

# CALCULATIONS OF DRILLING:

## MAXIMUM ANTICIPATED SURFACE PRESSURE (MASP) & MAXIMUM ANTICIPATED CASING PRESSURE (MACP)

Casing Size: 22 in. Setting Depth (TVD): 9000 ft.

Data: Frac. Grad. @ csg shoe 9000 ft. = 10.6 ppg  
 Form. Pore Press. Grad @ csg shoe 9000 ft. = 9.2 ppg  
 Mud Wt. @ csg shoe 9000 ft. = 9.3 ppg  
 TVD next csg shoe 10800 ft.  
 MW @ next csg shoe 10.5 ppg  
 Form. Pore Press. Grad @ next csg shoe 10.3 ppg

For Subsea Wellhead: Water Depth 6340 ft. (Leave Blank for Surface Stack)  
 RKB 75 ft. (Leave Blank for Surface Stack)

Gas Grad: 0' to 10,000' Below Mudline = 0.1 psi/ft  
 Gas Grad: 10,000' or Greater Below Mudline = 0.15 psi/ft

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### FRAC. GRAD.

$$\begin{aligned} \text{MASP} &= (.052 \times \text{FG @ Csg Shoe} \times \text{Csg Shoe Depth}) - (\text{Gas Grad} \times \text{Csg Shoe Depth}) \\ &= (.052 \times \underline{10.6} \text{ ppg} \times \underline{9000} \text{ ft.}) - (\underline{0.10} \text{ psi/ft} \times \underline{9000} \text{ ft.}) \\ &= (\underline{4961}) - (\underline{900}) = \underline{4061} \text{ psi} \end{aligned}$$

$$\begin{aligned} \text{MACP} &= \text{MASP} + (\text{Gas Grad} \times (\text{Water Depth} + \text{RKB})) \\ &= \underline{4061} + \underline{0.10} \times (\underline{6340} + \underline{75}) = \underline{4702} \text{ psi} \end{aligned}$$

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BHP MASP & MACP assumes the following conditions:

Next Casing Shoe: 0' to 12,000' BML - 70% of the hole filled with gas & 30% filled with fluid  
 Next Casing Shoe: 12,000' to 15,000' BML - 60% gas & 40% fluid  
 Next Casing Shoe: 15,000' and deeper BML - 50% gas & 50% fluid

### BHP

$$\begin{aligned} \text{Press. Of Gas Column} &= \text{gas \%} \times \text{TVD/next csg shoe depth} \times \text{gas grad.} \\ \text{Press. Of Gas Column} &= \underline{70\%} \times \underline{10800} \text{ ft.} \times \underline{0.10} \text{ psi/ft} \\ \text{Press. Of Gas Column} &= \underline{756} \text{ psi} \end{aligned}$$

$$\begin{aligned} \text{Press. Of Mud Column} &= \text{fluid\%} \times \text{TVD/next csg shoe} \times \text{MW @ TVD/next csg shoe} \times 0.052 \\ \text{Press. Of Mud Column} &= \underline{30\%} \times \underline{10800} \text{ ft.} \times \underline{10.5} \text{ ppg} \times \underline{0.052} \text{ psi/ft} \\ \text{Press. Of Mud Column} &= \underline{1769} \text{ psi} \end{aligned}$$

$$\begin{aligned} \text{BHP} &= \text{TD/next csg shoe depth} \times \text{pore pressure @ TVD/next csg shoe depth} \times 0.052 \\ &= \underline{10800} \text{ ft.} \times \underline{10.3} \text{ ppg} \times 0.052 \text{ psi/ft} \\ &= \underline{5784} \text{ psi} \end{aligned}$$

$$\begin{aligned} \text{MASP} &= \text{BHP} - \text{Press. of Fluid Column} - \text{Press. Of Gas Column} \\ &= \underline{5784} \text{ psi} - \underline{1769} \text{ psi} - \underline{756} \text{ psi} \\ &= \underline{3259} \text{ psi} \end{aligned}$$

$$\begin{aligned} \text{MACP} &= \text{MASP} + (\text{Gas Grad} \times (\text{Water Depth} + \text{RKB})) \\ &= \underline{3259} + \underline{0.10} \times (\underline{6340} + \underline{75}) = \underline{3901} \text{ psi} \end{aligned}$$

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$$\begin{aligned} \text{MASP} &= \text{Lesser of FG MASP or BHP MASP} \\ &= \underline{4061} \text{ psi or } \underline{3259} \text{ psi} \\ &= \underline{3259} \text{ psi} \end{aligned}$$

$$\begin{aligned} \text{MACP} &= \text{Lesser of FG MACP or BHP MACP} \\ &= \underline{4702} \text{ psi or } \underline{3901} \text{ psi} \\ &= \underline{3901} \text{ psi} \end{aligned}$$

# CALCULATIONS OF DRILLING:

## MAXIMUM ANTICIPATED SURFACE PRESSURE (MASP) & MAXIMUM ANTICIPATED CASING PRESSURE (MACP)

Casing Size: 17-7/8 in. Setting Depth (TVD): 10800 ft.

