

DIMENSION BID



DULANG D-26L ZONE SHUT OFF

Revision: 1
Prepared for: Arsyamimi Bt. Mohamed
Date Prepared: 26th June 2024
Well: D-26L
Field: Dulang D
Operation Region: PMA
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26/06/2024

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Date

Remark: Do not execute the procedures in this document if it is not fully approved and signed by all parties.

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DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		
	DULANG D-26L	ZONE SHUT OFF	

PERSONNEL CONTACT

Any means of following doubt / unusual parameters / Emergency, please contact Dimension Bid personnel in onshore immediately.

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REVISION HISTORY

Rev. No	Section	Date	Revised By
0	All	26/4/2024	M. Ameerul Zaeem
1	Revise on setting depth	26/6/2024	M. Ameerul Zaeem

ACRONYM

Acronym	Abbreviation
BHA	Bottom Hole Assembly
RIH	Run In Hole
POOH	Pull Out of Hole
HUD	Hang Up Depth
TCC	Tubing Clearance Check
SCO	Sand Clean Out
TIT	Tubing Integrity Test
BOP	Blow Out Preventer
CT	Coiled Tubing
ID	Internal Diameter
MDTHF	Measure Depth Tubing Head Flange


TOP	Top of Plug
MASTP	Maximum Allowable Surface Treating Pressure
STP	Surface Treating Pressure

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DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		
	DULANG D-26L	ZONE SHUT OFF	


OBJECTIVES

The objective of this job is to perform zone shut off on zone E-10/11 prior rig entry for Plug & Abandonment (P&A) activity. CTU operation consists of 3 CT runs.

BACKGROUND

Dulang D-26 is a dual string oil producer with combination of 3-1/2" & 2-7/8" completion which was completed on October 1996 with maximum deviation of 72.3 degree at 2,657 m MDTHF. Currently both short & long string are in shut in condition. PCSB has engaged DB to perform zone shut off on zone E-10/11 via CTU prior to Plug & Abandonment (P&A) activity.


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	DULANG D-26L	ZONE SHUT OFF	

WELL DATA

Input Parameter	Parameter Value
Field	Dulang
Well	D-26
Max. Deviation (degrees)	72.3 degree @ 2,657 m MDTHF
Min. Restriction (inch)	2.812" (TRSV, WP1 Nipple, SSD Depth)
Tubing Specification	3-1/2" Production Tubing (Refer Well Schematic)
Type of Fluid & Density	N/A
Top of Fluid	No fluid level detected
Current Well Status	Both String in Shut-In Condition
Depth of zone	E10/11 (2891.37 - 2900.37m MDTHF)
Reservoir Pressure (psi)	E10/11: 1,072 psi (From nearby well)
Reservoir Temperature (deg F)	E10/11: 224 deg F
Porosity	E10/11: 0.287
Permeability (mD)	E10/11: 209
Fracture Gradient	0.7 psi/ft
H ₂ S Content	Not available
CO ₂ Content	Not available
Mercury, HG	Not available
Additional Information / Notes / Special Requirement:	
<ul style="list-style-type: none"> Leak detected at 2,906.62 m MDTHF (PLT conducted on August 2016) 	

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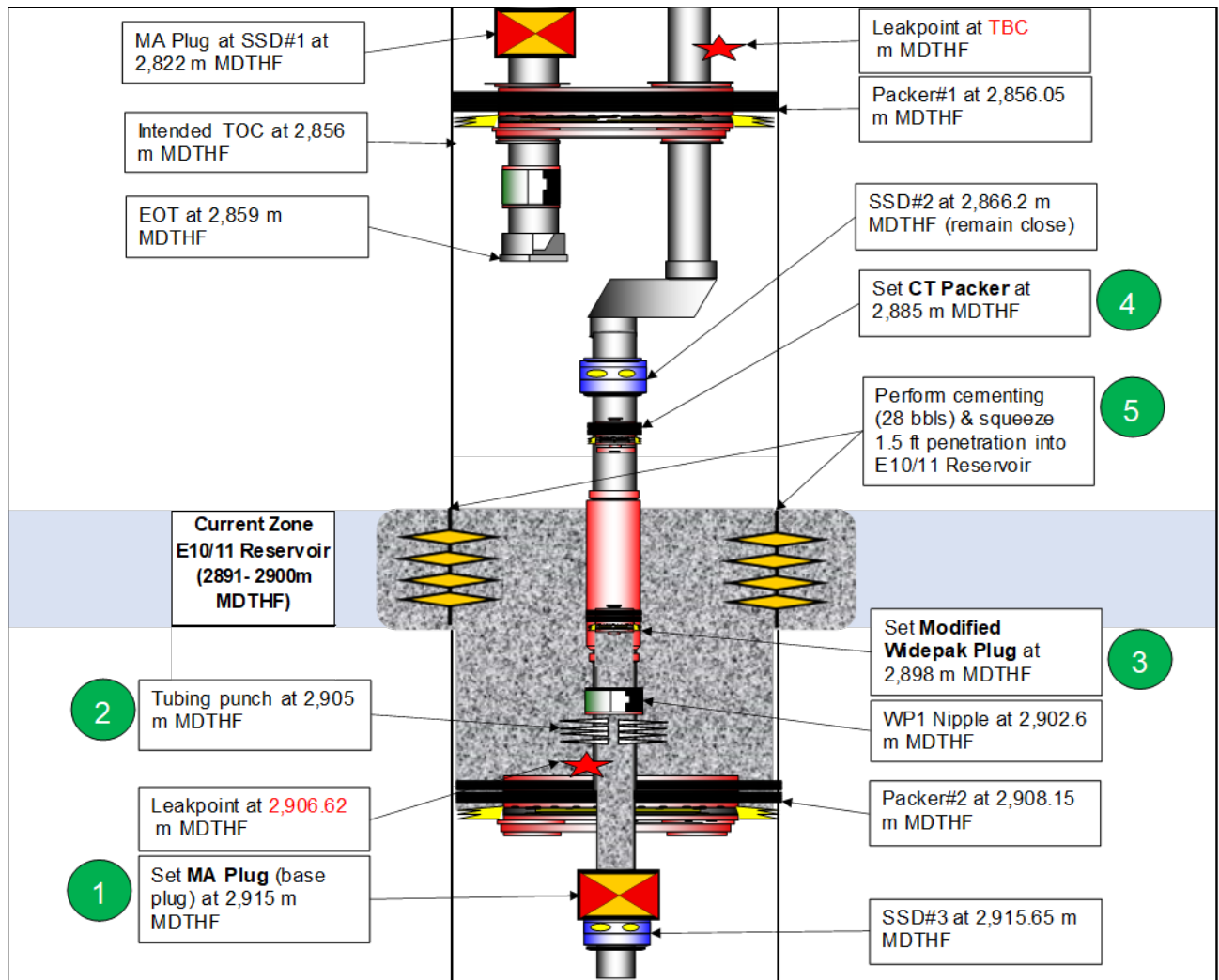
DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		
	DULANG D-26L	ZONE SHUT OFF	

