

SECTION II

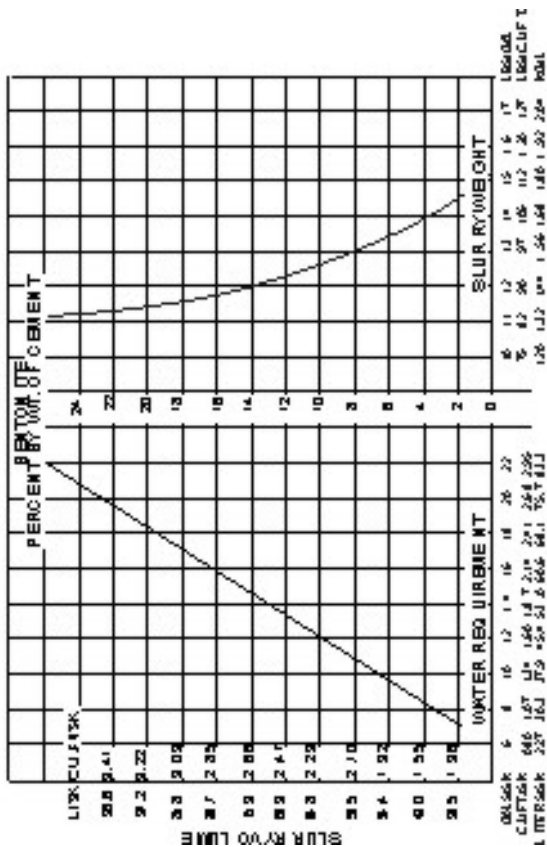
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ENGLISH/METRIC UNITS

API CLASSACEMENT



ENGLISH UNITS

PORTLAND CEMENT — CLASS A OR B WITH BENTONITE

SLURRY PROPERTIES

Per Cent Bentonite	Maximum Water Requirements		Slurry Weight		Slurry Volume
	Gal./Sk.	Cu. Ft./Sk.	Lbs./Gal.	Lbs./Cu. Ft.	Cu. Ft./Sk.
0	5.2	0.70	15.6	117	1.18
2	6.5	0.87	14.7	110	1.36
4	7.8	1.04	14.1	105	1.55
6	9.1	1.22	13.5	101	1.73
8	10.4	1.39	13.1	98	1.92

THICKENING TIME — HOURS:MINUTES

(Pressure-Temperature Thickening-Time Test)

Per Cent Bentonite	API CASING TESTS			API SQUEEZE TESTS		
	4,000'	6,000'	8,000'	2,000'	4,000'	6,000'
0	3:00+	2:25	1:40	2:14	1:32	1:01
2	2:25	1:48	1:34	2:25	1:29	0:56
4	2:34	1:57	1:32	2:26	1:18	0:58
6	2:35	1:45	1:22	2:16	1:26	0:56
8	2:44	1:50	1:24	2:31	1:28	0:58

COMPRESSIVE STRENGTHS — PSI

Atmospheric Pressure

Percent Bentonite	60°F	80°F	100°F	120°F
12 HOURS				
0	80	580	1035	1905
2	55	455	635	1280
4	20	220	375	780
6	15	85	245	500
8	15	50	155	310
24 HOURS				
0	615	1905	2610	3595
2	365	1090	1520	2040
4	225	750	1015	1380
6	85	360	730	925
8	60	265	510	610
72 HOURS				
0	2050	4125	6150	6650
2	1185	2840	3350	4110
4	960	1775	2430	2800
6	615	1170	1610	1710
8	425	720	1045	1215

METRIC UNITS

PORTLAND CEMENT — CLASS A OR B WITH BENTONITE

SLURRY PROPERTIES

Per Cent Bentonite	Maximum		
	Water Requirements L/Sk	Slurry Weight Kg/Liters	Slurry Volume L / Sk.
0	19.7	1.87	33.41
2	24.6	1.76	38.50
4	29.5	1.69	43.88
6	34.4	1.62	48.98
8	39.4	1.57	54.36

THICKENING TIME — HOURS:MINUTES

(Pressure-Temperature Thickening-Time Test)

