**Definitions of Lines**

Lines are the basic communication tool used in blueprints. Listed below are examples of the most common lines used in blueprints today. Take the time to memorize each type of line and know its uses too.

<table>
<thead>
<tr>
<th>NAME</th>
<th>CONVENTION</th>
<th>DESCRIPTION AND APPLICATION</th>
<th>EXAMPLE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Visible Lines</td>
<td></td>
<td>Heavy unbroken lines</td>
<td><img src="image.png" alt="Example" /></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Used to indicate visible edges of an object</td>
<td></td>
</tr>
<tr>
<td>Hidden Lines</td>
<td></td>
<td>Medium lines with short evenly spaced dashes</td>
<td><img src="image.png" alt="Example" /></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Used to indicate concealed edges</td>
<td></td>
</tr>
<tr>
<td>Center Lines</td>
<td></td>
<td>Thin lines made up of long and short dashes alternately spaced and consistent in length</td>
<td><img src="image.png" alt="Example" /></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Used to indicate symmetry about an axis and location of centers</td>
<td></td>
</tr>
<tr>
<td>Dimension Lines</td>
<td></td>
<td>Thin lines terminated with arrow heads at each end</td>
<td><img src="image.png" alt="Example" /></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Used to indicate distance measured</td>
<td></td>
</tr>
<tr>
<td>Extension Lines</td>
<td></td>
<td>Thin unbroken lines</td>
<td><img src="image.png" alt="Example" /></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Used to indicate extent of dimensions</td>
<td></td>
</tr>
<tr>
<td>NAME</td>
<td>CONVENTION</td>
<td>DESCRIPTION AND APPLICATION</td>
<td>EXAMPLE</td>
</tr>
<tr>
<td>------------------</td>
<td>------------</td>
<td>---------------------------------------------------------------------------------------------</td>
<td>---------</td>
</tr>
<tr>
<td>BREAK (LONG)</td>
<td></td>
<td>THIN, SOLID RULED LINES WITH FREE-HAND ZIG-ZAGS</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>USED TO REDUCE SIZE OF DRAWING REQUIRED TO DELINEATE OBJECT AND REDUCE DETAIL</td>
<td></td>
</tr>
<tr>
<td>BREAK (SHORT)</td>
<td></td>
<td>THICK, SOLID FREE HAND LINES</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>USED TO INDICATE A SHORT BREAK</td>
<td></td>
</tr>
<tr>
<td>PHANTOM OR</td>
<td></td>
<td>MEDIUM SERIES OF ONE LONG DASH AND TWO SHORT DASHES EVENLY SPACED ENDING WITH LONG DASH</td>
<td></td>
</tr>
<tr>
<td>DATUM LINE</td>
<td></td>
<td>USED TO INDICATE ALTERNATE POSITION OF PARTS, REPEATED DETAIL OR TO INDICATE A DATUM PLANE</td>
<td></td>
</tr>
<tr>
<td>STITCH LINE</td>
<td></td>
<td>MEDIUM LINE OF SHORT DASHES EVENLY SPACED AND LABELED</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>USED TO INDICATE STITCHING OR SEWING</td>
<td></td>
</tr>
<tr>
<td>CUTTING-PLANE LINE</td>
<td></td>
<td>USED TO DESIGNATE WHERE AN IMAGINARY CUTTING TOOK PLACE</td>
<td></td>
</tr>
<tr>
<td>VIEWING-PLANE LINE</td>
<td></td>
<td>USED TO INDICATE DIRECTION OF SIGHT WHEN A PARTIAL VIEW IS USED</td>
<td></td>
</tr>
<tr>
<td>SECTION LINES</td>
<td></td>
<td>USED TO INDICATE THE SURFACE IN THE SECTION VIEW IMAGINED TO HAVE BEEN CUT ALONG THE</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>CUTTING-PLANE LINE</td>
<td></td>
</tr>
<tr>
<td>CHAIN LINE</td>
<td></td>
<td>USED TO INDICATE THAT A SURFACE OR ZONE IS TO RECEIVE ADDITIONAL TREATMENT OR CONSIDERATIONS</td>
<td></td>
</tr>
</tbody>
</table>
Orthographic Blueprints

Orthographic (ortho) views are two-dimensional drawings used to represent or describe three-dimensional objects. The ortho views represent the exact shape of an object seen from one side at a time as you are looking perpendicularly to it without showing any depth to the object.

Primarily, three ortho views (top, front, and right) adequately depict the necessary information to illustrate the object. Sometimes, only two ortho views are needed as in a cylinder. The diameter of the cylinder and its length are the only dimension information needed to complete the drawing. A sphere only needs the diameter. It is the same from all angles and remains a perfect circle in the ortho drawing.

The "six" side method is a process of making six primary ortho views that represent the entire image. This method gives you all the information to create the object from different isometric views.
P.C.C. Basic Fabrication Problem set 2

Instructions: Change the following pictorial drawing to multiview sketches. Label views.