OPERATION SUMMARY

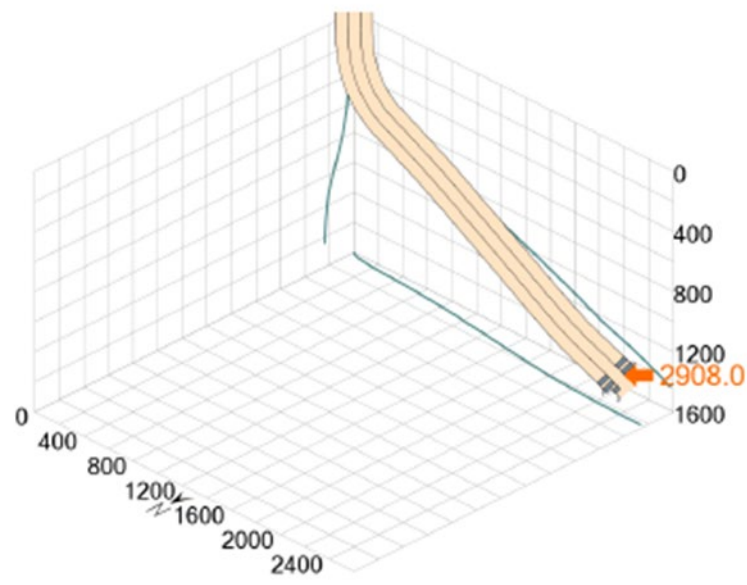
<i>Item</i>	<i>Job Description</i>	<i>Remark</i>
A	Slickline (SS)	<ol style="list-style-type: none"> 1. Retrieve CSA Plug at TRSV 2. Inflow Test MA Plug at SSD#1
B	Slickline (LS)	<ol style="list-style-type: none"> 1. Retrieve CSA Plug at TRSV 2. Retrieve MA Plug at WP1 Nipple @ 302m MDTHF 3. TCC 4. Set MA Plug at 2,915 m MDTHF at SSD#3 5. Tubing Punch at 2,905 m MDTHF
C	Bullheading Operation	<ol style="list-style-type: none"> 1. Injectivity test post tubing punch at 2,905 m MDTHF
D	Slickline (LS)	<ol style="list-style-type: none"> 1. TCC with at least 2.75" OD 2. Set Modified Widepak Plug at 2,898 m MDTHF
E	Coiled Tubing Operation	<ol style="list-style-type: none"> 1. CT Run#1 Drift & Correlation Run with 2.75" FC Until Modified Widepak Plug at 2,898 m MDTHF 2. CT Run#2 Set CT Packer at 2,885 m MDTHF and Perform Cementing (22 bbls) 3. CT Run#3: Post Cementing CT Cleanout Until Modified Widepak Plug at 2,898 m MDTHF

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WELL CEMENTING ILLUSTRATION



WELL 3D PLOT



Well name: Dulang D26L
 Total depth: 3032.5 m
 Max Inclination: 72.4° at 2684.3 m
 Max DLS: 4.974 °/100ft at 640.5 m
 Min ID: 2.992 in at surface.
 WHP: 150 psi

Input Parameter	Parameter Value
Well	Dulang D-26L
Trajectory Until Depth	3,032 m MDTHF
Max. Deviation (degrees)	72.4 degree at 2,684 m MDTHF
Min. Restriction (inch)	2.812" (TRSV, WP1 Nipple, SSD depth)

TREATMENT VOLUME

Description	Details
Tubing Specification	3-1/2" 9.2ppf# N-80
Production Casing Specification	9-5/8" 40ppf# N-90

Dulang D-26 Downhole Calculation Prepared Date:
26/6/2024

Tubing (Long String)															Total Volume (bbls)	
Type	External Pipe			Internal Pipe			Internal Pipe			Caps	From	To	From	To		Length
	OD (inch)	ID (inch)	W(lb/ft)	OD (inch)	ID (inch)	W(lb/ft)	OD (inch)	ID (inch)	W(lb/ft)						Barrel/lin (ft)	
THF to SSD#1	3 1/2	2.992	9.2							0.00870	14.63	2822.57	48	9261	9213	80
SSD#1 to SSD#2	3 1/2	2.992	9.2							0.00870	2822.57	2866.22	9261	9404	143	1
SSD#2 to Leakpoint	3 1/2	2.992	9.2							0.00870	2866.22	2906.62	9404	9537	133	1
Leakpoint to EOT	3 1/2	2.992	9.2							0.00870	2906.62	2959.10	9537	9709	172	1
TOTAL															84	

A-Annulus															Total Volume (bbls)	
Type	External Pipe			Internal Pipe			Internal Pipe			Caps	From	To	From	To		Length
	OD (inch)	ID (inch)	W(lb/ft)	OD (inch)	ID (inch)	W(lb/ft)	OD (inch)	ID (inch)	W(lb/ft)						Barrel/lin (ft)	
THF to SSD#1	9 5/8	8.835	40	3 1/2	2.992	9.2	3 1/2	2.992	9.2	0.05203	14.63	2822.57	48	9261	9213	479
SSD#1 to Packer#1	9 5/8	8.835	40	3 1/2	2.992	9.2	3 1/2	2.992	9.2	0.05203	2822.57	2856.05	9261	9371	110	6
TOTAL															485	

B-Annulus															Total Volume (bbls)	
Type	External Pipe			Internal Pipe			Internal Pipe			Caps	From	To	From	To		Length
	OD (inch)	ID (inch)	W(lb/ft)	OD (inch)	ID (inch)	W(lb/ft)	OD (inch)	ID (inch)	W(lb/ft)						Barrel/lin (ft)	
Packer#1 to EOT (SS)	9 5/8	8.835	40	3 1/2	2.992	9.2	3 1/2	2.992	9.2	0.05203	2856.05	2859.71	9371	9383	12	1
EOT (SS) to Packer #2	9 5/8	8.835	40	3 1/2	2.992	9.2				0.06393	2859.71	2908.15	9383	9542	159	10
TOTAL															11	

Cement Volume															Total Volume (bbls)	
Type	External Pipe			Internal Pipe			Internal Pipe			Caps	From	To	From	To		Length
	OD (inch)	ID (inch)	W(lb/ft)	OD (inch)	ID (inch)	W(lb/ft)	OD (inch)	ID (inch)	W(lb/ft)						Barrel/lin (ft)	
Modified Widepak Plug to MA Plug	3 1/2	2.992	9.2							0.00870	2898.00	2915.00	9508	9564	56	1
E10-11 Top Perf to Packer#2	9 5/8	8.835	40	3 1/2	2.992	9.2				0.06393	2891.00	2908.15	9485	9542	56	5
TOTAL															6	

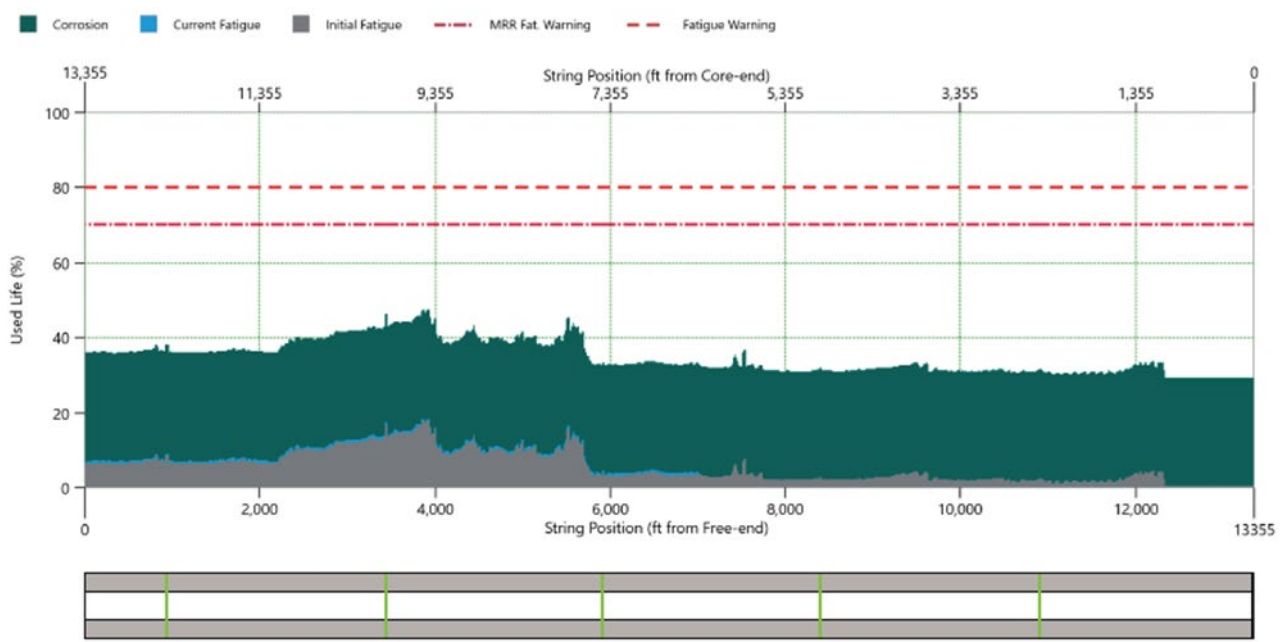
1.5 ft Penetration - Zone E-10/11															Total Volume (bbls)
Type	External Pipe			Internal Pipe			Penetration	Caps	From	To	From	To	Length		
	OD (inch)	ID (inch)	W(lb/ft)	OD (inch)	ID (inch)	W(lb/ft)								(in)	Barrel/lin (ft)
E-10/11 Reservoir			44.835			8.835			1.87686	2891.37	2900.37	9487	9516	30	55.4
														Porosity	0.287
														Total	15.9
Total Cement Volume														22	