Per Cent Bentonite	APICASING TESTS			APISQUEEZE TESTS		
	1 220m	1 830m	2 440m	610m	1 220m	1 830m
0	3:00+	2:25	1:40	2:14	1:32	1:01
2	2:25	1:48	1:34	2:25	1:29	0:56
4	2:34	1:57	1:32	2:26	1:18	0:58
6	2:35	1:45	1:22	2:16	1:26	0:56
8	2:44	1:50	1:24	2:31	1:28	0:58

COMPRESSIVE STRENGTHS — MEGAPASCALS

Atmospheric Pressure

Per cent Bentonite	Atmospheric Pressure			
	16°C	27°C	38°C	49°C
12 HOURS				
0	0.55	3.99	7.13	13.13
2	0.37	3.13	4.37	8.82
4	0.13	1.51	2.58	5.37
6	0.10	0.58	1.68	3.44
8	0.10	0.34	1.06	2.13
24 HOURS				
0	4.24	13.13	17.99	24.78
2	2.51	7.51	10.48	14.06
4	1.41	5.17	6.99	9.51
6	0.58	2.48	5.03	6.37
8	0.41	1.82	3.51	4.20
72 HOURS				
0	14.13	28.44	42.40	45.85
2	8.17	19.58	23.09	28.33
4	6.61	11.23	16.75	19.85
6	4.24	8.06	11.10	11.79
8	2.93	4.96	7.20	8.37

ENGLISH UNITS

CLASS A CEMENT

COMPRESSIVE STRENGTH — psi

2 PER CENT BENTONITE — 14.7 lbs/gal

Percent Calcium Chloride	CURING TEMPERATURE AND PRESSURE				
	60°F 0 psi	80°F 0 psi	95°C 800 psi	110°F 1,600 psi	140°F 3,000 psi
6 HOURS					
0	Not Set	70	180	415	1330
2	85	350	515	695	1730
4	185	535	700	1040	1650
8 HOURS					
0	15	200	310	660	1905
2	135	620	770	905	2185
4	240	730	930	1260	1830
12 HOURS					
0	55	455	630	1150	2350
2	255	1150	1310	1610	2850
4	450	1100	1340	2000	2440
18 HOURS					
0	260	885	1065	1740	2890
2	520	1805	1925	2290	3340
4	660	1610	1915	2450	2900
24 HOURS					
0	365	1090	1340	1540	3380
2	765	1820	2025	2390	3520
4	1040	2020	2200	2610	3490

4 PER CENT BENTONITE — 14.1 lbs/gal

Percent Calcium Chloride	CURING TEMPERATURE AND PRESSURE				
	60°F 0 psi	80°F 0 psi	95°C 800 psi	110°F 1,600 psi	140°F 3,000 psi
6 HOURS					
0	Not Set	45	120	270	890
2	30	170	285	395	1065
4	80	265	405	525	1345
8 HOURS					
0	10	115	195	320	1160
2	75	240	380	445	1295
4	95	335	465	575	1400
12 HOURS					
0	20	220	285	410	1400
2	135	500	600	750	1475
4	170	355	605	980	1425
18 HOURS					
0	125	440	610	975	1950
2	305	785	990	1400	2135
4	410	865	1150	1640	2100
24 HOURS					
0	225	750	900	1410	2225
2	395	1085	1225	1440	2275
4	510	1195	1350	1690	2145

