Application for Permit to Drill
OCS-G 31376, Well No. 001ST00BP00, Block 290
Eugene Island Area, Offshore, Louisiana

CASING DESIGN CALCULATIONS
Proposed Conductor Casing
20" 94# J-55 BT&C
0' – ±1500' MD/TVD

I. Calculate Collapse Safety Factor

CSF = Casing Collapse Design Pressure / Hydrostatic Pressure at TVD

Assume casing filled with half water/air and set in 9.0 ppg mud

HP @ 1500' = (1500' x .052 x 9.0 ppg) - (750 x.465) = 353 psi

$$CSF = \frac{520}{353} = 1.47$$

II. Calculate Tension Safety Factor

TSF = Casing Tension Design Strength / Actual Weight of Casing String

$$TSF = \frac{1,402,000}{141,000} = 9.94$$

III. Calculate Burst Safety Factor

BSF = Casing Burst Design Pressure / Maximum Shut-In Surface Casing Pressure

MSISCP = (Fracture Gradient at Casing Shoe x .052 x TVD) - (Gas-Condensate Gradient x TVD to Casing Shoe)

Assume Dry Gas Gradient to be .115 psi/foot

MSISCP = (11.0 ppg x .052 x 1500') - (.115 x 1500') = 685 psi

$$BSF = \frac{2110}{685} = 3.08$$

Actual casing test pressure will be 250 psi or MISISCP, whichever is the lesser.

Test 29-1/2" 500 psi rental diverter to 250 psi.

CASING DESIGN CALCULATIONS
Proposed Surface Casing
13-3/8" 68# K-55 BT&C
0' – ±4500' MD/TVD

I. Calculate Collapse Safety Factor

$$CSF = \frac{\text{Casing Collapse Design Pressure}}{\text{Hydrostatic Pressure at TVD}}$$

Assume casing half filled with water (.465 psi/ft) and gas (.115 psi/ft). Set in 9.6 ppg mud

HP @ 4500' = (4500' x .052 x 9.6 ppg) - (.29 x 2250') = 1593 psi

$$CSF = \frac{1950}{1593} = 1.22$$

II. Calculate Tension Safety Factor

$$TSF = \frac{\text{Casing Tension Design Strength}}{\text{Actual Weight of Casing String}}$$

$$TSF = \frac{1{,}300{,}000}{306{,}000} = 4.24$$

III. Calculate Burst Safety Factor

$$BSF = \frac{\text{Casing Burst Design Pressure}}{\text{Maximum Shut-In Surface Casing Pressure}}$$

MSISCP = (Fracture Gradient at Casing Shoe x .052 x TVD) - (Gas Gradient x TVD to Casing Shoe)

Assume Dry Gas Gradient to be .125 psi/ft

MSISCP = (15.0 ppg x .052 x 4500') - (.125 x 4500') = 2947 psi

$$BSF = \frac{3450}{2947} = 1.17$$

Test casing to 2600 psi.
Test BOP's to 5000 psi.

CASING DESIGN CALCULATIONS
Proposed Production Casing
9-5/8" 53.5# Q-125 LTC
0' - ±12,000' MD/TVD

I. Calculate Collapse Safety Factor

$$CSF = \frac{\text{Casing Collapse Design Pressure}}{\text{Hydrostatic Pressure at TVD}}$$

Assume casing filled with gas condensate w/ gas and water w/ gradient .35 psi with 12.5 ppg mud back-up.

HP @ 12,000' = (12.5 ppg x .052 x 12,000') - (12,000' x .35) = 3600 psi

$$CSF = \frac{8440}{3600} = 2.35$$

II. Calculate Tension Safety Factor

$$TSF = \frac{\text{Casing Tension Design Strength}}{\text{Actual Weight of Casing String in air}}$$

$$TSF = \frac{1,595,000}{642,000} = 2.48$$

III. Calculate Burst Safety Factor for Production casing

$$BSF = \frac{\text{Casing Burst Design Pressure}}{\text{Maximum Shut-In Casing Pressure}}$$

MSISCP = (Pore Pressure @ TD x .052 x TVD – (Internal gas gradient .15 psi/ft x TVD)

MSISCP = (15.0 ppg x .052 x 14,500') - (.15 x 14,500') = 9135 psi

$$BSF = \frac{12,390}{9135} = 1.36$$

Test casing to 7000 psi.
Test BOP's to 7000 psi.

CASING DESIGN CALCULATIONS
Proposed Production liner
7-5/8" 39# P-110 STL
±11,800' MD/TVD – ±14,727' MD/14,500' TVD)

I. Calculate Collapse Safety Factor

CSF = Casing Collapse Design Pressure / Hydrostatic Pressure at TVD

Assume casing filled with Gas condensate w/ .15 psi/ft gradient. Used 16.0 ppg back up and 1000 psi abandonment

HP @ 14,500' = (16.0 ppg x .052 x 14,500') - (14,500' x .15) - 1000 = 8889 psi

CSF = 11,080 / 8889 = 1.24

II. Calculate Tension Safety Factor

TSF = Casing Tension Design Strength / Actual Weight of Casing String in air

TSF = 1,231,000 / 114,153 = 10.78

III. Calculate Burst Safety Factor for Production casing

BSF = Casing Burst Design Pressure / Maximum Shut-In Casing Pressure

MSISCP = (Pore Pressure @ TD x .052 x TVD) – (Internal gas gradient .15 psi/ft x TVD)

MSISCP = 15.0 ppg x .052 x 14,500') - (.15 x 14,500') = 9135 psi

BSF = 12,620 / 9,135 = 1.38

Test TOL to 2000 psi.
Test BOP's to 7000.