

Buckhorn Draw Unit 1-9-299
 2,604' FSL 1,181' FEL (NE /4 SE /4)
 Sec. 1 T 2S R 99W
 Rio Blanco County, Colorado
 Federal Mineral Lease: COC64204

SURFACE CASING AND CENTRALIZER DESIGN

Proposed Total Depth: 9,825 '
 Proposed Depth of Surface Casing: 2,500 '
 Estimated Pressure Gradient: 0.45 psi/ft
 Bottom Hole Pressure at 9,825 '
 0.45 psi/ft x 9,825 ' = 4,421 psi
 Hydrostatic Head of gas/oil mud: 0.22 psi/ft
 0.22 psi/ft x 9,825 ' = 2,162 psi

Maximum Design Surface Pressure

Bottom Hole Pressure – Hydrostatic Head =
 (0.45 psi/ft x 9,825 ') – (0.22 psi/ft x 9,825 ') =
 4,421 psi – 2,162 psi = 2,260 psi

Casing Strengths 9-5/8" J-55 36# ST&C

Wt.	Tension (lbs)	Burst (psi)	Collapse (psi)
36 #	394,000	3,520	2,020
40 #	452,000	3,950	2,570

Safety Factors

Tension (Dry): 1.8 Burst: 1.0 Collapse: 1.125

Tension (Dry): 36 # / ft x 2,500 ' = 90,000 #
 Safety Factor = $\frac{394,000}{90,000}$ = 4.38 ok

Burst: Safety Factor = $\frac{3,520 \text{ psi}}{2,260 \text{ psi}}$ = 1.56 ok

Collapse: Hydrostatic = 0.052 x 9.0 ppg x 2,500 ' = 1,170 psi
 Safety Factor = $\frac{2,020 \text{ psi}}{1,170 \text{ psi}}$ = 1.73 ok

Use 2,500 ' 9-5/8" J-55 36# ST&C

Use 3,000 psi minimum casinghead and BOP's

Centralizers

17 Total
 1 near surface at 160'
 3 -1 each at middle of bottom joint, second joint, third joint
 13 -1 each at every other joint ±80' spacing
 Total centralized ± 1320 ' (1,180 ' – 2,500 ')

Note that field experience indicates that additional centralizers greatly increase the chance of "sticking" the surface casing prior to reaching surface casing total depth.