Data: Frac. Grad. @ csg shoe 10800 ft. = 11.8 ppg  
 Form. Pore Press. Grad @ csg shoe 10800 ft. = 10.3 ppg  
 Mud Wt. @ csg shoe 10800 ft. = 10.5 ppg  
 TVD next csg shoe 12900 ft.  
 MW @ next csg shoe 11.5 ppg  
 Form. Pore Press. Grad @ next csg shoe 11.2 ppg

For Subsea Wellhead: Water Depth 6340 ft. (Leave Blank for Surface Stack)  
 RKB 75 ft. (Leave Blank for Surface Stack)

Gas Grad: 0' to 10,000' Below Mudline = 0.1 psi/ft  
 Gas Grad: 10,000' or Greater Below Mudline = 0.15 psi/ft

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### FRAC. GRAD.

$$\begin{aligned} \text{MASP} &= (.052 \times \text{FG @ Csg Shoe} \times \text{Csg Shoe Depth}) - (\text{Gas Grad} \times \text{Csg Shoe Depth}) \\ &= (.052 \times 11.8 \text{ ppg} \times 10800 \text{ ft.}) - (0.10 \text{ psi/ft} \times 10800 \text{ ft.}) \\ &= (6627) - (1080) = 5547 \text{ psi} \end{aligned}$$

$$\begin{aligned} \text{MACP} &= \text{MASP} + (\text{Gas Grad} \times (\text{Water Depth} + \text{RKB})) \\ &= 5547 + 0.10 \times (6340 + 75) = 6188 \text{ psi} \end{aligned}$$

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BHP MASP & MACP assumes the following conditions:

Next Casing Shoe: 0' to 12,000' BML - 70% of the hole filled with gas & 30% filled with fluid  
 Next Casing Shoe: 12,000' to 15,000' BML - 60% gas & 40% fluid  
 Next Casing Shoe: 15,000' and deeper BML - 50% gas & 50% fluid

### BHP

$$\begin{aligned} \text{Press. Of Gas Column} &= \text{gas \%} \times \text{TVD/next csg shoe depth} \times \text{gas grad.} \\ \text{Press. Of Gas Column} &= 70\% \times 12900 \text{ ft.} \times 0.10 \text{ psi/ft} \\ \text{Press. Of Gas Column} &= 903 \text{ psi} \end{aligned}$$

$$\begin{aligned} \text{Press. Of Mud Column} &= \text{fluid\%} \times \text{TVD/next csg shoe} \times \text{MW @ TVD/next csg shoe} \times 0.052 \\ \text{Press. Of Mud Column} &= 30\% \times 12900 \text{ ft} \times 11.5 \text{ ppg} \times 0.052 \text{ psi/ft} \\ \text{Press. Of Mud Column} &= 2314 \text{ psi} \end{aligned}$$

$$\begin{aligned} \text{BHP} &= \text{TD/next csg shoe depth} \times \text{pore pressure @ TVD/next csg shoe depth} \times 0.052 \\ &= 12900 \text{ ft} \times 11.2 \text{ ppg} \times 0.052 \text{ psi/ft} \\ &= 7513 \text{ psi} \end{aligned}$$

$$\begin{aligned} \text{MASP} &= \text{BHP} - \text{Press. of Fluid Column} - \text{Press. Of Gas Column} \\ &= 7513 \text{ psi} - 2314 \text{ psi} - 903 \text{ psi} \\ &= 4296 \text{ psi} \end{aligned}$$

$$\begin{aligned} \text{MACP} &= \text{MASP} + (\text{Gas Grad} \times (\text{Water Depth} + \text{RKB})) \\ &= 4296 + 0.10 \times (6340 + 75) = 4937 \text{ psi} \end{aligned}$$

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$$\begin{aligned} \text{MASP} &= \text{Lesser of FG MASP or BHP MASP} \\ &= 5547 \text{ psi or } 4296 \text{ psi} \\ &= 4296 \text{ psi} \end{aligned}$$

$$\begin{aligned} \text{MACP} &= \text{Lesser of FG MACP or BHP MACP} \\ &= 6188 \text{ psi or } 4937 \text{ psi} \\ &= 4937 \text{ psi} \end{aligned}$$

**CALCULATIONS OF DRILLING:****MAXIMUM ANTICIPATED SURFACE PRESSURE (MASP) &  
MAXIMUM ANTICIPATED CASING PRESSURE (MACP)**Casing Size: 16 in. Setting Depth (TVD): 12900 ft.