METRIC UNITS

CLASS A CEMENT

COMPRESSIVE STRENGTH — MEGAPASCALS

2 PER CENT BENTONITE — 1.76 Kg/L

Percent Calcium Chloride	CURING TEMPERATURE AND PRESSURE				
	16°C 0 MPa	27°C 0 MPa	35°C 5.51 MPa	43°C 11.03 MPa	60°C 20.68 MPa
6 HOURS					
0	Not Set	0.48	1.24	2.86	9.17
2	0.58	2.41	3.55	4.79	11.92
4	1.27	3.68	4.82	7.17	11.37
8 HOURS					
0	0.10	1.37	2.13	4.55	13.13
2	0.93	4.27	5.30	6.24	15.06
4	1.65	5.03	6.41	8.68	12.61
12 HOURS					
0	0.37	3.13	4.34	7.92	16.20
2	1.75	7.92	9.03	11.10	19.65
4	3.10	7.58	9.23	13.78	16.82
18 HOURS					
0	1.79	6.10	7.34	11.99	19.92
2	3.58	12.44	13.27	15.78	23.02
4	4.55	11.10	13.20	16.89	19.99
24 HOURS					
0	2.51	7.51	9.23	10.61	23.30
2	5.27	12.54	13.96	16.47	24.26
4	7.17	13.92	15.16	17.99	24.06

4 PER CENT BENTONITE — 7.69 Kg/L

Percent Calcium Chloride	CURING TEMPERATURE AND PRESSURE				
	16°C 0 MPa	27°C 0 MPa	35°C 5.51 MPa	43°C 11.03 MPa	60°C 20.68 MPa
6 HOURS					
0	Not Set	0.31	0.82	1.86	6.13
2	0.20	1.17	1.96	2.72	7.34
4	0.55	1.82	2.79	3.62	9.27
8 HOURS					
0	0.06	0.79	1.34	2.20	7.99
2	0.51	1.65	2.62	3.06	8.92
4	0.65	2.31	3.20	3.96	9.65
12 HOURS					
0	0.13	1.51	1.96	2.82	9.65
2	0.93	3.44	4.13	5.17	10.17
4	1.17	2.44	4.17	6.75	9.82
18 HOURS					
0	0.86	3.03	4.20	6.72	13.44
2	2.10	5.41	6.82	9.65	14.72
4	2.82	5.96	7.92	11.30	14.47
24 HOURS					
0	1.41	5.17	6.20	9.72	15.34
2	2.72	7.48	8.44	9.92	15.75
4	3.51	8.44	9.30	11.58	14.78

ENGLISH UNITS

CLASS A CEMENT WITH SALT

Salt Cement slurries are recommended for use in cementing through salt sections, shale formations, bentonitic sands as well as other types of formations that are susceptible to fresh water contamination. When salt is preferentially dry blended with cement, ¼ lb. of D-AIR 1™ per sack is recommended to reduce foaming of the slurry. Where blending facilities are not available and the salt must be placed in the mixing water, 1 gallon of D-AIR-2 per 1,000 gallons of water will aid in reducing foaming during mixing.

SLURRY PROPERTIES

Water Requirements		Per Cent Salt by Weight of Water	Weight of Dry Salt Lbs./Sk. Cement	Slurry Weight		Slurry Volume Cu. Ft./Sk.
Gals./Sk.	Cu. Ft./Sk.			Lbs./Gal.	Lbs./Cu. Ft.	
5.2	0.70	0	0	15.6	117	1.18
		5	2.17	15.7	117	1.19
		10	4.33	15.8	118	1.20
		15	6.50	15.9	119	1.21
		20	8.66	16.0	120	1.22
		Sat. (140°F)	16.12	16.1	120	1.27

THICKENING TIME AND COMPRESSIVE STRENGTH

Per Cent Salt	Per Cent Calcium Chloride	Thickening Time Hrs:mins. 2,000' Csg. Test	Compressive Strength - PSI			
			8 Hours		24 Hours	
			95°F 800 psi	110°F 1600 psi	95°F 800 psi	110°F 1600 psi
0	0	4:15	305	925	2240	3230
0	2	1:40	1365	2000	3920	4815
5	0	2:30	1050	2060	3990	4350
5	2	1:49	1630	2515	4530	5465
10	0	2:30	965	1925	4150	4730
10	2	1:48	1235	2200	3775	4650
15	0	3:01	700	1735	4015	4480
15	2	2:31	945	1605	3075	3820
20	0	3:00	380	1140	3175	3495
20	2	3:13	490	1065	2390	3155
Sat.	0	7:15+	Not Set	15	930	1955
Sat.	2	5:00+	50	290	1570	2450

CLASS A CEMENT WITH RETARDER

Water - 5.2 Gals./Sk.

