

BDU 26-7-199  
 1497 FNL 1504 FEL ( SW /4 NE /4 )  
 Sec. 26 T 1S R 99W  
 Rio Blanco County, Colorado  
 Federal Mineral Lease: COC64841

**SURFACE CASING AND CENTRALIZER DESIGN**

Proposed Total Depth: 10,000 '  
 Proposed Depth of Surface Casing: 3,000 '  
 Estimated Pressure Gradient: 0.45 psi/ft  
 Bottom Hole Pressure at 10,000 '  
     0.45 psi/ft x 10,000 ' = 4,500 psi  
 Hydrostatic Head of gas/oil mud: 0.22 psi/ft  
     0.22 psi/ft x 10,000 ' = 2,200 psi

Maximum Design Surface Pressure

Bottom Hole Pressure – Hydrostatic Head =  
 ( 0.45 psi/ft x 10,000 ' ) – ( 0.22 psi/ft x 10,000 ' ) =  
     4,500 psi – 2,200 psi = 2,300 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 3,000 ' = 108,000 #  
 Safety Factor =  $\frac{394,000}{108,000}$  = 3.65      ok  
 Burst: Safety Factor =  $\frac{3,520 \text{ psi}}{2,300 \text{ psi}}$  = 1.53      ok  
 Collapse: Hydrostatic = 0.052 x 9.0 ppg x 3,000 ' = 1,404 psi  
 Safety Factor =  $\frac{2,020 \text{ psi}}{1,404 \text{ psi}}$  = 1.44      ok

Use 3,000 ' 9-5/8" J-55 36# ST&C

Use 3,000 psi minimum casinghead and BOP's

Centralizers

8 Total  
 1 near surface at 160'  
 3 -1 each at middle of bottom joint, second joint, third joint  
 4 -1 each at every other joint ±80' spacing  
 Total centralized ± 600 ' ( 2,400 ' – 3,000 ' )

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