Data: Frac. Grad. @ csg shoe 12900 ft. = 12.6 ppg  
 Form. Pore Press. Grad @ csg shoe 12900 ft. = 11.2 ppg  
 Mud Wt. @ csg shoe 12900 ft. = 11.5 ppg  
 TVD next csg shoe 14800 ft.  
 MW @ next csg shoe 12.0 ppg  
 Form. Pore Press. Grad @ next csg shoe 11.7 ppg

For Subsea Wellhead: Water Depth 6340 ft. (Leave Blank for Surface Stack)  
 RKB 75 ft. (Leave Blank for Surface Stack)

Gas Grad: 0' to 10,000' Below Mudline = 0.1 psi/ft  
 Gas Grad: 10,000' or Greater Below Mudline = 0.15 psi/ft

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**FRAC. GRAD.**

$$\begin{aligned} \text{MASP} &= (.052 \times \text{FG @ Csg Shoe} \times \text{Csg Shoe Depth}) - (\text{Gas Grad} \times \text{Csg Shoe Depth}) \\ &= (.052 \times \underline{12.6} \text{ ppg} \times \underline{12900} \text{ ft.}) - (\underline{0.10} \text{ psi/ft} \times \underline{12900} \text{ ft.}) \\ &= (\underline{8452}) - (\underline{1290}) = \underline{7162} \text{ psi} \end{aligned}$$

$$\begin{aligned} \text{MACP} &= \text{MASP} + (\text{Gas Grad} \times (\text{Water Depth} + \text{RKB})) \\ &= \underline{7162} + (\underline{0.10} \times (\underline{6340} + \underline{75})) = \underline{7804} \text{ psi} \end{aligned}$$

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BHP MASP &amp; MACP assumes the following conditions:

Next Casing Shoe: 0' to 12,000' BML - 70% of the hole filled with gas & 30% filled with fluid  
 Next Casing Shoe: 12,000' to 15,000' BML - 60% gas & 40% fluid  
 Next Casing Shoe: 15,000' and deeper BML - 50% gas & 50% fluid

**BHP**

$$\begin{aligned} \text{Press. Of Gas Column} &= \text{gas \%} \times \text{TVD/next csg shoe depth} \times \text{gas grad.} \\ \text{Press. Of Gas Column} &= \underline{70\%} \times \underline{14800} \text{ ft.} \times \underline{0.10} \text{ psi/ft} \\ \text{Press. Of Gas Column} &= \underline{1036} \text{ psi} \end{aligned}$$

$$\begin{aligned} \text{Press. Of Mud Column} &= \text{fluid\%} \times \text{TVD/next csg shoe} \times \text{MW @ TVD/next csg shoe} \times 0.052 \\ \text{Press. Of Mud Column} &= \underline{30\%} \times \underline{14800} \text{ ft.} \times \underline{12.0} \text{ ppg} \times \underline{0.052} \text{ psi/ft} \\ \text{Press. Of Mud Column} &= \underline{2771} \text{ psi} \end{aligned}$$

$$\begin{aligned} \text{BHP} &= \text{TD/next csg shoe depth} \times \text{pore pressure @ TVD/next csg shoe depth} \times 0.052 \\ &= \underline{14800} \text{ ft.} \times \underline{11.7} \text{ ppg} \times \underline{0.052} \text{ psi/ft} \\ &= \underline{9004} \text{ psi} \end{aligned}$$

$$\begin{aligned} \text{MASP} &= \text{BHP} - \text{Press. of Fluid Column} - \text{Press. Of Gas Column} \\ &= \underline{9004} \text{ psi} - \underline{2771} \text{ psi} - \underline{1036} \text{ psi} \\ &= \underline{5198} \text{ psi} \end{aligned}$$

$$\begin{aligned} \text{MACP} &= \text{MASP} + (\text{Gas Grad} \times (\text{Water Depth} + \text{RKB})) \\ &= \underline{5198} + (\underline{0.10} \times (\underline{6340} + \underline{75})) = \underline{5839} \text{ psi} \end{aligned}$$

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$$\begin{aligned} \text{MASP} &= \text{Lesser of FG MASP or BHP MASP} \\ &= \underline{7162} \text{ psi or } \underline{5198} \text{ psi} \\ &= \underline{5198} \text{ psi} \end{aligned}$$

$$\begin{aligned} \text{MACP} &= \text{Lesser of FG MACP or BHP MACP} \\ &= \underline{7804} \text{ psi or } \underline{5839} \text{ psi} \\ &= \underline{5839} \text{ psi} \end{aligned}$$

# CALCULATIONS OF DRILLING:

## MAXIMUM ANTICIPATED SURFACE PRESSURE (MASP) & MAXIMUM ANTICIPATED CASING PRESSURE (MACP)

Casing Size: 13-5/8 in. Setting Depth (TVD): 14800 ft.

