Using Engineer Scales

NOTE: When PRINTING this document, be sure the pull down menu next to "Print Scaling" in the Print Dialog window is set to "None". This will ensure the sample drawings will measure accurately.

Introduction

Using and interpreting information from engineer (civil) and architect scales is an important fire protection engineering skill. Construction and fire protection equipment drawings must be interpreted with a high degree of accuracy.

Student Performance Objective

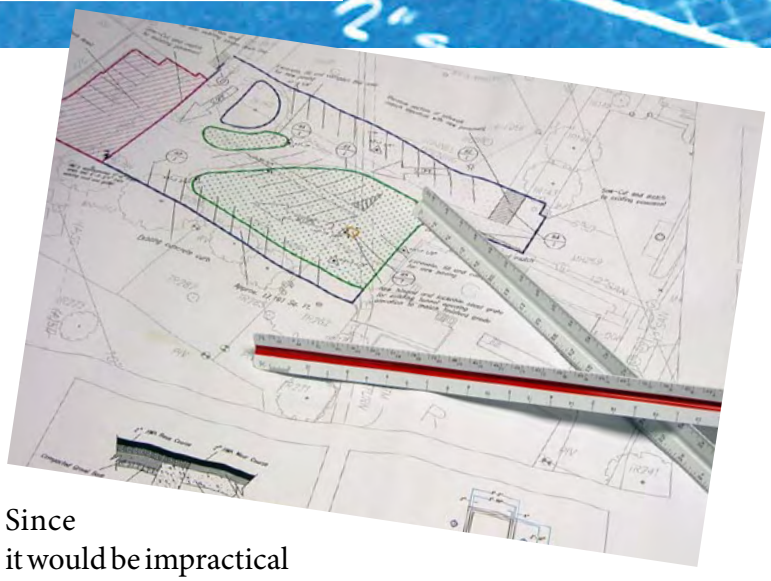
Given an architect or engineer scale and a set of scaled drawings, you will be able to select the correct scale (tool) and interpret dimensions with 100 percent accuracy.

Enabling Objectives

1) *You will be able to identify the difference between engineer (civil) and architect scales.*
2) *Using a scale, you will be able to measure objects shown on civil engineering plans and architectural renditions of buildings and structures.*
3) *You will be able to interpret the results of the measurements.*

Scales

Before they are built or assembled, roads, water mains, structures, and fire protection systems are designed in accordance with nationally recognized standards. The design concept is transferred to a set of plans (drawings) that provide a two- or three-dimensional representation of the project.



Since it would be impractical to create full-size drawings for these objects, they are reduced to a manageable size (scale) so they can be studied. A set of plans may include a variety of different scales, depending upon what objects are being rendered. The selected scale normally is found in the title block in the lower right hand corner of the drawings, but may be found anywhere on the plans. You may find more than one scale on a single sheet when there are "details," parts of the objects that are enlarged for clearer explanation.

In order to interpret the size of what the renderings represent, the plan reviewer must use a tool called a "scale." The word "scale" is used synonymously to represent the tool and the size reduction in the drawing. The scale tool provides a quick method for measuring the object and interpreting its eventual size when finished.

Selecting the Correct Tool

Traditional scales are prism-shaped tools that look similar to the rulers you may have used in elementary school. There are two types of drafting scales used in design and construction:

1. *Engineer, or civil, scales*, such as 1″ = 10′ or 1″ = 50′, are used for measuring roads, water mains, and topographical features. The distance relationships also may be shown as 1:10 or 1:50.

1. Look closely at the dimensions shown on the faces of the tools.

- Engineer scales have numbers that run incrementally from *left to right*. The whole number to the left of the number line indicates the scale those numbers represent.

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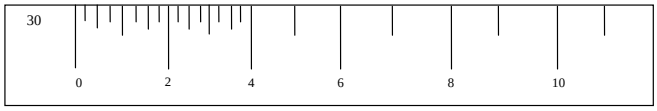
3. *Engineer scales* have the following dimensional relationships:

1 inch = 10 feet	1 inch = 40 feet
1 inch = 20 feet	1 inch = 50 feet
1 inch = 30 feet	1 inch = 60 feet



- When using the engineer scale, you must multiply the value you identify by 10.
- The small lines between the whole numbers represent individual feet, so a point that falls two marks to the right of the whole number 4 is interpreted as 42 feet.

Using the Tool and Interpreting the Results

You should never use your scale to draw lines. It should be used *only* for measuring.

1. Identify the scale shown on the plans by the architect, engineer or fire protection contractor (*i.e.,* 1/8 = 1 foot; 1:40).
2. Select the object you wish to measure, and select the appropriate *architect* or *engineer* scale (tool).
3. Align your scale tool with the selected scale to verify they match. During blueprint reproduction, the image size may be adjusted to fit the paper so it may not represent precisely the scale the designer intended to use.
4. Correctly align the "0" with one end of the object as a starting point, and identify the object's end point. The corresponding number on the scale tool represents the object's length when built.

Example No. 4:

Use the same line, but this time you are measuring a "water main" and the plans show a scale of 1 inch equals 20 feet. Use the *engineer* scale to measure this water line.