CT STRING INFORMATION

OD (in)	Spec	W/T (in)	ID (in)	Length (ft)
1.5	TENARIS HS-90	0.125	1.25	13,355
CT Volume: 20.3 bbls				

CT STRING FATIGUE

- Current **used life** for Tenaris #40146 is at **47.31%**



Run #	Date	Field Name	Well Num	Job type	Run in ft	Cum. Run ft	Job Description	CT leng ft	CT cut ft	New CT leng ft	Job Fatigue %	Job Corrosion %	Max Fatigue %	Cum. Corrosion %	Used String Life %
NA	27-Apr-24	Dulang-D	D-06S	Trim Coil 32FT	0	N/A	Trim Coiled 32FT	13,355	32	13,357	N/A	N/A	N/A	N/A	N/A
NA	9-May-24	Dulang-D	D-06S	Trim Coil 2FT	0	N/A	Trim CT 2ft & pickling CT.	13,357	2	13,355	N/A	N/A	N/A	N/A	N/A
24	10-May-24	Dulang-D	D-06S	Cementing	7,018	203,267	Depth Corrosion & Drift Run With 2.20 PC	13,355	0	13,355	0.71	0.5	22.81	23	45.81
25	11-May-24	Dulang-D	D-06S	Cementing	6,929	210,216	To Perform Self Cement Repair	13,355	0	13,355	0.85	0.5	23.76	23.55	47.31

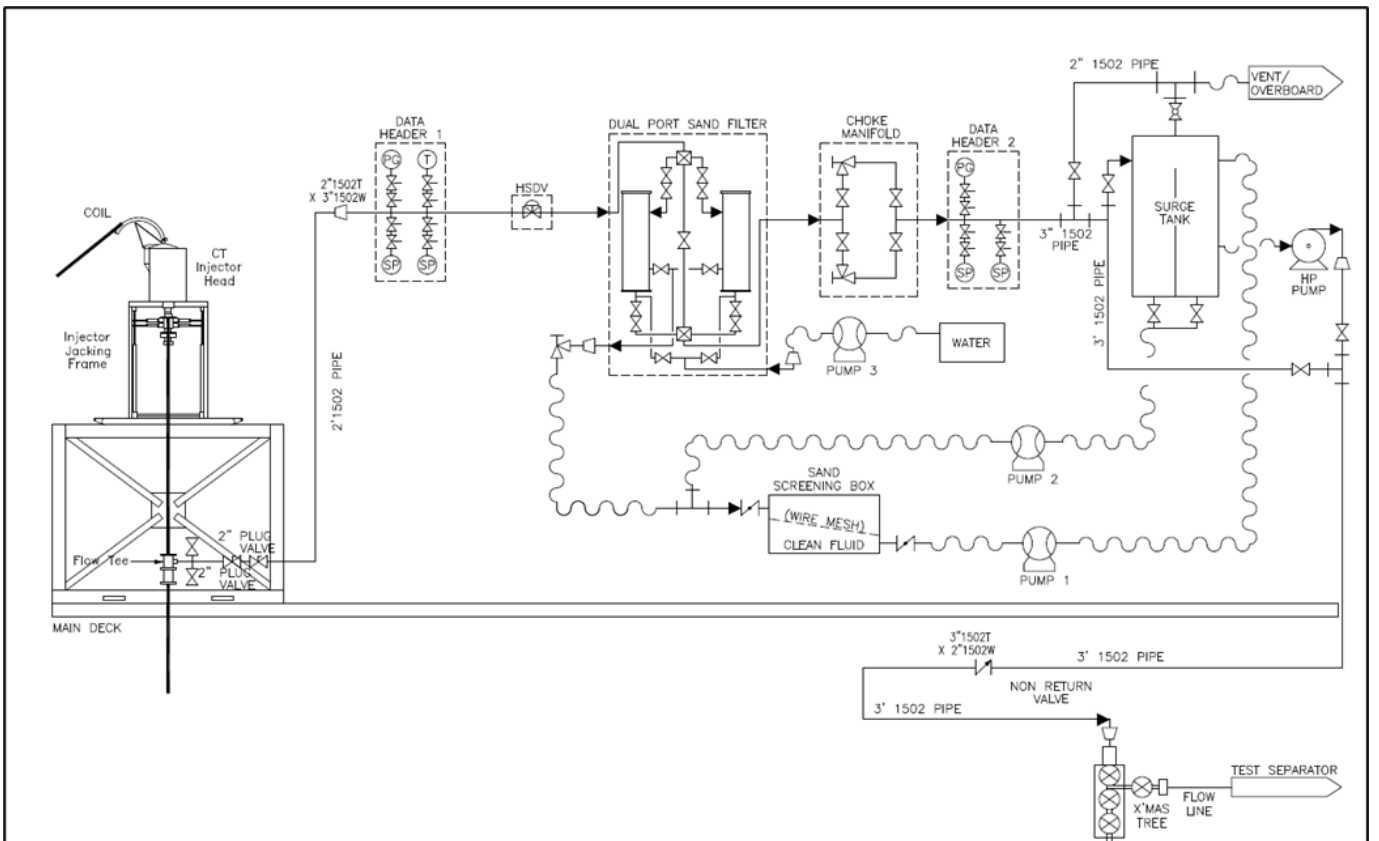
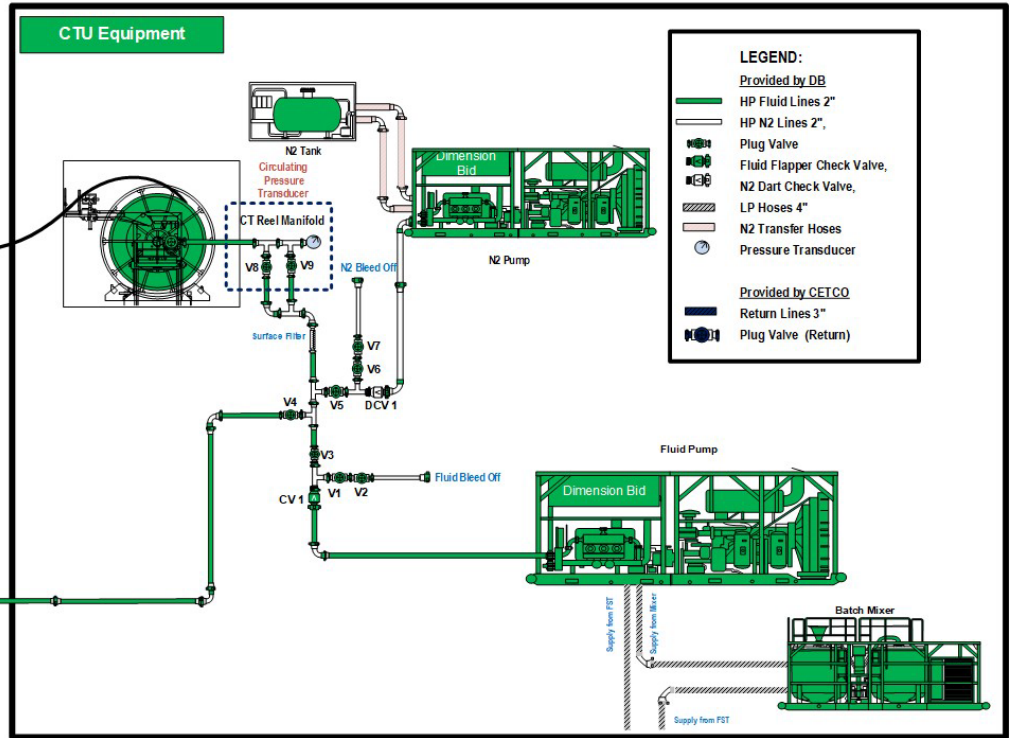
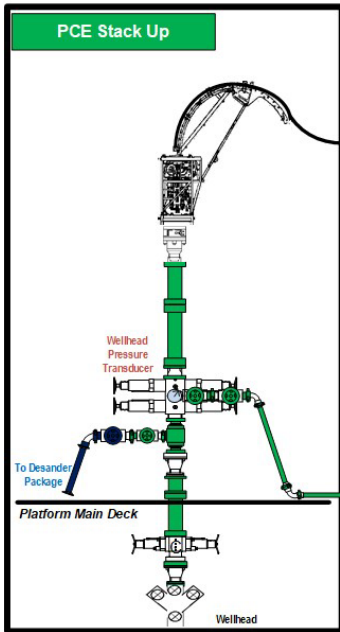
MAXIMUM ALLOWABLE SURFACE TREATING PRESSURE (MASTP)


