GROUTING INFORMATION

The following table is the minimum acceptable amount of cement per ft. at 5.2 gallons of water per 94 lb. bag of cement (yields 8.82 gallons of slurry/bag) for neat cement slurry to be used in grouting wells. Table assumes no formation loss. Quantity actually used may be rounded up to the nearest ¼ bag.

CEMENT ONLY (No Bentonite) TABLE

OPEN HOLE / ONE FT. INTERVAL			ANNULUS / ONE FT. INTERVAL			
Hole Diameter	Hole Volume Gallons/one ft.	Bags/ one ft.	Casing Diameter	Hole Diameter	Hole Volume Gallons/one ft.	Bags/ one ft.
2”	.16	.02	2”	4”	.42	.05
3”	.37	.04	2”	5”	.779	.09
4”	.65	.07	2”	6”	1.24	.14
5”	1.02	.12	3”	5”	.52	.06
6”	1.47	.17	3”	6”	.97	.11
8”	2.61	.30	4”	8”	1.79	.20
10”	4.08	.46	4”	10”	3.25	.37
12”	5.87	.67	5”	10”	2.85	.32
14”	8.00	.91	6”	10”	2.29	.26
16”	10.44	1.18	8”	12”	2.84	.32
18”	13.22	1.50	10”	14”	3.28	.37
20”	16.32	1.85	10”	16”	5.73	.65
			12”	16”	3.81	.43
			12”	18”	6.59	.75
			16” (O.D.)	20”	5.88	.67

BENTONITE ADDITIVE TO CEMENT TABLE

Percent Bentonite	Gallons of water/ bags of cement	Slurry Yield gallons/ bag	** Multiply for bags of Bentonite required	** Multiply for bags of cement required
10	11.7	15.78	0.103	.56
8	10.4	14.36	0.092	.61
6	9.1	12.94	0.077	.68
4	7.8	11.59	0.057	.76
2	6.5	10.17	0.032	.87
0	5.2	8.82	0.000	1.00

**Multiply the theoretical number of (Cement Only Table) bags required by the corresponding decimal values for the bags of cement and Bentonite mixture desired. A dispersant may be added if slurry becomes difficult to pump.

DRY BENTONITE

One 50 lb. bag (granular/chips) is equivalent to approximately 5.5 gal. (±10%). In order to determine a theoretical estimate of number of bags required, determine total hole volume in gallons from the "Cement Only Table" and divide by 5.5 gal./bag to obtain the number of bags of dry (granular/chip) Bentonite.

Example: 100 feet, 4 inch diameter hole; 100 ft × 0.65 gal/foot = 65 gal; 65 gal ÷ 5.5 gal/bag = 12 bags dry Bentonite.

TECHNIQUES AND PROCEDURES

The following grouting techniques and procedures shall be adhered to. Failure to do so could jeopardize the approval of the well abandonment due to the grouting technique used.

1. Measure the annulus to ensure that the 20 ft. (for top grouting), or the total depth of the casing, is exact. If a tremie is introduced, then the annulus should be checked by rotating the tremie pipe clockwise around the casing.
2. Calculate a theoretical amount of cement needed prior to the beginning of the grouting operation.
3. The cement and water shall be mixed at a ratio of 5.2 gallons of water to one 94 lb. bag of Portland cement.
4. Should the cement return to the surface with less than the acceptable amount, then the tremie pipe should be moved to clear the annulus. Should the cement not return at or near the surface due to potential voids, then additional grout may be required.
5. After cement has cured, add additional cement to the annulus if the top of the cement is over six (6) inches below land surface.