

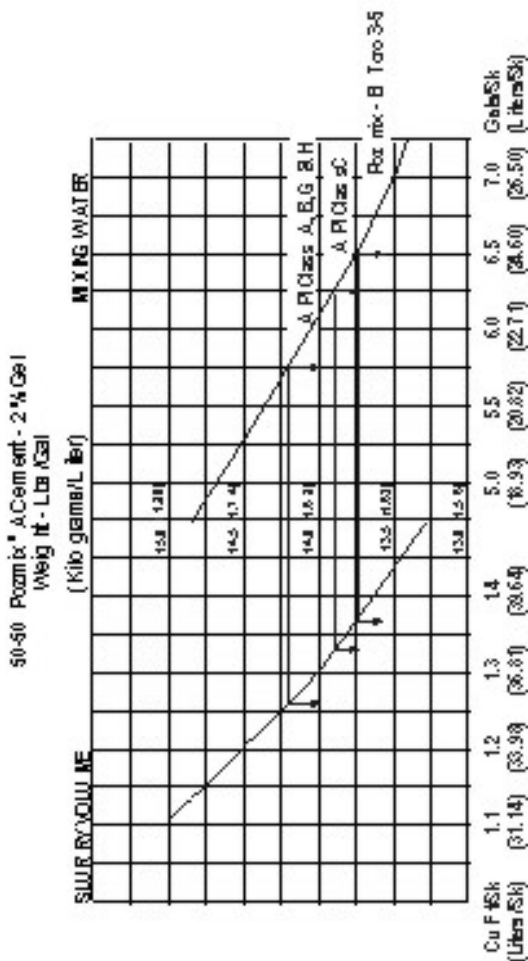
SECTION VI

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ENGLISH/METRIC UNITS



ENGLISH UNITS

POZMIX® A CEMENT (CLASS A)

2 Per Cent Bentonite

SLURRY PROPERTIES

| Per Cent Mixture Pozmix A | Portland Cement* | Weight Lbs./Sk. | Water Requirements | | Slurry Weight | | Slurry Volume Cu. Ft./Sk. |
|---------------------------------|---------------------|--------------------|---------------------|-------------------|---------------|-------------|---------------------------------|
| | | | Gals./Sk. of Mix | Ft./Sk. of Mix | Lbs./Gal. | Lbs./Cu.Ft. | |
| 25 | 75 | 89 | 5.98 | 0.80 | 14.55 | 109 | 1.29 |
| 50 | 50 | 84 | 5.75 | 0.77 | 14.15 | 106 | 1.26 |
| 60 | 40 | 82 | 5.71 | 0.76 | 14.00 | 105 | 1.25 |
| 75 | 25 | 79 | 5.97 | 0.80 | 13.55 | 101 | 1.29 |

THICKENING TIME — HOURS:MINUTES

(Pressure-Temperature Thickening-Time Test)

| Per Cent Mixture Pozmix A | Portland Cement | API CASING TESTS | | | |
|---------------------------------|--------------------|------------------|--------|--------|--------|
| | | 2,000' | 4,000' | 6,000' | 8,000' |
| 25 | 75 | 4:01 | 3:01 | 2:04 | 1:51 |
| 50 | 50 | 4:17 | 3:19 | 2:21 | 1:56 |
| 60 | 40 | 4:00+ | 2:43 | 2:20 | 1:57 |
| 75 | 25 | 4:00+ | 3:00+ | 3:00+ | 2:41 |

COMPRESSIVE STRENGTHS — PSI

Slurry Weight — 14.15 Lbs./Gal. (106 Lbs./cu. Ft.)

Water — 5.75 Gals./Sk. (0.77 Cu. Ft./sk.)

Slurry Volume — 1.26 cu. Ft./Sk.

| Curing Time Hours | CURING TEMPERATURE † | | | | |
|----------------------|----------------------|------|-------|-------|-------|
| | 60°F | 80°F | 100°F | 120°F | 140°F |
| 6 | ** | ** | 110 | 235 | 380 |
| 12 | 25 | 120 | 295 | 490 | 685 |
| 18 | 60 | 195 | 445 | 660 | 880 |
| 24 | 100 | 350 | 600 | 815 | 1125 |
| 48 | 215 | 610 | 965 | 1180 | 1685 |
| 72 | 375 | 880 | 1210 | 1460 | 2145 |
| 7 Days | 1335 | 1620 | 2305 | 3565 | 4075 |

* API Class A

** Not Set

† Atmospheric Pressure

METRIC UNITS

POZMIX® A CEMENT (CLASS A)

2 Per Cent Bentonite

SLURRY PROPERTIES

| Per Cent Mixture Pozmix A | Portland Cement* | Weight Kg/Sk. | Water | Slurry Weight Kg/L | Slurry Volume L/Sk. |
|---------------------------------|---------------------|------------------|---------------------------------|-----------------------|---------------------------|
| | | | Requirements L/Sk. of Mix | | |
| 25 | 75 | 40.4 | 22.64 | 1.74 | 36.52 |
| 50 | 50 | 38.1 | 21.77 | 1.70 | 35.67 |
| 60 | 40 | 37.2 | 21.61 | 1.68 | 35.39 |
| 75 | 25 | 35.8 | 22.60 | 1.62 | 36.67 |

THICKENING TIME — HOURS:MINUTES

(Pressure-Temperature Thickening-Time Test)

| Per Cent Mixture Pozmix A | Portland Cement | API CASING TESTS | | | |
|---------------------------------|--------------------|------------------|-------|-------|-------|
| | | 610m | 1220m | 1830m | 2440m |
| 25 | 75 | 4:01 | 3:01 | 2:04 | 1:51 |
| 50 | 50 | 4:17 | 3:19 | 2:21 | 1:56 |
| 60 | 40 | 4:00+ | 2:43 | 2:20 | 1:57 |
| 75 | 25 | 4:00+ | 3:00+ | 3:00+ | 2:41 |

COMPRESSIVE STRENGTHS — MEGAPASCALS

Slurry Weight — 1.70 Kg/L

Water — 21.77 L/Sk.

Slurry Volume — 35.67 L/Sk.

| Curing Time Hours | CURING TEMPERATURE*** | | | | |
|----------------------|-----------------------|-------|-------|-------|-------|
| | 16°C | 27°C | 38°C | 49°C | 60°C |
| 6 | ** | ** | 0.75 | 1.62 | 2.62 |
| 12 | 0.17 | 0.82 | 2.03 | 3.37 | 4.72 |
| 18 | 0.41 | 1.34 | 3.06 | 4.55 | 6.06 |
| 24 | 0.68 | 2.41 | 4.13 | 5.61 | 7.75 |
| 48 | 1.48 | 4.20 | 6.65 | 8.13 | 11.61 |
| 72 | 2.58 | 6.06 | 8.34 | 10.06 | 14.78 |
| 7 Days | 9.20 | 11.16 | 15.89 | 24.58 | 28.09 |

* API Class A

** Not Set

*** Atmospheric Pressure

ENGLISH UNITS

POZMIX® FOR LOW TEMPERATURE

(SURFACE PIPE, ETC.)

50-50 POZMIX® A CEMENT (CLASS A) BLEND

0 Per Cent Bentonite

Slurry Weight—15.1 Lbs./Gal. (113 Lbs./Cu. Ft.)

Water—4.40 Gal./SK. (0.59 cu. Ft./Sk.)

Slurry Volume—1.07 Cu. Ft./Sk.

| Curing Time Hours | Per Cent Calcium Chloride | CURING TEMPERATURE † | | | |
|----------------------|---------------------------|----------------------|------|-------|-------|
| | | 60°F | 80°F | 100°F | 120°F |
| 6 | 0 | ** | ** | 180 | 455 |
| 12 | 0 | 25 | 235 | 515 | 1050 |
| 24 | 0 | 270 | 690 | 1200 | 1470 |
| 6 | 2 | 35 | 240 | 560 | 935 |
| 12 | 2 | 320 | 750 | 1285 | 1740 |
| 24 | 2 | 885 | 1420 | 2210 | 2800 |
| 36 | 2 | 1590 | 1940 | 2740 | 3310 |

THICKENING TIME — HOURS:MINUTES

(Pressure-Temperature Thickening-Time Test)

API CASING TESTS — 2,000'

| BLEND | Water Gal./Sk. | Slurry Weight Lbs./Gal. | Per Cent HA-5 | | |
|-----------------|-------------------|----------------------------|---------------|------|------|
| | | | 0 | 2 | 3 |
| Pozmix A Cement | 4.40 | 15.1 | 4:17 | 1:58 | 1:43 |
| Pozmix A Cement | 3.60 | 15.8 | 2:00+ | 0:48 | 0:44 |

COMPRESSIVE STRENGTHS — PSI

| Curing Time Hours | Slurry Weight Lbs./Gal. | CURING TEMPERATURE † | | | | | |
|----------------------|----------------------------|----------------------|------|------|---------------|------|------|
| | | 80°F | | | 100°F | | |
| | | Per Cent HA-5 | | | Per Cent HA-5 | | |
| | | 0 | 2 | 3 | 0 | 2 | 3 |
| 4 | 15.1 | ** | 125 | 150 | 20 | 270 | 305 |
| 8 | 15.1 | 65 | 345 | 375 | 280 | 655 | 630 |
| 24 | 15.1 | 690 | 1030 | 1015 | 1200 | 1580 | 1510 |
| 4 | 15.8 | ** | 250 | 280 | 55 | 515 | 570 |
| 8 | 15.8 | 125 | 660 | 725 | 490 | 1170 | 1195 |
| 24 | 15.8 | 1195 | 1980 | 1930 | 2050 | 2780 | 2615 |

† Atmospheric Pressure

** Not Set

METRIC UNITS**POZMIX® FOR LOW TEMPERATURE**

(SURFACE PIPE, ETC.)

50-50 POZMIX® A CEMENT (CLASS A) BLEND

0 Per Cent Bentonite

Slurry Weight — 1.81 Kg/L

Water — 16.66 L/Sk.

Slurry Volume — 30.29 L/Sk.

| Curing Time Hours | Per Cent Calcium Chloride | CURING TEMPERATURE † | | | |
|----------------------|---------------------------------|----------------------|-------|-------|-------|
| | | 16°C | 27°C | 38°C | 49°C |
| 6 | 0 | ** | ** | 1.24 | 3.13 |
| 12 | 0 | 0.17 | 1.62 | 3.55 | 7.23 |
| 24 | 0 | 1.88 | 4.75 | 8.27 | 10.13 |
| 6 | 2 | 0.24 | 1.65 | 3.86 | 6.44 |
| 12 | 2 | 2.20 | 5.17 | 8.86 | 11.99 |
| 24 | 2 | 6.10 | 9.79 | 15.23 | 19.30 |
| 36 | 2 | 10.96 | 13.37 | 18.89 | 22.82 |

THICKENING TIME — HOURS:MINUTES

(Pressure-Temperature Thickening-Time Test)

API CASING TESTS — 610m

| BLEND | Water L/Sk. | Slurry Weight kG/l | Per Cent HA-5 | | |
|-----------------|----------------|-----------------------|---------------|------|------|
| | | | 0 | 2 | 3 |
| Pozmix A Cement | 16.66 | 1.81 | 4:17 | 1:58 | 1:43 |
| Pozmix A Cement | 13.63 | 1.89 | 2:00+ | 0:48 | 0:44 |

