Alphabet of Lines

Chapter 3

Engineering Design Technology
Sacramento City College
Alphabet of Lines

- The design industry has agreed on a set of standard lines that are used to represent various objects.

- The American Society of Mechanical Engineers (ASME) has developed this standard which is accepted throughout the industry.

- Written down in a standards manual.
The Alphabet of Lines reveals shape, size, hidden surfaces, interior detail, alternate positions, etc. of parts, etc.
The Alphabet of Lines

Look different.

Some are
- Thin width
- Medium width
- Thick width

The various lines are easily distinguishable.
The Alphabet of Lines

- Object
- Hidden
- Center
- Dimension
- Extension
- Phantom
- Break
- Datum
- Construction
Alphabet of Lines

- Refer to Handout
  - The Alphabet of Lines
  - Available on Blackboard
APPLICATION OF LINES

- VIEWING-PLANE LINE
- EXTENSION LINE
- DIMENSION LINE
- CENTER LINE
- HIDDEN LINE
- BREAK LINE
- CUTTING-PLANE LINE
- VISIBLE LINE
- CENTER LINE (PATH OF MOTION)
- LEADER
- CHAIN LINE
- PHANTOM LINE
- SECTION LINE
- SECTION A-A
- VIEW B-B

(ANSI Y14.2M, 1982)
Line Characteristics

- All lines should be dense black, regardless of line type and regardless of width.
  - Thin, dense black
  - Medium weight, dense black
  - Thick weight, dense black

- Light pencil lines tend to “burn out” during the reproduction process.
  - Make “fuzzy” lines on blueprint/copy.
Line Characteristics

❖ Lines are **uniform** within the line.

❖ Looks the same width all along the length of the line.
  ❖ Thin – thin all along the length
  ❖ Medium – medium all along the length
  ❖ Thick – thick all along the length
Visible Lines
Object/Visible Lines

- Show the object.
- Show the outline of the visible edges or contours of an object that can be seen by an observer.
Object/Visible Lines

- Should stand out sharply when contrasted with other lines on the drawing.

Object/Visible Lines - Spacing and Size.

- Medium width.
- Continuous line (no dashes)
- Dense black.
Visible Lines

- Cutting-Plane Line
- Visible Line
- Center Line (Path of Motion)
- Leader
- Chain Line
Hidden Lines
Hidden Lines

- Show
  - Edges
  - Surfaces
  - Corners

of an object that are concealed from the view of the observer.
Hidden Lines

- **Hidden Lines**

- **Spacing and Size**
  - Thin lines.
  - Evenly space short dashes
    - Approximately 1/8” long,
    - Spaces 1/32” long.
  - Dense black.
Hidden Lines

Hidden Line “Rules”

1. Start and end with a dash.
2. If a hidden line is a continuation of a visible line then a gap is shown.
3. A gap is also shown when a hidden line crosses but does not intersect another line.

Hidden lines should be omitted when they are not needed for clarity.
Hidden Lines

- DIMENSION LINE
- CENTER LINE
- HIDDEN LINE
- BREAK LINE
Center Lines
Center Lines

Show

1. Axes of symmetrical parts
2. Centers of circles and
3. Paths of motion.
Center Lines

- Center Lines - Spacing and Size.
  - Thin lines.
  - Alternating long and short dashes.
    - The long dash (3/4” to 1-1/2”)
    - The short dash (1/16” to 1/8”)
  - Dense black.
Center Lines

- Center Lines “Rules”
  1. Center lines intersect at the short dashes.
  2. Center lines extend only a short distance past the object.
  3. Center lines start and end with a long dash.
Center Lines
Dimension Lines
Extension Lines
Leaders
Dimension Lines, Extension Lines and Leaders

- **Dimension lines**
  - Indicate the **size** and **direction** of dimensions.
  - Are terminated by arrowheads.

- **Dimension Lines - Spacing and Size**
  - Thin lines.
  - Continuous.
  - Dense black.
Dimension Lines, Extension Lines and Leaders
Dimension Lines, Extension Lines and Leaders

- **Extension lines**
  - Indicate the termination of a dimension.
  - Extend from approximately
    - 1/16 inch from the object to
  - 1/8 inch beyond the last arrowhead.