THICKENING TIME—HOURS:MINUTES

(Pressure-Temperature Thickening-Time Tests)

Per Cent Retarder	API Casing Cementing				API Squeeze Cementing		
	4,000'	6,000'	8,000'	10,000'	4,000'	6,000'	8,000'
	0% SALT						
0.0	3:36	2:25	1:59	1:14	1:32	1:01	0:44
	10% SALT WATER						
0.0	1:53	1:30	1:10	0:50	1:08	1:00	0:30
0.2	2:29	2:05	1:33	1:18	1:43	1:15	0:34
0.4	3:00+	3:00+	3:08	3:14	2:59	2:45	—
	15% SALT WATER						
0.0	2:05	1:33	1:25	1:10	1:35	0:55	0:21
0.2	3:00+	2:17	2:02	1:48	2:19	2:07	0:22
0.4	3:00+	3:00+	3:00+	3:00	—	—	0:15
	20% SALT WATER						
0.0	2:00+	2:00	1:50	1:13	1:47	1:23	0:42
0.2	3:00+	3:00+	2:36	1:36	3:00+	2:12	—
	SATURATED SALT WATER						
0.0	3:00+	3:00+	3:25	2:25	3:00+	3:05	1:29
0.4	—	—	—	—	3:00+	3:00+	2:04

METRIC UNITS

CLASS A CEMENT WITH SALT

Salt Cement slurries are recommended for use in cementing through salt sections, shale formations, bentonitic sands as well as other types of formations that are susceptible to fresh water contamination. When salt is preferentially dry blended with cement, 114 grams of D-AIR 1™ per sack is recommended to reduce foaming of the slurry. Where blending facilities are not available and the salt must be placed in the mixing water, 1 L of D-AIR-2 per 1000L of water will aid in reducing foaming during mixing.

SLURRY PROPERTIES

Water Requirements L/Sk.	Per Cent Salt by Weight of Water	Weight of Dry Salt Kg/Sk. Cement	Slurry Weight Kg/L	Slurry Volume L/Sk.
19.7	0	0	1.87	33.41
	5	1.00	1.88	33.69
	10	1.96	1.89	33.97
	15	2.95	1.90	34.26
	20	3.93	1.92	34.54
	Sat. (60°C)	7.31	1.93	35.96

THICKENING TIME AND COMPRESSIVE STRENGTH

Per Cent Salt	Per Cent Calcium Chloride	Thickening Time Hrs:mins. 610 m Csg. Test	Compressive Strength - mPa			
			8 Hours		24 Hours	
			35°C 5.51 MPa*	43°C 11.03 MPa*	35°C 5.51 MPa*	43°C 11.03 MPa*
0	0	4:15	2.10	6.37	15.44	22.27
0	2	1:40	9.41	13.78	27.02	33.19
5	0	2:30	7.23	14.20	27.51	29.99
5	2	1:49	11.23	17.34	31.28	37.68
10	0	2:30	6.65	13.27	28.61	32.61
10	2	1:48	8.51	15.16	26.02	32.06
15	0	3:01	4.82	11.96	27.68	30.88
15	2	2:31	6.51	11.06	21.20	26.33
20	0	3:00	2.62	7.86	21.89	24.09
20	2	3:13	3.37	7.34	16.47	21.75
Sat.	0	7:15+	Not Set	0.10	6.41	13.47
Sat.	2	5:00+	3.45	1.99	10.82	16.89

CLASS A CEMENT WITH RETARDER

Water - 19.7 L/Sk.