Fluid	Fluid Density, ppg	Interval TVD, ft	Hyd. Pressure, psi	Fracture Pressure, psi	STP, psi	80% MASTP, psi
Sea Water	8.50	4,426	2,089	3,098	1,009	800
Cement Slurry	15.0	171				

PROCESS FLOW DIAGRAM

DIMENSION BID

Pre-Redev CTU Campaign
Coiled Tubing P&ID
Platform: Dulang D



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SAFETY OPERATIONAL PROCEDURES

Prior to commencement of the CT / Bullheading operation, a pre-job meeting will be held. This should be attended by the following parties as a minimum:


OIM, WSS, CT Supervisor, Representatives of other service companies involved and others as necessary.

Safety meetings should be held at the start of every shift and risk assessments must be evaluated during this time. Tool box talks should be held immediately prior to the job execution.

Note: The safety meeting must be driven by DB Supervisor addressing the following topics as a minimum:

1. Muster point.
2. Take list of personnel on site (Head count)
3. All personnel should review and be familiar with escape routes and emergency procedures.
4. Describe the **job objective, fluids and volumes to be pumped, pressures expected** during the job, and others.
5. Review **Dimension Bid Operations Policy and Procedure Manual**.
 - 5.1. Ensure at all steps carried out during the operations comply with this Manual.
 - 5.2. Management of change **MUST** be applied any time there is a need to deviate from the steps contained this procedure.
 - 5.3. A document **MUST** be created describing each the step of the deviation. This document shall also include the deviation Risk Assessment and it **MUST** be approved and signed by PCSB – Head of Well Intervention and Dimension Bid Operations Manager.
6. Exercise Stop work authority if unsafe condition occurs and assess situation with all team members, resume operation after mitigation plan is in place.
7. Personnel responsibilities throughout the job.
8. Spills, fire, blow out, unexpected well behaviour.
9. Emergency shower station and eye wash station location.
10. Trapped potential energy such as pressure or CT stiffness.
11. Prepare related Job Hazard Analysis (JHA) prior commencement of any work, get approval from Client Site Representative (CSR) and review it with all personnel involved as well as to review Risk Assessment.
12. Discuss the well H₂S, CO₂, Hg (Mercury) content (if applicable).
13. Adhere all **PCSB Zeto Rules** and other guidelines.
14. Take a physical count of inventory and make sure all required materials are available on site.
15. **Barricade** the work area and display the appropriate **warning sign**.
16. On chemical mixing and handling; all personnel involved shall hold **safety meeting** and review **Safety Data Sheet** (SDS).
 - 16.1. Personnel involve during chemical handling shall be briefed by DB Chemical Specialist onsite and extra precautions must be taken. All SDS must be available on site and reviewed prior chemical handling.
 - 16.2. All non-essential personnel shall stay away from mixing site.
 - 16.3. Use PPE including respirators, hard hats, eye protection and steel-toed boots.
 - 16.4. Verify if there is any **dead volume** in the mixing tanks and adjust volumes to account for non-usable volume in the blender / mix tank.
 - 16.5. Consider wind direction and note all trip hazards in the mix / pumping area.

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- 16.6. Prior to mixing chemicals, clean and verify the tank/batch mixer and lines are free of any debris and or contaminants.
- 16.7. In case of spill; wash the place where any chemical has been spilt with available spill kit.
- 16.8. Take care to prevent leakage due to ejection from valves, fittings, flanges, or other joints flexible chemical hoses and pumps. Never repair the equipment during transfer into mixing tank/container.
17. Take reading of Shut in / Flowing Tubing Head Pressure (SI/F/THP), Casing Head Pressure (CHP) and fluid sample (if available) prior to operation.
18. Check gas lift condition and capability with Site Operation Representative (SOR).
19. Ensure fitness prior to perform duties assigned.
20. Ensure all barriers are in place and followed.

HEALTH, SAFETY & ENVIRONMENT

1. Evaluate possible risks to arise during the job execution.
2. Evaluate risk assessment. Report any abnormal or insecure condition on site, taking into account all the steps or procedures to follow. Discuss with PCSB HSE coordinator, the execution or suspension of the job.
3. Review SDS of each product that will be used. Verify that all personnel on location handling toxic or corrosive products have the proper PPE.
4. Review the contingency plan for spills.
5. Do not vent / release any hydrocarbons from the well to atmosphere. Returns from the well should be handled safely by Flowback Company.
6. Prior to DB personnel walking on upper deck, DB Supervisor to inspect upper deck and ensure that the area it is in good condition (Gratings, Hatches, etc.)

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EQUIPMENT RIG UP PROCEDURE

Conduct safety meeting with all personnel on location detailing the program, pressure limitations, and personnel responsibilities, well control emergency drill and safety precautions.