- **Extension Lines - Spacing and Size**
  - Thin lines.
  - Dense black.
  - Continuous lines.
Dimension Lines, Extension Lines and Leaders

VIEWING-PLANE LINE

EXTENSION LINE

DIMENSION LINE

75
Leaders

- Are drawn to notes or identification symbols used on the drawing.
- **Start with 1/8 “shoulder”**
- **End with arrowhead.**

Leaders - Spacing and Size

- Thin lines.
- Continuous lines.
- Dense black.
Leader Lines

VIEWING-PLANE LINE
EXTENSION LINE

DIMENSION LINE

75
Cutting Plane Lines
Cutting Plane Lines

- Indicate the location of the edge view of the cutting plane.

Cutting Plane Lines - Spacing and Size
- Thick line.
- Dense black.

Two forms are approved for general use.
Cutting Plane Lines

- **First Form**
  - Alternating long dashes (3/4” to 1 1/2”) and
  - pairs of short dashes (1/8” with 1/16” space).

- **Second Form**
  - Equal dashes 1/4” in length.

- **Both forms**
  - Ends bent at 90° and
  - Ends are terminated by arrowheads to indicate the direction of viewing of the section.
  - Arrow stems are continuous lines.
Cutting Plane Lines

- Cutting-Plane Line
- Visible Line
- Center Line (Path of Motion)
- Leader
- Chain Line
- Phantom Line
- Section Line
- Section A-A
- View B-B
Section Lines
Section Lines

- Section Lines
  - Represent surfaces exposed by a cutting plane passing through an object.
  - Sometimes called "cross-hatching".
  - "hatching"
  - Drawn at an angle of 45° with a sharp 2H pencil.
Section Lines

Section Lines - Spacing and Size

- Thin lines
- Continuous lines.
- Dense black.

Space about 1/8” apart.

- small drawings - 1/32
  - Space lines close together
- large drawings - 3/16”
  - Space lines further apart.
- Make line spacing uniform.
Section Lines
Break Lines
Break Lines

- Break lines
  - Show the limit of a partial view of a **broken section**.
  - For **short breaks**,
    - a **thick line** is drawn **freehand**.
    - Usually used for **mechanical work**.
  - For **large breaks**
    - A long, thin line joined by freehand “zig-zags”.
    - Usually used for **architectural work**.
Break Lines

Break Lines - Spacing and Size

- Thick.
- Dense black.
- Freehand.
- Continuous.

- Thin
- Dense black
- Straight line with freehand “zig”
- Continuous.
Break Lines
Phantom Lines
Phantom Lines

- **Phantom lines:**
  - Show
    - Alternate positions.
    - Repeated details.
    - Paths of motion.

- **Phantom Lines - Spacing and Size**
  - Thin lines.
  - Dense black.
  - Long dashes 3/4” to 1-1/2” in length with alternating with pairs of short dashes 1/8” long with 1/16” spacing between the dashes.
Phantom Lines
Datum Lines
Datum Dimensions

- Datum Lines
  - Show Lines, points, surfaces that are assumed to be accurate.
  - Are placed on drawings as datum dimensions since they may be used for exact reference and location purposes.
Datum Dimensions

 Datum Lines - Spacing and Size

- Thin lines.
- Dense black.
- Thin, long dashes - 3/4” to 1-1/2” long
  - alternating with
- Pairs of short dashes - 1/8” long
  - 1/16” spacing between the dashes.
Construction Lines
Construction Lines

- **Construction Lines**
  - Used to lay out all work PRIOR to drawing ANY object lines.
  - Drawn **very light** so they **will not reproduce** when making a **blue print**.
    - (They should not be visible when viewing beyond an arm’s length from the drawing.)

- **Construction Lines - Spacing and Size**
  - Thin lines.
  - Light gray lines.
  - Draw with very hard pencil 2H, 3H, 4H.
Border Lines
Border Lines

- **Border lines**
  - Are the “frame” of the drawing.

- **Spacing and Size**
  - Thickest lines.
  - Dense black.
  - Continuous.

- Border lines are the heaviest of all lines.