.ucvts.tec.nj.us/cms/lib/NJ03001805/Centricity/Domain/611/Lesson%203%20Lettering.pdf>.

“How Do I Read And Understand ASME Standards?” *Quora.com*. Accessed July 31, 2018.  
<https://www.quora.com/How-do-I-read-and-understand-ASME-standards>.

“Line Conventions and Lettering: Engineering Drawing and Related Documentation Practices,” *The American Society of Mechanical Engineers (ASME)*. Accessed July 31, 2018.  
[http://gost-snip.su/download/asme\\_y14\\_22008\\_line\\_conventions\\_and\\_lettering](http://gost-snip.su/download/asme_y14_22008_line_conventions_and_lettering).



## ■ **Equipment, Tools, Supplies, and Facilities**

- ✓ Overhead or PowerPoint projector
- ✓ Visual(s) from accompanying master(s)
- ✓ Copies of sample test, lab sheet(s), and/or other items designed for duplication
- ✓ Materials listed on duplicated items
- ✓ Computers with printers and Internet access
- ✓ Classroom resource and reference materials

## ■ **Key Terms.** The following terms are presented in this lesson (shown in bold italics):

- ▶ ASME
- ▶ ASME standards
- ▶ font
- ▶ freehand lettering
- ▶ freehand sketch
- ▶ lettering
- ▶ single stroke Gothic lettering
- ▶ standard
- ▶ technical lettering
- ▶ technique

## ■ **Interest Approach.** Use an interest approach that will prepare the students for the lesson. Teachers often develop approaches for their unique class and student situations. A possible approach is included here.

*Show students examples of excellent and poor freehand lettering. Have students visit <http://media.scc.losrios.edu/FitzpaK/300/Lettering.pdf>. The examples shown on pages 7 and 9 can be used to illustrate correct and incorrect freehand letter spacing. Explain the importance of producing standard, easily readable lettering. Open a dialogue about the purpose and functions of ASME and the ASME standards.*

# CONTENT SUMMARY AND TEACHING STRATEGIES

**Objective 1:** Explain ASME and ASME standards.

**Anticipated Problem:** What is ASME? What are the ASME standards?

## I. ASME Standards

A. **ASME** (The American Society of Mechanical Engineers) is a professional association that promotes the art, science, and practice of multidisciplinary engineering and allied sciences around the globe. ASME provides continuing education, training, professional development, codes and standards, research and other outreach forms. A **standard** is a set of technical definitions, instructions, rules, guidelines, or characteristics that provide consistent and comparable results. **ASME standards** establish the line and lettering practices for use in the preparation of engineering drawings, including the recognition of the requirements of CAD and manual preparation for their reduction and reproduction.

1. **ASME LETTERING STANDARD:** The ASME standard for lettering is the “Line Conventions and Lettering Standard Y14.2-2014.” Topics addressed under this section for lettering include:
  - a. Lettering type
  - b. Letter style
  - c. Upper and lowercase letters
  - d. Letter height
  - e. Letter spacing
  - f. Legibility
2. **FONT: *Single stroke Gothic lettering*** is a sans serif font formed by a series of short strokes: a typeface with no serifs (small lines at the end of a letter or number character). Single stroke Gothic lettering is the common font for free-hand lettering is opaque with well-spaced characters. The term “single stroke” means that the width of the stroke of the pencil is also the width of the stem of the letter whether drawn horizontally, obliquely, or vertically. The same letter font and style should be maintained throughout a drawing/set of drawings. A **font** is a specific typeface of a particular size and style.
  - a. Popular sans serif fonts are Helvetica, Arial, Geneva, and Avant Garde.
  - b. Popular serif fonts are Times New Roman, Courier, and Palatino.
3. **LETTERING STYLE:** The lettering style should be drawn consistently for all drawings/drawing sets: vertical (straight up) or inclined (leaning) lettering.
  - a. The preferred slope for the inclined characters is 68° from the horizontal.
  - b. Upper case letters are generally used for all freehand lettering on drawings unless lower case letters are required.