THICKENING TIME—HOURS:MINUTES (Pressure-Temperature Thickening-Time Tests)

Per Cent Retarder	API Casing Cementing				API Squeeze Cementing		
	1 220m	1 830m	2 440m	3 050m	1 220m	1 830m	2 440m
	0% SALT						
0.0	3:36	2:25	1:59	1:14	1:32	1:01	0:44
	10% SALT WATER						
0.0	1:53	1:30	1:10	0:50	1:08	1:00	0:30
0.2	2:29	2:05	1:33	1:18	1:43	1:15	0:34
0.4	3:00+	3:00+	3:08	3:14	2:59	2:45	—
	15% SALT WATER						
0.0	2:05	1:33	1:25	1:10	1:35	0:55	0:21
0.2	3:00+	2:17	2:02	1:48	2:19	2:07	0:22
0.4	3:00+	3:00+	3:00+	3:00	—	—	0:15
	20% SALT WATER						
0.0	2:00+	2:00	1:50	1:13	1:47	1:23	0:42
0.2	3:00+	3:00+	2:36	1:36	3:00+	2:12	—
	SATURATED SALT WATER						
0.0	3:00+	3:00+	3:25	2:25	3:00+	3:05	1:29
0.4	—	—	—	—	3:00+	3:00+	2:04

*Curing Pressure

ENGLISH UNITS

SAND FOR PLUG BACK JOBS

Fracturing sand (20-40 grade) can be used to increase the strength of portland or retarded cement for "plug back jobs to whipstock" in order to provide a tougher plug having greater compressive strengths. When used in cement it requires very little water for wetting and does not seem to affect the pumpability.

PORTLAND CEMENT — CLASS A

SLURRY PROPERTIES

Cement Lbs.	Sand Lbs.	Water Gals./Sk.	Slurry Weight Lbs./Gal.	Slurry Volume Cu. Ft./Sk.
94	—	5.2	15.60	1.18
94	5	5.2	15.76	1.21
94	10	5.2	15.91	1.24
94	15	5.2	16.07	1.27
94	20	5.2	16.20	1.30
94	32	5.2	16.50	1.37
94	56	5.2	17.00	1.52
94	85	5.2	17.50	1.70
94	123	5.2	18.00	1.93

24 HOUR COMPRESSIVE STRENGTH — PSI

Typical Data With Class A Cement
5.2 Gallons Water Per Sack

Cement Pounds	Sand Pounds	95°F 800 psi	110°F 1,600 psi
94	0	2085	2925
94	10	1795	3125
94	20	2125	3100
94	30	2250	3325
94	40	2285	3375
94	50	2036	3385
94	60	2065	3525

METRIC UNITS

SAND FOR PLUG BACK JOBS

Fracturing sand (20-40 grade) can be used to increase the strength of portland or retarded cement for "plug back jobs to whipstock" in order to provide a tougher plug having greater compressive strengths. When used in cement it requires very little water for wetting and does not seem to affect the pumpability.

PORTLAND CEMENT — CLASS A

SLURRY PROPERTIES

Cement Kg	Sand Kg	Water L/Sk	Slurry Weight Kg/L	Slurry Volume L/Sk
42.6	—	19.7	1.87	33.41
42.6	2.3	19.7	1.89	34.26
42.6	4.5	19.7	1.91	35.11
42.6	6.8	19.7	1.93	35.96
42.6	9.1	19.7	1.94	36.81
42.6	14.5	19.7	1.98	38.79
42.6	25.4	19.7	2.04	43.03
42.6	38.6	19.7	2.10	48.13
42.6	55.8	19.7	2.16	54.64

24 HOUR COMPRESSIVE STRENGTH — MEGAPASCALS

Typical Data With Class A Cement
19.7 Liters Water Per Sack

Cement Kg	Sand Kg	35°C 5.51 MPa*	43°C 11.03 MPa*
42.6	0.0	14.37	20.16
42.6	4.5	12.37	21.54
42.6	9.1	14.65	21.37
42.6	13.6	15.51	22.92
42.6	18.1	15.75	23.27
42.6	22.7	14.03	23.33
42.6	27.2	14.23	24.30

*Curing Pressure

ENGLISH UNITS

GILSONITE CEMENT

Gilsonite is a special type of solid hydrocarbon (asphaltite) used with cements to reduce slurry weight and minimize lost circulation. It is a black granular material having a specific gravity of 1.07 and a relatively low water requirement (2 Gals. per Cu. Ft.). It has a bulk density of 50 Lbs. per Cu. Ft., and is supplied in 100 pound paper bags.

