

## Example:

# Small-diameter well-plugging

(Figure 3A)

## Well dimensions

- 4 inch diameter
- 140 feet in depth
- 20 feet to the water table

## Volume calculations

$\pi r^2$  = area of a circle

$\pi = 3.14$

r = radius in ft = .17

$3.14 \times (.17) \times (.17) = 0.09 \text{ ft}^2$

The volume in cubic feet (ft<sup>3</sup>) now can be calculated for a given length of well casing by multiplying the area or 0.09 ft<sup>2</sup>.

## Calculations for chlorine

Depth of well – Depth to water table = Depth of water

140 ft – 20 ft = 120 ft of water

120 ft X 0.09 ft<sup>2</sup> = 10.8 ft<sup>3</sup> of water

1 ft<sup>3</sup> = 7.5 gal

10.8 ft<sup>3</sup> X 7.5 gal = 81 gal water

1 gal chlorine/500 gal water = ? gal chlorine/81 gal water

81/500 = 0.16 gal chlorine needed to disinfect well

## Calculations for bentonite chips

134 ft X 0.09 ft<sup>2</sup> = 12.1 ft<sup>3</sup> of bentonite needed

50 lb bag of bentonite chips = 0.7 ft<sup>3</sup>

therefore

12.1 ft<sup>3</sup>/0.7 ft<sup>3</sup> = 17.3 bags of chipped bentonite

## Calculations for water required to wet bentonite chips

4 gal of water is required to hydrate one 50 lb bag of bentonite chips

17 bags of bentonite chips are needed

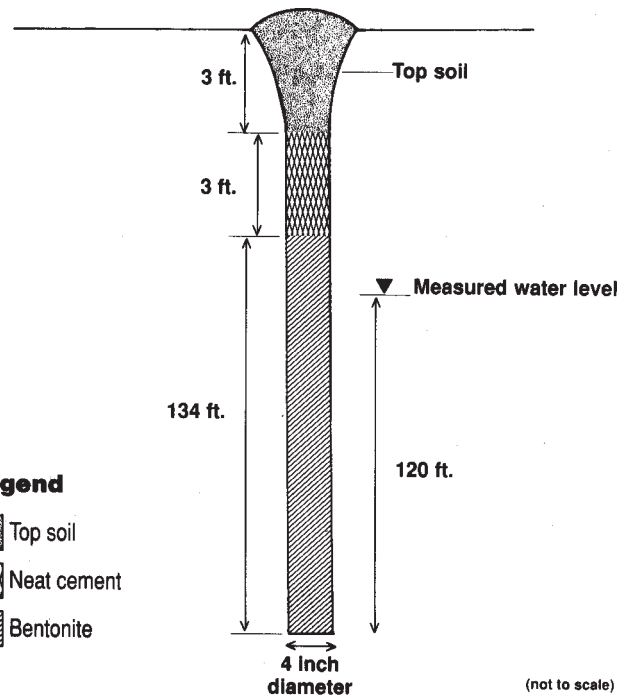


Figure 3A. Diagram of an effective well-plugging method for small-diameter wells (less than 10 inches) using chipped bentonite.

therefore

4 gals X 17 = 68 gals needed

Water needed – water available = additional water required  
68 gal – 81 gal = 0 gal of additional water is required

## Calculations for neat cement

3 ft X 0.09 ft<sup>2</sup> = 0.27 ft<sup>3</sup> of neat cement needed

94 lb bag Portland cement = 1 ft<sup>3</sup> neat cement grout

therefore

0.27 ft<sup>3</sup>/1 ft<sup>3</sup> = 0.27 bags of Portland cement needed

## Calculations for water required to make neat cement

94 lb bag of Portland cement requires 6 gals of water

therefore

0.27 X 6 gals = 1.6 gals of water needed for neat cement

## Approximate cost of plugging materials

Chlorine cost = \$1/gal X 0.16 gal = \$0.16

Bentonite = \$6/bag X 17 bags = \$102

Neat cement = \$6/bag X 0.27 bags = \$1.80

Total cost of well-plugging materials = \$103.96

## ▼ Your Small-diameter Well

### Well dimensions

\_\_\_\_\_ inch diameter

\_\_\_\_\_ feet in depth

\_\_\_\_\_ feet to the water table

### Volume calculations

r = radius in ft = \_\_\_\_\_

$3.14 \times (\text{_____}) \text{ ft} \times (\text{_____}) \text{ ft} = \text{_____} \text{ ft}^2$

### Calculations for chlorine

\_\_\_\_\_ ft - \_\_\_\_\_ ft = \_\_\_\_\_ ft of water

\_\_\_\_\_ ft  $\times$  \_\_\_\_\_  $\text{ft}^2 = \text{_____} \text{ft}^3$  of water

\_\_\_\_\_  $\text{ft}^3 \times 7.5 \text{ gal} = \text{_____} \text{ gal}$  water

\_\_\_\_\_ / 500 = \_\_\_\_\_ gal chlorine needed

### Calculations for bentonite chips

\_\_\_\_\_ ft  $\times$  \_\_\_\_\_  $\text{ft}^2 = \text{_____} \text{ft}^3$  of bentonite

\_\_\_\_\_  $\text{ft}^3 / 0.7 \text{ ft}^3 = \text{_____} \text{ bags}$

### Calculations for water required to wet bentonite chips

4 gals  $\times$  \_\_\_\_\_ = \_\_\_\_\_ gals needed

\_\_\_\_\_ gal - \_\_\_\_\_ gal = \_\_\_\_\_ gal additional water

### Calculations for neat cement

3 ft  $\times$  \_\_\_\_\_  $\text{ft}^2 = \text{_____} \text{ft}^3$  of neat cement

\_\_\_\_\_  $\text{ft}^3 / 1 \text{ ft}^3 = \text{_____} \text{ bags}$  of Portland cement

### Calculations for water required to make neat cement

\_\_\_\_\_  $\times 6 \text{ gals} = \text{_____} \text{ gals}$  of water

### Approximate cost of plugging materials

Chlorine cost = \_\_\_\_\_ / gal  $\times$  \_\_\_\_\_ gal = \$ \_\_\_\_\_

Bentonite = \_\_\_\_\_ / bag  $\times$  \_\_\_\_\_ bags = \$ \_\_\_\_\_

Neat cement = \_\_\_\_\_ / bag  $\times$  \_\_\_\_\_ bags = \$ \_\_\_\_\_

**Total cost of well-plugging materials** = \$ \_\_\_\_\_