IADC WellCAP Well Control Worksheet
Bullhead

Well Name: _____ **Completed By:** _____ **Date:** _____ / _____ / _____

PRE-RECORDED INFORMATION

TRUE PUMP OUTPUT:

_____ (m³/Stk @ 100%) x _____ (% Efficiency) = _____ (TPO (m³/Stk))

PUMP RATE CONSIDERATIONS:

Kill Rate Speeds and Volume

Desired Barrels per Minute (m³/MIN)	÷	Pump Output (m³/STK)	=	Pump Rate (STKS/MIN)
	÷		=	
	÷		=	
	÷		=	

VOLUME AND STROKE CONSIDERATIONS:

Tubing Volume/Strokes (Surface to End of Tubing, E.O.T.)

Tubing Length Surface to E.O.T. (MD — m)	x	Capacity per Foot in Tubing (m³/m)	=	Tubing Volume Surface to E.O.T. (m³)	÷	Pump Output (m³/STK)	=	Strokes Surface to E.O.T. (STKS)
	x		=		÷		=	

Casing Volumes/Strokes (Below End of Tubing, E.O.T. to Perforations)

Length E.O.T. to Perfs Top/Middle/Bottom (MD — m)	x	Capacity per Foot in Casing (m³/m)	=	Casing Volume E.O.T. to Perforations (m³)	÷	Pump Output (m³/STK)	=	Strokes E.O.T. to Perforations (STKS)
	x		=		÷		=	

Surface to Perforations Volume/Strokes (Kill Point)

Tubing Volume Surface to E.O.T. (m³)	+	Casing Volume E.O.T. to Perforations (m³)	=	Surface to Perforations Volume (m³)	÷	Pump Output (m³/STK)	=	Strokes Surface to Perforations (Kill Point — STKS)
	+		=		÷		=	

Total Volume/Stokes to Pump (Including Overdisplacing)

Surface to Perforations Volume (m³)	+	Overdisplacement — if any — (m³)	=	Total Volume to Pump (m³)	÷	Pump Output (m³/STK)	=	Total Strokes to Pump (Overdisplace — STKS)
	+		=		÷		=	

FORMATION PRESSURE CONSIDERATIONS:

Kill Fluid Density

Formation Pressure (kPa)	÷ 0.00981 ÷	Depth to Perforations Top/Middle/Bottom (TVD — m)	=	Kill Fluid Density (kg/m³)
			=	

Estimated Formation Integrity Pressure (Fracture)

Max. Allowable Mud Density (kg/m³)	x 0.00981	Depth to Perforations Top/Middle/Bottom (TVD — m)	=	Estimated Formation Integrity Pressure (kPa)
	x		=	

Average Hydrostatic Pressure in Tubing

Formation Pressure (kPa)	–	Initial Shut in Tubing Pressure (kPa)	=	Average Hydrostatic Pressure in Tubing (kPa)
	–		=	

Initial Estimated Maximum Pressure on Tubing (Static)

Est. Formation Integrity Pressure (kPa)	–	Average Hydrostatic Pressure in Tubing (kPa)	=	Initial Estimated Max. Pressure on Tubing (kPa)
	–		=	

Hydrostatic Pressure (kPa)

Fluid Density (kg/m³)	x 0.00981 x	TVD (m)	=	Hydrostatic Pressure (kPa)
	x		=	

SLOW CIRCULATION RATE (SCR):

	STKS/MIN	Pressure(kPa)	m³/MIN	Pressure(kPa)
Pump #1				
Pump #2				
Pump #3				

RECORDED WELL DATA:

Formation Pressure _____ kPa

Max. Allowable Mud Density _____ kg/m³

Maximum Pump Pressure _____ kPa

Shut In Tubing Pressure _____ kPa

Shut In Casing Pressure _____ kPa

Tree/Wellhead/ BOP Stack Rating _____ kPa

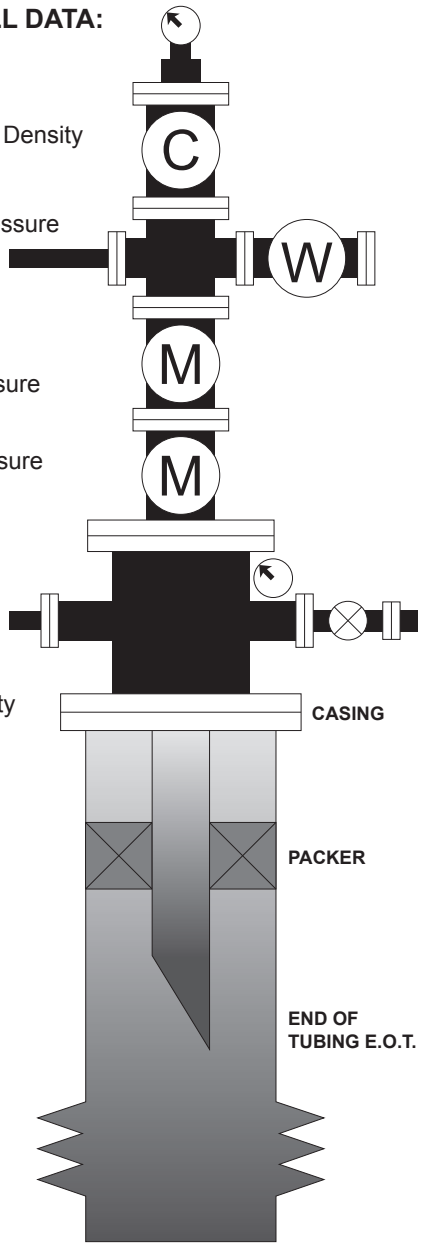
Annulus Fluid Density _____ kg/m³

Packer Set _____ TVD _____ MD meters

Top Perforation _____ TVD _____ MD meters

Middle Perforation _____ TVD _____ MD meters

Bottom Perforation _____ TVD _____ MD meters



Final Estimated Maximum Pressure on Tubing (Static)

