Titan Industries, Inc.
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<u>**Technical Bulletin**</u>

**To calculate the amount of annular space of borehole & / or casing for
silica sand, hole plug (bentonite fill), vol-clay grout**

First calculate the cubic area of the entire borehole:

  **Area = 3.1416 X Diameter (expressed in feet) simply means divide diameter by 12
  Then Square, then divide by 4. (see example below)
  Area = 3.1416 X 1.33' (16"/12=1.33') squared, divided by 4 = 1.389294 cu. ft**

Then calculate the cubic area taken up by the screen &/ or casing:

**Subtract the cubic area taken up by the screen/casing from the cubic area of the
entire borehole:**

Multiply the difference by the depth of the annular space to be filled.

This yields the amount of cubic feet of annular space.

If the annular space is to be filled with Silica Sand…
  1 Bag of 100 # = 1 cubic ft. of fill

If the annular space is to be filled with CETCO Vol-Clay Grout…
  1 Bag of 50 # = 3.5 cubic ft. of fill

If the annular space is to be filled with Hole Plug…
  **If coarse chips   (3/4" average) = 71 pounds per cubic ft. of fill
  If medium chips (3/8" average) = 74 pounds per cubic ft. of fill**

One example of this calculation is:

  **Size of borehole is 16" diameter
  Size of Casing & Screen is 8" PVC (8.625" O.D.)
  Depth of the well is 280'
  This is 80' of Screen and 200" of Casing**

Area = 3.1416 X 1.33' (16") squared, divided by 4 = 1.389294 cu. ft.
                          (for entire borehole)

Area =3.1416 X .71875 (8.625") squared, divided by 4 = .4057388 cu. ft.
                          (space taken up by Screen/Casing)

Subtract .4057388 from 1.389294 = .9835552 Cu. Ft. Per Linear Foot.

**Therefore to gravel pack 80' of screen + 5' above screen =
85 X .9835552 = 83.6022 cu. ft. of sand = 8,360.22 pounds = 84 of 100# bags**

**Remaining fill with bentonite or cement (cement not recommended with PVC) =
Approx. 200 X .983552 = 196.711 cu. ft. of fill**