COMPRESSIVE STRENGTHS — MEGAPASCALS

| Curing Time Hours | Slurry Weight Kg/L | CURING TEMPERATURE † | | | | | |
|----------------------|-----------------------|----------------------|-------|-------|---------------|-------|-------|
| | | 27°C | | | 38°C | | |
| | | Per Cent HA-5 | | | Per Cent HA-5 | | |
| 0 | 2 | 3 | 0 | 2 | 3 | | |
| 4 | 1.81 | ** | 0.86 | 1.03 | 0.13 | 1.86 | 2.10 |
| 8 | 1.81 | 0.44 | 2.37 | 2.58 | 1.93 | 4.51 | 4.34 |
| 24 | 1.81 | 4.75 | 7.10 | 6.99 | 8.27 | 10.89 | 10.41 |
| 4 | 1.89 | ** | 1.72 | 1.93 | 0.37 | 3.55 | 3.93 |
| 8 | 1.89 | 0.86 | 4.55 | 4.99 | 3.37 | 8.06 | 8.23 |
| 24 | 1.89 | 8.23 | 13.65 | 13.30 | 14.13 | 19.16 | 18.03 |

† Atmospheric Pressure

** Not Set

ENGLISH UNITS

50-50 POZMIX® A CEMENT (CLASS A) BLEND WITH SALT

2% Bentonite

Water — 5.75 Gals./SK. (0.77 Cu. Ft./Sk.)

| Per Cent Salt By Wt. of Water | Dry Salt Lbs./Sk. | Slurry Weight | | Slurry Volume Cu.Ft./Sk. |
|-------------------------------------|----------------------|---------------|-------------|--------------------------------|
| | | Lbs./Gal | Lbs./Cu.Ft. | |
| 0 | 0.00 | 14.15 | 106 | 1.26 |
| 5 | 2.40 | 14.28 | 107 | 1.27 |
| 10 | 4.79 | 14.38 | 108 | 1.29 |
| 18 | 8.62 | 14.52 | 109 | 1.31 |
| Saturated* | 17.11 | 14.78 | 111 | 1.37 |

THICKENING TIME — HOURS:MINUTES

(Pressure-Temperature Thickening-Time Test)

| Per Cent Salt | API CASING TESTS | |
|------------------|------------------|--------|
| | 4,000' | 8,000' |
| 0 | 4:10 | 1:56 |
| 5 | 3:51 | 1:48 |
| 10 | 4:20 | 2:05 |
| 18 | 4:00+ | 2:56 |
| Saturated | 4:00+ | 4:00+ |

COMPRESSIVE STRENGTHS — PSI

| Per Cent Salt | CURING TEMPERATURE** | | | |
|------------------|----------------------|-------|-------|-------|
| | 80°F | 100°F | 120°F | 140°F |
| 24 HOURS | | | | |
| 0 | 350 | 600 | 815 | 1125 |
| 5 | 615 | 1025 | 1230 | 1620 |
| 10 | 545 | 910 | 1115 | 1605 |
| 18 | 275 | 465 | 635 | 1170 |
| Saturated | 135 | 355 | 430 | 755 |
| 72 HOURS | | | | |
| 0 | 880 | 1210 | 1460 | 2145 |
| 5 | 1260 | 1550 | 2020 | 2450 |
| 10 | 1220 | 1550 | 2110 | 3000 |
| 18 | 990 | 1230 | 1710 | 2405 |
| Saturated | 675 | 845 | 1235 | 1700 |

* All saturated solutions at 140°F.

** Atmospheric Pressure

METRIC UNITS**50-50 POZMIX® A CEMENT (CLASS A)
BLEND WITH SALT**

2% Bentonite

Water — 21.77 L/Sk.

SLURRY PROPERTIES

| Per Cent Salt By Wt. of Water | Dry Salt Kg/Sk. | Slurry Weight Kg/L | Slurry Volume L/Sk. |
|-------------------------------------|--------------------|-----------------------|---------------------------|
| 0 | 0.0 | 1.70 | 35.67 |
| 5 | 1.1 | 1.71 | 35.96 |
| 10 | 2.2 | 1.72 | 36.52 |
| 18 | 3.9 | 1.74 | 37.09 |
| Sat. (60°C) | 8.1 | 1.77 | 38.79 |

THICKENING TIME — HOURS:MINUTES

(Pressure-Temperature Thickening-Time Test)

| Per Cent Salt | API CASING TESTS | |
|------------------|------------------|--------|
| | 1 220m | 2 440m |
| 0 | 4:10 | 1:56 |
| 5 | 3:51 | 1:48 |
| 10 | 4:20 | 2:05 |
| 18 | 4:00+ | 2:56 |
| Saturated (60°C) | 4:00+ | 4:00+ |

COMPRESSIVE STRENGTHS — MEGAPASCALS

| Per Cent Salt | CURING TEMPERATURE** | | | |
|------------------|----------------------|-------|-------|-------|
| | 27°C | 38°C | 49°C | 60°C |
| 24 HOURS | | | | |
| 0 | 2.41 | 4.13 | 5.61 | 7.75 |
| 5 | 4.24 | 7.06 | 8.48 | 11.16 |
| 10 | 3.75 | 6.27 | 7.68 | 11.06 |
| 18 | 1.89 | 3.20 | 4.37 | 8.06 |
| Saturated (60°C) | .93 | 2.44 | 2.96 | 5.20 |
| 72 HOURS | | | | |
| 0 | 6.06 | 8.34 | 10.06 | 14.78 |
| 5 | 8.68 | 10.68 | 13.92 | 16.89 |
| 10 | 8.41 | 10.68 | 14.54 | 20.68 |
| 18 | 6.82 | 8.48 | 11.79 | 16.58 |
| Saturated (60°C) | 4.65 | 5.82 | 8.51 | 11.72 |

** Atmospheric Pressure

ENGLISH UNITS

POZMIX® A CEMENT (CLASS H)

Since field reports generally indicate that Class H cement is mixed at the same water ratio and slurry weight as Class A cement, except in the deep, high temperature, high pressure wells, these data on this cement in Pozmix Cement blends have been obtained for the same slurry properties as reported in the Pozmix Manual (C-1025) for Class A cement. Potentially the Pozmix with Class H cement could be mixed, when desired, to a higher slurry weight (14.5 Lbs./Gal) than shown, in which case the slurry would have a somewhat shorter pumping time and higher compressive strength than indicated herein.

The following data represent the average performance of two brands of Class H cement with a single source (2 batches) of Pozmix A. Slightly different performance could be expected with other brands and batches of cement, but on the whole Class H cement is more uniform than different brands and batches of Class A cement.

POZMIX® A CEMENT (CLASS H)

FOR LOW TEMPERATURES

50-50 Blend with 0 Per Cent Bentonite

Water Ratio — 4.4 Gals./Sk. (0.59 Cu. Ft./Sk.)

Slurry Weight — 15.1 Lbs./Gal. (113 Lbs./Cu. Ft.)

Slurry Volume — 1.07 Cu. Ft./Sk.

COMPRESSIVE STRENGTHS — PSI

| Curing Time Hours | CaCl ₂ Per Cent | API CURING CONDITIONS: TEMPERATURE & PRESSURE | | | |
|----------------------|-------------------------------|--|---------------|-----------------|--------------------|
| | | 60°F 0 psi | 80°F 0 psi | 95°F 800 psi | 110°F 1,600 psi |
| 6 | 0 | N.S. | 5 | 35 | 160 |
| 12 | 0 | N.S. | 125 | 155 | 580 |
| 24 | 0 | 55 | 490 | 750 | 1160 |
| 6 | 2 | N.S. | 130 | 155 | 485 |
| 12 | 2 | 90 | 385 | 625 | 825 |
| 24 | 2 | 320 | 685 | 715 | 1610 |
| 36 | 2 | 570 | 1225 | 1445 | 1680 |

N.S. - Not Set

ENGLISH UNITS

POZMIX® A CEMENT (CLASS H)

Since field reports generally indicate that Class H cement is mixed at the same water ratio and slurry weight as Class A cement, except in the deep, high temperature, high pressure wells, these data on this cement in Pozmix Cement blends have been obtained for the same slurry properties as reported in the Pozmix Manual (C-1025) for Class A cement. Potentially the Pozmix with Class H cement could be mixed, when desired, to a higher slurry weight (1.74 Kg/L) than shown, in which case the slurry would have a somewhat shorter pumping time and higher compressive strength than indicated herein.

The following data represent the average performance of two brands of Class H cement with a single source (2 batches) of Pozmix A. Slightly different performance could be expected with other brands and batches of cement, but on the whole Class H cement is more uniform than different brands and batches of Class A cement.

POZMIX® A CEMENT (CLASS H)

FOR LOW TEMPERATURES

50-50 Blend with 0 Per Cent Bentonite

Water Ratio — 16.7 L/Sk.

Slurry Weight — 1.81 Kg/L

Slurry Volume — 30.29 L/Sk.

COMPRESSIVE STRENGTHS — MEGAPASCALS

| Curing Time Hours | CaCl ₂ Per Cent | API CURING CONDITIONS: TEMPERATURE & PRESSURE | | | |
|----------------------|-------------------------------|--|---------------|------------------|-------------------|
| | | 16°C 0 MPa | 27°C 0 MPa | 35°C 5.51 MPa | 43°C 11.03 MPa |
| 6 | 0 | N.S. | 0.03 | 0.24 | 1.10 |
| 12 | 0 | N.S. | 0.86 | 1.06 | 3.99 |
| 24 | 0 | 0.37 | 3.37 | 5.17 | 7.99 |
| 6 | 2 | N.S. | 0.89 | 1.06 | 3.34 |
| 12 | 2 | 0.62 | 2.65 | 4.30 | 5.68 |
| 24 | 2 | 2.20 | 4.72 | 4.93 | 11.10 |
| 36 | 2 | 3.93 | 8.44 | 9.96 | 11.58 |

N.S. - Not Set

ENGLISH UNITS

POZMIX® A CEMENT (CLASS H)**50-50 BLEND WITH 2% BENTONITE**

Water Ratio — 5.75 Gals./Sk. (0.77 Cu. Ft./Sk.)

Slurry Weight — 14.15 Lbs./Gal. (106 Lbs./Cu. Ft.)

Slurry Volume — 1.26 Cu. Ft./Sk.

THICKENING TIME — HOURS:MINUTES

(Pressure-Temperature Thickening-Time Tests)

| API CASING TESTS | | | |
|------------------|--------|--------|--------|
| 2,000' | 4,000' | 6,000' | 8,000' |
| 4:00+ | 4:16 | 3:18 | 2:16 |

COMPRESSIVE STRENGTHS — PSI

| Curing Time Hours | API CURING CONDITIONS: TEMPERATURE & PRESSURE | | | | |
|----------------------|---|---------------|-----------------|--------------------|--------------------|
| | 60°F 0 psi | 80°F 0 psi | 95°F 800 psi | 110°F 1,600 psi | 140°F 3,000 psi |
| 6 | N.S. | N.S. | 10 | 55 | 185 |
| 12 | N.S. | 70 | 160 | 275 | 475 |
| 18 | 10 | 165 | 250 | 420 | 645 |
| 24 | 45 | 265 | 360 | 475 | 800 |
| 48 | 190 | 445 | 570 | 805 | 2430 |
| 72 | 210 | 680 | 815 | 1135 | 3110 |
| 7 days | 430 | 1030 | 1600 | 1815 | 3510 |

† Atmospheric Pressure

** Not Set

POZMIX® A CEMENT (CLASS H)**WITH RETARDER****THICKENING TIME — HOURS:MINUTES**

| Retarder Per Cent | API CASING TESTS | | | |
|----------------------|------------------|---------|---------|---------|
| | 8,000' | 10,000' | 12,000' | 14,000' |
| 0.0 | 2:16 | 1:35 | 1:12 | 0:52 |
| 0.2 | 2:41 | 2:17 | 1:53 | 1:50 |
| 0.3 | 4:23 | 4:00+* | 3:55 | 2:45 |
| 0.4 | 4:00+ | 4:00+* | 4:00+* | 3:33 |
| 0.5 | 4:00+ | 4:00+* | 4:00+* | 4:00+* |

COMPRESSIVE STRENGTHS — PSI

| Curing Time Hours | Retarder Per Cent | Curing Temperature @ 3,000 psi Pressure | | |
|----------------------|----------------------|---|-------|-------|
| | | 140°F | 170°F | 200°F |
| 24 | 0.0 | 800 | 2295 | 2995 |
| | 0.2 | 460 | 2200 | 2760 |
| | 0.3 | 380 | 1325 | 2700 |
| | 0.4 | 90 | 1200 | 2600 |
| | 0.5 | N.S. | N.S. | N.S. |
| 48 | 0.0 | 2430 | 2870 | 3745 |
| | 0.2 | 2350 | 2760 | 3410 |
| | 0.3 | 1765 | 2550 | 3480 |
| | 0.4 | 1290 | 2155 | 2825 |
| | 0.5 | N.S. | N.S. | N.S. |
| 72 | 0.0 | 3110 | 3385 | 4005 |
| | 0.2 | 2825 | 2950 | 3450 |
| | 0.3 | 2490 | 2935 | 3880 |
| | 0.4 | 2455 | 2600 | 3150 |
| | 0.5 | N.S. | N.S. | 350 |

† Atmospheric Pressure

** Not Set

METRIC UNITS**POZMIX® A CEMENT (CLASS H)****50-50 BLEND WITH 2% BENTONITE**

Water Ratio — 21.77 L/Sk.