The following recommendations should be noted:

1. Bottom plugs should not be used ahead of Gilsonite cement.
2. A viscous slurry should precede the Gilsonite cement to help prevent separation of the light material.
3. The use of centralizers and scratchers should be minimal with this material.
4. Twenty-five pounds of Gilsonite per sack of cement should be the normally recommended amount although higher concentrations may be used for extremely severe lost circulation.

SLURRY PROPERTIES

Portland Cement

Class A Cement

Gilsonite Lbs./Sk.	Per Cent Bentonite	Water Gals.	Per Sk. Cu. Ft.	Slurry Weight Lbs./Gal.	Slurry Volume Lbs./Cu. Ft.	Cu. Ft./sk.
0	0	5.20	0.70	15.6	117	1.18
	4	7.80	1.04	14.1	105	1.55
12.5	0	5.60	0.75	14.4	108	1.42
	4	8.30	1.11	13.3	99	1.80
25	0	6.00	0.80	13.6	102	1.66
	4	8.80	1.18	12.7	95	2.05
50	0	7.00	0.94	12.5	94	2.17
	4	9.80	1.31	11.9	89	2.56

THICKENING TIME — HOURS:MINUTES

Gilsonite Lbs./Sk.	Per Cent Bentonite	API CASING TESTS		Compressive Strength—PSI 24 Hours — Atm. Pressure			
		6,000'	8,000'	80°F	100°F	120°F	140°F
0	0	2:30+	1:44	2135	2740	4935	6285
	4	1:57	1:32	750	1015	1380	2025
25	0	2:30+	1:46	1250	1660	2560	2725
	4	2:30+	1:42	365	605	965	1210
50	0	2:30+	1:48	740	960	1485	1675
	4	2:30+	1:40	275	485	715	890

COMPRESSIVE STRENGTH — PSI

Gilsonite Lbs./Sk.	Per Cent Bentonite	24 HOURS				28 DAYS	
		170°F*	200°F*	230°F**	260°F**	230°F**	260°F**
0	0	4065	4850	4500	4440	4390	3540
	4	1960	1575	1610	1615	1535	775
12.5	0	2715	2800	2875	2675	2160	2130
	4	1215	1140	1165	1245	980	540
25	0	2725	2200	1965	1995	1430	1760
	4	1150	890	790	1015	765	360
50	0	1010	1000	1170	1130	1005	1020
	4	1075	700	660	775	595	335

*Slurries cured @ 3,000 psi @ 170°F and 200°F contained 0.3% Retarder.

**Slurries cured @ 3,000 psi @ 230°F and 260°F contained 0.5% Retarder.

METRIC UNITS

GILSONITE CEMENT

Gilsonite is a special type of solid hydrocarbon (asphaltite) used with cements to reduce slurry weight and minimize lost circulation. It is a black granular material having a specific gravity of 1.07 and a relatively low water requirement (7.6 Liters). It has a bulk density of 801 Kg/m³, and is supplied in 45.4 Kg paper bags.

The following recommendations should be noted:

1. Bottom plugs should not be used ahead of Gilsonite cement.
2. A viscous slurry should precede the Gilsonite cement to help prevent separation of the light material.
3. The use of centralizers and scratchers should be minimal with this material.
4. 11.3 Kg of Gilsonite per sack of cement should be the normally recommended amount although higher concentrations may be used for extremely severe lost circulation.

SLURRY PROPERTIES

Portland Cement

Class A Cement

Gilsonite Lbs./Sk.	Per Cent Bentonite	Water L/Sk.	Slurry Weight Kg/L	Slurry Volume L/Sk.
0	0	19.68	1.87	33.41
	4	29.53	1.69	43.88
5.7	0	21.20	1.73	40.20
	4	31.42	1.59	50.96
11.3	0	22.71	1.63	47.00
	4	33.31	1.52	50.04
22.7	0	26.50	1.50	61.44
	4	37.10	1.43	72.48