4. LETTER HEIGHTS: Minimum letter heights vary depending on what they indicate. For example:
  - a. Drawing Title: The drawing title's size and number, and any revision notes and code information, should be a minimum height of 6 mm ( $\frac{1}{4}$ -inch) on sheet sizes of A0 and A1. The minimum height of sheet sizes A2, A3, and A4 are a minimum of 3 mm ( $\frac{1}{8}$ -inch).
  - b. Section and View: Section and view letters and numerals in borders and zone letters is a minimum of 6mm.
  - c. Heading and Other Characters: The drawing block heading is a minimum of 2.5 mm. All other characters are a minimum of 3 mm ( $\frac{1}{8}$ -inch).
5. LETTERS WITHIN WORDS: The letters within words are spaced so the background areas between the letters are approximately equal, and words are clearly separated. For example:
  - a. Two numbers having a decimal between them have a minimum of two-thirds the height of the letter.
  - b. The horizontal (or vertical) spaces between lines of letters has a maximum height equal to that of the lettering and a minimum height equal to one-half of the lettering height.
6. LEGIBILITY: The basic drawing requirement for all letters is that each produces fully legible (readable, clear) copies.

**Teaching Strategy:** Many techniques can be used to help students master this objective. Have students visit <http://media.scc.losrios.edu/FitzpaK/300/Lettering.pdf>. The examples shown on pages 7 and 9 can be used to illustrate correct and incorrect use of letter, word, and line spacing in freehand lettering. Use VM-A to illustrate serif and sans serif style. Students could research examples of freehand lettering to compare and use as a reference. YouTube has several "how to" tutorials. Introduce the ASME standard for lettering: "Line Conventions and Lettering standard (Y14.2-2014)" and discuss its importance.

**Objective 2:** Practice freehand lettering techniques.

**Anticipated Problem:** What is lettering? What is freehand lettering? What are lettering tips for beginners?

## II. Lettering techniques

- A. **Lettering** is the creation of hand-drawn letters applied to an object or surface. A **technique** is the process of carrying out a particular task, especially the execution or performance of an artistic work or a scientific procedure. In technical drawings, lettering is used to provide titles, dimensions, notes, and other details to a freehand sketch. It adds detail to the basic ideas and concepts of a freehand sketch. A **freehand sketch** is the initial transfer of an idea from an engineer's abstract idea into a 2D and/or 3D working drawing.

1. **Freehand lettering** is drawing or executing legible letters without the assistance of tools: guides, measurement tools, and other aides. In design and drafting freehand lettering is typically drawn in a “Gothic” style with the following characteristics:
    - a. Consistent/constant line thickness
    - b. “Straight Gothic” (vertical strokes perpendicular to the baseline) or “inclined Gothic” (vertical strokes at about 70 to 75°).
  2. **Technical lettering** is the process of forming letters and other characters for a mechanical drawing.
  3. Standard lettering techniques require use of the appropriate pencil. Pencils ideal for lettering are grades H, HB, and F. [These choices are “in the middle” in terms of softness and hardness.]
    - a. The pencil is held and positioned at an angle: approximately 65 to 75° off the paper. Pencil lead wears down during drawing, so holding the pencil at an angle is important.
    - b. The pencil is twisted (or slowly spun) in the fingers as each stroke is drawn. In this way the tip size remains the same. For example, should the pencil be held at 90° to the paper and not spun, the pencil tip quickly wears down. As a result, the beginning of the stroke will be thinner than the end of the stroke.
- B. Freehand lettering technique tips
1. TIP 1: Determine the angle that works best and practice drawing letters and numbers while rotating the pencil at an angle.
  2. TIP 2: Practice using the arm and wrist rather than moving fingers. Movement of the fingers tends to create arcs rather than straight lines.
  3. TIP 3: Freehand lettering is accomplished with a pulling rather than a pushing motion of the pencil. Pushing tends to curve lines in a forced direction.
  4. TIP 4: Each line or arc of the letter or the number is completed in a single stroke. For example:
    - a. An uppercase “A” is drawn in three strokes.
      - (1) The first stroke starts from the top center of the “A” down to the left.
      - (2) The second stroke is drawn from the top center of the “A” down to the bottom right.
      - (3) The third stroke is straight across the center of the two drawn lines.
    - b. An upper and lower case “O” takes two strokes and, with practice, one stroke.
      - (1) The stroke for the left side of the arc is from a top starting point to the bottom.
      - (2) The second stroke is drawn from the top starting point around the right to the bottom.
      - (3) With some practice an “O” can be made in one stroke.