Slurry Weight — 1.70 Kg

Slurry Volume — 35.67 L/Sk.

THICKENING TIME — HOURS:MINUTES

(Pressure-Temperature Thickening-Time Tests)

| API CASING TESTS | | | |
|------------------|-------|--------|--------|
| 610m | 1 220 | 1 830m | 2 440m |
| 4:00+ | 4:16 | 3:18 | 2:16 |

COMPRESSIVE STRENGTHS — MEGAPASCALS

| Curing Time Hours | API CURING CONDITIONS: TEMPERATURE & PRESSURE | | | | |
|----------------------|---|-------|----------|-----------|-----------|
| | 16°C | 27°C | 35°C | 43°C | 60°C |
| | 0 MPa | 0 MPa | 5.51 MPa | 11.03 MPa | 20.63 MPa |
| 6 | N.S. | N.S. | 0.06 | 0.37 | 1.27 |
| 12 | N.S. | 0.48 | 1.10 | 1.89 | 3.72 |
| 18 | 0.06 | 1.13 | 1.72 | 2.89 | 4.44 |
| 24 | 0.31 | 1.82 | 2.48 | 3.72 | 5.51 |
| 48 | 1.31 | 3.06 | 3.93 | 5.55 | 16.75 |
| 72 | 1.44 | 4.68 | 5.61 | 7.82 | 21.44 |
| 7 days | 3.96 | 7.10 | 11.03 | 12.51 | 24.20 |

† Atmospheric Pressure

** Not Set

POZMIX® A CEMENT (CLASS H)

WITH RETARDER

THICKENING TIME — HOURS:MINUTES

| Retarder Per Cent | API CASING TESTS | | | |
|----------------------|------------------|--------|--------|--------|
| | 2 440m | 3 050m | 3 660m | 4 270m |
| 0.0 | 2:16 | 1:35 | 1:12 | 0:52 |
| 0.2 | 2:41 | 2:17 | 1:53 | 1:50 |
| 0.3 | 4:23 | 4:00* | 3:55 | 2:45 |
| 0.4 | 4:00+ | 4:00* | 4:00* | 3:33 |
| 0.5 | 4:00+ | 4:00* | 4:00* | 4:00* |

COMPRESSIVE STRENGTHS — MEGAPASCALS

| Curing Time Hours | Retarder Per Cent | Curing Temperature @ 20.63 MPa Pressure | | |
|----------------------|----------------------|---|-------|-------|
| | | 60°C | 77°C | 93°C |
| 24 | 0.0 | 5.51 | 15.82 | 20.65 |
| | 0.2 | 3.17 | 15.16 | 19.02 |
| | 0.3 | 2.62 | 9.13 | 18.61 |
| | 0.4 | 0.62 | 8.27 | 17.92 |
| | 0.5 | N.S. | N.S. | N.S. |
| 48 | 0.0 | 16.75 | 19.78 | 25.82 |
| | 0.2 | 16.20 | 19.02 | 23.51 |
| | 0.3 | 12.16 | 17.58 | 23.99 |
| | 0.4 | 8.89 | 14.85 | 19.47 |
| | 0.5 | N.S. | N.S. | N.S. |
| 72 | 0.0 | 21.44 | 23.33 | 27.61 |
| | 0.2 | 19.47 | 20.33 | 23.78 |
| | 0.3 | 17.16 | 20.33 | 26.75 |
| | 0.4 | 16.92 | 17.92 | 21.71 |
| | 0.5 | N.S. | N.S. | 2.41 |

† Atmospheric Pressure

** Not Set

ENGLISH UNITS
POZMIX® A CEMENT (CLASS H)
(50-50 BLEND — 2% BENTONITE)
WITH GILSONITE

SLURRY PROPERTIES

| Gilsonite Lbs./Sk. | Water Ratio | | Slurry Weight | | Slurry Volume |
|-----------------------|-------------|-------------|---------------|--------------|---------------|
| | Gals./Sk. | Cu. Ft./Sk. | Lbs./Gal. | Lbs./Cu. Ft. | Cu. Ft./Sk. |
| 0 | 5.75 | 0.77 | 14.15 | 106 | 1.26 |
| 6 | 6.1 | 0.82 | 13.6 | 102 | 1.40 |
| 10 | 6.3 | 0.84 | 13.3 | 99½ | 1.48 |
| 12.5 | 6.4 | 0.86 | 13.2 | 99 | 1.53 |
| 25 | 7.0 | 0.94 | 12.5 | 93½ | 1.80 |

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

| Gilsonite Kg/Sk. | API CASING TESTS | | |
|---------------------|------------------|--------|--------|
| | 4,000' | 6,000' | 8,000' |
| 0 | 4:16 | 3:18 | 2:16 |
| 6 | 3:53 | 3:20 | 2:26 |
| 10 | 4:00+ | 3:18 | 2:43 |
| 12.5 | 4:00+ | 4:02 | 3:49 |
| 25 | 4:00+ | 3:21 | 2:37 |

COMPRESSIVE STRENGTHS — PSI @ 24 HOURS

| Gilsonite Lbs./Sk. | API CURING CONDITIONS: TEMPERATURE & PRESSURE | | | | | | |
|-----------------------|---|--------------|--------------|--------------|--------------|--------------|--------------|
| | 95°F | 110°F | 140°F | 170°F | 200°F | 230°F | 260°F |
| | 800 psi | 1,600 psi | 3,000 psi | 3,000 psi | 3,000 psi | 3,000 psi | 3,000 psi |
| 0 | 360 | 475 | 800 | 2295 | 2995 | 2840 | 2400 |
| 6 | 270 | 400 | 640 | 2100 | 2355 | 2520 | 2300 |
| 10 | 220 | 375 | 610 | 1960 | 2075 | 2185 | 2110 |
| 12.5 | 200 | 380 | 580 | 1810 | 1960 | 2135 | 2090 |
| 25 | 190 | 300 | 420 | 1320 | 1455 | 1725 | 1610 |

POZMIX® A CEMENT (CLASS H)
(50-50 BLEND WITH BENTONITE)

SLURRY PROPERTIES

| Bentonite Per Cent | Water Ratio | | Slurry Weight | | Slurry Volume |
|-----------------------|-------------|------------|---------------|--------------|---------------|
| | Gals./Sk. | Cu.Ft./Sk. | Lbs./Gal. | Lbs./Cu. Ft. | Cu. Ft./Sk. |
| 0 | 4.4 | 0.59 | 15.1 | 113 | 1.07 |
| 2 | 5.75 | 0.77 | 14.15 | 106 | 1.26 |
| 4 | 7.0 | 0.94 | 13.5 | 101 | 1.44 |
| 6 | 7.7 | 1.03 | 13.3 | 99½ | 1.54 |
| 8 | 8.4 | 1.12 | 13.1 | 98 | 1.64 |
| 10 | 9.0 | 1.20 | 12.9 | 96½ | 1.74 |

| Bentonite Per Cent | Thickening Time Hrs:Min. 4,000 Ft. Casing | COMPRESSIVE STRENGTH — PSI | | | |
|-----------------------|---|---|----------|-------------------|----------|
| | | API Curing Conditions : Temperature & Pressure | | | |
| | | 95°F 800 psi | | 110°F - 1,600 psi | |
| | | 24 Hours | 72 Hours | 24 Hours | 72 Hours |
| 2 | 4:16 | 360 | 815 | 475 | 1135 |
| 6 | 3:57 | 250 | 305 | 375 | 510 |
| 10 | 3:43 | 120 | 150 | 185 | 275 |

METRIC UNITS

POZMIX® A CEMENT (CLASS H)
(50-50 BLEND — 2% BENTONITE)
WITH GILSONITE

SLURRY PROPERTIES

| Gilsonite Kg./Sk. | Water Ratio L/Sk. | Slurry Weight Kg/L | Slurry Volume L/Sk. |
|----------------------|----------------------|-----------------------|------------------------|
| 0.0 | 21.8 | 1.70 | 35.67 |
| 2.7 | 23.1 | 1.63 | 39.64 |
| 4.5 | 23.8 | 1.59 | 41.90 |
| 5.7 | 24.2 | 1.58 | 43.32 |
| 11.3 | 26.5 | 1.50 | 50.96 |

THICKENING TIME — HOURS:MINUTES

(Pressure-Temperature Thickening-Time Test)

| Gilsonite Kg/Sk. | API CASING TESTS | | |
|---------------------|------------------|--------|--------|
| | 1 220m | 1 830m | 2 440m |
| 0 | 4:16 | 3:18 | 2:16 |
| 2.7 | 3:53 | 3:20 | 2:26 |
| 4.5 | 4:00+ | 3:18 | 2:43 |
| 5.7 | 4:00+ | 4:02 | 3:49 |
| 11.3 | 4:00+ | 3:21 | 2:37 |

COMPRESSIVE STRENGTHS — MPa @ 24 HOURS

| Gilsonite Kg/Sk | API CURING CONDITIONS: TEMPERATURE & PRESSURE | | | | | | |
|--------------------|---|-------------------|-------------------|-------------------|-------------------|--------------------|--------------------|
| | 35°C 5.51 MPa | 43°C 11.03 MPa | 60°C 20.68 MPa | 77°C 20.68 MPa | 93°C 20.68 MPa | 110°C 20.68 MPa | 127°C 20.68 MPa |
| 0.0 | 2.48 | 3.72 | 5.51 | 15.82 | 20.65 | 19.58 | 16.54 |
| 2.7 | 1.86 | 2.75 | 4.41 | 14.47 | 16.23 | 17.37 | 15.85 |
| 4.5 | 1.51 | 2.58 | 4.20 | 13.51 | 14.30 | 15.06 | 14.54 |
| 5.7 | 1.37 | 2.62 | 3.99 | 12.47 | 13.51 | 14.72 | 14.41 |
| 11.3 | 1.31 | 2.06 | 2.89 | 9.10 | 10.03 | 11.89 | 11.10 |

POZMIX® A CEMENT (CLASS H)
(50-50 BLEND WITH BENTONITE)

