Pictorial Drawing

- Pictorial drawing is
  - part of graphic language.
- Used in
  - Engineering
  - Architecture
  - Science
  - Electronics
  - Technical illustration, and
  - Other professions.
**Pictorial Drawing**

- **Examples of pictorial drawing use:**
  - **Architects**
    - Use pictorial drawing to show what a finished building will look like.
  - **Ad agencies**
    - Use pictorial drawing to display new products.
Pictorial Drawing
Pictorial Drawing

- Pictorial drawing is often used in exploded drawings on production and assembly drawings.
- Refer to Figure 12-1
Views are made to illustrate the operation of machines, and equipment.

Pictorial sketches are used to help convey ideas that are hard to describe in words.
Pictorial Drawing

• SPACE SHUTTLE ORBITER

LENGTH: 122 FT.
WINGSSPAN: 78 FT.
WEIGHT: 150,000 LBS.
HEIGHT: 57 FT.
RIGHT HAND ILLUSTRATION
Parts are numbered in order of disassembly.
Pictorial Drawing

◆ Pictorial drawing can be
  ◆ **Perspective Views**
    ◆ Show object as it actually looks to the eye.
    ◆ Most difficult to draw
  ◆ **Isometric Views**
    ◆ Easier to draw than perspective.
    ◆ Do not look as good as perspective.
  ◆ **Oblique Views**
    ◆ Easier to draw than perspective.
    ◆ Do not look as good as perspective or isometric.
    ◆ Is a “front view” with a depth.
Isometric Drawing
Isometric Drawing

- Pictorial drawings, in general, are made to show how something looks.

- Since hidden lines are “not part of the picture” they are normally left out and are not drawn in isometric drawings.
Isometric Drawing

- Isometric drawing is
  - Similar to isometric sketching except that it is created using instruments.
Isometric Drawing

- Objects are aligned with three isometric axes at 120° angles to each other.
  - X
  - Y
  - Z
    - Oriented 120 degrees apart from each other.

- Refer to Figure 12.4.
**Isometric Drawing**

- X, Y and Z axes
  - Can be positioned in several arrangements
  - Must remain at 120 degrees to each other.
Isometric Drawing

- Vertical Orientation - Regular Position
  - First position - the axes meet at the upper front corner of the object
  - Second position - the axes meet at the lower front corner of the object.
Figure 12-4

VERTICAL

FIRST POSITION

SECOND POSITION

REGULAR
**Figure 12-4**

FIRST POSITION

SECOND POSITION

REVERSED

HORIZONTAL
Isometric Drawing

- **Horizontal Orientation - Regular Position**
  - **First position** - the axes meet at the left front corner of the object
  - **Second position** - the axes meet at the right front corner of the object.
**Figure 12-4**

FIRST POSITION

SECOND POSITION

REGULAR
Figure 12-4

FIRST POSITION

SECOND POSITION

REVERSED
Isometric Lines
Isometric Lines

Any line parallel to one of the isometric axes is called an isometric line.
Isometric Lines

- Isometric lines are EASY to draw.
  - Simply measure the length of the line in an orthographic view and then
  - Draw the line the SAME LENGTH in the same axis in the isometric view.
Non-isometric Lines
Non-isometric Lines

- Lines that are not parallel to one of the axes are called non-isometric lines.
Non-isometric Lines

- Measurements can be made only on isometric lines.

- Non-isometric lines do not show in their true length so they cannot be measured.
Non-isometric Lines

E
Non-isometric Lines

Diagram showing non-isometric lines with points labeled A, B, C, D, E, F, J, G, I, H.
**Drawing Non-Isometric Lines**

- **To draw non-isometric lines:**
  - Locate the end points first.
  - Use the Box Method.
- **Refer to Figure 12-6.**

![Non-Isometric Lines Diagram]
Drawing Non-Isometric Lines
Drawing Angles

- Follow the procedure shown in Figure 12-7
  - Construct angle parts AO, AB, OB
  - Transfer AO and AB to the isometric cube
  - Lay off AO on the base of the cube
  - Draw AB parallel to the vertical axis
  - Finally, connect points O and B to complete the isometric angle
Drawing Angles
Isometric Circles
Isometric Circles

- In isometric drawings, circles appear as ellipses.
Use the four centered approximation method to draw the ellipse.