THICKENING TIME — HOURS:MINUTES

Gilsonite Kg./Sk.	Per Cent Bentonite	API CASING TESTS		Compressive Strength—MPa			
				24 Hours — Atm. Pressure			
				1830m	2440m	27°C	38°C
0	0	2:30+	1:44	14.72	18.89	34.02	43.33
	4	1:57	1:32	5.17	6.99	9.51	13.96
11.3	0	2:30+	1:46	8.61	11.44	17.65	18.78
	4	2:30+	1:42	2.51	4.17	6.65	8.34
22.7	0	2:30+	1:48	5.10	6.61	10.23	11.54
	4	2:30+	1:40	1.89	3.34	4.93	6.13

COMPRESSIVE STRENGTH — MEGAPASCALS

Gilsonite Kg./Sk.	Per Cent Bentonite	24 HOURS				28 DAYS	
		77°C*	93°C*	110°C**	127°C**	110°C**	127°C**
		0	0	28.02	33.34	31.02	30.54
4	13.51		10.85	11.11	11.13	10.58	5.34
5.7	0	18.71	19.30	19.82	18.44	14.89	14.68
	4	8.37	7.86	8.03	8.58	6.75	3.72
11.3	0	18.78	15.16	13.54	13.75	9.86	12.13
	4	7.92	6.13	5.44	6.99	5.27	2.48
22.7	0	6.96	6.89	8.06	7.79	6.92	7.03
	4	7.41	4.82	4.55	5.34	4.10	2.31

*Slurries cured @ 20.68 mPa @ 77°C and 93°C contained 0.3% Retarder.

**Slurries cured @ 20.68 mPa @ 110°C and 127°C contained 0.5% Retarder.

ENGLISH UNITS

HALLIBURTON LATEX CEMENT

Latex cement is a blend of water, latex and portland cement. This type of slurry has two major advantages.

1. Low Filtration rates.
2. Good bonding qualities.

SLURRY PROPERTIES

Class A Cement

Latex (LA-2) Additive Gal./Sk.	Water Gal./Sk.	Fluid Loss Paper - 100 psi cc/30 Min.	Slurry Weight Lbs./Gal.	Slurry Volume Cu. Ft./Sk.
0.0	5.2	Dehydrated*	15.60	1.18
0.9	6.0	24	14.50	1.40

*Less than one minute required for dehydration

THICKENING TIME — HOURS:MINUTES

(Pressure-Temperature Thickening-Time Test)

Latex (LA-2) Additive Gal./Sk.	Water Gal./Sk.	API CASING TESTS		
		4,000'	6,000'	8,000'
0.0	5.2	3:36	2:41	1:59
0.9	6.0	4:00+	4:00+	3:03

COMPRESSIVE STRENGTH — PSI

Latex (LA-2) Additive Gal./Sk.	Water Gal./Sk.	Per Cent Calcium Chloride	CURING TEMPERATURE**			
			80°F	100°F	120°F	140°F
24 HOURS						
0.9	6.00	0	510	1320	1690	1920
0.9	6.00	2	750	1490	1860	2165
72 HOURS						
0.9	6.00	0	1335	2085	2440	2865
0.9	6.00	2	1625	2355	2965	3435

**Atmospheric Pressure.

METRIC UNITS

HALLIBURTON LATEX CEMENT

Latex cement is a blend of water, latex and portland cement. This type of slurry has two major advantages.

1. Low Filtration rates.
2. Good bonding qualities.

SLURRY PROPERTIES

Class A Cement

Latex (LA-2) Additive L/Sk.	Water L/Sk.	Fluid Loss Paper - 6.89 MPa cc/30 Min.	Slurry Weight Kg./L	Slurry Volume L/Sk.
0.0	19.7	Dehydrated*	1.87	33.41
3.4	22.7	24	1.74	39.64

*Less than one minute required for dehydration

THICKENING TIME — HOURS:MINUTES

(Pressure-Temperature Thickening-Time Test)

Latex (LA-2) Additive L/Sk.	Water L/Sk.	API CASING TESTS		
		1 220m	1 830m	2 440m
0.0	19.7	3:36	2:41	1:59
3.4	22.7	4:00+	4:00+	3:03