SLURRY PROPERTIES

| Bentonite Per Cent | Water Ratio L/Sk. | Slurry Weight Kg/L | Slurry Volume L/Sk. |
|-----------------------|----------------------|-----------------------|------------------------|
| 0 | 16.7 | 1.81 | 30.29 |
| 2 | 21.8 | 1.70 | 35.67 |
| 4 | 26.5 | 1.62 | 40.77 |
| 6 | 29.1 | 1.59 | 43.60 |
| 8 | 31.8 | 1.57 | 46.43 |
| 10 | 34.1 | 1.55 | 49.26 |

| Bentonite Per Cent | Thickening Time | COMPRESSIVE STRENGTH — MPa | | | |
|-----------------------|--------------------|---|----------|------------------|----------|
| | Hrs:Min. | API Curing Conditions : Temperature & Pressure | | | |
| | 1 220m Casing | 35°C - 5.51 MPa | | 43°C - 11.03 MPa | |
| | | 24 Hours | 72 Hours | 24 Hours | 72 Hours |
| 2 | 4:16 | 2.48 | 5.61 | 3.72 | 7.82 |
| 6 | 3:57 | 1.72 | 2.10 | 2.58 | 3.51 |
| 10 | 3:43 | 0.82 | 1.03 | 1.27 | 1.89 |

ENGLISH UNITS

POZMIX® A CEMENT (CLASS H)
(50-50 BLEND — 2% BENTONITE)
WITH SALT (NaCl)

SLURRY PROPERTIES

Water Ratio — 5.75 Gals./Sk. (0.77 Cu. Ft./Sk.)

| Salt (NaCl) % by Weight of Water | Dry Salt Lbs./Sk | Slurry Weight | | Slurry Volume Cu. Ft./Sk. |
|--|------------------------|---------------|--------------|------------------------------|
| | | Lbs./Gal. | Lbs./Cu. Ft. | |
| 0 | 0 | 14.15 | 106 | 1.26 |
| 5 | 2.4 | 14.3 | 107 | 1.27 |
| 6 | 2.9 | 14.3 | 107 | 1.27 |
| 10 | 4.8 | 14.4 | 108 | 1.28 |
| 12 | 5.8 | 14.4 | 108 | 1.29 |
| 18 | 8.6 | 14.5 | 108.5 | 1.31 |
| Saturated* | 17.8 | 14.8 | 111 | 1.37 |

** — at 140°F.

THICKENING TIME — HOURS:MINUTES

(Pressure-Temperature Thickening-Time Test)

| Salt Per Cent | API CASING TESTS | | |
|------------------|------------------|--------|--------|
| | 4,000' | 6,000' | 8,000' |
| 0 | 4:16 | 3:18 | 2:16 |
| 5 | 4:13 | 3:04 | 2:28 |
| 6 | 3:56 | 2:59 | 2:30 |
| 10 | 4:00+ | 3:00 | 2:36 |
| 12 | 4:00+ | 3:36 | 3:08 |
| 18 | 4:00+ | 4:00+ | 4:21 |
| Saturated | 4:00+ | 4:00+ | 4:00+ |

COMPRESSIVE STRENGTHS — PSI

API CURING CONDITIONS: TEMPERATURE & PRESSURE

| Salt Per Cent | 80°F | 95°F | 110°F | 140°F |
|------------------|-------|---------|-----------|-----------|
| | 0 psi | 800 psi | 1,600 psi | 3,000 psi |
| 24 HOURS | | | | |
| 0 | 265 | 360 | 475 | 800 |
| 5 | 270 | 695 | 725 | 1635 |
| 6 | 385 | 740 | 840 | 1940 |
| 10 | 350 | 655 | 750 | 2075 |
| 12 | 375 | 630 | 675 | 1930 |
| 18 | 255 | 460 | 585 | 1675 |
| Saturated | 25 | 175 | 275 | 1320 |
| 72 HOURS | | | | |
| 0 | 680 | 815 | 1135 | 3110 |
| 5 | 805 | 1480 | 1885 | 3300 |
| 6 | 775 | 1425 | 1875 | 2860 |
| 10 | 750 | 1340 | 1790 | 2775 |
| 12 | 725 | 1400 | 1785 | 2710 |
| 18 | 535 | 1175 | 1615 | 2795 |
| Saturated | 250 | 630 | 1280 | 3140 |

METRIC UNITS

POZMIX® A CEMENT (CLASS H)
(50-50 BLEND — 2% BENTONITE)
WITH SALT (NaCl)

SLURRY PROPERTIES

Water Ratio — 21.77 L/Sk.

| Salt (NaCl) % by Weight of Water | Dry Salt Kg/Sk. | Slurry Weight Kg/L | Slurry Volume L/Sk. |
|--|-----------------------|-----------------------|------------------------|
| 0 | 0.0 | 1.70 | 35.67 |
| 5 | 1.1 | 1.71 | 35.96 |
| 6 | 1.3 | 1.71 | 35.96 |
| 10 | 2.2 | 1.73 | 36.24 |
| 12 | 2.6 | 1.73 | 36.52 |
| 18 | 3.9 | 1.74 | 37.09 |
| Saturated** | 8.1 | 1.77 | 38.79 |

**—at 60°C.

THICKENING TIME — HOURS:MINUTES

(Pressure-Temperature Thickening-Time Test)

| Salt Per Cent | API CASING TESTS | | |
|------------------|------------------|-------|-------|
| | 1220m | 1830m | 2440m |
| 0 | 4:16 | 3:18 | 2:16 |
| 5 | 4:13 | 3:04 | 2:28 |
| 6 | 3:56 | 2:59 | 2:30 |
| 10 | 4:00+ | 3:00 | 2:36 |
| 12 | 4:00+ | 3:36 | 3:08 |
| 18 | 4:00+ | 4:00+ | 4:21 |
| Saturated | 4:00+ | 4:00+ | 4:00+ |

COMPRESSIVE STRENGTHS — MPa

API CURING CONDITIONS: TEMPERATURE & PRESSURE

| Salt Per Cent | 27°C | 35°C | 43°C | 60°C |
|------------------|-------|----------|-----------|-----------|
| | 0 MPa | 5.51 MPa | 11.03 MPa | 20.68 MPa |
| 24 HOURS | | | | |
| 0 | 1.82 | 2.48 | 3.72 | 5.51 |
| 5 | 1.86 | 4.79 | 4.99 | 11.27 |
| 6 | 2.65 | 5.10 | 5.79 | 13.37 |
| 10 | 2.41 | 4.51 | 5.17 | 14.30 |
| 12 | 2.58 | 4.34 | 4.65 | 13.30 |
| 18 | 1.75 | 3.17 | 4.03 | 11.54 |
| Saturated | 0.17 | 1.20 | 1.89 | 9.10 |
| 72 HOURS | | | | |
| 0 | 4.68 | 5.61 | 7.82 | 21.44 |
| 5 | 5.55 | 10.20 | 12.99 | 22.75 |
| 6 | 5.34 | 9.82 | 10.85 | 19.71 |
| 10 | 5.17 | 9.23 | 12.34 | 19.13 |
| 12 | 4.99 | 9.65 | 12.30 | 18.68 |
| 18 | 3.68 | 8.10 | 11.13 | 19.27 |
| Saturated | 1.72 | 4.34 | 8.82 | 21.64 |

ENGLISH UNITS

POZMIX® A CEMENT (CLASS C)
 (SOUTHWESTERN EL TORO 35)
 (LONE STAR SPECIAL INCOR®)

SLURRY PROPERTIES

| Bentonite Per Cent | Water Gals./Sk. | Slurry Weight Lbs./Gal. | Slurry Volume Cu. Ft./Sk. |
|-----------------------|--------------------|----------------------------|------------------------------|
| 0 | 5.50 | 14.2 | 1.22 |
| 2 | 6.50 | 13.7 | 1.36 |
| 4 | 7.60 | 13.2 | 1.52 |

THICKENING TIME — HOURS:MINUTES

(Pressure-Temperature Thickening-Time Test)

| Bentonite Per Cent | API CASING TESTS | | | API SQUEEZE TESTS | | |
|-----------------------|------------------|--------|--------|-------------------|--------|--------|
| | 4,000' | 6,000' | 8,000' | 4,000' | 6,000' | 8,000' |
| 0 | 3:00+ | 3:00+ | 2:54 | 2:35 | 1:58 | 1:45 |
| 2 | 3:00+ | 3:00+ | 3:05 | 2:00 | 1:44 | 1:23 |

COMPRESSIVE STRENGTHS — PSI

| Bentonite Per Cent | CURING TEMPERATURE | | | |
|-----------------------|--------------------|-------|-------|-------|
| | 80°F | 100°F | 120°F | 140°F |
| 24 HOURS | | | | |
| 0 | 625 | 1170 | 1385 | 1870 |
| 2 | 475 | 885 | 1045 | 1265 |
| 72 HOURS | | | | |
| 0 | 1565 | 1830 | 2500 | 4210 |
| 2 | 1160 | 1390 | 1800 | 3085 |

POZMIX® A CEMENT (CLASS C)
 WITH FLUID LOSS AGENT (2% BENTONITE)

THICKENING TIME — HOURS:MINUTES

(Pressure-Temperature Thickening-Time Test)

| Fluid Loss Agent Per Cent | API CASING TESTS | | | | API SQUEEZE TESTS | | | |
|------------------------------|------------------|--------|--------|--------|-------------------|--------|--------|--------|
| | 2,000' | 4,000' | 6,000' | 8,000' | 2,000' | 4,000' | 6,000' | 8,000' |
| 0.80 | 4:00+ | 4:00+ | 4:00+ | 4:00+ | 4:00+ | 4:00+ | 2:10 | 1:35 |
| 1.00 | 4:00+ | 4:00+ | 4:00+ | 4:00+ | 4:00+ | 4:00+ | 3:50 | 2:40 |
| 1.20 | 4:00+ | 4:00+ | 4:00+ | 4:00+ | 4:00+ | 4:00+ | 4:00+ | 3:26 |

FLUID LOSS TESTS

325 Mesh Screen @ 1,000 psi
 cc Per 30 Minutes

| Fluid Loss Agent Per Cent | PER CENT SALT | | | | NO BENTONITE | | |
|------------------------------|---------------|-----|-----|------|--------------|----------------------|---------|
| | 0.0 | 10 | 18 | Sat. | Neat | 2% CaCl ₂ | 3% HA-5 |
| 0.60 | 334 | 225 | 462 | 486 | — | — | — |
| 0.80 | 195 | 192 | 329 | 402 | 62 | 170 | 160 |
| 1.00 | 125 | 128 | 278 | 345 | 30 | 94 | 116 |
| 1.20 | 64 | 84 | 170 | 247 | 22 | 44 | 82 |

COMPRESSIVE STRENGTHS — PSI

Curing Time — 24 Hours

| Fluid Loss Agent Per Cent | 95°F - 800 PSI | | 110°F - 1,600 PSI | | 140°F |
|------------------------------|----------------------|----------------------|----------------------|----------------------|-----------|
| | 0% CaCl ₂ | 2% CaCl ₂ | 0% CaCl ₂ | 2% CaCl ₂ | 3,000 psi |
| 0.80 | 335 | — | 630 | — | 1010 |
| 1.00 | 285 | 465 | 445 | 765 | 915 |
| 1.20 | 270 | 460 | 400 | 710 | 890 |

METRIC UNITS

POZMIX® A CEMENT (CLASS C)
(SOUTHWESTERN EL TORO 35)
(LONE STAR SPECIAL INCOR®)

SLURRY PROPERTIES

| Bentonite Per Cent | Water L/Sk. | Slurry Weight Kg/L | Slurry Volume L/Sk. |
|-----------------------|----------------|-----------------------|------------------------|
| 0 | 20.82 | 1.70 | 34.54 |
| 2 | 24.60 | 1.64 | 38.50 |
| 4 | 28.77 | 1.58 | 43.03 |

THICKENING TIME — HOURS:MINUTES

(Pressure-Temperature Thickening-Time Test)

| Bentonite Per Cent | API CASING TESTS | | | API SQUEEZE TESTS | | |
|-----------------------|------------------|--------|--------|-------------------|--------|--------|
| | 1 220m | 1 830m | 2 440m | 1 220m | 1 830m | 2 440m |
| 0 | 3:00+ | 3:00+ | 2:54 | 2:35 | 1:58 | 1:45 |
| 2 | 3:00+ | 3:00+ | 3:05 | 2:00 | 1:44 | 1:23 |