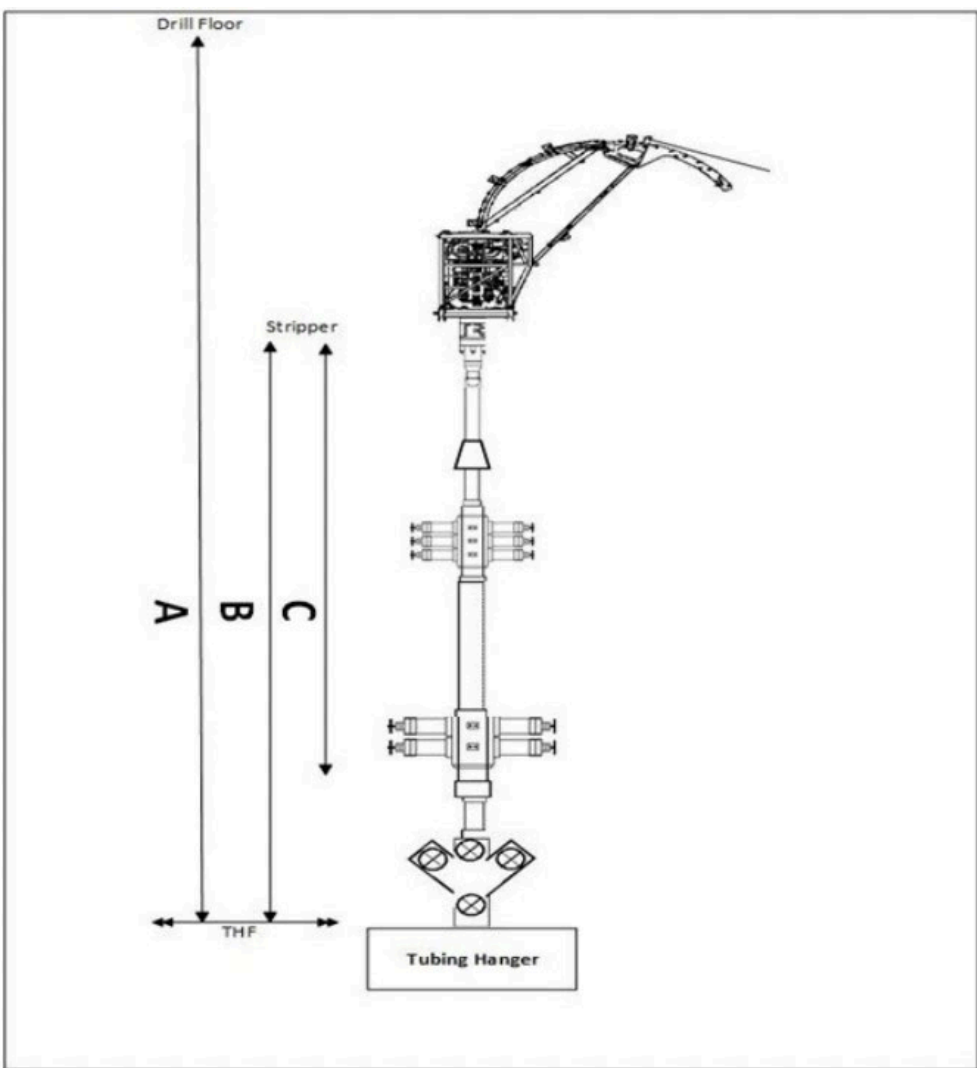
1. Spot the equipment accordingly to space availability, ensure reel position is aligned with the well.
2. Spot jacking frame at available space with sufficient height and crane capacity to rig up the injector head and gooseneck.
3. Rig up the 4" LP hoses from fluid storage tanks to batch mixer and single pump unit
4. Rig up 2" HP treating line as per DB Technical Standard from single pump unit and N2 converter unit to CT reel manifold. Include bleed off line on both lines as well.
5. Install correct wellhead crossover on the wellhead. Ensure well is fully secure and record the MV and CV turns.
6. Install Blowout Preventer (BOPs):
 - 6.1. Rig up Single BOP with necessary length of risers on top of the wellhead crossover.
 - 6.2. Rig up Combi BOP with flow tee above the risers
 - 6.3. Hook up BOP hoses and conduct function test for each ram.
7. Rig up 2" kill line from single pump unit line to BOP kill port
8. Rig up flow back line from flow tee to Choke manifold -> desander unit -> High pressure flowback pump -> Donor Well
9. Spot injector head assembly (c/w stripper) with jacking frame on top of wellhead area. Ensure the gooseneck is aligned with the reel position
10. Inspect the chain and gripper block condition and ensure the alignment is correct
11. Rig up the following hydraulic hoses:
 - 11.1. From CT Power Pack to CT Control Cabin
 - 11.2. From CT Power Pack to CT Injector hose reel
 - 11.3. From CT Control Cabin to CT Reel
 - 11.4. From CT Control Cabin to CT BOPs
 - 11.5. From CT Power Pack to Jacking Frame
12. Perform EMC 1 for all equipment. Start up and run all equipment for few minutes.
13. Jack up CT control cabin.
14. Function test both BOP rams.

*Observe indicator pin to confirm that all rams are in good working condition.
15. Install the stab-in-guide on the CT then stab the string into injector head.
16. Record the total cut length of CT String in Cerberus and Pipe Management for future reference.
17. Make up the CT connector and perform pull test at least 15,000 lbs as per DB SOP. This test to be recorded in OrionNET.

*Do not perform pull test more than 80% from CT Limit.
18. Install pressure test plate onto the CT connector.
19. Pickle CT String with 7.5% HCl acid to remove internal rust & foreign debris.
20. Circulate the string with water until clean return is seen prior to proceed with pressure test CT Connector.


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21. Pressure up the CT string to 5,000 psi gradually by 500 psi increment then hold for 10 minutes.
22. Open the needle valve to release the pressure slowly.
23. Make up the BHA onto the string as per BHA diagram provided.
24. Use the jacking frame to pick up the injector and risers then connect to the Combi BOP. Secure down the injector assembly with chains.
25. Measure the following length to set the CT depth:



Distance	Length (ft)
A: Tubing Hanger (THF) to RKB	
B: Tubing Hanger (THF) to Stripper	
C: BHA Length	

26. Pick up CT and tag the stripper to set CT depth based on this calculation "A-B+C".
- *Ensure to cut sufficient CT String length in order to shift fatigue after every three (3) CT run.*

DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		
	DULANG D-26L	ZONE SHUT OFF	

EQUIPMENT PRESSURE TESTING PROCEDURE

Conduct safety meeting with all personnel on location detailing the program, pressure limitations, and personnel responsibilities, well control emergency drill and safety precautions. Refer the following procedure to pressure test BOP Body, Blind Ram, Surface Line and Wellhead connection.

1. Isolate the line to CT. Double confirm the valve is closed.
2. Fill and pressure test the treating line with water to 500 psi and hold for 5 minutes. Inspect the lines for leaks and observe for any pressure drop.
3. Increase pressure to 3,000 psi and hold for 10 minutes. Inspect the lines for leaks and observe for any pressure drop.
4. Fill the pressure control equipment and ensure air is vented from the system by leaving the blind ram and blind ram equalizing valves open.
5. Close blind ram and equalizing valve. Pressure up the surface lines, BOP body, blind rams and wellhead connection to 500 psi then increase gradually to 3,000 psi through the kill line, hold for 10 minutes. Inspect the lines for leaks and observe for any pressure drop.
6. Once test complete, open blind ram pressure equalizing port then bleed off any residual pressure and open the blind rams.

Conduct safety meeting with all personnel on location detailing the program, pressure limitations, and personnel responsibilities, well control emergency drill and safety precautions. Refer the following procedure to pressure test BOP Body, Blind Ram, Surface Line and Wellhead connection.

1. Fill up the CT string and stack up until leak can be seen at stripper.
2. Energize the stripper and begin pressure test the complete stack up (CT string, stripper, CT stack and risers) to 3,000 psi against Crown Valve, hold for 10 minutes.
3. Bleed off pressure inside stack up to 1,500psi and bleed off pressure inside CT to 0psi immediately to test the Double Flapper Check Valve with DP of 1,500psi and hold for 10 minutes.
4. Bleed off the pressure from BOP kill port side.
 - *Step 4-8 can be neglected if pipe ram has been pressure tested prior to the job.
5. Place CT string across pipe ram then close the ram.
6. Open pipe ram equalizing valve then fill up the BOP slowly through the CT String.
7. Close the equalizing valve and begin pressure test the pipe ram to 3,000 psi, hold for 10 minutes.
8. When the tests are complete, bleed off the pressure.

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OPERATIONAL PROCEDURE

All depths specified below are in m-MDTHF.

CT RUN#1: DEPTH CORRELATION & DRIFT RUN WITH 2.75" FLUTED CENTRALIZER

Conduct safety meeting with all personnel on location detailing the program, pressure limitations, personnel responsibilities, emergency well control drill, and safety precautions.

1. Prepare 100bbls of Injection Water, IW as per recipe below:

Injection Water (IW)				100	BBL	Description
Seq.	Product	Concentration		Volume		
1	Injection Water	994	gptg	4,175	gal	Base Fluid
Mixing Instruction:						
a) Prepare Injection Water into the mixing tank.						

Note: The above recipe is for 100bbls of IW. Please prepare another batch of Injection Water once needed.

2. Prepare 50bbls of D801 Cleanout Gel (if require) as per recipe below:

D801 Cleanout Gel				50	BBL	Description
Seq.	Product	Concentration		Volume		
1	Injection Water	992	gptg	2,083	gal	Base Fluid
2	D801 Gel	40.5	pptg	85	lbs	Gelling Agent
Mixing Instruction:						
1. Prepare Injection water in the mixing tank.						
2. Add D801 Gel into the tank and circulate the mixture until homogenous.						

Note: The above recipe is for 50bbls of gel. Please prepare another batch of gel once needed.