Lay the engineer scale marked "20" on the left end of the line. The right end of the line should align with the number "8". Remember to multiply that value by 10 to get an answer of "80 feet."

Try the activities on the next pages to test your new skills. The answers are found on the last page.

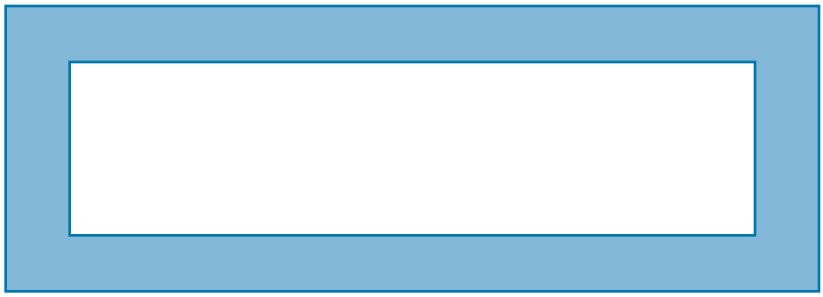
1. Measure the height and width of this rectangle.

Use the engineers scale, 1 inch on drawing = 20 feet in real world

Height:_____feet Width:_____feet

2. Measure the exterior dimensions of this rectangle.

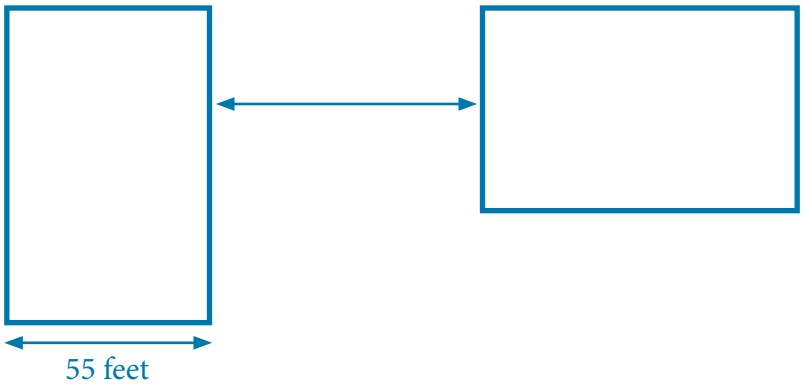
Use the engineers scale, 1 inch on drawing = 40 feet in real world



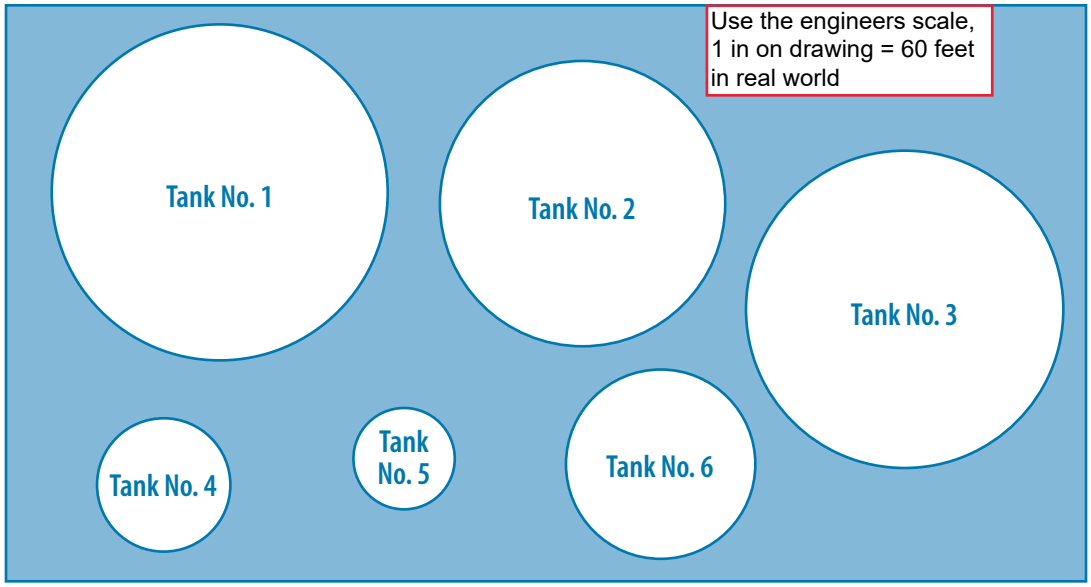
Height:_____feet Width:_____feet

3. In scale, how far apart are these two rectangles?

Use the engineers scale, 1 inch on drawing = 50 feet in real world



4. This drawing represents the plan view of a bulk tank facility. What are the tank diameters in feet?



Tank No. 1 =_____feet Tank No. 4 =_____feet

Tank No. 2 =_____feet Tank No. 5 =_____feet

Tank No. 3 =_____feet Tank No. 6 =_____feet

5. Given the above information, how far apart at their nearest edges are Tanks 1 and 6, measured in a straight line?

6. This drawing represents the floor plan of a small office. Use the engineers scale, 1 in on drawing = 10 feet in real world t, how long in feet is the exit access corridor?