COMPRESSIVE STRENGTHS — MEGAPASCALS @ 24 HOURS

| Bentonite Per Cent | CURING TEMPERATURE | | | |
|-----------------------|--------------------|-------|-------|-------|
| | 27°C | 38°C | 49°C | 60°C |
| | 24 HOURS | | | |
| 0 | 4.30 | 8.06 | 9.54 | 12.89 |
| 2 | 3.72 | 6.10 | 7.20 | 8.72 |
| | 72 HOURS | | | |
| 0 | 10.79 | 12.61 | 17.23 | 29.02 |
| 2 | 7.99 | 9.58 | 12.41 | 21.27 |

POZMIX® A CEMENT (CLASS C)
WITH FLUID LOSS AGENT (2% BENTONITE)

THICKENING TIME — HOURS:MINUTES

(Pressure-Temperature Thickening-Time Test)

| Fluid Loss Agent Per Cent | API CASING TESTS | | | | API SQUEEZE TESTS | | | |
|------------------------------|------------------|--------|--------|--------|-------------------|--------|--------|--------|
| | 610m | 1 220m | 1 830m | 2 440m | 610m | 1 220m | 1 830m | 2 440m |
| 0.80 | 4:00+ | 4:00+ | 4:00+ | 4:00+ | 4:00+ | 4:00+ | 2:10 | 1:35 |
| 1.00 | 4:00+ | 4:00+ | 4:00+ | 4:00+ | 4:00+ | 4:00+ | 3:50 | 2:40 |
| 1.20 | 4:00+ | 4:00+ | 4:00+ | 4:00+ | 4:00+ | 4:00+ | 4:00+ | 3:26 |

FLUID LOSS TESTS

325 Mesh Screen @ 6.89 MEGAPASCALS
 cc Per 30 Minutes

| Fluid Loss Agent Per Cent | PER CENT SALT | | | Sat. (60°C) | NO BENTONITE | | |
|------------------------------|---------------|------|------|----------------|--------------|----------------------|---------|
| | 0.0 | 10 | 18 | | Neat | 2% CaCl ₂ | 3% HA-5 |
| 0.60 | 2.30 | 1.55 | 3.18 | 3.35 | — | — | — |
| 0.80 | 1.34 | 1.32 | 2.26 | 2.77 | 0.42 | 1.1 | 1.10 |
| 1.00 | 0.86 | 0.88 | 1.91 | 2.37 | 0.20 | 6.4 | 0.80 |
| 1.20 | 0.44 | 0.57 | 1.17 | 1.70 | 0.15 | 3.0 | 0.56 |

COMPRESSIVE STRENGTHS — MEGAPASCALS

Curing Time — 24 Hours

| Fluid Loss Agent Per Cent | 35°C - 5.51 MPa | | 43°C - 11.03 MPa* | | 60°C |
|------------------------------|----------------------|----------------------|----------------------|----------------------|------------|
| | 0% CaCl ₂ | 2% CaCl ₂ | 0% CaCl ₂ | 2% CaCl ₂ | 20.68 MPa* |
| 0.80 | 2.31 | — | 4.34 | — | 6.96 |
| 1.00 | 1.96 | 3.20 | 3.06 | 5.27 | 6.30 |
| 1.20 | 1.86 | 3.17 | 2.75 | 4.89 | 6.13 |

*Curing Pressure

ENGLISH UNITS

HALLIBURTON "LIGHT" CEMENT

This product has a wide range water requirement and can be mixed for either maximum strength or at maximum yield without experiencing excessive free water separation. For lost circulation application a formulation of 10 pounds of Halliburton's high sealing Gilsonite is recommended. Values shown in parenthesis below are for 10 Lbs./Sack.

SLURRY PROPERTIES

| Water Gals./Sack | Slurry Weight Lbs./Gal. | Slurry Volume Cu. Ft./Sk. | Thickening Time - Hrs:mins. API Casing Schedules | |
|---------------------|-------------------------------|---------------------------------|---|------------|
| | | | 4,000 Feet | 6,000 Feet |
| 7.7 | 13.6 (13.1) | 1.54 (1.70) | 4:00+ | 3:00 |
| 8.8 | 13.1 (12.7) | 1.69 (1.84) | 4:00+ | 3:40 |
| 9.9 | 12.7 (12.4) | 1.84 (1.99) | 4:00+ | 4:00+ |
| 10.9 | 12.4 (12.1) | 1.97 (2.12) | 4:00+ | 4:00+ |

() 10 Lbs. Gilsonite/Sack

COMPRESSIVE STRENGTH — PSI

| Slurry Weight Lbs./Gal. | CURING TIME - HOURS | | | |
|-------------------------------|---------------------|------|-------------------|------|
| | 95°F - 800 PSI | | 110°F - 1,600 PSI | |
| | 24 | 72 | 24 | 72 |
| 13.6 | 495-720* | 1050 | 645-825* | 1340 |
| 13.1 | 320-520* | 745 | 435-700* | 820 |
| 12.7 | 235-405* | 485 | 330-490* | 570 |
| 12.4 | 165-245* | 315 | 225-315* | 485 |

SLURRY PROPERTIES

WITH SALT

| Water Gals./Sk. | Salt Per Cent | Slurry Weight Lbs./Gal. | Slurry Volume Cu. Ft./Sk. |
|--------------------|------------------|----------------------------|------------------------------|
| 9.9 | — | 12.7 | 1.84 |
| 9.9 | 18 | 13.2 | 1.92 |

API PRESSURE-TEMPERATURE THICKENING-TIME
& COMPRESSIVE STRENGTH TESTS

| Slurry Weight Lbs./Gal. | Salt Per Cent | HR-4 Per Cent | Thickening Time Hours:Minutes | 24 Hour Comp. Stg. PSI |
|-----------------------------------|------------------|------------------|----------------------------------|------------------------------|
| 8,000 Ft. Casing Schedule | | | | |
| | | | | BHST -200°F 3,000 PSI |
| 12.7 | — | 0.30 | 3:00 | 1,185 |
| 13.2 | 18 | 0.30 | 3:30+ | 1,005 |
| 10,000 Ft. Casing Schedule | | | | |
| | | | | BHST -230°F 3,000 PSI |
| 12.7 | — | 0.50 | 3:08 | 1,490 |
| 13.2 | 18 | 0.40 | 4:15 | 1,460 |

METRIC UNITS**HALLIBURTON "LIGHT" CEMENT**

This product has a wide range water requirement and can be mixed for either maximum strength or at maximum yield without experiencing excessive free water separation. For lost circulation application a formulation of 4.5 Kg of Halliburton's high sealing Gilsonite is recommended. Values shown in parenthesis below are for 4.5 Kg/Sack.

SLURRY PROPERTIES

| Water L/Sack | Slurry Weight Kg/L | Slurry Volume L/Sk. | Thickening Time - Hrs:mins. | |
|-----------------|--------------------------|---------------------------|--------------------------------|--------|
| | | | API Casing Schedules 1 220m | 1 830m |
| 29.1 | 1.63 (1.57) | 43.60 (48.13) | 4:00+ | 3:00 |
| 33.3 | 1.57 (1.52) | 47.85 (52.10) | 4:00+ | 3:40 |
| 37.5 | 1.52 (1.49) | 52.10 (56.34) | 4:00+ | 4:00+ |
| 41.3 | 1.49 (1.45) | 55.77 (60.02) | 4:00+ | 4:00+ |

() 4.5 Kg Gilsonite/Sack

COMPRESSIVE STRENGTH — MEGAPASCALS

| Slurry Weight Lbs./Gal. | CURING TIME - HOURS | | | |
|-------------------------------|---------------------|------|--------------------|------|
| | 35°C - 5.51 MPa** | | 43°C - 11.03 MPa** | |
| | 24 | 72 | 24 | 72 |
| 1.63 | 3.41-4.96* | 7.23 | 4.44-5.68* | 9.23 |
| 1.57 | 2.20-3.58* | 5.13 | 2.99-4.82* | 5.65 |
| 1.52 | 1.62-2.79* | 3.34 | 2.27-3.37* | 3.93 |
| 1.49 | 1.13-1.16* | 2.17 | 1.55-2.17* | 3.34 |

*Sea Water (Density - 1.02 Kg/L)

SLURRY PROPERTIES**WITH SALT**

| Water L/Sk. | Salt Per Cent | Slurry Weight Kg./L. | Slurry Volume L/Sk. |
|----------------|------------------|-------------------------|------------------------|
| 37.5 | — | 1.52 | 52.10 |
| 37.5 | 18 | 1.58 | 54.36 |

**API PRESSURE-TEMPERATURE THICKENING-TIME
& COMPRESSIVE STRENGTH TESTS**

| Slurry Weight Kg/L | Salt Per Cent | HR-4 Per Cent | Thickening Time Hours:Minutes | 24 Hour Comp. Stg. MPa |
|-------------------------------|------------------|------------------|----------------------------------|------------------------------|
| 2 440m Casing Schedule | | | | |
| | | | | BHST 93°C 20.68 MPa** |
| 1.52 | — | 0.30 | 3:00 | 8.17 |
| 1.58 | 18 | 0.30 | 3:30+ | 6.92 |
| 3 050m Casing Schedule | | | | |
| | | | | BHST 110°C 20.68 MPa** |
| 1.52 | — | 0.50 | 3:08 | 10.27 |
| 1.58 | 18 | 0.40 | 4:15 | 10.06 |

**Curing Pressure

ENGLISH UNITS

HALLIBURTON LIGHT CEMENT WITH ECONOLITE

SLURRY PROPERTIES

| ECONOLITE Additive Percent | Water | | Slurry Viscosity—Bc | | Free Water Percent | Slurry Density | | Yield Ft.Cu. Ft./Sk. |
|----------------------------------|----------|-------------|------------------------|---------|--------------------------|----------------|-------------|-------------------------|
| | Gal./Sk. | Cu. Ft./Sk. | Initial | 20 Min. | | Lb./Gal. | Lb./Cu. Ft. | |
| 0 | 7.7 | 1.03 | 7 | 14 | 0.60 | 13.6 | 102 | 1.54 |
| 0 | 8.8 | 1.17 | 5 | 9 | 0.60 | 13.1 | 98 | 1.69 |
| 0 | 9.9 | 1.32 | 4 | 6 | 1.30 | 12.7 | 95 | 1.84 |
| 0 | 10.9 | 1.45 | 5 | 7 | 1.30 | 12.4 | 93 | 1.97 |
| 1 | 10.9 | 1.45 | 11 | 12 | 0.40 | 12.4 | 93 | 1.97 |
| 1 | 12.9 | 1.72 | 8 | 8 | 0.56 | 11.8 | 88 | 2.21 |
| 1 | 14.9 | 1.99 | 5 | 5 | 0.72 | 11.4 | 85 | 2.46 |
| 1 | 16.9 | 2.25 | 3 | 4 | 2.10 | 11.1 | 83 | 2.74 |
| 2 | 16.9 | 2.25 | 7 | 8 | 0.24 | 11.1 | 83 | 2.74 |

PRESSURE-TEMPERATURE THICKENING TIME TESTS

API CASING-CEMENTING SCHEDULES

| ECONOLITE Additive Percent | Slurry Density | | Thickening Time—Hours:Minutes | |
|----------------------------------|----------------|------------|-------------------------------|-----------------|
| | Lb./Gal. | Lb./Cu.Ft. | 4,000' 103°F | 8,000' 125°F |
| 0 | 13.6 | 102 | 4:00+ | 2:02 |
| 0 | 13.1 | 98 | 4:00+ | 2:00 |
| 0 | 12.7 | 95 | 4:00+ | 2:25 |
| 0 | 12.4 | 93 | 4:00+ | 3:30 |
| 1 | 12.4 | 93 | 2:15 | 1:12 |
| 1 | 11.8 | 88 | 4:00+ | 1:55 |
| 1 | 11.4 | 86 | 4:00+ | 4:00+ |
| 1 | 11.1 | 83 | 4:00+ | 4:00+ |
| 2 | 11.1 | 83 | 4:00+ | 4:00+ |

