Scales

- The purpose of scales is to allow an engineer, architect, technician or contractor to determine scaled measurements from drawings or maps very quickly and easily.
- Drawings and maps are drawn to different scales such as: 1” = 100’, 1” = 1’-0” or 1:2 (half size).

Types of Scales

Civil Engineering Scale
Architect’s Scale

Metric Scale
Civil Engineer’s Scale

• Full Divided Scale
• 1” is divided into equal decimal units of 10, 20, 30, 40, 50, 60 and 80 divisions.
• For example, 1” = 100’ is a typical scale used for Civil Engineering Drawings. This means that 1” on the drawing represents 100’ in the real world.

Scale & Size

• 10 scale represents full size in decimal inches. 1” on paper represents 1” in real life. Hence the name “full size”.
• 20 scale represents half scale where 1” on a drawing represents 2” in real life.
• 40 scale represents quarter size where 1” on a drawing represents 4” in real life.
Applications

• Civil Engineers typically design large things such as, bridges, roads, buildings, shopping centers etc. Therefore typical scales used include: 1” = 100’ for plan views of highway designs and 1” = 5’ vertical and 1” = 100’ horizontal for profile views. Section views are typically 1” = 5’ vertical and 1” = 10’ horizontal.

Other Applications

• Sometimes scales are used to compute quantities based on a graphical analysis. When this is the case units of measurement other than length are often used. Examples include:
  • 1” = 10 kips, 1” = 2000 volts, 1” = 50 buses, 1” = 20 GHz and 1” = 40 people.
  • Always remember that your answer will be recorded in a decimal format for the CE scale.
How to use an Engineer’s Scale

### CIVIL ENGINEER’S SCALE

<table>
<thead>
<tr>
<th>Divisions</th>
<th>Ratio</th>
<th>Scales Used with This Division</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>1:1</td>
<td>1&quot; = 1&quot; 1&quot; = 1&quot; 1&quot; = 10' 1&quot; = 100'</td>
</tr>
<tr>
<td>20</td>
<td>1:2</td>
<td>1&quot; = 2&quot; 1&quot; = 20' 1&quot; = 200'</td>
</tr>
<tr>
<td>30</td>
<td>1:3</td>
<td>1&quot; = 3&quot; 1&quot; = 30' 1&quot; = 300'</td>
</tr>
<tr>
<td>40</td>
<td>1:4</td>
<td>1&quot; = 4&quot; 1&quot; = 40' 1&quot; = 400'</td>
</tr>
<tr>
<td>50</td>
<td>1:5</td>
<td>1&quot; = 5&quot; 1&quot; = 50' 1&quot; = 500'</td>
</tr>
<tr>
<td>60</td>
<td>1:6</td>
<td>1&quot; = 6&quot; 1&quot; = 60' 1&quot; = 600'</td>
</tr>
</tbody>
</table>

Steps in Reading CE Scale
Examples of Using the CE Scale

Reading the 50 scale
Architect’s Scale

- Architects are involved in large scale projects as well as smaller scale projects. They use a wide range of different scales for their drawings.
- Many Structural Engineering detail drawings are read using the Architect’s scale.
- Architect’s scale always reads X” = 1’- 0”
  For example, ½” = 1’- 0” or 3” = 1’- 0”.

Architect’s Scales and Sizes

- 16 Scale = Full Size 12” = 1’- 0”. (standard ruler)
- 3” = 1’- 0” = Quarter Size (divide 3”/12” = ¼)
- 1-1/2” = 1’- 0” = 1/8 size
- 1” = 1’- 0” = 1/12 size
- 3/4” = 1’- 0” = 1/16 size
- 1/2” = 1’- 0” = 1/24 size
- 3/8” = 1’- 0” = 1/32 size
- 1/4” = 1’- 0” = 1/48 size
- 1/8” = 1’- 0” = 1/96 size
- 3/32” = 1’- 0” = 1/128 size
Reading an Architect’s Scale

Examples of using the Architect’s Scale
International System of Units

- Millimeter (mm) is the primary SI unit.
- Conversion: U.S. Customary 1” = 25.4 mm.
- Kilometer is used for large scale drawings.
  - 1 km = 1,000 m
  - 1 m = 1,000 mm
  - 1 m = 100 cm
  - 1 cm = 10 mm

Common Metric Scales

- 1: 1 Full Size
- 1: 2 Half Size
- 1:5 1/5 Size
- 1:20 1/20 Size (can be used for 1/200 size)
- 1:331/3 LP Size
- 1:50 (can be used for 1/5 size)
- 1: 100 (can be used for full size)
Reading the Metric Scale

Examples of Using the Metric Scale
ANSI Lettering Standards

• Use Gothic Text Style Vertical or Inclined.
• Use all Capital Letters.
• Use 1/8” (3 mm) for Most Text Heights.
• Use 1/4” (6 mm) for the height of fractions.
• Determine the minimum space between lines of text by taking the text height and dividing by 2.

Vertical Gothic Lettering Guide
Alphabet of Lines

SCALES (DR-4) Completed Example

<table>
<thead>
<tr>
<th>ANSWERS</th>
<th>1 mm = 200 m</th>
</tr>
</thead>
<tbody>
<tr>
<td>250,000</td>
<td></td>
</tr>
<tr>
<td>351,43</td>
<td>1&quot; = 50 Watts</td>
</tr>
<tr>
<td>7/16&quot;</td>
<td>3/32&quot; = 1&quot; - 0&quot;</td>
</tr>
<tr>
<td>3/16&quot;</td>
<td>3/8&quot; = 1&quot; - 0&quot;</td>
</tr>
<tr>
<td>3/32&quot;</td>
<td>1/16&quot; = 1&quot; - 0&quot;</td>
</tr>
<tr>
<td>3/16&quot;</td>
<td>3/32&quot; = 1&quot; - 0&quot;</td>
</tr>
<tr>
<td>1/4&quot;</td>
<td>1&quot; = 300 miles</td>
</tr>
<tr>
<td>1/4&quot;</td>
<td>3&quot; = 1&quot; - 0&quot;</td>
</tr>
<tr>
<td>200 RPM</td>
<td>1 mm = 10 km</td>
</tr>
<tr>
<td>1,950 ft</td>
<td>1&quot; = 300 m</td>
</tr>
</tbody>
</table>

Christian Brothers University

CE 111 DESIGN GRAPHICS