Data: Frac. Grad. @ csg shoe 14800 ft. = 13.4 ppg  
 Form. Pore Press. Grad @ csg shoe 14800 ft. = 11.7 ppg  
 Mud Wt. @ csg shoe 14800 ft. = 12.0 ppg  
 TVD next csg shoe 17000 ft.  
 MW @ next csg shoe 12.7 ppg  
 Form. Pore Press. Grad @ next csg shoe 12.4 ppg

For Subsea Wellhead: Water Depth 6340 ft. (Leave Blank for Surface Stack)  
 RKB 75 ft. (Leave Blank for Surface Stack)

Gas Grad: 0' to 10,000' Below Mudline = 0.1 psi/ft  
 Gas Grad: 10,000' or Greater Below Mudline = 0.15 psi/ft

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### FRAC. GRAD.

$$\begin{aligned} \text{MASP} &= (.052 \times \text{FG @ Csg Shoe} \times \text{Csg Shoe Depth}) - (\text{Gas Grad} \times \text{Csg Shoe Depth}) \\ &= (.052 \times \underline{13.4} \text{ ppg} \times \underline{14800} \text{ ft.}) - (\underline{0.15} \text{ psi/ft} \times \underline{14800} \text{ ft.}) \\ &= (\underline{10313}) - (\underline{2220}) = \underline{8093} \text{ psi} \end{aligned}$$

$$\begin{aligned} \text{MACP} &= \text{MASP} + (\text{Gas Grad} \times (\text{Water Depth} + \text{RKB})) \\ &= \underline{8093} + \underline{0.15} \times (\underline{6340} + \underline{75}) = \underline{9055} \text{ psi} \end{aligned}$$

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BHP MASP & MACP assumes the following conditions:

Next Casing Shoe: 0' to 12,000' BML - 70% of the hole filled with gas & 30% filled with fluid  
 Next Casing Shoe: 12,000' to 15,000' BML - 60% gas & 40% fluid  
 Next Casing Shoe: 15,000' and deeper BML - 50% gas & 50% fluid

### BHP

$$\begin{aligned} \text{Press. Of Gas Column} &= \text{gas \%} \times \text{TVD/next csg shoe depth} \times \text{gas grad.} \\ \text{Press. Of Gas Column} &= \underline{70\%} \times \underline{17000} \text{ ft.} \times \underline{0.15} \text{ psi/ft} \\ \text{Press. Of Gas Column} &= \underline{1785} \text{ psi} \end{aligned}$$

$$\begin{aligned} \text{Press. Of Mud Column} &= \text{fluid\%} \times \text{TVD/next csg shoe} \times \text{MW @ TVD/next csg shoe} \times 0.052 \\ \text{Press. Of Mud Column} &= \underline{30\%} \times \underline{17000} \text{ ft.} \times \underline{12.7} \text{ ppg} \times \underline{0.052} \text{ psi/ft} \\ \text{Press. Of Mud Column} &= \underline{3368} \text{ psi} \end{aligned}$$

$$\begin{aligned} \text{BHP} &= \text{TD/next csg shoe depth} \times \text{pore pressure @ TVD/next csg shoe depth} \times 0.052 \\ &= \underline{17000} \text{ ft.} \times \underline{12.4} \text{ ppg} \times 0.052 \text{ psi/ft} \\ &= \underline{10962} \text{ psi} \end{aligned}$$

$$\begin{aligned} \text{MASP} &= \text{BHP} - \text{Press. of Fluid Column} - \text{Press. Of Gas Column} \\ &= \underline{10962} \text{ psi} - \underline{3368} \text{ psi} - \underline{1785} \text{ psi} \\ &= \underline{5809} \text{ psi} \end{aligned}$$

$$\begin{aligned} \text{MACP} &= \text{MASP} + (\text{Gas Grad} \times (\text{Water Depth} + \text{RKB})) \\ &= \underline{5809} + \underline{0.15} \times (\underline{6340} + \underline{75}) = \underline{6771} \text{ psi} \end{aligned}$$

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$$\begin{aligned} \text{MASP} &= \text{Lesser of FG MASP or BHP MASP} \\ &= \underline{8093} \text{ psi or } \underline{5809} \text{ psi} \\ &= \underline{5809} \text{ psi} \end{aligned}$$

$$\begin{aligned} \text{MACP} &= \text{Lesser of FG MACP or BHP MACP} \\ &= \underline{9055} \text{ psi or } \underline{6771} \text{ psi} \\ &= \underline{6771} \text{ psi} \end{aligned}$$

# CALCULATIONS OF DRILLING:

## MAXIMUM ANTICIPATED SURFACE PRESSURE (MASP) & MAXIMUM ANTICIPATED CASING PRESSURE (MACP)

Casing Size: Lnr 11-7/8 in. Setting Depth (TVD): 17000 ft.