COMPRESSIVE STRENGTH — PSI

| ECONOLITE Additive Percent | Slurry Density | | 100°F | 140°F — 3000 PSI | |
|----------------------------------|----------------|-------------|----------|------------------|---------|
| | Lb./Gal. | Lb./Cu. Ft. | 24 Hours | 12 Hrs. | 24 Hrs. |
| 0 | 13.6 | 102 | 240 | 285 | 550 |
| 0 | 13.1 | 98 | 160 | 195 | 400 |
| 0 | 12.7 | 95 | 110 | 130 | 240 |
| 0 | 12.4 | 93 | 60 | 90 | 170 |
| 1 | 12.4 | 93 | 120 | 135 | 295 |
| 1 | 11.8 | 88 | 60 | 80 | 180 |
| 1 | 11.4 | 86 | 50 | 50 | 110 |
| 1 | 11.1 | 83 | 45 | 25 | 70 |
| 2 | 11.1 | 83 | 105 | 45 | 95 |

METRIC UNITS
HALLIBURTON LIGHT CEMENT WITH ECONOLITE
SLURRY PROPERTIES

| ECONOLITE Additive Percent | Water L/Sk. | Slurry Viscosity—Bc | | Free Water Percent | Slurry Density Kg/L | Yield L/Sk. |
|----------------------------------|----------------|------------------------|---------|--------------------------|------------------------|----------------|
| | | Initial | 20 Min. | | | |
| 0 | 29.1 | 7 | 14 | 0.60 | 1.63 | 43.61 |
| 0 | 33.3 | 5 | 9 | 0.60 | 1.57 | 47.86 |
| 0 | 37.5 | 4 | 6 | 1.30 | 1.52 | 52.10 |
| 0 | 41.3 | 5 | 7 | 1.30 | 1.49 | 55.78 |
| 1 | 41.3 | 11 | 12 | 0.40 | 1.49 | 55.78 |
| 1 | 48.8 | 8 | 8 | 0.56 | 1.41 | 62.58 |
| 1 | 56.4 | 5 | 5 | 0.72 | 1.37 | 69.66 |
| 1 | 64.0 | 3 | 4 | 2.10 | 1.33 | 77.59 |
| 2 | 64.0 | 7 | 8 | 0.24 | 1.33 | 77.59 |

PRESSURE-TEMPERATURE THICKENING TIME TESTS

API CASING-CEMENTING SCHEDULES

| ECONOLITE Additive Percent | Slurry Density Kg/L | Thickening Time—Hours:Minutes | |
|----------------------------------|------------------------|-------------------------------|--------|
| | | 1 220m | 2 440m |
| | | 39°C | 52°C |
| 0 | 1.63 | 4:00+ | 2:02 |
| 0 | 1.57 | 4:00+ | 2:00 |
| 0 | 1.52 | 4:00+ | 2:25 |
| 0 | 1.49 | 4:00+ | 3:30 |
| 1 | 1.49 | 2:15 | 1:12 |
| 1 | 1.41 | 4:00+ | 1:55 |
| 1 | 1.37 | 4:00+ | 4:00+ |
| 1 | 1.33 | 4:00+ | 4:00+ |
| 2 | 1.33 | 4:00+ | 4:00+ |

COMPRESSIVE STRENGTH — MPa

| ECONOLITE Additive Percent | Slurry Density Kg/L | 38°C | 60°C — 20.68 MPa | |
|----------------------------------|------------------------|----------|------------------|---------|
| | | 24 Hours | 12 Hrs. | 24 Hrs. |
| 0 | 1.63 | 1.65 | 1.97 | 3.79 |
| 0 | 1.57 | 1.10 | 1.34 | 2.76 |
| 0 | 1.52 | 0.76 | 0.90 | 1.65 |
| 0 | 1.49 | 0.41 | 0.62 | 1.17 |
| 1 | 1.49 | 0.83 | 0.93 | 2.03 |
| 1 | 1.41 | 0.41 | 0.55 | 1.24 |
| 1 | 1.37 | 0.34 | 0.34 | 0.76 |
| 1 | 1.33 | 0.31 | 0.17 | 0.48 |
| 2 | 1.33 | 0.72 | 0.31 | 0.66 |

ENGLISH UNITS
POZMIX® A CEMENT (CLASS G)
50-50 BLEND WITH 2% BENTONITE

SLURRY PROPERTIES

| Per Cent** | Salt | Water Requirement | | Slurry Weight | | Slurry Volume |
|------------|----------|-------------------|------------|---------------|-------------|---------------|
| | Lbs./Sk. | Gal./Sk. | Cu.Ft./Sk. | Lbs./Gal | Lbs./cu.Ft. | Cu.Ft./Sk. |
| 0 | 0 | 5.75 | 0.77 | 14.15 | 106 | 1.26 |
| 18 | 8.62 | 5.75 | 0.77 | 14.52 | 109 | 1.31 |
| Sat. | 17.77 | 5.75 | 0.77 | 14.78 | 111 | 1.37 |

**Per Cent by Weight of Water.

COMPRESSIVE STRENGTH — PSI†

| Per Cent Salt | 24 HOURS | | | 72 HOURS |
|------------------|----------|-------|-------|----------|
| | 110°F | 140°F | 170°F | 170°F |
| 0 | 500 | 840 | 1,685 | 2,960 |
| 18 | 575 | 825 | 2,010 | 2,925 |
| Sat. | 160 | 660 | 1,785 | 2,250 |

| Per Cent Salt | Per Cent HR-4 | 24 HOURS | | | 72 HOURS | | |
|------------------|------------------|----------|-------|-------|----------|-------|-------|
| | | 170°F | 230°F | 260°F | 170°F | 230°F | 260°F |
| 0 | 0.40 | 1,485 | 2,935 | 2,960 | 2,375 | 2,725 | 2,825 |
| 18 | 0.40 | 1,810 | 1,875 | 2,110 | 2,150 | 2,550 | 1,885 |
| Sat. | 0.40 | Not Set | 1,185 | 1,600 | 1,935 | 2,235 | 1,475 |

†API Curing Pressures

On all salt water slurries, the amount of salt to use per sack of cement can be calculated by using the following figures per Cu. Ft. of water:

| SALT % by Wt. of Water | SALT Lbs./Cu. Ft. of Water |
|---------------------------|-------------------------------|
| 10 | 6.24 |
| 14 | 8.74 |
| 18 | 11.23 |
| 24 | 15.00 |
| Sat. | 23.20 |

Salt should be dry blended with the cement, where possible.

METRIC UNITS
POZMIX® A CEMENT (CLASS G)
50-50 BLEND WITH 2% BENTONITE

SLURRY PROPERTIES

| Per Cent** | Salt | | Water Requirement L/Sk. | Slurry Weight Kg/L | Slurry Volume L/Sk. |
|-------------|------------|--------|----------------------------|-----------------------|------------------------|
| | Per Cent** | Kg/Sk. | | | |
| 0 | | 0.0 | 21.77 | 1.70 | 35.67 |
| 18 | | 3.9 | 21.77 | 1.74 | 37.09 |
| Sat. (60°C) | | 8.1 | 21.77 | 1.77 | 38.79 |

**Per Cent by Weight of Water.

COMPRESSIVE STRENGTH — MEGAPASCALS

| Per Cent Salt | 43°C** | 24 HOURS | | 72 HOURS | |
|------------------|--------|----------|---------|----------|--------|
| | | 60°C*** | 77°C*** | 77°C** | 77°C** |
| 0 | 3.44 | 5.79 | 11.61 | 20.40 | 20.40 |
| 18 | 3.96 | 5.68 | 13.85 | 20.16 | 20.16 |
| Sat. | 1.10 | 4.55 | 12.30 | 15.51 | 15.51 |

| Per Cent Salt | Per Cent HR-4 | 24 HOURS | | | 72 HOURS | | |
|------------------|------------------|----------|----------|----------|----------|----------|----------|
| | | 77°C*** | 110°C*** | 127°C*** | 77°C*** | 110°C*** | 127°C*** |
| 0 | 0.40 | 10.23 | 20.23 | 20.40 | 16.37 | 18.78 | 19.47 |
| 18 | 0.40 | 12.47 | 10.85 | 13.85 | 14.82 | 17.58 | 12.99 |
| Sat. | 0.40 | Not Set | 81.70 | 11.03 | 13.34 | 15.41 | 10.17 |

On all salt water slurries, the amount of salt to use per sack of cement can be calculated by using the following figures per Liter of water:

| SALT | | SALT | |
|-------------------|-------------|----------------------------|--------|
| % by Wt. of Water | | Kg/m ³ of Water | |
| | 10 | | 99.69 |
| | 14 | | 140.00 |
| | 18 | | 179.90 |
| | 24 | | 240.30 |
| | Sat. (60°C) | | 371.66 |

Salt should be dry blended with the cement, where possible.

**11.03 MPa Curing Pressure

***20.68 MPa Curing Pressure

ENGLISH UNITS

POZMIX® 140

RECOMMENDED TEMPERATURE RANGE

| Formation Temperature °F (Static) | Per Cent Chemical Activator | Per Cent Retarder | 24-Hour Compressive Strength—PSI | Thickening Time (Hrs.) |
|-----------------------------------|-----------------------------|-------------------|----------------------------------|------------------------|
| 140-230 | 4 | None | 300-4000 | 2-4 |
| 230-290 | 2 | 0.3-0.5 | 2500-4000 | 2-4 |
| 290 plus | 0 | 0.6-1.5 | 1500 plus | 2-4 |

SLURRY PROPERTIES

| Pozmix A | | Hydrated Lime | Water Requirements | | Slurry Weight | Slurry Volume |
|----------|------|---------------|--------------------|-----------|---------------|---------------|
| Lbs. | Lbs. | Gals./Sk. | Ft./Sk. | Lbs./Gal. | Lbs./Cu. Ft. | Cu. Ft./Sk. |
| 74 | 11 | 4.65 | 0.62 | 14.0 | 105 | 1.10 |

Note: Water value is an average for Pozmix A from St. Louis, Louisville and Kansas City and is based on 74 pounds.
Per Cent activator not shown.

THICKENING TIME — HOURS:MINUTES

(Pressure-Temperature Thickening-Time Test)

| Per Cent Retarder* | API CASING TESTS | | | | |
|--------------------|------------------|--------|---------|---------|---------|
| | 6,000' | 8,000' | 10,000' | 12,000' | 14,000' |
| 0.0 | 4:00+ | 4:00+ | 3:30 | 1:59 | 1:12 |
| 0.3 | 4:00+ | 4:00+ | 4:00+ | 3:15 | 2:15 |
| 0.5 | 4:00+ | 4:00+ | 4:00+ | 4:00+ | 2:45 |

*Retarder added by weight of Pozmix A.