Refer to Figure 12-9.
**Drawing Isometric Circles**

- First, draw an isometric square, with the sides equal to the diameter of the circle.

**Drawing an isometric square with the sides equal to the diameter of the circle.**
Use a 30° 60° triangle to locate points A, B, C, D and points 1, 2, 3, 4.

Use a 30°– 60° triangle to locate points A, B, C, D, and 1, 2, 3, 4.
Use A and B as centers, and radius = $A^2$, draw the arcs.

With A and B as centers and a radius equal to $A^2$, draw arcs as shown.
Use C and C as centers, radius = C4, draw arcs to complete the ellipse.

With C and D as centers and a radius equal to C4, draw arcs to complete the isometric circle (ellipse).
Isometric Cylinder

To draw an isometric cylinder

- Use Figure 12-9 to construct the top ellipse.
- Drop centers at a distance equal to the height of the cylinder.
- Draw three arcs using the same radii as the ellipse at the top.
- Notice that the radii for the arcs at the bottom match those at the top.
Isometric Cylinder

A

3.00

4.00

B

C

R_2

R_1

R_{\frac{2}{3}}

R_1

C'

D'

A'

A
Isometric Quarter Rounds

To draw quarter rounds
- Refer to Figure 12-12.
- Follow procedure for quarters of circles.
- In each case measure the radii along the tangent lines from the corner.
- Then draw the perpendiculars to locate the centers for the isometric arcs.

Figure 12-13 shows how to draw outside and inside corner arcs.
Isometric Quarter Rounds

\[ \square = \text{RIGHT ANGLE (90°)} \]
Isometric Templates
Isometric Templates

- Isometric templates come in a variety of forms
  - $15^\circ$, $30^\circ$, $45^\circ$, $50^\circ$, $60^\circ$
  - They are convenient and can save you time.
Creating an Isometric Drawing
Creating an Isometric Drawing

- Filler Block Example
- Refer to Figure 12-17.

Fig. 12-17 Steps in making an isometric drawing.
Creating an Isometric Drawing

- Filler Block Example
  - Draw the isometric axes in the first position.
Creating an Isometric Drawing

- Filler Block Example
  - Measure off the width, the depth and the height of the block on the three axes.
Creating an Isometric Drawing

- Filler Block Example
  - Draw lines parallel to axes to make the isometric drawing of the block.

![Diagram of isometric block with dimensions labeled]
Creating an Isometric Drawing

- Filler Block Example

**Fig. 12-17** Steps in making an isometric drawing.
Reversed Axes

- To draw an object as if viewed from below, reverse the position of the axes.
- Follow example in Figure 12-20.
Reversed Axes

A

B

C
When long pieces are drawn in isometric, make the long axis horizontal.

Refer to Figure 12-21
Dimensioning Isometric Drawings
Dimensioning Isometrics

- Isometrics are seldom used as working drawings.

- Remember, working drawings are the drawings used to actually construct the object.

- If dimensions are required, follow the newer unidirectional format.
  - Refer to Figure 12-22.
Dimensioning Isometrics

ALIGNED

Dimensions:
- 200
- 300
- 100
- 100
- 50
- 125
- 125
Dimensioning Isometrics
Isometrics – Multiple Scales
Isometrics-Multiple Scales

- **Isometric**
  - Only one scale is used

- **Dimetric**
  - Two scales are used.

- **Trimetric**
  - Three scales are used.
Isometrics-Multiple Scales

ISOMETRIC  DIMETRIC  TRIMETRIC

120° 120° 120°
30° 30°

150° 105° 105°
15° 15° 15°

120° 105° 135°
45°
Oblique Drawings
Oblique Drawings

- Oblique drawings are
  - Similar to isometric drawings,
  - Are drawn on three axes (X, Y, Z).
  - Two axes are parallel to the picture plane (the plane on which the view is drawn).
  - These two axes always are at right angles.
  - Think “Front View with depth”.

