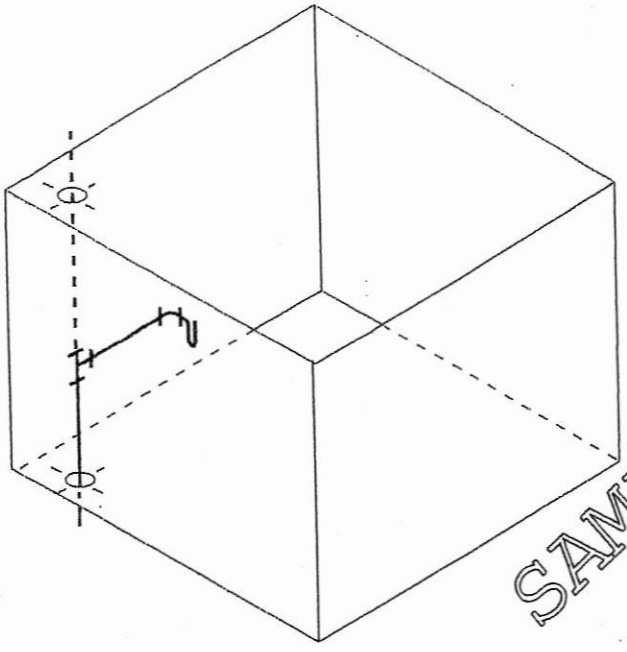
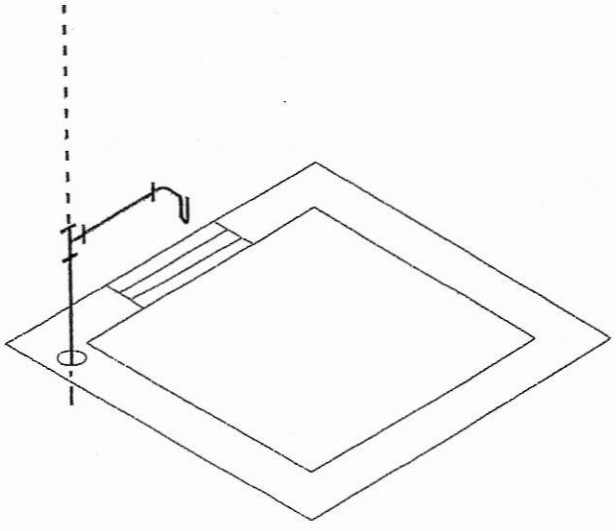
READING ISOMETRIC SKETCHES

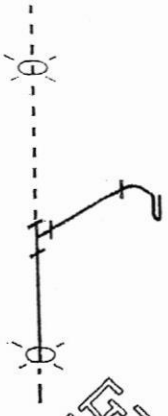
To understand an isometric sketch of a piping system you might start by trying to visualize the inside of a room in which the pies are located. Try to "look into" this room. The room is drawn in thin lines; the pipe layout is in dark object lines.



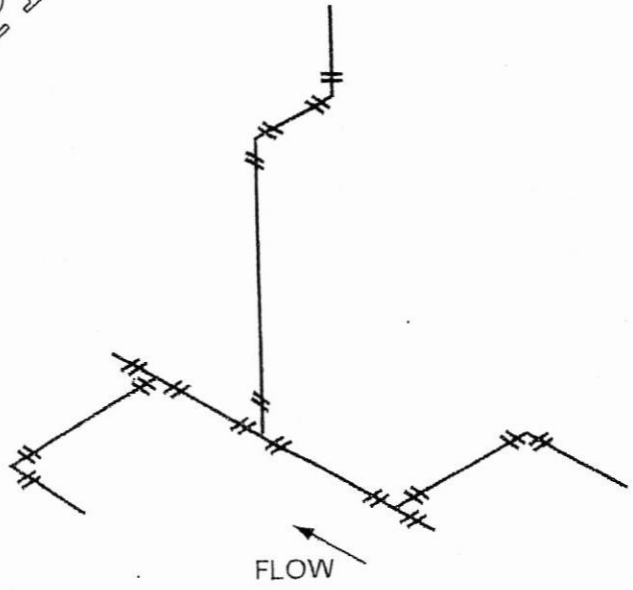
Now look at this drawing which removes the walls from the sketch.



Finally, the isometric sketch is reduced to merely the pipe diagram itself.



Here is an example of another isometric pipe diagram with 90° fittings.



To compare orthographic and isometric drawings, look at the sketches in Figure 2.7. Sketch Ais an isometric sketch of the PLAN and ELEVATIONS in Sketch B. You will remember that in an isometric sketch **vertical lines are shown in a vertical position**, and

horizontal lines are drawn at an angle of 30° to an imaginary horizontal line. You will also remember that an isometric drawing is three dimensional and is more picture-like than an orthographic drawing.

Study the sketches in Figure 2.7 until you understand the relationship between the isometric drawing and the orthographic sketches.