COMPRESSIVE STRENGTHS — PSI

| Curing Time Days | CURING TEMPERATURE | | | | | |
|------------------|--------------------|---------|---------|---------|----------|----------|
| | 120°F** | 140°F** | 160°F** | 180°F** | 220°F*** | 270°F*** |
| 1 | 195 | 780 | 2385 | 2505 | 4400 | 4005 |
| 3 | 1890 | 3410 | 4200 | 4285 | 4925 | 4950 |
| 7 | 2460 | 4070 | 4470 | 3940 | 4925 | 4950 |

** Atmospheric Pressure

*** Values above 200°F were cured under pressure of 3,000 psi and contained 0.30% retarder.

METRIC UNITS**POZMIX® 140****RECOMMENDED TEMPERATURE RANGE**

| Formation Temperature °C (Static) | Per Cent Chemical Activator | Per Cent Retarder | 24-Hour Compressive Strength—MPa | Thickening Time (Hrs.) |
|-----------------------------------|-----------------------------|-------------------|----------------------------------|------------------------|
| 60-110 | 4 | None | 2.06-27.57 | 2-4 |
| 110-143 | 2 | 0.3-0.5 | 17.23-27.57 | 2-4 |
| 143 plus | 0 | 0.6-1.5 | 10.34 plus | 2-4 |

SLURRY PROPERTIES

| Pozmix A Kg. | Hydrated Lime Kg. | Water Requirements L/Sk. | Slurry Weight Kg/L | Slurry Volume L/Sk. |
|--------------|-------------------|--------------------------|--------------------|---------------------|
| 33.5 | 4.9 | 17.60 | 1.68 | 33.41 |

Note: Water value is an average for Pozmix A from St. Louis, Louisville and Kansas City and is based on 33.6 Kg.
Per Cent activator not shown.

THICKENING TIME — HOURS:MINUTES

(Pressure-Temperature Thickening-Time Test)

| Per Cent Retarder* | API CASING TESTS | | | | |
|--------------------|------------------|--------|--------|--------|--------|
| | 1 830m | 2 440m | 3 050m | 3 660m | 4 270m |
| 0.0 | 4:00+ | 4:00+ | 3:30 | 1:59 | 1:12 |
| 0.3 | 4:00+ | 4:00+ | 4:00+ | 3:15 | 2:15 |
| 0.5 | 4:00+ | 4:00+ | 4:00+ | 4:00+ | 2:45 |

*Retarder added by weight of Pozmix A.

COMPRESSIVE STRENGTHS — MPa

| Curing Time Days | CURING TEMPERATURE | | | | | |
|------------------|--------------------|--------|--------|--------|----------|----------|
| | 49°C** | 60°C** | 71°C** | 82°C** | 104°C*** | 132°C*** |
| 1 | 1.34 | 5.37 | 16.44 | 17.27 | 30.33 | 27.61 |
| 3 | 13.03 | 22.82 | 28.95 | 29.54 | 33.95 | 34.12 |
| 7 | 16.96 | 28.06 | 30.82 | 27.16 | 33.95 | 34.12 |

** Atmospheric Pressure

*** Values above 93°C were cured under pressure of 20.68 MPa and contained 0.30% retarder.

ENGLISH UNITS
POZMIX® 140 (74-11)
 (With Salt)

SLURRY PROPERTIES

| Water Gal./Sk. | Salt Per Cent | Slurry Density | | Slurry Volume Cu. Ft./Sk. |
|-------------------|------------------|----------------|--------------|------------------------------|
| | | Lbs./Gal. | Lbs./Cu. Ft. | |
| 4.65 | 0 | 14.0 | 105 | 1.18 |
| 4.65 | 4 | 14.0 | 105 | 1.19 |
| 4.65 | 6 | 14.1 | 105 | 1.19 |
| 4.65 | 10 | 14.2 | 106 | 1.20 |
| 4.65 | 18 | 14.3 | 107 | 1.22 |

THICKENING TIME — HOURS:MINUTES

(Pressure-Temperature Thickening-Time Test)

API Casing Cementing Schedules

| Depth Feet | Temperature—°F | | Calcium Chloride Per Cent | Retarder Per Cent | Thickening Time Hrs:Min. |
|---------------------------|----------------|-------------|---------------------------------|----------------------|--------------------------------|
| | Static | Circulating | | | |
| 10,000 | 230 | 144 | 4 | 0.0 | 4:00+ |
| 10,000 | 230 | 144 | 4 | 0.0 | 5:00+ |
| 12,000 | 260 | 172 | 0 | 0.0 | 5:38 |
| 14,000 | 290 | 206 | 0 | 0.1 | 4:18 |
| 14,000 | 290 | 206 | 0 | 0.1 | 5:00+ |
| 16,000 | 320 | 248 | 0 | 0.4 | 3:06 |
| SALT — 4 PER CENT | | | | | |
| 10,000 | 230 | 144 | 2 | 0.0 | 5:00+ |
| 10,000 | 230 | 144 | 2 | 0.0 | 5:00+ |
| 12,000 | 260 | 172 | 0 | 0.0 | 5:05 |
| 14,000 | 290 | 206 | 0 | 0.1 | 3:45 |
| 16,000 | 320 | 248 | 0 | 0.4 | 3:05 |
| SALT — 6 PER CENT | | | | | |
| 10,000 | 230 | 144 | 2 | 0.0 | 5:00+ |
| 12,000 | 260 | 172 | 0 | 0.0 | 4:53 |
| 14,000 | 290 | 206 | 0 | 0.1 | 3:20 |
| 16,000 | 320 | 248 | 0 | 0.4 | 3:13 |
| SALT — 10 PER CENT | | | | | |
| 10,000 | 230 | 144 | 2 | 0.0 | 3:43 |
| 12,000 | 260 | 172 | 0 | 0.0 | 4:45 |
| 14,000 | 290 | 206 | 0 | 0.1 | 3:45 |
| 16,000 | 320 | 248 | 0 | 0.4 | 3:50 |
| SALT — 18 PER CENT | | | | | |
| 10,000 | 230 | 144 | 2 | 0.0 | 3:07 |
| 10,000 | 230 | 144 | 2 | 0.0 | 5:00+ |
| 12,000 | 260 | 172 | 0 | 0.1 | 6:54 |
| 14,000 | 290 | 206 | 0 | 0.2 | 4:28 |
| 14,000 | 290 | 206 | 0 | *0.2 | 5:00* |
| 16,000 | 320 | 248 | 0 | 0.3 | 3:06 |

*—Slurries contain 1.0% CFR-2

METRIC UNITS

POZMIX® 140 (74-11)

(With Salt)

SLURRY PROPERTIES

| Water L/Sk. | Salt Per Cent | Slurry Density Kg/L | Slurry Volume L/Sk. |
|----------------|------------------|------------------------|------------------------|
| 17.60 | 0 | 1.68 | 33.41 |
| 17.60 | 4 | 1.68 | 33.69 |
| 17.60 | 6 | 1.69 | 33.69 |
| 17.60 | 10 | 1.70 | 33.97 |
| 17.60 | 18 | 1.73 | 34.57 |

THICKENING TIME — HOURS:MINUTES

(Pressure-Temperature Thickening-Time Test)

API Casing Cementing Schedules

| Depth meters | Temperature—°C | | Calcium Chloride Per Cent | Retarder Per Cent | Thickening Time Hrs:Min. |
|---------------------------|----------------|-------------|---------------------------------|----------------------|--------------------------------|
| | Static | Circulating | | | |
| 3 050 | 110 | 62 | 4 | 0.0 | 4:00+ |
| 3 050 | 110 | 62 | 4 | 0.0 | 5:00+ |
| 3 660 | 127 | 78 | 0 | 0.0 | 5:38 |
| 4 270 | 143 | 97 | 0 | 0.1 | 4:18 |
| 4 270 | 143 | 97 | 0 | 0.1 | 5:00+ |
| 4 880 | 160 | 120 | 0 | 0.4 | 3:06 |
| SALT — 4 PER CENT | | | | | |
| 3 050 | 110 | 62 | 2 | 0.0 | 5:00+ |
| 3 050 | 110 | 62 | 2 | 0.0 | 5:00+ |
| 3 660 | 127 | 78 | 0 | 0.0 | 5:05 |
| 4 270 | 143 | 97 | 0 | 0.1 | 3:45 |
| 4 880 | 160 | 120 | 0 | 0.4 | 3:05 |
| SALT — 6 PER CENT | | | | | |
| 3 050 | 110 | 62 | 2 | 0.0 | 5:00+ |
| 3 660 | 127 | 78 | 0 | 0.0 | 4:53 |
| 4 270 | 143 | 97 | 0 | 0.1 | 3:20 |
| 4 880 | 160 | 120 | 0 | 0.4 | 3:13 |
| SALT — 10 PER CENT | | | | | |
| 3 050 | 110 | 62 | 2 | 0.0 | 3:43 |
| 3 660 | 127 | 78 | 0 | 0.0 | 4:45 |
| 4 270 | 143 | 97 | 0 | 0.1 | 3:45 |
| 4 880 | 160 | 120 | 0 | 0.4 | 3:50 |
| SALT — 18 PER CENT | | | | | |
| 3 050 | 110 | 62 | 2 | 0.0 | 3:07 |
| 3 050 | 110 | 62 | 2 | 0.0 | 5:00+* |
| 3 660 | 127 | 78 | 0 | 0.1 | 6:54 |
| 4 270 | 143 | 97 | 0 | 0.2 | 4:28 |
| 4 270 | 143 | 97 | 0 | *0.2 | 5:00* |
| 4 880 | 160 | 120 | 0 | 0.3 | 3:06 |

*—Slurries contain 1.0% CFR-2

ENGLISH UNITS

COMPRESSIVE STRENGTH — PSI API CURING CONDITIONS

| Temp °F | Calcium Chloride Per Cent | Retarder Per Cent | Curing Time — Hours | | |
|---------------------------|---------------------------------|----------------------|---------------------|-------|-------|
| | | | 12 | 24 | 48 |
| 230 | 4 | 0.0 | 2535 | 3000 | 3900 |
| 230 | 4 | 0.0 | 1435* | 2150* | 3500 |
| 260 | 0 | 0.0 | 1550 | 1700 | 1875 |
| 290 | 0 | 0.1 | 875 | 975 | 1560 |
| 290 | 0 | 0.1 | 600* | 950* | 1200 |
| 320 | 0 | 0.4 | 1200 | 1575 | 1610 |
| SALT — 4 PER CENT | | | | | |
| 230 | 2 | 0.0 | 2850 | 3225 | 3600 |
| 260 | 0 | 0.0 | 885 | 1075 | 1135 |
| 290 | 0 | 0.1 | 825 | 1175 | 1335 |
| 320 | 0 | 0.4 | 1375 | 1435 | 1560 |
| SALT — 6 PER CENT | | | | | |
| 230 | 2 | 0.0 | 2625 | 3225 | 3355 |
| 260 | 0 | 0.0 | 1060 | 1125 | 1250 |
| 290 | 0 | 0.1 | 860 | 1135 | 1375 |
| 320 | 0 | 0.4 | 1310 | 1500 | 1610 |
| SALT — 10 PER CENT | | | | | |
| 230 | 2 | 0.0 | 2325 | 2610 | 3160 |
| 260 | 0 | 0.0 | 1035 | 1185 | 1210 |
| 290 | 0 | 0.1 | 850 | 1010 | 1175 |
| 320 | 0 | 0.4 | 1510 | 1700 | 1755 |
| SALT — 18 PER CENT | | | | | |
| 230 | 2 | 0.0 | 2400 | 2660 | 2975 |
| 230 | 2 | 0.0 | 2335* | 2600* | 2925* |
| 260 | 0 | 0.1 | 860 | 1035 | 1075 |
| 290 | 0 | 0.2 | 775* | 875* | 935* |
| 290 | 0 | 0.2 | 975 | 1310 | 1335 |
| 320 | 0 | 0.3 | 1425 | 1625 | 1760 |

*—Slurries contain 1.0% CFR-2

POZMIX® A 140 WEIGHTED WITH BARITE

SLURRY PROPERTIES

| Pozmix A Lbs. | Hydrated | | Water | | Slurry Weight | | Slurry |
|------------------|--------------|----------------|--------------------------|-------------|---------------|--------------|-----------------------|
| | Lime Lbs. | Barite Lbs. | Requirements Gals/Sk. | Cu. Ft./Sk. | Lbs./Gal. | Lbs./Cu. Ft. | Volume Cu. Ft./Sk. |
| 74 | 11.0 | | 4.65 | 0.62 | 14.00 | 105 | 1.18 |
| 74 | 11.0 | 50 | 5.85 | 0.78 | 16.00 | 120 | 1.53 |
| 74 | 11.0 | 90 | 6.95 | 0.93 | 17.00 | 127 | 1.83 |
| 74 | 11.0 | 155 | 8.81 | 1.18 | 18.00 | 135 | 2.33 |

Note: Water based on 74 pounds Pozmix A.
Per Cent activator not shown.

