SAN JUAN 29-7 UNIT #79
CEMENT CALCULATIONS FOR 7" CASING

TOP OF CEMENT @ 3670' BEHIND 7" CASING WAS NOTED IN DRILLING RECORDS WITH TEMPERATURE SURVEY. NO TEMPERATURE SURVEY LOG WAS FOUND. NMOCD RECORDS WERE CHECKED AND IT WAS NOT LOCATED THERE EITHER.

TOP OF CEMENT @ 2840' BEHIND 4-1/2" CASING WAS NOTED IN DRILLING RECORDS WITH TEMPERATURE SURVEY. TEMPERATURE LOG CONCURRED.

CEMENT BOND LOG WAS RUN ON 4-1/2" CASING FROM 4500' TO SURFACE. TOP OF CEMENT WAS LOCATED @ 2960'. FREEPOINT TOOL WAS RUN AND SHOWED 100% FREE @ 2870' AND 80% FREE @ 3019'. CHEMICAL CUT 4-1/2" CASING @ 2870'.

AFTER SECOND SQUEEZE JOB BEHIND 7" CASING, A CEMENT BOND LOG WAS RUN FROM 2780' - 50' AND SHOWED:
2780' - 1850' (80% BOND)
1850' - 1350' (20% BOND)
1350' - 1020' (80% BOND)
1020' - 730' (FREE PIPE)
730' - 620' (60% BOND)
620' - 450' (FREE PIPE)
450' - 430' (60% BOND)
430' - 50' (FREE PIPE)

PRIMARY CEMENT JOB FOR 7" CASING:

CASING SIZE: 7", 20.0# J-55 8RD
HOLE SIZE: 8-3/4"
CASING DEPTH: 4500'
CEMENT: 300 SX CLASS B
TEMPERATURE SURVEY: TOC @ 3670'

CEMENT VOLUME: $300SX * 1.18FT^3/SX * 0.1781BBL/FT^3 = 63.05BBLS$

CAPACITY OF ANNULUS BETWEEN 7" CASING AND 8-3/4" HOLE: 37.35 FT/BBL

COVERAGE OF CEMENT BEHIND 7" CASING:

$$63BBLS * 37.35FT/BBL * 100\%EFF = 2355'$$

$$63BBLS * 37.35FT/BBL * 70\%EFF = 1648'$$

$$63BBLS * 37.35FT/BBL * 50\%EFF = 1177'$$

TOP OF CEMENT:
$TOC @ 100\%EFF = 4500' - 2355' = 2145'$
$TOC @ 70\%EFF = 4500' - 1648' = 2852'$
$TOC @ 50\%EFF = 4500' - 1177' = 3323'$ Temp Survey @ 3670'

1ST SQUEEZE JOB BEHIND 7" CASING:

CEMENT: 550 SX CLASS G NEAT THEN 200 SX CLASS G W/ 2% $CaCL_2$ (750 SX TOTAL)
PUMPED FROM SURFACE. BOTTOM HOLE @ 1907'.

DRILLED CEMENT FROM 190' TO 1907'

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CEMENT LEFT INSIDE 7" CASING:

$$1907' - 190' = 1717'$$

COVERAGE OF CEMENT BEHIND 7" CASING AFTER 1ST SQUEEZE JOB:

CAPACITY OF 7", 20.0# CASING: 0.0405 BBL/FT

VOLUME OF CEMENT LEFT INSIDE 7" CASING:

$$1717' * 0.0405 BBL/FT = 69.5 BBLS$$

$$69.5 BBL * 5.6146 FT^3/BBL = 390 FT^3$$

CALCULATIONS FOR CEMENT COVERAGE BASED ON CLASS G CEMENT ONLY.

YIELD FOR CLASS G CEMENT: 1.15 FT^3/SX

SACKS OF CEMENT LEFT INSIDE 7" CASING:

$$390 FT^3 / 1.15 FT^3/SX = 340 SX$$

SACKS OF CEMENT BEHIND 7" CASING:

$$750 SX - 340 SX = 410 SX$$

VOLUME OF CEMENT BEHIND 7" CASING:

$$410 SX * 1.15 FT^3/SX = 472 FT^3$$

CAPACITY OF ANNULUS BETWEEN 7" CASING AND 8-3/4" HOLE: 6.652 FT/FT^3

COVERAGE OF CEMENT BEHIND 7" CASING:

$$472 FT^3 * 6.652 FT/FT^3 = 3136 FT$$

GOOD BOND BEHIND 7" CASING WITH CEMENT BOND LOG:

$$2780' - 1850' = 930'$$

EXCESS CEMENT SQUEEZED BEHIND 7" CASING:

$$3136' * 100\% EFF - 930' = 2206'$$

$$3136' * 70\% EFF - 930' = 1265'$$

BOTTOM OF CEMENT INTERPRETED FROM CEMENT BOND LOG: 2780'

POSSIBLE DEPTH OF EXCESS CEMENT:

$$@100\%: \ 2780' + 2206' = 4986'$$

$$@70\%: \ 2780' + 1265' = 4045'$$

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2ND SQUEEZE JOB BEHIND 7" CASING:

CEMENT: 300 SX CLASS G NEAT.
SET PACKER 655'.
DRILLED CEMENT FROM 654' TO 1330'

CEMENT LEFT INSIDE 7" CASING:

$$1330' - 654' = 676'$$

TOTAL CEMENT DRILLED INSIDE 7" CASING:

$$1717' + 676' = 2393'$$

COVERAGE OF CEMENT BEHIND 7" CASING AFTER 1ST AND 2ND SQUEEZE JOBS:

VOLUME OF CEMENT LEFT INSIDE 7" CASING:

$$2393' * 0.0405 BBL/FT = 96.9 BBLS$$

$$96.9 BBLS * 5.6146 FT^3/BBL = 544 FT^3$$

TOTAL SACKS OF CEMENT LEFT INSIDE 7" CASING:

$$544 FT^3 / 1.15 FT^3/SX = 473 SX$$

TOTAL CEMENT PUMPED BEFORE CEMENT BOND LOG:

$$750 SX + 350 SX = 1100 SX$$

TOTAL CEMENT SQUEEZED BEHIND 7" CASING:

$$1100 SX - 473 SX = 627 SX$$

VOLUME OF CEMENT BEHIND 7" CASING:

$$627\ SX * 1.15\ FT^3/SX * 0.1781 BBL/FT^3 = 128.4\ BBLS$$

COVERAGE OF CEMENT BEHIND 7" CASING:

$$128.4 BBL * 37.35 FT/BBL * 100\% EFF = 4796'$$

$$128.4 BBL * 37.35 FT/BBL * 70\% EFF = 3357'$$

CEMENT BOND LOG INTERPRETATION:

80% BOND FROM 2780' TO 1850' (930')
80% BOND FROM 1350' TO 1020' (330')
60% BOND FROM 730' - 620' (110')
60% BOND FROM 450' TO 430' (20')

TOTAL CEMENT BONDED TO PIPE FROM CBL:

$$930' + 330' + 110' + 20' = 1390'$$