



# Bison Oil Well Cementing Tail & Lead

Date: 7/12/2017  
 Invoice # 200120  
 API# \_\_\_\_\_  
 Foreman: Kirk Kallhoff

Customer: Noble Energy Inc.  
 Well Name: freedom federal lc 21-630

County: Weld Consultant: charles  
 State: Colorado Rig Name & Number: H&P 524  
 Distance To Location: 67  
 Units On Location: 4028/4033/4039  
 Time Requested: 1000 am  
 Time Arrived On Location: 830 am  
 Range: 58w Time Left Location: 6:00 pm

WELL DATA	Cement Data
Casing Size (in) : <u>9.625</u> Casing Weight (lb) : <u>36</u> Casing Depth (ft.) : <u>1,892</u> Total Depth (ft) : <u>1937</u> Open Hole Diameter (in) : <u>13.50</u> Conductor Length (ft) : <u>80</u> Conductor ID : <u>15.6</u> Shoe Joint Length (ft) : <u>42</u> Landing Joint (ft) : <u>35</u>  Sacks of Tail Requested <u>100</u> HOC Tail (ft): <u>0</u> One or the other, cannot have quantity in both  Max Rate: Max Pressure:	Lead Cement Name: <u>fn3 gel calcium</u> Cement Density (lb/gal) : <u>13.5</u> Cement Yield (cuft) : <u>1.7</u> Gallons Per Sack <u>9.00</u> % Excess <u>15%</u>  Tail Cement Name: <u>bfm 3</u> Cement Density (lb/gal) : <u>15.2</u> Cement Yield (cuft) : <u>1.27</u> Gallons Per Sack: <u>5.89</u> % Excess: <u>0%</u>  Fluid Ahead (bbls) <u>145.7</u> H2O Wash Up (bbls) <u>20.0</u>  Spacer Ahead Makeup

Casing ID 8.921 Casing Grade J-55 only used

Lead Calculated Results	Tail Calculated Results
HOC of Lead <u>1554.44 ft</u>	Tail Cement Volume In Ann <u>127.00 cuft</u>
Casing Depth - HOC Tail	(HOC Tail) X (OH Ann)
Volume of Lead Cement <u>759.70 cuft</u>	Total Volume of Tail Cement <u>108.77 Cuft</u>
HOC of Lead X Open Hole Ann	(HOC Tail X OH Ann) - (Shoe Length X Shoe Joint Ann)
Volume of Conductor <u>65.76 cuft</u>	bbls of Tail Cement <u>22.62 bbls</u>
(Conductor ID Squared) - (Casing Size OD Squared) X (.005454) X (Conductor Length ft)	(HOC of Tail) X (OH Ann) + (Cement Yield) X (Shoe Joint Ann) X (.1781) X (% Excess)
Total Volume of Lead Cement <u>825.46 cuft</u>	HOC Tail <u>222.56 ft</u>
(cuft of Lead Cement) + (Cuft of Conductor)	(Tail Cement Volume) ÷ (OH Ann)
bbls of Lead Cement <u>169.07 bbls</u>	Sacks of Tail Cement <u>100.00 sk</u>
(Total cuft of Lead Cement) X (.1781) X (1+%Lead Excess)	(Total Volume of Tail Cement) ÷ (Cement Yield)
Sacks of Lead Cement <u>558.40 sk</u>	bbls of Tail Mix Water <u>14.02 bbls</u>
(Total Slurry Volume) ÷ (Cement Yield) X (% Excess Cement)	(Sacks of Tail Cement X Gallons Per Sack) ÷ 42
bbls of Lead Mix Water <u>119.66 bbls</u>	Pressure of cement in annulus
(Sacks Needed) X (Gallons Per Sack) ÷ 42	Hydrostatic Pressure <u>585.23 PSI</u>
Displacement <u>145.71 bbls</u>	Collapse PSI: <u>2020.00 psi</u>
(Casing ID Squared) X (.0009714) X (Casing Depth) + (Landing Joint) - (Shoe Length)	Burst PSI: <u>3520.00 psi</u>
Total Water Needed: <u>445.10 bbls</u>	

X [Signature]  
 Authorization To Proceed

Customers hereby acknowledges and specifically agrees to the terms and condition on this work order, including, without limitation, the provisions on this work order.