COMPRESSIVE STRENGTH — MEGAPASCALS

Latex (LA-2) Additive L/Sk.	Water L/Sk.	Per Cent Calcium Chloride	CURING TEMPERATURE**			
			27°C	38°C	49°C	60°C
24 HOURS						
3.4	22.7	0	3.51	9.10	11.65	13.23
3.4	22.7	2	5.17	10.27	12.82	14.92
72 HOURS						
3.4	22.7	0	9.20	14.37	16.82	19.75
3.4	22.7	2	11.20	16.23	20.44	23.68

**Atmospheric Pressure.

ENGLISH UNITS

CLASS A CEMENT WITH ECONOLITE

SLURRY PROPERTIES

ECONOLITE Additive Percent	Water		Slurry Viscosity-BC		Free Water	Slurry Density		Yield
	Gal./Sk.	Cu.Ft./Sk.	Initial	20 Min.	Percent	Lb./Gal.	Lb./Cu. Ft.	Cu.Ft./Sk.
0	5.2	0.70	4	9	2.30	15.6	117	1.18
2	9.0	1.20	7	8	0.00	13.4	100	1.68
2	11.8	1.58	6	6	0.52	12.5	94	2.06
2	14.7	1.96	3	2	0.68	11.8	88	2.45
2	17.5	2.34	2	2	1.50	11.4	86	2.82
3	17.5	2.34	3	3	1.00	11.4	86	2.82

PRESSURE-TEMPERATURE THICKENING TIME TESTS

API CASING-CEMENTING SCHEDULES

ECONOLITE Additive Percent	Slurry Density		Thickening Time-Hours:Minutes	
	Lb./Ga.	Lb./Cu.Ft.	4,000' 103°F	8,000' 125°F
0	15.6	117	3:47	1:30
2	13.4	100	1:08	0:58
2	12.5	94	2:15	1:42
2	11.8	88	2:38	2:14
2	11.4	86	4:00+	4:00+
3	11.4	86	4:40	2:12

COMPRESSIVE STRENGTH — PSI

ECONOLITE Additive Percent	Slurry Density		100°F	140°F - 3000 PSI	
	Lb./Gal.	Lb./Cu. Ft.	24 Hrs.	12 Hrs.	24 Hrs.
0	15.6	117	3260	3245	5010
2	13.4	100	1095	480	975
2	12.5	94	555	385	675
2	11.8	88	300	310	410
2	11.4	86	195	170	255
3	11.4	86	225	245	405

METRIC UNITS

CLASS A CEMENT WITH ECONOLITE

SLURRY PROPERTIES

ECONOLITE Additive Percent	Water Gal./Sk.	Slurry Viscosity-BC		Free Water Percent	Slurry Density Kg./L.	Yield L/Sk.
		Initial	20 Min.			
0	19.7	4	9	2.30	1.87	33.41
2	34.1	7	8	0.00	1.61	47.57
2	44.7	6	6	0.52	1.50	58.33
2	55.6	3	2	0.68	1.41	69.38
2	66.2	2	2	1.50	1.37	79.85
3	66.2	3	3	1.00	1.37	79.85

PRESSURE-TEMPERATURE THICKENING TIME TESTS

API CASING-CEMENTING SCHEDULES

ECONOLITE Additive Percent	Slurry Density Kg./L.	Thickening Time-Hours:Minutes	
		1 220m 39°C	2 440m 52°C
0	1.87	3:47	1:30
2	1.61	1:08	0:58
2	1.50	2:15	1:42
2	1.41	2:38	2:14
2	1.37	4:00+	4:00+
3	1.37	4:40	2:12

COMPRESSIVE STRENGTH — MPa

ECONOLITE Additive Percent	Slurry Density Kg/L	60°F -20.68 MPa		
		38°C 24 Hrs.	12 Hrs.	24 Hrs.
0	1.87	22.48	22.37	34.45
2	1.61	7.55	3.31	6.72
2	1.50	3.83	2.65	4.65
2	1.41	2.07	2.14	2.83
2	1.37	1.34	1.17	1.76
3	1.37	1.55	1.69	2.79