NAME: ______________ DATE: ____________

9/14/2011

Matt Scott
**Pictorial Drawings to Orthographic Projections**

In this section the student is to convert the pictorial drawing to an orthographic view by using the correct lay out technique.

---

**Portland Community College**

Welding Technology Class Project –
Convert the pictorial drawing to an orthographic projection.

Name______________________________________ Date______________

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---
Portland Community College
Welding Technology Class Project – Convert the pictorial drawing to an orthographic projection.

Name ________________________________________  Date _____________

9/14/2011
Matt Scott
Portland Community College
Welding Technology Class Project – Convert the pictorial drawing to an orthographic projection.

Name ____________________________ Date ____________
Portland Community College
Welding Technology Class Project – Convert the pictorial drawing to an orthographic projection.

Name ___________________________ Date _____________
Portland Community College
Welding Technology Class Project – Convert the pictorial drawing to an orthographic projection.

Name ______________________________________  Date _____________
Portland Community College

Welding Technology Class Project –
Convert the pictorial drawing to an orthographic projection.

Name ___________________________ Date _____________
Portland Community College
Welding Technology Class Project –
Convert the pictorial drawing to an orthographic projection.

Name ___________________________ Date _____________
Portland Community College
Welding Technology Class Project –
Convert the pictorial drawing to an orthographic projection.

Name ___________________________ Date __________
**Orthographic Blueprints**

**Orthographic Views**

**Isometric Views**

Isometric means "equal measurement". The true dimension of the object is used to construct the drawing. You get the true dimension from either orthographic views or by measuring the object. Because of the convenience of using actual measurements to create the isometric image, it has become the industry standard for parts manuals, technical proposals, patent illustrations and maintenance publications.

The height of the object is measured along vertical lines. The width and depth of the object are measured along the 30 degree to the horizontal plane.

Isometric Construction Process

9/14/2011

Matt Scott
Orthographic Drawings to Isometric Projections
In this section the student is to convert the orthographic drawing to an isometric view by using the correct lay out technique

Portland Community College
Welding Technology Class Project

Name ___________________________ Date ___________
Ortho Completion

Name ____________________________________  Date  ________________

Complete the following drawings given the information

1. [Diagram]

2. [Diagram]

3. [Diagram]

4. [Diagram]

5. [Diagram]
Matching the Drawings

Study the pictorial views and match each orthographic drawing with its pictorial drawing by inserting the correct letter in the space provided.
Welding Symbol

Information
Welding Symbols

The use of welding symbols enables a designer to indicate clearly to the welder important detailed information regarding the weldment. The information in the welding symbol can include the following details for the weld:

- Length,
- Depth of penetration
- Height of reinforcement
- Groove type
- Groove dimensions
- Location, process
- Filler metal
- Strength, number of welds
- Weld shape
- Surface finishing.

All this information would normally be included on the welding assembly drawings.

Indicating Types of Welds

Weld types are classified as follows:

- Fillets
- Grooves
- Flange
- Plug or slot
- Spot or protecting
- Seam
- Back or backing
- Surfacing

Each type of weld has a specific symbol that is used on drawings to indicate the weld. A fillet weld, for example, is designated by a right triangle.

Weld Location

Welding symbols are applied to the joint as the basic reference. All joints have an arrow side (near side) and another side (far side). Accordingly, the terms arrow side, other side, and both sides are used to indicate the weld location with respect to the joint. The reference line is always drawn horizontally. An arrow line is drawn from one end or both ends of a reference line to the location of the weld. The arrow line can point to either side of the joint and extend either upward or downward.

Location Significance of the Arrow

In the case of fillet and groove welding symbols, the arrow connects the welding symbol reference line to one side of the joint. The surface of the joint the arrow point actually touches is considered to be the arrow side of the joint. The side opposite the arrow side of the joint is considered to be the other (far) side of the joint.
Parts of a Weld Symbol

The standard weld symbol consists of a reference line, an arrow and a tail.

**Reference Line**
Reference line
Horizontally Only

**Other Side**

**Arrow**
The arrow is always
Drawn at an angle to
Reference line

**Arrow with Break**

**Tail**
To include Specification
Process or other References

**Standard Weld Symbol**

**Symbol for a Fillet Weld**
The symbol to be centered
On the reference line

Fillet Weld

9/14/2011
Matt Scott
Location of Elements of a Welding Symbol

- **Finish symbol**
- **Contour symbol**
- **Root opening depth of filling**
- **Groove weld size**
- **Depth of preparation size or strength**
- **Basic weld symbol or detail reference**
- **Tall (tail omitted when reference is not used)**
- **Elements in this area remain as shown when tail and arrow are reversed**
- **Reference line**
- **Weld all around symbol**
- **Field weld symbol**
- **Length of weld**
- **Pitch (center-to-center spacing) of weld**
- **Arrow connecting reference line to arrow side number of joint or arrow side of joint**
- **Number of spot, stud, or projection welds**

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*Portland Community College*