Data: Frac. Grad. @ csg shoe 17000 ft. = 13.6 ppg  
 Form. Pore Press. Grad @ csg shoe 17000 ft. = 12.4 ppg  
 Mud Wt. @ csg shoe 17000 ft. = 12.7 ppg  
 TVD next csg shoe 19800 ft.  
 MW @ next csg shoe 13.1 ppg  
 Form. Pore Press. Grad @ next csg shoe 12.8 ppg

For Subsea Wellhead: Water Depth 6340 ft. (Leave Blank for Surface Stack)  
 RKB 75 ft. (Leave Blank for Surface Stack)

Gas Grad: 0' to 10,000' Below Mudline = 0.1 psi/ft  
 Gas Grad: 10,000' or Greater Below Mudline = 0.15 psi/ft

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### FRAC. GRAD.

$$\begin{aligned} \text{MASP} &= (.052 \times \text{FG @ Csg Shoe} \times \text{Csg Shoe Depth}) - (\text{Gas Grad} \times \text{Csg Shoe Depth}) \\ &= (.052 \times 13.6 \text{ ppg} \times 17000 \text{ ft.}) - (0.15 \text{ psi/ft} \times 17000 \text{ ft.}) \\ &= (12022) - (2550) = 9472 \text{ psi} \end{aligned}$$

$$\begin{aligned} \text{MACP} &= \text{MASP} + (\text{Gas Grad} \times (\text{Water Depth} + \text{RKB})) \\ &= 9472 + (0.15 \times (6340 + 75)) = 10435 \text{ psi} \end{aligned}$$

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BHP MASP & MACP assumes the following conditions:

Next Casing Shoe: 0' to 12,000' BML - 70% of the hole filled with gas & 30% filled with fluid  
 Next Casing Shoe: 12,000' to 15,000' BML - 60% gas & 40% fluid  
 Next Casing Shoe: 15,000' and deeper BML - 50% gas & 50% fluid

### BHP

$$\begin{aligned} \text{Press. Of Gas Column} &= \text{gas \%} \times \text{TVD/next csg shoe depth} \times \text{gas grad.} \\ \text{Press. Of Gas Column} &= 60\% \times 19800 \text{ ft.} \times 0.15 \text{ psi/ft} \\ \text{Press. Of Gas Column} &= 1782 \text{ psi} \end{aligned}$$

$$\begin{aligned} \text{Press. Of Mud Column} &= \text{fluid\%} \times \text{TVD/next csg shoe} \times \text{MW @ TVD/next csg shoe} \times 0.052 \\ \text{Press. Of Mud Column} &= 40\% \times 19800 \text{ ft.} \times 13.1 \text{ ppg} \times 0.052 \text{ psi/ft} \\ \text{Press. Of Mud Column} &= 5375 \text{ psi} \end{aligned}$$

$$\begin{aligned} \text{BHP} &= \text{TD/next csg shoe depth} \times \text{pore pressure @ TVD/next csg shoe depth} \times 0.052 \\ &= 19800 \text{ ft.} \times 12.8 \text{ ppg} \times 0.052 \text{ psi/ft} \\ &= 13127 \text{ psi} \end{aligned}$$

$$\begin{aligned} \text{MASP} &= \text{BHP} - \text{Press. of Fluid Column} - \text{Press. Of Gas Column} \\ &= 13127 \text{ psi} - 5375 \text{ psi} - 1782 \text{ psi} \\ &= 5971 \text{ psi} \end{aligned}$$

$$\begin{aligned} \text{MACP} &= \text{MASP} + (\text{Gas Grad} \times (\text{Water Depth} + \text{RKB})) \\ &= 5971 + (0.15 \times (6340 + 75)) = 6933 \text{ psi} \end{aligned}$$

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$$\begin{aligned} \text{MASP} &= \text{Lesser of FG MASP or BHP MASP} \\ &= 9472 \text{ psi or } 5971 \text{ psi} \\ &= 5971 \text{ psi} \end{aligned}$$

$$\begin{aligned} \text{MACP} &= \text{Lesser of FG MACP or BHP MACP} \\ &= 10435 \text{ psi or } 6933 \text{ psi} \\ &= 6933 \text{ psi} \end{aligned}$$

**CALCULATIONS OF COMPLETION: MAXIMUM ANTICIPATED SURFACE PRESSURE (MASP) & MAXIMUM ANTICIPATED CASING PRESSURE (MACP)**

Casing Size: 9-7/8 in. Setting Depth (TVD): 19800 ft.