- c. Fractions are created with a division line (/) and the whole fraction is usually twice the height of regular numbers. Numbers in the fraction do not touch the division line.
5. TIP 5: To achieve the desired line thickness takes practice. Beginners must practice until they “feel” how much pressure to apply to the lead to achieve the desired line thickness.
6. TIP 6: Height-to-width ratio is an important consideration in freehand lettering. All the letters for technical drawings should be consistent: none visibly thinner or wider than other letters or numbers.
  - a. Condensed letters are narrow compared to their height.
  - b. Extended letters are wide compared to their height.
7. TIP 7: Spacing of letters and numbers is critical to ease of reading. Most letters have equal spacing in a word. The amount of background space (white space between strokes) and the letter itself (black strokes) have equal spacing in a word. Balancing the perceived spacing of letters and numbers can be difficult. Some letters and numbers do not appear to occupy exactly the same space or have the same “spread” as other characters in the line. There are times the line may appear unbalanced. Learning to visually space different letters takes practice.

**Teaching Strategy:** *Many techniques can be used to help students master this objective. To illustrate basic freehand lettering strokes, show the examples on pages 2, 20, and 21 at <https://www.ucvts.tec.nj.us/cms/lib5/NJ03001805/Centricity/Domain/611/Lesson%203%20Lettering.pdf>. At this same website, show the examples on page 23 to illustrate straight and curved freehand letters and numbers. Use VM–B to illustrate technical lettering available in AutoCAD. Have the students practice drawing straight and curved lines strokes for letters and numbers. They can also practice basic letters in a grid, ensuring the white space is equal to the dark line spaces of the lettering and numbering. Assign LS–A.*

- **Review/Summary.** Use the student learning objectives to summarize the lesson. Have students explain the content associated with each objective. Student responses can be used in determining which objectives need to be reviewed or taught from a different angle. Questions at the ends of chapters in the textbook may also be used in the Review/Summary.
- **Application.** Use the included visual master(s) and lab sheet(s) to apply the information presented in the lesson.
- **Evaluation.** Evaluation should focus on student achievement of the objectives for the lesson. Various techniques can be used, such as student performance on the application activities. A sample written test is provided.

## ■ **Answers to Sample Test:**

### **Part One: Matching**

1. e
2. a
3. b
4. c
5. f
6. d

### **Part Two: Completion**

1. font
2. ASME standards
3. narrow
4. fingers
5. 65 to 75°
6. pulling
7. freehand sketch

### **Part Three: Short Answer**

The pencil is twisted (or slowly spun) in the fingers as each stroke is drawn. In this way the tip size remains the same. Holding a pencil steady, rather than twisting, would create a stroke that is thinner at the beginning than at the end.

# Freehand Lettering Techniques and ASME Standards

## ► Part One: Matching

**Instructions:** Match the term with the correct definition.

- a. ASME
- b. freehand lettering
- c. lettering
- d. single stroke Gothic lettering
- e. technical lettering
- f. technique

- \_\_\_ 1. The process of forming letters and other characters for a mechanical drawing
- \_\_\_ 2. A professional association that promotes the art, science, and practice of multidisciplinary engineering and allied sciences around the globe
- \_\_\_ 3. Drawing or executing legible letters without the assistance of tools
- \_\_\_ 4. The creation of hand-drawn letters applied to an object or surface
- \_\_\_ 5. The process of carrying out a particular task, especially the execution or performance of an artistic work or a scientific procedure
- \_\_\_ 6. A sans serif font formed by a series of short strokes

## ► Part Two: Completion

**Instructions:** Provide the word or words to complete the following statements.

- 1. A specific typeface of a particular size and style is a/an \_\_\_\_\_.
- 2. The establishment of line and lettering practices for use in the preparation of engineering drawings, including the recognition of the requirements of CAD and manual preparation for their reduction and reproduction is set by the \_\_\_\_\_.



