

### SERIES 2, ISSUE 2 – MATH FOR PRESTRESSED CONCRETE: VOLUME

It is necessary to calculate the volume of precast concrete members to know how much concrete it will take to fill the corresponding formwork.

#### Rectangular Shapes

The simple equation is:

$$\text{Length} \times \text{Width} \times \text{Height} = \text{Volume}$$

Concrete volume is usually discussed in terms of cubic yards.

$$\text{One cubic yard (yd}^3\text{)} = 3 \times 3 \times 3 \text{ ft} = 27 \text{ cubic feet (ft}^3\text{)}$$

If you have an 18 in. square beam that's 30 ft long, you will need to convert all the measurements to the same unit to determine the volume. In this case, let's use feet. 18 in. = 1.5 ft, so:

$$1.5 \times 1.5 \times 30 \text{ ft} = 67.5 \text{ ft}^3$$

To convert to cubic yards, divide by 27 (the number of cubic feet per cubic yard):

$$67.5/27 = 2.5 \text{ yd}^3 \text{ of concrete}$$

If you have a panel that's 5 in. thick, 12 ft 6 in. wide, and 26 ft 9 in. long, you will need to convert all the measurements to the same unit before calculating the volume. In this example, let's use feet. (To convert inches to feet, divide by 12.) So:

$$5 \text{ in.} = 0.417 \text{ ft, } 12 \text{ ft } 6 \text{ in.} = 12.5 \text{ ft, and } 26 \text{ ft } 9 \text{ in.} = 26.75 \text{ ft.}$$

$$0.417 \times 12.5 \times 26.75 \text{ ft} = 139.4 \text{ ft}^3$$

$$\text{To convert to cubic yards, divide by 27: } 139.4/27 = 5.16 \text{ yd}^3$$

If that same panel included a block-out or opening that was 4 × 5 ft, then you would need to calculate that volume and subtract it from the total panel volume to figure out how much concrete it would take to fill the mold, but not the block-out. So:

$$0.417 \times 4 \times 5 \text{ ft} = 8.34 \text{ ft}^3$$

$$8.34/27 = 0.31 \text{ yd}^3$$

$$5.16 - 0.31 \text{ yd}^3 = 4.85 \text{ yd}^3 \text{ of concrete}$$

#### Cylinders

Determining the volume of a cylinder is a little different. The equation is:

$$\text{Volume} = \pi \times r^2 \times h$$

where

$$\pi = \text{pi} = 3.14$$

$r$  = the radius of the cylinder (half the diameter)

$h$  = the height of the cylinder

So, the volume of a cylinder that is 6 in. across and 12 in. high would be:

$$r = \frac{1}{2} \text{ of } 6 \text{ in.} = 3 \text{ in.}$$

$$r^2 = 3 \times 3 = 9 \text{ in.}^2$$

$$h = 12 \text{ in.}$$

$$3.14 \times 9 \times 12 = 339 \text{ in.}^3$$

To convert to cubic feet, divide by 1728 (the number of cubic inches per cubic foot: 12 × 12 × 12 in.)

$$339/1728 = 0.20 \text{ ft}^3$$

# PCI Plant Quality Talk Quality Enhancement Committee



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**Note:** Please complete this form and return to the Quality Control Manager. All crew members should be observant and report to their foreman anything out of the ordinary on a project. *See something, say something.*

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