Data: Frac. Grad. @ csg shoe 19800 ft. = 14.6 ppg  
 Form. Pore Press. Grad @ csg shoe 19800 ft. = 12.8 ppg  
 Mud Wt. @ csg shoe 19800 ft. = 13.1 ppg  
 TVD @ Top Prod Interval 18770 ft.  
 MW @ Top Prod Interval 13.1 ppg  
 Form. Pore Press. Grad @ Top Prod Interval 12.8 ppg

For Subsea Wellhead: Water Depth 6340 ft. (Leave Blank for Surface Stack)  
 RKB 75 ft. (Leave Blank for Surface Stack)

Gas Grad: 0' to 10,000' Below Mudline = 0.1 psi/ft  
 Gas Grad: 10,000' or Greater Below Mudline = 0.15 psi/ft

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**FRAC. GRAD.**

$$\begin{aligned} \text{MASP} &= (.052 \times \text{FG @ Csg Shoe} \times \text{Csg Shoe Depth}) - (\text{Gas Grad} \times \text{Csg Shoe Depth}) \\ &= (.052 \times 14.6 \text{ ppg} \times 19800 \text{ ft.}) - (0.15 \text{ psi/ft} \times 19800 \text{ ft.}) \\ &= (15032) - (2970) = 12062 \text{ psi} \end{aligned}$$

$$\begin{aligned} \text{MACP} &= \text{MASP} + (\text{Gas Grad} \times (\text{Water Depth} + \text{RKB})) \\ &= 12062 + (0.15 \times (6340 + 75)) = 13024 \text{ psi} \end{aligned}$$

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BHP MASP & MACP assumes the following conditions:

Column of Gas to Surface @ Gas Gradient as Above

**BHP**

$$\begin{aligned} \text{Press. Of Gas Column} &= \text{gas \%} \times \text{TVD/next csg shoe depth} \times \text{gas grad.} \\ \text{Press. Of Gas Column} &= 100\% \times 18770 \text{ ft.} \times 0.15 \text{ psi/ft} \\ \text{Press. Of Gas Column} &= 2816 \text{ psi} \end{aligned}$$

$$\begin{aligned} \text{Press. Of Mud Column} &= \text{fluid\%} \times \text{TVD/next csg shoe} \times \text{MW @ TVD/next csg shoe} \times 0.052 \\ \text{Press. Of Mud Column} &= 0\% \times 18770 \text{ ft} \times 13.1 \text{ ppg} \times 0.052 \text{ psi/ft} \\ \text{Press. Of Mud Column} &= 0 \text{ psi} \end{aligned}$$

$$\begin{aligned} \text{BHP} &= \text{TD/next csg shoe depth} \times \text{pore pressure @ TVD/next csg shoe depth} \times 0.052 \\ &= 18770 \text{ ft} \times 12.8 \text{ ppg} \times 0.052 \text{ psi/ft} \\ &= 12445 \text{ psi} \end{aligned}$$

$$\begin{aligned} \text{MASP} &= \text{BHP} - \text{Press. of Fluid Column} - \text{Press. Of Gas Column} \\ &= 12445 \text{ psi} - 0 \text{ psi} - 2816 \text{ psi} \\ &= 9629 \text{ psi} \end{aligned}$$

$$\begin{aligned} \text{MACP} &= \text{MASP} + (\text{Gas Grad} \times (\text{Water Depth} + \text{RKB})) \\ &= 9629 + (0.15 \times (6340 + 75)) = 10591 \text{ psi} \end{aligned}$$

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$$\begin{aligned} \text{MASP} &= \text{Lesser of FG MASP or BHP MASP} \\ &= 12062 \text{ psi or } 9629 \text{ psi} \\ &= 9629 \text{ psi} \end{aligned}$$

$$\begin{aligned} \text{MACP} &= \text{Lesser of FG MACP or BHP MACP} \\ &= 13024 \text{ psi or } 10591 \text{ psi} \\ &= 10591 \text{ psi} \end{aligned}$$

**CALCULATIONS OF COMPLETION:      MAXIMUM ANTICIPATED SURFACE PRESSURE (MASP) &  
MAXIMUM ANTICIPATED CASING PRESSURE (MACP)**

Casing Size: \_\_\_\_\_ in.      Setting Depth (TVD): \_\_\_\_\_ ft.