**Welding Technology**

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**Part No. Required**

**Size (In/In.)**

**SL Conversion**

**Reference** (unless otherwise specified)

**Dimension: E-1/64” Angle E-0°**

---

**Get a copy of this**

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**Date:** 8/30/02
<table>
<thead>
<tr>
<th>APPLICATION</th>
<th>DESIRED WELD</th>
<th>SECTION OR END</th>
<th>ELEVATION</th>
<th>PLAN</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARROW-SIDE FILLET WELD</td>
<td><img src="image1" alt="Arrow-Side Fillet Weld" /></td>
<td><img src="image2" alt="Section or End" /></td>
<td><img src="image3" alt="Elevation" /></td>
<td><img src="image4" alt="Plan" /></td>
</tr>
<tr>
<td>OTHER-SIDE FILLET WELD</td>
<td><img src="image5" alt="Other-Side Fillet Weld" /></td>
<td><img src="image6" alt="Section or End" /></td>
<td><img src="image7" alt="Elevation" /></td>
<td><img src="image8" alt="Plan" /></td>
</tr>
<tr>
<td>BOTH-SIDES FILLET WELD, ONE JOINT</td>
<td><img src="image9" alt="Both-Sides Fillet Weld, One Joint" /></td>
<td><img src="image10" alt="Section or End" /></td>
<td><img src="image11" alt="Elevation" /></td>
<td><img src="image12" alt="Plan" /></td>
</tr>
<tr>
<td>BOTH-SIDES FILLET WELD, TWO JOINTS</td>
<td><img src="image13" alt="Both-Sides Fillet Weld, Two Joints" /></td>
<td><img src="image14" alt="Section or End" /></td>
<td><img src="image15" alt="Elevation" /></td>
<td><img src="image16" alt="Plan" /></td>
</tr>
<tr>
<td>ARROW-SIDE SQUARE GROOVE WELD</td>
<td><img src="image17" alt="Arrow-Side Square Groove Weld" /></td>
<td><img src="image18" alt="Section or End" /></td>
<td><img src="image19" alt="Elevation" /></td>
<td><img src="image20" alt="Plan" /></td>
</tr>
<tr>
<td>BOTH-SIDES SQUARE GROOVE WELD</td>
<td><img src="image21" alt="Both-Sides Square Groove Weld" /></td>
<td><img src="image22" alt="Section or End" /></td>
<td><img src="image23" alt="Elevation" /></td>
<td><img src="image24" alt="Plan" /></td>
</tr>
<tr>
<td>ARROW-SIDE BEVEL GROOVE WELD</td>
<td><img src="image25" alt="Arrow-Side Bevel Groove Weld" /></td>
<td><img src="image26" alt="Section or End" /></td>
<td><img src="image27" alt="Elevation" /></td>
<td><img src="image28" alt="Plan" /></td>
</tr>
<tr>
<td>BOTH-SIDES BEVEL GROOVE WELD</td>
<td><img src="image29" alt="Both-Sides Bevel Groove Weld" /></td>
<td><img src="image30" alt="Section or End" /></td>
<td><img src="image31" alt="Elevation" /></td>
<td><img src="image32" alt="Plan" /></td>
</tr>
<tr>
<td>ARROW-SIDE V-GROOVE WELD</td>
<td><img src="image33" alt="Arrow-Side V-Groove Weld" /></td>
<td><img src="image34" alt="Section or End" /></td>
<td><img src="image35" alt="Elevation" /></td>
<td><img src="image36" alt="Plan" /></td>
</tr>
<tr>
<td>BOTH-SIDES V-GROOVE WELD</td>
<td><img src="image37" alt="Both-Sides V-Groove Weld" /></td>
<td><img src="image38" alt="Section or End" /></td>
<td><img src="image39" alt="Elevation" /></td>
<td><img src="image40" alt="Plan" /></td>
</tr>
<tr>
<td>ARROW-SIDE J-GROOVE WELD</td>
<td><img src="image41" alt="Arrow-Side J-Groove Weld" /></td>
<td><img src="image42" alt="Section or End" /></td>
<td><img src="image43" alt="Elevation" /></td>
<td><img src="image44" alt="Plan" /></td>
</tr>
<tr>
<td>BOTH-SIDES J-GROOVE WELD</td>
<td><img src="image45" alt="Both-Sides J-Groove Weld" /></td>
<td><img src="image46" alt="Section or End" /></td>
<td><img src="image47" alt="Elevation" /></td>
<td><img src="image48" alt="Plan" /></td>
</tr>
<tr>
<td>ARROW-SIDE U-GROOVE WELD</td>
<td><img src="image49" alt="Arrow-Side U-Groove Weld" /></td>
<td><img src="image50" alt="Section or End" /></td>
<td><img src="image51" alt="Elevation" /></td>
<td><img src="image52" alt="Plan" /></td>
</tr>
<tr>
<td>BOTH-SIDES U-GROOVE WELD</td>
<td><img src="image53" alt="Both-Sides U-Groove Weld" /></td>
<td><img src="image54" alt="Section or End" /></td>
<td><img src="image55" alt="Elevation" /></td>
<td><img src="image56" alt="Plan" /></td>
</tr>
</tbody>
</table>