Measurements: Construction Supervisor
MONROC
Job Description: Responsible for coordinating subcontractors' work and arrival of materials. Insures work is done correctly, safely, and on time.
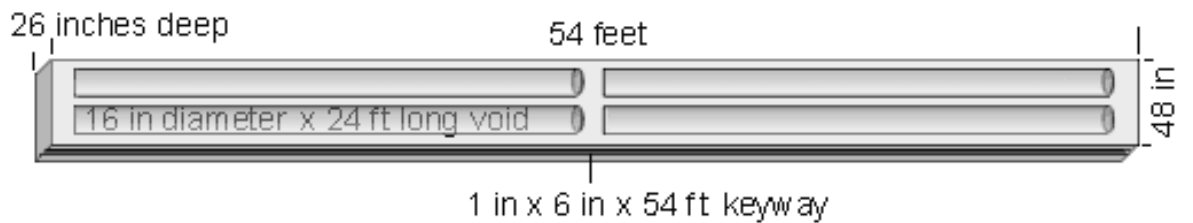
Problem:
How many cubic yards of concrete will it take to make a bridge girder, called a *voided flat slab?*

The girder is 48 inches wide, 26 inches tall, and 54 feet long.

There are four 16 inch diameter voids within the slab – each is 24 feet long.

On each side of the girder is a 1" by 6" keyway.

Foundation
Micron

Measurements: Construction Supervisor
MONROC
Job Description: Responsible for coordinating subcontractors' work and arrival of materials. Insures work is done correctly, safely, and on time.
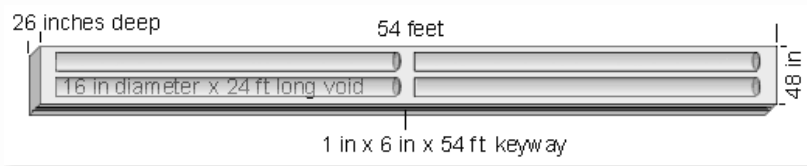
___

Problem:
How many cubic yards of concrete will it take to make a bridge girder, called a *voided flat slab?*

The girder is 48 inches wide, 26 inches tall, and 54 feet long.

There are four 16 inch diameter voids within the slab – each is 24 feet long.

On each side of the girder is a 1" by 6" keyway.

26 inches deep   54 feet   48 in
16 in diameter x 24 ft long void
1 in x 6 in x 54 ft keyway

Solution:
1. Figure the total possible volume of the voided flat slab.

$$VOL = W \times H \times L \quad 48" \text{ width} \times 26" \text{ height} \times (54' \times 12") \text{ length} = 808,704 \text{ in}^3$$

$$808,704 \text{ in}^3 \div (12" \times 12" \times 12") = 468 \text{ ft}^3 \text{ (volume)}$$

2. Calculate the 1" x 6" keyways on each side of the girder.

    Girder length in inches = 54' x 12"/ft = 648"

    1" x 6" x 648" = 3,888 in³ ÷ 12" x 12" x 12" = 2.25 ft³

    2.25 ft³ x 2 keyways = 4.5 ft³ for both keyways

3. Calculate the 16" diameter voids.

    Volume of cylinder = πr^2 x length   r = 16 ÷ 2 = 8

    Length of cylinder in inches = 24' x 12"/ft = 288"

    3.14 x (8" x 8") x 288" = 57,876.48 in³ ÷ (12in/ft)³ = 33.499 ft³

    33.49 ft³ x 4 voids = 133.97 ft³

4. Subtract the volume of the keys and voids from the total volume of concrete.

    468 ft³ - (4.5 + 133.97) ft³ = 329.53 ft³ ÷ (3ft/yd)³ = 12.21 yd³

This is a common geometry problem for engineers and construction supervisors. It requires math and geometry as well as analytical thought.