Revised Permit to Drill – Revised 03 January 2012
OCS-G 31366, Well No. 001ST00BP00
Block 51, Eugene Island Area, Offshore, Louisiana

CASING DESIGN CALCULATIONS
Proposed Liner & Production Casing 7-3/4" 46.10 Q-125 HDY 513 Liner and Tie Back
(0' to ±17,841' MD/TVD)

I. Calculate Collapse Safety Factor

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

Assume casing filled with gas gradient set in 18.3 ppg back up fluid and internal abandonment pressure of 2500 psi

HP @ 18,000' = (18.3 ppg x .052 x 17,841') - (.14 x 17,841') - 2500 psi = 11,979 psi

$$CSF = \frac{16,580}{11,979} = 1.38$$

II. Calculate Tension Safety Factor

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

$$TSF = \frac{1,672,000}{723,000} = 2.31 \ \frac{\text{tie back load}}{}$$

III. Calculate Burst Safety Factor

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

MSISCP = (Pore Pressure @ T.D. x 052 x TVD) – (Internal gas gradient x TVD)

MSISCP = (17.7 ppg x .052 x 19,000') - (.14 x 19,000') = 14827 psi during production only

$$BSF = \frac{16,790}{14827} = 1.13$$

Test Liner Top to 3500 psi
Test BOP's to 250 psi low and 8000 psi high

Note: Tieback procedure will be submitted with completion procedure

CASING DESIGN CALCULATIONS
Proposed Production 5-1/2" 23# Q-125 HDY 513 Liner
(±17641' MD/TVD to ±19,000' MD/TVD)

I. Calculate Collapse Safety Factor

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

Assume casing filled with gas gradient set in 18.3 ppg back up fluid and internal abandonment pressure of 2500 psi

HP @ 19,000'= (18.3 ppg x .052 x 19,000') - (.14 x 19,000') - 2500 psi = 12920 psi

$$CSF = \frac{16070}{12920} = 1.24$$

II. Calculate Tension Safety Factor

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

$$TSF = \frac{694{,}000}{31{,}600} = 21.96$$

III. Calculate Burst Safety Factor

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

MSISCP = (Pore Pressure @ T.D. x 052 x TVD) – (Internal gas gradient x TVD)

MSISCP = (17.7 ppg x .052 x 19,000') - (.14 x 19,000') = 14827 psi

$$BSF = \frac{16{,}510}{14827} = 1.11$$

Test Liner Top to 3500 psi
Tested BOP's to 250 psi low and 8000 psi high