**Data:** Frac. Grad. @ csg shoe \_\_\_\_\_ 0 ft. = \_\_\_\_\_ ppg  
 Form. Pore Press. Grad @ csg shoe \_\_\_\_\_ 0 ft. = \_\_\_\_\_ ppg  
 Mud Wt. @ csg shoe \_\_\_\_\_ 0 ft. = \_\_\_\_\_ ppg  
 TVD @ Top Prod Interval \_\_\_\_\_ ft.  
 MW @ Top Prod Interval \_\_\_\_\_ ppg  
 Form. Pore Press. Grad @ Top Prod Interval \_\_\_\_\_ ppg

**For Subsea Wellhead:** Water Depth \_\_\_\_\_ ft. (Leave Blank for Surface Stack)  
 RKB \_\_\_\_\_ ft. (Leave Blank for Surface Stack)

Gas Grad: 0' to 10,000' Below Mudline = 0.1 psi/ft  
 Gas Grad: 10,000' or Greater Below Mudline = 0.15 psi/ft

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**FRAC. GRAD.**

$$\begin{aligned} \text{MASP} &= (.052 \times \text{FG @ Csg Shoe} \times \text{Csg Shoe Depth}) - (\text{Gas Grad} \times \text{Csg Shoe Depth}) \\ &= (.052 \times \underline{0.0} \text{ ppg} \times \underline{0} \text{ ft.}) - (\underline{0.10} \text{ psi/ft} \times \underline{0} \text{ ft.}) \\ &= (\underline{0}) - (\underline{0}) = \underline{0} \text{ psi} \end{aligned}$$

$$\begin{aligned} \text{MACP} &= \text{MASP} + (\text{Gas Grad} \times (\text{Water Depth} + \text{RKB})) \\ &= \underline{0} + (\underline{0.10} \times (\underline{0} + \underline{0})) = \underline{0} \text{ psi} \end{aligned}$$

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BHP MASP & MACP assumes the following conditions:

Column of Gas to Surface @ Gas Gradient as Above

**BHP**

$$\begin{aligned} \text{Press. Of Gas Column} &= \text{gas \%} \times \text{TVD/next csg shoe depth} \times \text{gas grad.} \\ \text{Press. Of Gas Column} &= \underline{100\%} \times \underline{0} \text{ ft.} \times \underline{0.10} \text{ psi/ft} \\ \text{Press. Of Gas Column} &= \underline{0} \text{ psi} \end{aligned}$$

$$\begin{aligned} \text{Press. Of Mud Column} &= \text{fluid\%} \times \text{TVD/next csg shoe} \times \text{MW @ TVD/next csg shoe} \times 0.052 \\ \text{Press. Of Mud Column} &= \underline{0\%} \times \underline{0} \text{ ft} \times \underline{0.0} \text{ ppg} \times \underline{0.052} \text{ psi/ft} \\ \text{Press. Of Mud Column} &= \underline{0} \text{ psi} \end{aligned}$$

$$\begin{aligned} \text{BHP} &= \text{TD/next csg shoe depth} \times \text{pore pressure @ TVD/next csg shoe depth} \times 0.052 \\ &= \underline{0} \text{ ft} \times \underline{0.0} \text{ ppg} \times 0.052 \text{ psi/ft} \\ &= \underline{0} \text{ psi} \end{aligned}$$

$$\begin{aligned} \text{MASP} &= \text{BHP} - \text{Press. of Fluid Column} - \text{Press. Of Gas Column} \\ &= \underline{0} \text{ psi} - \underline{0} \text{ psi} - \underline{0} \text{ psi} \\ &= \underline{0} \text{ psi} \end{aligned}$$

$$\begin{aligned} \text{MACP} &= \text{MASP} + (\text{Gas Grad} \times (\text{Water Depth} + \text{RKB})) \\ &= \underline{0} + (\underline{0.10} \times (\underline{0} + \underline{0})) = \underline{0} \text{ psi} \end{aligned}$$

\*\*\*\*\*

$$\begin{aligned} \text{MASP} &= \text{Lesser of FG MASP or BHP MASP} \\ &= \underline{0} \text{ psi or } \underline{0} \text{ psi} \\ &= \underline{0} \text{ psi} \end{aligned}$$

$$\begin{aligned} \text{MACP} &= \text{Lesser of FG MACP or BHP MACP} \\ &= \underline{0} \text{ psi or } \underline{0} \text{ psi} \\ &= \underline{0} \text{ psi} \end{aligned}$$

# CALCULATIONS OF DRILLING:

## MAXIMUM ANTICIPATED SURFACE PRESSURE (MASP) & MAXIMUM ANTICIPATED CASING PRESSURE (MACP)

Casing Size: 28 in. Setting Depth (TVD): 7500 ft.