3. Rig up CT unit and surface line on Dulang-D platform as per Site Visit Report:
 - 3.1. Review JHA and risk assessment with all personnel involve in the rig up operation. Please send a copy of JHA to Engineer in Charge.
 - 3.2. Lift up CT unit using crane and spot on platform.
 - 3.3. Rig up CT package and surface treating line.
 - 3.4. Rig up 2" kill line to BOP kill port.
 - 3.5. Rig up 2" flexible hose from pumping tee.
 - 3.6. Make up the **CT End Connector**.
 - 3.7. Install the Pull and Pressure Test Sub.
 - 3.8. **Activate Real Time data sharing (Max Completion) & ensure data is readable at town.**
 - 3.9. Perform Pull Test on the CT End Connector **to 15,000 lbf** and record this in OrionNET.

Note: Do not perform pull test more than 80% coil limit. Consult with town if require.
 - 3.10. Perform Pressure Test on CT End Connector. Pumping injection water through the CT, apply low pressure test of **300 psi for 5 minutes** and high-pressure test of **6,000 psi for 15 minutes** after stabilization. Record the pressure test.
 - 3.10.1. **For low pressure:** Acceptance criteria: No visible leaks. Pressure drop is less than 10% (above 270 psi) over 5-minutes test interval after the pressure stabilizes.
 - 3.10.2. **For high pressure:** Acceptance criteria: No visible leaks. Pressure drop is less than 10% (above 5,400 psi) over the 15- minutes test interval after the pressure stabilizes.
4. Perform pumping calibration test at surface prior for operation. (Ensure pump rate/ volume at pump, tally with DAS at cabin and volume inside the storage tank). **Witnessed and verify by WSS.**

NOTE: During the cementing operation, in the event pump rate doesn't tally with DAS, to always use volume inside the mixing / supply tank as reference.

5. Pickle the CT String with 10 bbls of 7.5% HCl, followed by 25 bbls of TIW and neutralization fluid (soda ash) to remove internal rust and ensure no foreign debris inside the CT string. *If CT Pickle has been done before, this will be not necessary.* Please refer below 7.5% HCl mixing chemical recipe:

7.5% HCl (CT Pickle)			4,200	gals	10	bbls	Description
Products	Concentration		Volume				
Injection Water	794	gptg	333	gals	7.92	bbls	Base Fluid
33% HCl	202	gptg	84	gals	2.00	bbls	Raw acid
Corr 400	4	gptg	2	gals	0.01	bbls	Corrosion Inhibitor

Mixing Instruction:

1. Fill up tank with injection water
2. Add 33% HCl & Corr 400 into the tank into the tank
3. Agitate until the mixture is homogenous

6. Once complete flush CT String until clear water is observed, launch Cement Dart with 1,650 psi rating (purple colour) at pig launcher. *This will not be necessary if has been done before.*
7. Pump and push cement dart to sit at the connector, record the volume. Once pumped 19.3 bbls of TIW (CT Volume: 20.3 bbls), slow down pump rate to 0.3 bpm to observe indication of pressure build up. (Once dart sit at connector, there will be increase in circulation pressure). *This will not be necessary if has been done before.*
8. Slowly increase pumping pressure to burst the cement dart (dart rating =1,650psi).
9. Remove used Cement Dart and make up new CT Connector. Repeat step 3.6 until 3.10. *This will not be necessary if has been done before.*
10. Make up 2-1/8" MultiJet Nozzle c/w 2.75" FC tool as per **BHA#1: 2-1/8" MultiJet Nozzle c/w 2.75" Fluted Centralizer BHA** in **Appendix 1**.
 - I. Take each BHA measurement and record in the DOR.
 - II. Record length of BHA from CT Connector until end of nozzle.
11. Perform function test of the MultiJet Nozzle to determine the pumping parameter and pressure of the tool. Record the data in the table below, do not exceed 5,000psi.

Flow rates (bpm)	Pressure (psi)	Remark
0.3		
0.5		
0.6		
0.7		
0.8		
0.9		
1.0		
1.1		
1.2		
1.3		

12. Box up to connect the riser and prepare for pressure test.
13. Pick up CT and tag BHA with the stripper.

14. CT stack up pressure test against Wellhead Crown valve. Pumping injection water through the CT, apply low pressure test of **300 psi for 5 minutes** and high-pressure test of **3,000 psi for 15 minutes** after stabilization. Record the pressure test. Record test on a chart. Upon successful pressure test, bleed off pressure via Pump-In Sub.
 - 14.1. For low pressure:

Acceptance criteria: No visible leaks. Pressure drop is less than 10% (above 270 psi) over 5-minutes test interval after the pressure stabilizes.
 - 14.2. For high pressure:

Acceptance criteria: No visible leaks. Pressure drop is less than 10% (above 2,700 psi) over the 15- minutes test interval after the pressure stabilizes.
15. Pressure tests the BHA Check Valve. With **3,000 psi** in the CT stack up, bleed off the stack up pressure to **1,500 psi** via pump-in sub; and bleed off pressure in the CT to zero (0) psi via reel manifold.
 - 15.1. Acceptance criteria: **Pressure drop is less than 10% (above 1,350 psi) over the 15- minute test interval after the pressure stabilizes.** Observe for any pressure changes in the stack up. If the BHA check valve is not holding, proceed to replace the MHA; do not RIH with leaking check valve; repeat steps 14 and 15.
16. Upon successful test, bleed off the pressure in the CT stack up to zero through the pump-in sub.
17. Zero both depth counters (Orion and mechanical) at reference point.
18. Confirm all wellhead and BOP valves are in open position via physical check.
 - 18.1. Prior opening the wellhead valve, pressure up above master valves to a pressure equal to the expected shut-in wellhead pressure.
 - 18.2. Count and record wellhead valves turns while opening and record it the operation report for reference in future.

CV Opening Turns	LMV Opening Turns

- 18.3. Record initial SITHP and PCP in the Daily Operation Report (DOR).
- 18.4. Manipulate surface valve to the following position:

Valve	Position
Reel Manifold	OPEN
Flow Cross Return Valve (Cetco lines)	OPEN
Wing Valve	CLOSE

19. Start RIH while pumping IW at idle rate until 2,888 m (10m above Widepak Plug at 2,898 m).
 - 19.1. Refer to CT Tubing Force simulation (Orpheus modelling), refer **Appendix III**.
 - 19.2. Maximum coil speed running in hole is **30-50 ft/min**.
 - 19.3. Closely observe weight indicator in control cabin while running in hole.
 - 19.4. Conduct **pull test minimum of every 500 ft interval**, use CT Fatigue graph as reference. [Ensure the CT Fatigue graph is available at location before RIH. Record RIH, Hanging and POOH weight in treatment report.](#)
 - 19.5. Slow down coil speed to 10 ft/min before and after passing through completion accessories.
 - 19.6. Observe return all the times. Flowback crew to monitor & record all return from time to time in Field Data Report.
 - 19.7. Do not exceed operating safety limits **5,000 psi (Circulating Pressure)**.

