

4.1.1 Unit Conversions

Unit conversion is a process for changing the units of a measured quantity without changing its value. It involves utilizing a **conversion factor** which expresses the relationship between units that is used to change the units of a measured quantity without changing the value. Examples of conversion factors include:

Fundamental Units	
Dimension	Conversion Factor
time	$\frac{60 \text{ sec}}{\text{min}}, \frac{1,440 \text{ sec}}{\text{day}}$
length	$\frac{12 \text{ in}}{\text{ft}}, \frac{5,280 \text{ ft}}{\text{mile}}$
mass	$\frac{2,000 \text{ lbs}}{\text{ton}}, \frac{1000 \text{ gm}}{\text{mg}}$
Derived Units	
Dimension	Conversion Factor
area	$\frac{43,560 \text{ ft}^2}{\text{acre}}, \frac{60 \text{ sec}}{\text{min}}$
volume	$\frac{27 \text{ ft}^3}{\text{yd}}, \frac{7.48 \text{ gal}}{\text{ft}^3}$

The numerator and the denominator of any conversion factor always equals one, they have the same value expressed in different units.

For converting one measurement unit to another.

Step 1: Make sure the original unit is for the same measurement as the conversion unit. So if the original unit is for area, say ft^2 the conversion unit can be another area unit such as in^2 or acre but it cannot be gallons as gallon is a unit of volume.

Step 2: Write down the conversion formula as:

$$\text{Quantity in converted unit} = \text{Quantity (Original Unit)} * \text{Conversion Factor} \frac{\text{Conversion unit}}{\text{Original unit}}$$

Unit conversions may involve single factor where the original unit value is multiplied by the conversion factor to obtain the measured parameter in the converted (desired) unit.

For example:

Converting 1000 ft^3 to cu. yards:

$$1000 \cancel{\text{ft}^3} * \frac{\text{cu.yards}}{27 \cancel{\text{ft}^3}} = 37 \text{cu.yards}$$