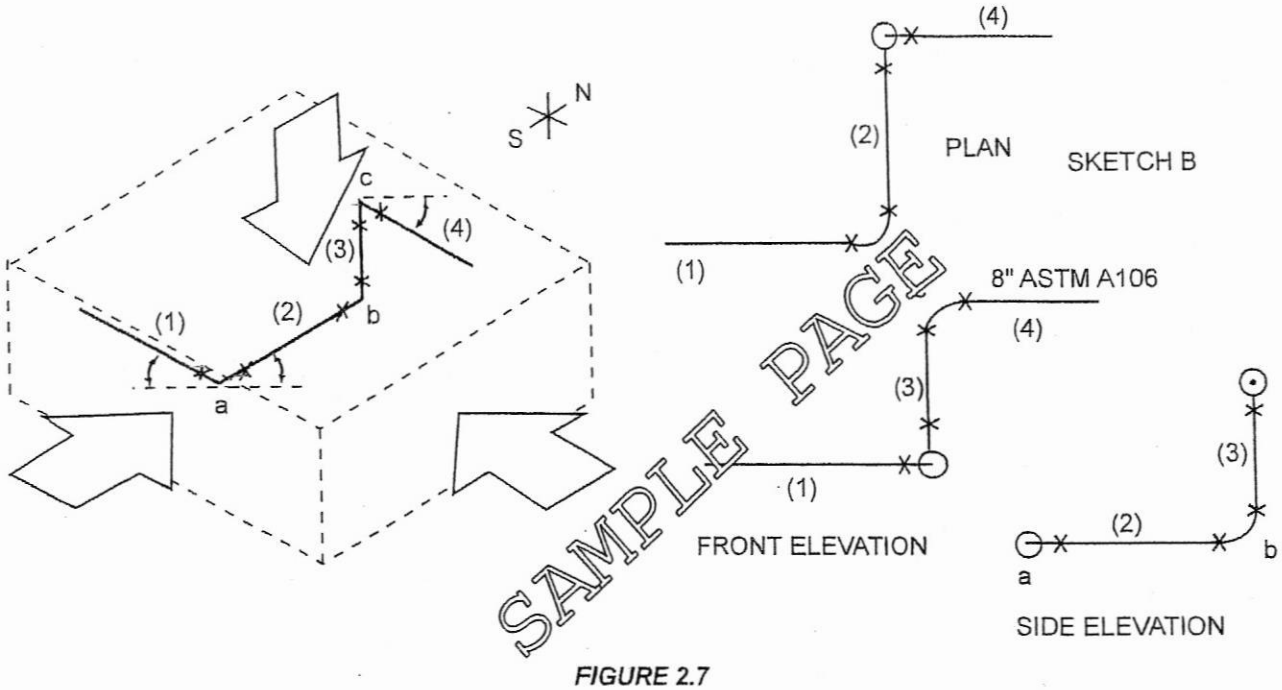


FIGURE 2.7

Exercises on Figure 2.7

What specific details can you learn from these drawings?

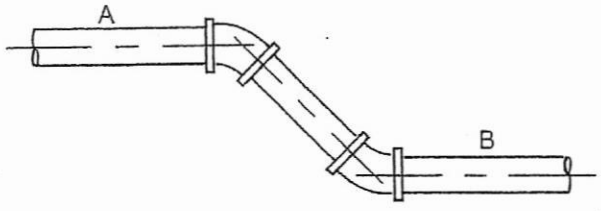
a. The pipe and the fittings are 8 inch butt welding carbon steel.
b. There are four sections of straight pipe.
c. The arrangement uses three 90° butt welded elbows.
d. Pipe section 3 is the only vertical pipe in the arrangement. (It appears as a vertical pipe in the isometric sketch and in the ELEVATIONS.)
e. Pipe sections 1, 2, and 4 are horizontal pipelines.
f. Pipe sections 1, 2 and 4 are at a 30° angle to and imaginary horizontal line in the isometric drawing.

OFFSETS

An Offset is a piping arrangement that includes two ***parallel*** pipes and two fittings of the same angle. An Offset permits a pipeline to move off course (around and obstruction such as a bema or a joist).

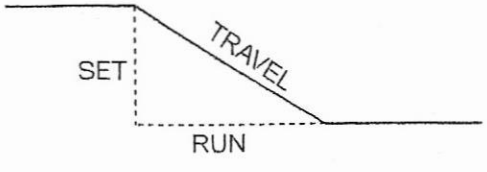
SIMPLE OFFSETS

A simple offset is an offset which has two parallel pipes and two angles of the same degree on the same plane.

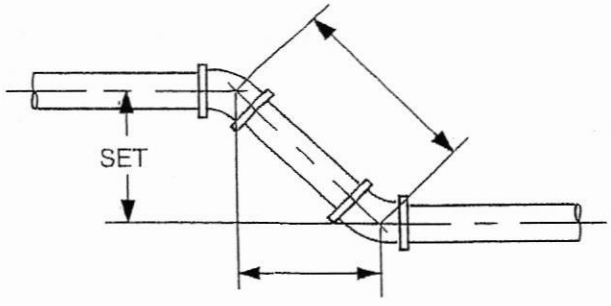


The centerlines of pipes A and B are parallel.
The angles of the offset are both 45°.