Data: Frac. Grad. @ csg shoe 7500 ft. = 9.6 ppg  
 Form. Pore Press. Grad @ csg shoe 7500 ft. = 9.2 ppg  
 Mud Wt. @ csg shoe 7500 ft. = 9.3 ppg  
 TVD next csg shoe 9000 ft.  
 MW @ next csg shoe 9.3 ppg  
 Form. Pore Press. Grad @ next csg shoe 9.2 ppg

For Subsea Wellhead: Water Depth 6340 ft. (Leave Blank for Surface Stack)  
 RKB 75 ft. (Leave Blank for Surface Stack)

Gas Grad: 0' to 10,000' Below Mudline = 0.1 psi/ft  
 Gas Grad: 10,000' or Greater Below Mudline = 0.15 psi/ft

### \*\*\*\*\* FRAC. GRAD.

$$\begin{aligned} \text{MASP} &= (.052 \times \text{FG @ Csg Shoe} \times \text{Csg Shoe Depth}) - (\text{Gas Grad} \times \text{Csg Shoe Depth}) \\ &= (.052 \times \underline{9.6} \text{ ppg} \times \underline{7500} \text{ ft.}) - (\underline{0.10} \text{ psi/ft} \times \underline{7500} \text{ ft.}) \\ &= (\underline{3744}) - (\underline{750}) = \underline{2994} \text{ psi} \end{aligned}$$

$$\begin{aligned} \text{MACP} &= \text{MASP} + (\text{Gas Grad} \times (\text{Water Depth} + \text{RKB})) \\ &= \underline{2994} + \underline{0.10} \times (\underline{6340} + \underline{75}) = \underline{3636} \text{ psi} \end{aligned}$$

\*\*\*\*\*

BHP MASP & MACP assumes the following conditions:

Next Casing Shoe: 0' to 12,000' BML - 70% of the hole filled with gas & 30% filled with fluid  
 Next Casing Shoe: 12,000' to 15,000' BML - 60% gas & 40% fluid  
 Next Casing Shoe: 15,000' and deeper BML - 50% gas & 50% fluid

### BHP

$$\begin{aligned} \text{Press. Of Gas Column} &= \text{gas \%} \times \text{TVD/next csg shoe depth} \times \text{gas grad.} \\ \text{Press. Of Gas Column} &= \underline{70\%} \times \underline{9000} \text{ ft.} \times \underline{0.10} \text{ psi/ft} \\ \text{Press. Of Gas Column} &= \underline{630} \text{ psi} \end{aligned}$$

$$\begin{aligned} \text{Press. Of Mud Column} &= \text{fluid\%} \times \text{TVD/next csg shoe} \times \text{MW @ TVD/next csg shoe} \times 0.052 \\ \text{Press. Of Mud Column} &= \underline{30\%} \times \underline{9000} \text{ ft} \times \underline{9.3} \text{ ppg} \times \underline{0.052} \text{ psi/ft} \\ \text{Press. Of Mud Column} &= \underline{1306} \text{ psi} \end{aligned}$$

$$\begin{aligned} \text{BHP} &= \text{TD/next csg shoe depth} \times \text{pore pressure @ TVD/next csg shoe depth} \times 0.052 \\ &= \underline{9000} \text{ ft} \times \underline{9.2} \text{ ppg} \times 0.052 \text{ psi/ft} \\ &= \underline{4306} \text{ psi} \end{aligned}$$

$$\begin{aligned} \text{MASP} &= \text{BHP} - \text{Press. of Fluid Column} - \text{Press. Of Gas Column} \\ &= \underline{4306} \text{ psi} - \underline{1306} \text{ psi} - \underline{630} \text{ psi} \\ &= \underline{2370} \text{ psi} \end{aligned}$$

$$\begin{aligned} \text{MACP} &= \text{MASP} + (\text{Gas Grad} \times (\text{Water Depth} + \text{RKB})) \\ &= \underline{2370} + \underline{0.10} \times (\underline{6340} + \underline{75}) = \underline{3011} \text{ psi} \end{aligned}$$

\*\*\*\*\*

$$\begin{aligned} \text{MASP} &= \text{Lesser of FG MASP or BHP MASP} \\ &= \underline{2994} \text{ psi or } \underline{2370} \text{ psi} \\ &= \underline{2370} \text{ psi} \end{aligned}$$

$$\begin{aligned} \text{MACP} &= \text{Lesser of FG MACP or BHP MACP} \\ &= \underline{3636} \text{ psi or } \underline{3011} \text{ psi} \\ &= \underline{3011} \text{ psi} \end{aligned}$$