Oblique drawings
Oblique Drawings

- In isometric drawings, only one axis is parallel to the picture plane.
- Refer to Figure 12-28.
Oblique Drawings

- Oblique drawings show an object as if viewed face on.
- The object is seen squarely with no distortion.
**Oblique Drawing Rules**

- **To create an oblique drawing:**
  - Draw a front view, long side horizontal
  - Draw the depth
  - Refer to Figure 12-29.
Fig. 12-29  **Two general rules for oblique drawings.**
Oblique Projection

- Oblique projection is a way of showing depth.
- Depth is shown by projector lines.

- Projector lines represent receding edges of an object.
  - These lines are drawn at an angle other than 90° from the picture plane so they will be visible in the front view.
Lines on these receding planes that are parallel to each other are drawn parallel.

Refer to Figure 12-30.
Oblique Projection

- Because oblique drawing can show one face of an object without distortion it has a distinct advantage over isometric.

- Oblique drawings are useful for showing objects with irregular outlines.
Oblique Drawing Types

- **Cavalier Oblique**
  - receding lines are drawn **full length**.

- **Normal Oblique**
  - receding lines are drawn **3/4 length**.

- **Cabinet Oblique**
  - receding lines are drawn **1/2 length**
  - named this way because it is often used in the furniture industry

- Refer to Figure 12-32
Oblique Drawing Types

MULTIVIEW

CAVALIER

NORMAL

CABINET
Oblique Constructions

- Angles and Inclined Surfaces
  - Angles that are parallel to the picture plane are shown full size.
  - For all other angles, lay the angle off by locating both ends of the slanting line.
  - Remember to lay off angles by measurements parallel to one of the axes.
Oblique Constructions

- **Oblique Circles**
  - Use the four-center method for ellipses.
  - Ellipse templates give better results.
  - If you use a template, block the oblique circle as an oblique square.
Perspective Drawings
Perspective Drawings

- A perspective drawing
  - a three-dimensional representation of an object as it looks to the eye from a particular point.
  - look the most like photographs of all pictorial drawings.
  - lines on the receding planes that are actually parallel are not drawn parallel.
  - These lines are drawn as if they were converging.
**Perspective Drawing Definitions**

- Refer to Figure 12-40
  - Sight lines which lead from the points on the card and converge at the eye are called **visual rays**.
  - The **picture plane** is the plane on which the card is drawn.
  - The **station plane** is the point from which the observer is looking at the card.
  - A horizontal plane passes through the observer’s eye. Where it meets the picture plane, it forms the **horizon line**.
Perspective Drawing Definitions

- Where the ground plane on which the observer stands meets the picture plane, it forms the ground line.
- The center of vision is the point at which the line of sight pierces the picture plane.
- The line of sight is the visual ray from the eye perpendicular to the picture plane.
- The point at which the receding axes meet (the projectors) is called the vanishing point.
**Perspective Drawing Definitions**

**Fig. 12-40** *Some perspective terms.*
Perspective Drawing Definitions

- If the object is seen from above, the view is **aerial or bird’s eye view**
- If the object is seen from below, the view is **ground or worm’s eye view**
- If the object is seen so that the line of sight is directly on it, the view is a **normal view**
Factors That Affect Appearance

- In perspective drawing, the size of the object seems to change as you move toward or away from it.
- Refer to Figure 12-42 for explanation.
- Each time the distance from the object is doubled, the object appears only half as large.
Factors That Affect Appearance

- The shape of the object seems to change when viewed from a different position
  - Looking at a square directly, the edges are parallel.
  - Looking at it from an angle, the edges seem to converge.
Fig. 12-42 The size of an object appears half as large when the distance from the observer is doubled.
One Point Perspective

- **One-point perspective,**
  - has **one vanishing point**
  - also called **parallel perspective.**

- **Two point** perspective drawings have two vanishing points.
  - Also called **angular perspective**
Fig. 12-49 When a building is viewed at an angle, two sides can be seen. The top and ground lines on each side appear to converge toward points. This is the effect in two-point, or angular, perspective. (Courtesy of Mishima)
Fig. 12-44  The lines of the sidewalk, roof, and building’s side appear to converge at a distance.  (Courtesy of Mishima)