Est. Formation Integrity Pressure (kPa)	–	Kill Fluid Hydrostatic Pressure (kPa)	=	Final Estimated Max. Pressure on Tubing (kPa)
	–		=	

TUBING & CASING DATA

TUBING DATA:

Tubing

Outside Diameter (mm)	Inside Diameter (mm)	Capacity per Foot (m^3/FT)	Length to E.O.T. (MD — m)

Tubing Collapse

Tubing Collapse (kPa)	x	Safety Factor (0.70 or Less)	=	Adjusted Tubing Collapse (kPa)
	x		=	

Tubing

Weight (kg/m)	Grade	Internal Yield (kPa @ 100%)	Collapse (kPa @ 100%)

Tubing Yield

Tubing Yield (kPa)	x	Safety Factor (0.70 or Less)	=	Adjusted Tubing Internal Yield (kPa)
	x		=	

CASING DATA:

Casing

Outside Diameter (mm)	Inside Diameter (mm)	Capacity per Foot (m^3/FT)	Length (MD — m)

Casing Internal Yield

Casing Internal Yield (kPa)	x	Safety Factor (0.70 or Less)	=	Adjusted Casing Yield (kPa)
	x		=	

Casing

Weight (kg/m)	Grade	Internal Yield (kPa @ 100%)	**TREE/BOP** Rated Pressure (kPa)

PRESSURE CONSIDERATIONS:

Pressure Consideration kPa per "Step"

Initial Max. Pressure on Tubing (kPa) (A)	−	Final Max. Pressure on Tubing (kPa) (B)	÷ 10 =	PSI per "Step" (kPa/STEP)
	−		÷ 10 =	

(A) Lesser value of "Tubing Yield" or "Initial Estimated Maximum Pressure on Tubing" results *(see page 1)*

(B) Lesser value of "Tubing Yield" or "Final Estimated Maximum Pressure on Tubing (Static)" results *(see page 1)*

Volume per "Step"

Surface to Perforations Volume (m^3)	÷ 10 =	Volume per "Step" (m^3/STEP)
	÷ 10 =	

Strokes per "Step"

Stroke Surface to Perforations (STKS)	÷ 10 =	Strokes per "Step" (STKS/STEP)
	÷ 10 =	

PRESSURE CHART

Strokes	Volume in m^3	Volume in GALS	Estimated Max. Static Pressure	Actual Tubing Pressure	Casing Pressure	Pump Rate	Notes
0	0	0	Initial				
Kill Point	Final ↓						
Overdisplace ↓							

FORMULAS

1. Pressure Gradient (kPa/m) = Fluid Density (kg/m^3) x 0.00981

2. Hydrostatic Pressure (kPa) = Fluid Density (kg/m^3) x 0.00981 x TVD (m)

3. Capacity (m^3/m) = Inside Diameter^2 (mm) ÷ 1273

4. Annular Capacity (m^3/m) = (Inside Diameter of Casing^2 (mm) or Hole Diameter^2 (mm) - Outside Diameter of Pipe^2 (mm)) ÷ 1273

5. Pipe Displacement (m^3/m) = (Outside Diameter of pipe^2 (mm) - Inside Diameter of pipe^2 (mm)) ÷ 1273

6. Maximum Allowable Fluid Density (kg/m^3) = $\frac{\text{Surface LOT Pressure (kPa)}}{\text{Shoe TVD (m) x 0.00981}}$ + LOT Fluid Density (kg/m^3)

7. MAASP (kPa) = [Maximum Allowable Fluid Density (kg/m^3) - Current Fluid Density (kg/m^3)] x 0.00981 x Shoe TVD (m)

8. Formation Pressure (kPa) = Hydrostatic Pressure Mud in Hole (kPa) + SIDPP (kPa)

9. Kg of Barite Needed to Weight-Up Mud = $\frac{m^3 \text{ of Mud in System x } 4250 \text{ x (KMW - OMW)}}{(4250 - \text{KMW})}$

   NOTE: This formula assumes that the average density of Barite is 35.4 kg/m^3 and the average number of kg per barrel is 4250.

10. Volume Increase from Adding Barite (m^3) = Number of kg added ÷ 4250

11. Estimated New Pump Pressure at New Pump Rate (kPa) = Old Pump Pressure (kPa) x $\left[\frac{\text{New Pump Rate (SPM)}}{\text{Old Pump Rate (SPM)}}\right]^2$

12. Estimated New Pump Pressure with New Mud Weight (kPa) = Old Pump Pressure (kPa) x $\frac{\text{New Mud Weight } (kg/m^3)}{\text{Old Mud Weight } (kg/m^3)}$

COMMENTS