METRIC UNITS

COMPRESSIVE STRENGTH — MEGAPASCALS API CURING CONDITIONS

| Temp °C** | Calcium Chloride Per Cent | Retarder Per Cent | Curing Time — Hours | | |
|---------------------------|---------------------------------|----------------------|---------------------|--------|--------|
| | | | 12 | 24 | 48 |
| 110 | 4 | 0.0 | 17.47 | 20.68 | 26.88 |
| 110 | 4 | 0.0 | 9.89* | 14.82* | 24.13 |
| 127 | 0 | 0.0 | 10.68 | 11.72 | 10.85 |
| 143 | 0 | 0.1 | 6.03 | 6.72 | 10.75 |
| 143 | 0 | 0.1 | 4.13* | 6.55* | 8.27 |
| 160 | 0 | 0.4 | 8.27 | 10.85 | 11.10 |
| SALT — 4 PER CENT | | | | | |
| 110 | 2 | 0.0 | 19.85 | 22.23 | 24.82 |
| 127 | 0 | 0.0 | 6.10 | 7.41 | 7.82 |
| 143 | 0 | 0.1 | 5.68 | 8.10 | 9.20 |
| 160 | 0 | 0.4 | 9.48 | 9.89 | 10.75 |
| SALT — 6 PER CENT | | | | | |
| 110 | 2 | 0.0 | 18.09 | 22.23 | 22.99 |
| 127 | 0 | 0.0 | 7.30 | 7.75 | 8.61 |
| 143 | 0 | 0.1 | 5.92 | 7.82 | 9.48 |
| 160 | 0 | 0.4 | 9.03 | 10.34 | 11.10 |
| SALT — 10 PER CENT | | | | | |
| 110 | 2 | 0.0 | 16.03 | 12.99 | 21.78 |
| 127 | 0 | 0.0 | 7.13 | 8.17 | 8.34 |
| 143 | 0 | 0.1 | 5.86 | 6.96 | 8.10 |
| 160 | 0 | 0.4 | 10.40 | 11.71 | 20.09 |
| SALT — 18 PER CENT | | | | | |
| 110 | 2 | 0.0 | 16.54 | 18.34 | 20.51 |
| 110 | 2 | 0.0 | 16.09* | 17.92* | 20.16* |
| 127 | 0 | 0.1 | 5.92 | 7.13 | 7.41 |
| 143 | 0 | 0.2 | 5.34* | 6.03 | 6.44* |
| 143 | 0 | 0.2 | 6.72 | 9.03 | 9.20 |
| 160 | 0 | 0.3 | 9.82 | 11.20 | 12.13 |

*—Slurries contain 1.0% CFR-2

**—20.68 MPa Curing Pressure

POZMIX® A 140 WEIGHTED WITH BARITE

SLURRY PROPERTIES

| Pozmix A Kg | Hydrated | | Water Requirements L/Sk | Slurry Weight Kg/L | Slurry Volume L/Sk |
|----------------|------------|--------------|-------------------------------|-----------------------|--------------------------|
| | Lime Kg | Barite Kg | | | |
| 33.6 | 5 | — | 17.60 | 1.68 | 33.41 |
| 33.6 | 5 | 22.7 | 22.14 | 1.92 | 43.32 |
| 33.6 | 5 | 40.8 | 23.31 | 2.04 | 51.81 |
| 33.6 | 5 | 70.3 | 33.35 | 2.16 | 65.97 |

Note: Water based on 33.6 Kg Pozmix A.
Per Cent activator not shown.

ENGLISH UNITS

POZMIX® A 140

WEIGHTED WITH HI-DENSE NO. 3

SLURRY PROPERTIES

Water Requirement — 4.65 Gals./Sk. — 0.62 Cu. Ft./Sk.

2 PER CENT ACTIVATOR

| Pozmix A Lbs. | Lime Lbs. | Hi-Dense No. 3 Lbs. | Water Requirement | | Slurry Weight | | Slurry Volume |
|------------------|--------------|---------------------------|-------------------|-------------|---------------|--------------|------------------|
| | | | Gals./Sk. | Cu. Ft./Sk. | Lbs./Gal. | Lbs./Cu. Ft. | Cu. Ft./Sk. |
| 74 | 11 | — | 4.65 | 0.62 | 14.00 | 105 | 1.18 |
| 74 | 11 | 30 | 4.76 | 0.64 | 16.00 | 120 | 1.30 |
| 74 | 11 | 47 | 4.82 | 0.64 | 17.00 | 127 | 1.36 |
| 74 | 11 | 66 | 4.89 | 0.65 | 18.00 | 135 | 1.43 |
| 74 | 11 | 88 | 4.97 | 0.66 | 19.00 | 142 | 1.51 |

THICKENING TIME — HOURS:MINUTES

(Pressure-Temperature Thickening-Time Test)

| Simulated Well Depths Feet | Per Cent Retarder | Per Cent Activator | API CASING TESTS | |
|----------------------------------|----------------------|-----------------------|------------------|--------------|
| | | | 16 Lbs./Gal | 18 Lbs./Gal. |
| 10,000 | 0.0 | 2 | 3:00+ | 3:00+ |
| 12,000 | 0.0 | 2 | 3:00+ | 3:00+ |
| 14,000 | 0.5 | 2 | 3:00+ | 3:00+ |
| 16,000 | 1.0 | 2 | 2:22 | 2:50 |
| 16,000 | 1.5 | 2 | 3:00+ | 3:00+ |

COMPRESSIVE STRENGTHS — PSI

Pozmix A 140 (2 Per Cent Activator)

| Slurry Weight Lbs./Gal. Lbs./Cu.Ft. | | CURING TEMPERATURE | | | | | |
|---|-----|----------------------|------|----------------------|------|----------------------|------|
| | | 140°F | | 160°F | | 180°F | |
| | | Per Cent Retarder | | Per Cent Retarder | | Per Cent Retarder | |
| | | 0.0 | 0.5 | 0.0 | 0.5 | 0.0 | 0.5 |
| 24 HOURS | | | | | | | |
| 16.00 | 120 | 350 | * | 1005 | * | 1520 | * |
| 18.00 | 135 | 360 | * | 1065 | * | 1350 | * |
| 72 HOURS | | | | | | | |
| 16.00 | 120 | 1860 | 1545 | 1815 | 1230 | 1960 | 1930 |
| 18.00 | 135 | 1840 | 1800 | 1800 | 1175 | 2005 | 2530 |
| 7 DAYS | | | | | | | |
| 16.00 | 120 | 2085 | 1690 | 2020 | 2005 | 1980 | 2200 |
| 18.00 | 135 | 2110 | 2135 | 2200 | 2605 | 2095 | 4350 |

*Not Set

COMPRESSIVE STRENGTHS — PSI

Pozmix A 140 (4 per Cent Activator)

| Slurry Weight Lbs./Gal. Lbs./Cu.Ft. | | CURING TEMPERATURE | | |
|---|-----|--------------------|-------|-------|
| | | 140°F | 160°F | 180°F |
| 24 HOURS | | | | |
| 16.0 | 120 | 755 | 1740 | 1750 |
| 18.0 | 135 | 730 | 1845 | 1860 |
| 72 HOURS | | | | |
| 16.0 | 120 | 2465 | 2685 | 2375 |
| 18.0 | 135 | 2245 | 2240 | 2400 |

Note: Properties shown on Pozmix A 140 typical of Kansas City, St. Louis, or Louisville Pozmix A.

METRIC UNITS**POZMIX® A 140****WEIGHTED WITH HI-DENSE NO. 3****SLURRY PROPERTIES**

Water Requirement — 17.6 Liters per Sack

2 PER CENT ACTIVATOR

| Pozmix A Kg | Lime Kg | Hi-Dense No. 3 Kg | Water Requirement L/Sk. | Slurry Weight Kg/L | Slurry Volume L/Sk. |
|----------------|------------|-------------------------|-------------------------------|--------------------------|---------------------------|
| 33.6 | 5 | — | 17.6 | 1.68 | 33.41 |
| 33.6 | 5 | 13.6 | 18.0 | 1.92 | 36.81 |
| 33.6 | 5 | 21.3 | 18.2 | 2.04 | 38.50 |
| 33.6 | 5 | 29.8 | 18.5 | 2.16 | 40.49 |
| 33.6 | 5 | 39.9 | 18.8 | 2.28 | 42.75 |

THICKENING TIME — HOURS:MINUTES

(Pressure-Temperature Thickening-Time Test)

| Simulated Well Depths meters | Per Cent Retarder | Per Cent Activator | API CASING TESTS | |
|------------------------------------|----------------------|-----------------------|------------------|-----------|
| | | | 1.92 Kg/L | 2.16 Kg/L |
| 3050 | 0.0 | 2 | 3:00+ | 3:00+ |
| 3660 | 0.0 | 2 | 3:00+ | 3:00+ |
| 4270 | 0.5 | 2 | 3:00+ | 3:00+ |
| 4880 | 1.0 | 2 | 3:22 | 2:50 |
| 4880 | 1.5 | 2 | 3:00+ | 3:00+ |

COMPRESSIVE STRENGTHS — MEGAPASCALS

Pozmix A 140 (2 Per Cent Activator)

| Slurry Weight Kg/L | CURING TEMPERATURE (20.68 mPa) | | | | | |
|-----------------------|--------------------------------|----------------------|----------------------|----------------------|----------------------|----------------------|
| | 60°C | | 71°C | | 82°C | |
| | Per Cent Retarder | Per Cent Retarder | Per Cent Retarder | Per Cent Retarder | Per Cent Retarder | Per Cent Retarder |
| | 0.0 | 0.5 | 0.0 | 0.5 | 0.0 | 0.5 |
| 24 HOURS | | | | | | |
| 1.92 | 2.41 | * | 6.92 | * | 10.48 | * |
| 2.16 | 2.48 | * | 7.24 | * | 9.30 | * |
| 72 HOURS | | | | | | |
| 1.92 | 12.82 | 10.65 | 12.51 | 8.48 | 13.51 | 13.30 |
| 2.16 | 12.68 | 12.41 | 12.41 | 8.10 | 13.62 | 17.44 |
| 7 DAYS | | | | | | |
| 1.92 | 14.37 | 11.65 | 13.92 | 13.82 | 13.65 | 15.16 |
| 2.16 | 14.54 | 14.72 | 15.16 | 17.96 | 14.44 | 29.99 |

*Not Set

COMPRESSIVE STRENGTHS — MEGAPASCALS

Pozmix A 140 (4 per Cent Activator)

| Slurry Weight Kg/L | CURING TEMPERATURE (20.68 mPa) | | |
|-----------------------|--------------------------------|-------|-------|
| | 60°C | 71°C | 82°C |
| | 24 HOURS | | |
| 1.92 | 5.20 | 11.99 | 12.06 |
| 2.16 | 5.03 | 12.72 | 12.82 |
| 72 HOURS | | | |
| 1.92 | 16.99 | 18.51 | 16.37 |
| 2.16 | 15.47 | 15.44 | 16.54 |

Note: Properties shown on Pozmix A 140 typical of Kansas City, St. Louis, or Louisville Pozmix A.