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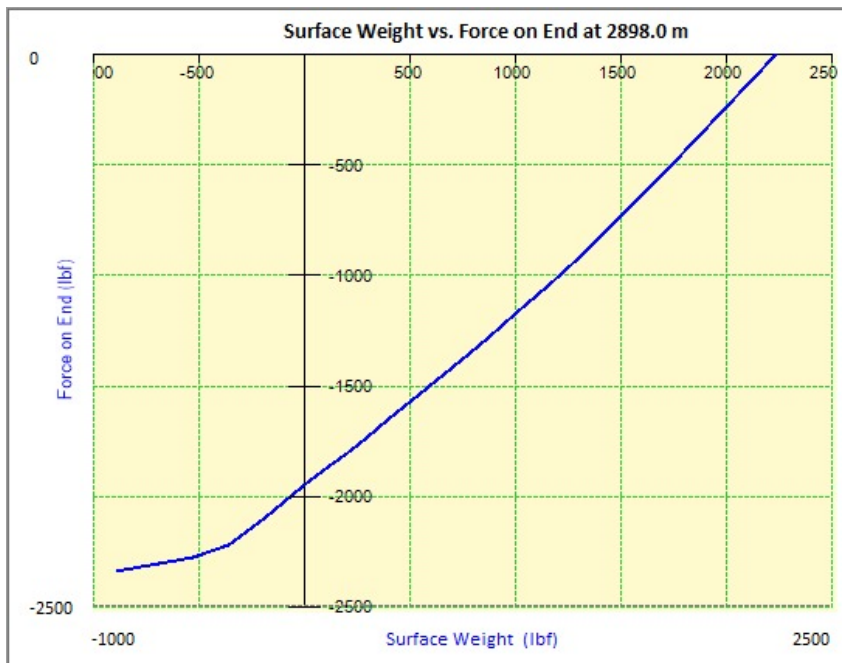
ZONE SHUT OFF

- 19.8. If the well condition differs from original job design, contact appropriate personnel in charge before proceeding.
- 19.9. At all time, while RIH, the injector torque control shall be set at the minimum pressure required to move the CT at specified speed.
- 20. Once BHA reached at 2,888 m (10m above Widepak Plug at 2,998 m), stop CT and conduct pull test of 10m/30ft and record the pulling weight both static and dynamic in the DOR as per table below.

Depth	RIH weight, lbf	Static weight, lbf	Pick up weight, lbf

- 21. Continue RIH slowly until 2,898 m (Modified Widepak Plug) until a loss weight is observed. Do not slack off more 500 lbf at downhole (downhole force). Consult Weatherford Tool Specialist advice on maximum allowable setdown applied on the Widepak Plug). Tag twice to confirm the depth.

21.1. Please refer below set down force graph for reference:



- 21.2. Once confirmed, flag the CT on surface, as Flag#1 & reset depth counter & Orion depth to 2,898 m as per well schematic.

Flag Number	Colour
Flag#1 (Modified Widepak Plug)	

- 22. Pick up CT to depth 2,885 m (CT Packer Setting Depth). Once confirmed, flag the CT on surface, as Flag#2. This will be setting depth for Cement Retainer.

Flag Number	Colour
Flag#2 (CT Packer)	

- i. Make 2 passes 10m above & 10m below across 2,885 m (CT Packer setting depth) at high rate.
- 35. While station CT at 2,885 m, proceed to pump IW to fill up 2x completion volume (**190 bbls**) prior injectivity test as per below table:

Pumping Schedule to Fill up Completion Volume for Injectivity Test						
Stage	Description	Fluid	Vol (bbl)	Pump Rates (bpm)	Remarks	MASTP (psi)
1	Fill-up Completion Volume	IW	190 bbls or till clear return is observed on surface without N2 Injection	0.3-1.3	190 bbls is calculated based on 2x completion volume	800

i. While fill up completion volume, **record every 5 minutes** as per table below:

Rate (bpm)	Pumping Pressure (psi)	Time (min)	Volume (bbls)	THP (psi) (LS)	THP (psi) (SS)	PCP (psi)

36. Proceed immediately to injection test without stop of fluid pumping to avoid fluid losses to well. Once the well is full with IW, manipulate surface valves as following position prior commence with injectivity test.

Valve	Position
Reel Manifold	OPEN
Flow Cross Return Valve (Cetco lines)	CLOSE
Wing Valve	CLOSE

37. Begin injectivity test via CT as per table below:

Rate (bpm)	Pumping Pressure (psi)	Time (min)	Volume (bbls)	THP (psi) (LS)	THP (psi) (SS)	PCP (psi)
0.30						
0.50						
0.70						
0.80						
0.90						
1.00						
1.10						
1.20						
1.30						

- I. Ensure PCSB Representative is available and witness the injectivity test.
- II. Sustain each pumping rate for **10 minutes** after pressure stabilises.
- III. DO NOT exceed MASTP of 800 psi.
- IV. Fill up table and include in daily report. Report the results of injectivity test to PCSB and DB EIC.
- V. Minimum injectivity require for this treatment is **0.5 bpm**.

38. After completed injectivity test, shut in well for 30 minutes. Perform losses rate test:

26.1. Manipulate wellhead valves as below:

Valve	Position
Reel Manifold	OPEN
Flow Cross Return Valve (Cetco lines)	OPEN
Wing Valve	CLOSE

- 26.2. Start pumping via CT and record volume of IW required to fill up the well until return is established.
- 26.3. Once return is established, divert return into Surge Tank (30 bbls capacity) for 15 - 30 minutes.
- 26.4. Record the volume inside the Surge Tank to calculate losses rate into reservoir. Repeat this step every time change in choke size. (Losses rate = Volume pumped – Volume inside surge tank / 15 minutes).
- 27. POOH CT to surface & prepare for next run to set CT Packer at 2,885 m MDTHF and perform cementing.

CT RUN#2: SET CT PACKER AT 2,885 M MDTHF AND PERFORM CEMENTING

28. Make up CT Packer BHA tool as per **BHA#2: CT Packer BHA** in **Appendix 1**.
- I. Ensure that burst disk at Motor Head Assembly (MHA) is changed to **6,000 psi pressure rating**. Record the burst disk rating in BHA checklist, witnessed and verify by WSS.
 - II. Measure length of BHA & length from CT Connector to Packer Mid Element (COE) in ft.
 - III. Ensure all BHA is properly torque according to Weatherford procedure.
 - IV. Perform function test of the Nozzle to determine the pumping parameter. Record the data in the table below, do not exceed 5,000psi.

Flow rates (bpm)	Flowrate (scfm) (if applicable)	Pressure (psi)	Remark
... (as minimum as possible)			
0.3			
0.5			
0.7			
1.0			
1.1			
1.3			
... (as maximum as possible)			

- V. Ensure PCE stack is as APPENDIX II – CT STACK UP with quick test sub is in place.
- VI. Nipple up riser, pressure test quick test sub, pick up CT and tag the stripper and manipulate surface valve to the following position:

Valve	Position
Reel Manifold	OPEN
Flow Cross Return Valve (Cetco lines)	OPEN
Wing Valve	CLOSE

29. Start RIH to **2,870 m (15 m above setting depth for CT Packer)** while pumping break circulation with **Sea Water** at 0.3 bpm for 2 bbl during pull test every 1,000 ft.
- 29.1. Refer to CT Tubing Force simulation (Orpheus modelling), refer Appendix II.
 - 29.2. Ensure Weatherford Tool Specialist is available on site during the whole of CT Run #2.
 - 29.3. Conduct pull test as per for every 300m (1,000ft), use CT Fatigue graph as reference. **Ensure the CT Fatigue graph is available at location before RIH. Record RIH, Hanging and POOH weight in treatment report. Break circulation as well.**
 - 29.4. **In the event of Jay mechanism activated during pull test, RIH to cycle the packer to release it (As per advice by Weatherford Toolman onboard).**
 - 29.5. Maximum coil speed running in hole is **30-40 ft/min**.
 - 29.6. Slow down coil speed to **10 ft/min**, 50 ft before and after passing through completion accessories.
 - 29.7. Closely observe weight indicator in control cabin while running in hole.
 - 29.8. Observe return all the times.
 - 29.9. Do not exceed operating safety limits **6,000 psi**.

29.10. If the well condition differs from original job design, contact appropriate personnel in charge before proceeding.