3. Condensed letters are \_\_\_\_\_ compared to their height.
4. To create freehand letters and numbers, you use your arm and wrist rather than moving your \_\_\_\_\_.
5. To create freehand letters and numbers, the pencil is held and positioned at an angle of approximately \_\_\_\_\_ off the paper.
6. Freehand lettering is accomplished with a \_\_\_\_\_ rather than a pushing motion of the pencil.
7. The initial transfer of an idea from an engineer's abstract world into a 2D and/or 3D working drawing is a/an \_\_\_\_\_.

► **Part Three: Short Answer**

**Instructions:** Answer the following.

What is the advantage of twisting a pencil when creating a freehand drawing?

# SERIF AND SANS SERIF EXAMPLES

---



The image displays six letters: A, a, B, b, C, and c. Each letter is rendered in a bold, black, sans-serif font. Red highlights are placed on the serifs of each letter: the top and bottom of the 'A', the top and bottom of the 'a', the top and bottom of the 'B', the top and bottom of the 'b', the top and bottom of the 'C', and the top and bottom of the 'c'. This highlights the serif feature of the font.

Single stroke Gothic lettering is a common sans serif font used in freehand lettering. A sans serif font is formed by a series of short strokes. Note the serif feature shown in red color. (Courtesy, Stannered and Chmod007 at English Wikipedia. Permissions can be viewed at <https://creativecommons.org/licenses/by-sa/3.0/deed.en>)

# TECHNICAL LETTERING AVAILABLE IN AUTOCAD

---

ABCDEFGHIJKLMNOPQRSTUVWXYZ  
abcdefghijklmnopqrstuvwxyz  
[(!?:"' - = + x : . % & )] 0123456789 IVX

ABCDEFGHIJKLMNOPQRSTUVWXYZ  
abcdefghijklmnopqrstuvwxyz  
[(!?:"' - = + x : . % & )] 0123456789 IVX

# Practice

## Freehand Lettering Techniques

### Purpose

The purpose of this lab is to practice freehand lettering and numbering techniques.

### Objectives

1. Practice single stroke straight line lettering techniques.
2. Practice curved lettering and number techniques.

### Materials

- ◆ lab sheet
- ◆ drawing board (optional)
- ◆ drawing paper (graph paper optional)
- ◆ pencil
- ◆ eraser
- ◆ straight edge and/or ruler

### Procedure

1. TASK #1: Practice single stroke lettering techniques by drawing straight, curved, and diagonal lines. To review basic strokes, see the examples on pages 2, 20, and 21 at <https://www.ucvts.tec.nj.us/cms/lib5/NJ03001805/Centricity/Domain/611/Lesson%203%20Lettering.pdf>.
  - a. Use a straight edge to create a series of light (in color) horizontal lines about  $\frac{1}{4}$ -inch apart. These will be used for guidelines.



- b. Use the guidelines you created to draw straight horizontal strokes all about  $\frac{1}{4}$ -inch long. Draw three (3) parallel strokes at a time between the guidelines. Create a line just below the first guideline in the middle of two guides and one just above. Your drawing should look similar to a capital “E” minus the vertical.
  - c. Repeat this process across the drawing paper ensuring each line is perfectly straight and parallel to the others.
  - d. Complete four rows.
  - e. Continue the same steps to create four (4) rows of short vertical strokes.
  - f. Continue the same steps to create four (4) rows of curved strokes (arcs or  $\frac{1}{2}$ -inch circles).
  - g. Continue the same steps to create four (4) rows of diagonal strokes.
2. **TASK #2:** Create a series of freehand straight and curved letters and numbers using the remaining guidelines. At the website shown in **TASK #1**, review page 23 about creating freehand straight and curved letters and numbers.
  3. Turn your completed freehand sketching practice in to your instructor.