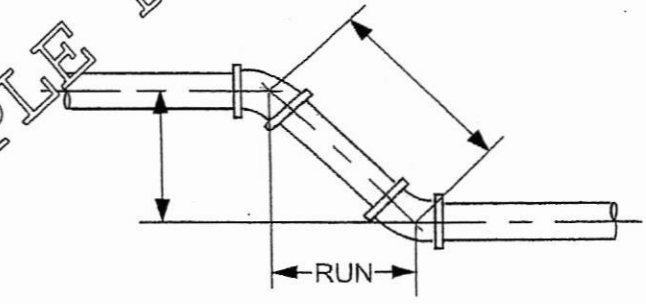
Run, Set, and Travel
All offsets are calculated on the basis of the RIGHT triangle. The three sides of the triangle have designated pipe fitting names, The hypotenuse is called the TRAVEL. The other two sides are called the SET and RUN.



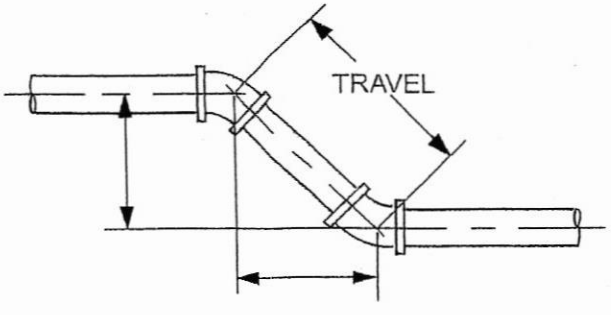
in pipe fitting terms, this is what these names represent: SET refers to the distance between the centerlines of the two parallel ***pipes***. These pipes are always a set distance apart.



RUN refers to the distance between the centerlines of the ***fittings***.

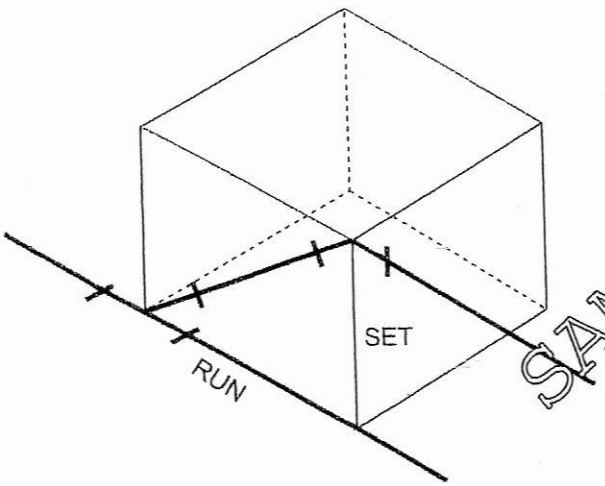


TRAVEL refers to the center-to--center length of the diagonal pipe of the offset.



Offsets are referred to by the angle of the fittings used to connect the pipes. An offset can range from an 11 1/2° offset to a 90° offset.

In an isometric drawing of an offset, the offset is usually represented within an imaginary box which shows the set and the run distances.



On a drawing of an offset, usually only one side of the offset triangle is dimensioned and the two fitting angles are identified. The pipe fitter must be able to calculate the other sides of the offset triangle in order to fabricate the offset in the field. Since all offsets are based on the concept of the right triangle and since at least one angle and one side has a known dimension, it is possible to calculate the other dimensions using either the principles of trigonometry (see Pages 3.49-3.51) or Smoley's Table of "Multipliers for Calculating Simple Offsets.

Calculation of Simple Offset Dimensions

This manual provides you with two ways to calculate the important dimensions of an offset. Obviously the easiest method is the one which permits you to look up all the information you need. This is possible by using Smoley's Table of "Multipliers for Calculating Simple Offsets." If this table is not available to you, you can always "resort" to trigonometry tables to find the dimensions you need to check your calculations. You will be shown the trigonometry method first and then the Smoley's Table Methods.

Trigonometry Method

Calculating the distances of an offset involves trigonometry functions which you already know. The TRAVEL is the same as the HYPOTENUSE; the SET and RUN correspond to the other two sides of a right triangle. You also know that:

$$\text{SINE of an angle} = \frac{\text{SIDE OPPOSITE}}{\text{HYPOTENUSE}}$$

$$\text{COSINE of an angle} = \frac{\text{SIDE ADJACENT}}{\text{HYPOTENUSE}}$$

$$\text{TANGENT of an angle} = \frac{\text{SIDE OPPOSITE}}{\text{SIDE ADJACENT}}$$

When you calculate an offset, you generally know the ***fitting angle***. Therefore, knowing the dimensions of one side, you can find the other sides.