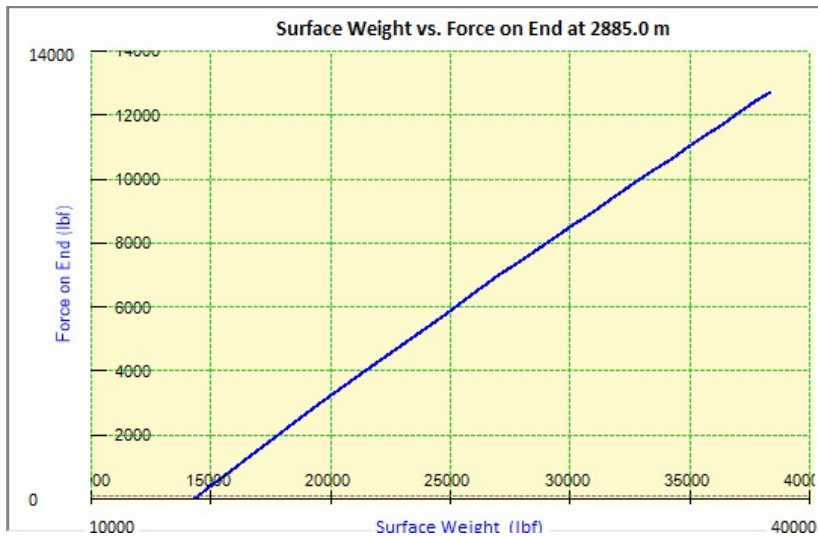
29.11. At all time, while RIH, the injector torque control shall be set at the minimum pressure required to move the Coiled Tubing at specified speed.

30. Once CT reach at **2,870 m (15 m above CT Packer setting depth)**, stop coil and conduct pull test of 10m/30ft without pumping and record the pulling weight both static and dynamic (**IMPORTANT**).

Depth, ft	RIH weight, lbf	Static weight, lbf	Pick up weight, lbf

31. RIH to **2,883 m (2m above CT Packer setting depth)** with reference of Flag#2. Proposed CT packer setting depth is at 2,885 m, any changes in depth subject to discussion and approval from client and town. Once CT in tension condition, proceed to set the CT packer as per Weatherford procedure below.

31.1. Active the Jay mechanism, once observed overpull (anchor at tubing), apply 3,000 lbs overpull (downhole) to set the CT packer. Please refer below pick up force graph for reference:



31.2. Once confirmed CT packer already set, slowly pumping SW through CT to perform pressure test 500 psi against modified widepak plug without bursting the pump out plug for 30 minutes, if pressure test fail, re-set the CT packer (2-m above the initial position) and re-do the pressure test.

31.3. On successful pressure test, inform town, obtain approval to proceed as per next step.

31.4. Increase pumping pressure through CT slowly until burst the pump out plug at modified cement retainer (rating – 1,000 psi).

32. Perform injectivity test with **Sea Water** by pumping through CT and monitor the rate and pumping pressure:

Note: To apply 300 psi on CT Annulus through kill line & monitor pressure during injectivity test & cementing.

Rate (bpm)	Pumping Pressure (psi)	Time (min)	Volume (bbls)	THP (psi) (LS)	THP (psi) (SS)	CHP (psi)
0.30						
0.50						
0.70						
0.80						

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ZONE SHUT OFF

0.90						
1.00						
1.10						
1.20						
1.30						

32.1. Report the injectivity test result to WSS and EIC at town.

32.2. Closely monitor the CT Annulus pressure for any changes.

33. After completed pumping, share injectivity test operating parameters with town before proceeding to next step.
34. Conduct job specific meeting between technical support team (base/office) and operation team (offshore).
35. Proceed to mix 30 bbls of 15.0 ppg cement in one BMX Tank and 30 bbls of Contaminated Gel in another BMX Tank as per below while continue pumping Sea Water through CT at idle rate.

Contaminated Gel			420	gals	10	bbls	Description	
Seq	Product	Concentration	Volume					
1	Sea Water	944	gptg	397	gals	9.4	bbls	Base Fluid
2	SCR	50	gptg	21	gals	0.5	bbls	Cement retarder
3	Gel	41	pptg	17	lbs			Gelling agent

Mixing Instruction:

1. Fill up tank with sea Water
2. Add additives as per above sequence
3. Agitate until mixture is homogeneous

15ppg Cement			1260	gals	30	bbls
Products	Concentration		Volume			
Sea Water	4.913	gps	604.48	gals	14.39	bbl
FP-32L (Defoamer)	0.05	gps	6.15	gals	0.15	bbl
ASA-304L (Anti Settling Agent)	0.022	gps	2.71	gals	0.06	bbl
BA-58L (Bonding Agent)	0.55	gps	67.67	gals	1.61	bbl
FL-70L (Fluid Loss Agent)	0.45	gps	55.37	gals	1.32	bbl
CD-38L (Dispersant)	0.12	gps	14.76	gals	0.35	bbl
R-21LS (Retarder)	0.13	gps	15.99	gals	0.38	bbl
Blended Slagment with 12.25% Silica	1.369	cuft/sk	12,015.47	lbs	218.5	55 lbs per sacks
EC-4 (Expanding Agent)	1.0%	bwoc	107.0	lbs	1.9	55 lbs per sacks

1. Fill up batch mixer with sea water
2. Add additives as per above sequence
3. Note the time when 1st cement sack is added into mixed water mixture. Thickening time starts once 1st cement sacks is added into mixed
4. Refer to [Appendix 5](#) for cement lab test results

Note:

1. **Record and inform Engineer in Charge when the first sack of cement is added to mixed water mixture.**
2. **Cement Thickening Time is 16 hours 18 minutes from first sack of cement added.**
3. **Cement Mixing Time is 2 hours and additional safety margin 1 hour.**
4. **Total Cement Mixing Cut-Off Time is 3 hours.**
5. **After complete mixing, take cement sample from Batch Mixer and CT Reel Manifold and keep sample for monitoring. Label sample properly.**

36. Upon complete mixing and density witness and confirmation of WSS, begin to pump cement according to the following steps:
 - 36.1. Take sample at surface, put into two conditions, one at surface temperature and another sample in water bath at max temperature.
 - 36.2. Open overboard valve and flush surface lines with cement slurry until neat cement is observed.
 - 36.3. Reset data acquisition before start pumping.

36.4. Close overboard valve and equalize pressure across reel valve.

36.5. Ensure wellhead valves are configured according to table below: -

Valve	Position
Reel Manifold	OPEN
Flow Cross Return Valve (Cetco lines)	CLOSE
Wing Valve	CLOSE

36.6. Start pumping according to pumping sequence specified below (CT Volume 20.3 bbls), maximum pumping rate subject to circulation pressure, based on Weatherford CT Packer pressure rating is 5,000 psi. Do not exceed 4,500 psi:


Note: To apply 300 psi on CT Annulus through kill line & monitor pressure during injectivity test & cementing.

#	Start Depth (ft)	End Depth (ft)	Fluid at Reel Manifold	Fluid Entry Volume (bbl)	Total Fluid Pumped (bbl)	Pump Rate (bpm)	CT Speed (ft/min)	Fluid at Nozzle	Valves Config.	Remarks
									Flow Tee	
1	9,466	9,466	SW	5	5	0.5	-	SW	Close	Reset DAS Volume
2	9,466	9,466	Install lead cement dart (3,000 psi cement dart rating), Green color							
3	9,466	9,466	Cement	20.3	25.3	0.3 – 1.0	-	SW	Close	Reduce pump rate to 0.3 bpm once 19.3 bbls is pumped until lead dart land at connector. Cement at tip of nozzle.
4	9,466	9,466	Once observe circulation pressure increase, apply at least 1,147 psi pumping pressure to burst the lead Cement Dart							
5	9,466	9,466	Cement	1.7	27	0.3 – 1.0	-	Cement	Close	Cement at tip of nozzle
6	9,466	9,466	Install tail cement dart (1,650 psi cement dart rating), Purple color							
7	9,466	9,466	SW	20.3	47.3	0.3 – 1.0	-	SW	Close	
8	9,466	9,466	Once Observe circulation pressure increase, Stop pumping. Sting out from cement retainer (Follow as per Weatherford's procedure)							
9	9,466	9,466	Open Flow cross return valve, apply at least 1,154 psi pumping pressure to burst the tail Cement Dart							
10	9,466	9,466	Contaminated Gel	5	52.3	0.5	0	SW	Open	-
11	9,466	9,466	SW	15.3	67.6	0.5	0	Contaminated Gel	Open	Contaminated gel at Nozzle.

12	9,466	8,891	SW	5	72.6	0.5	-50	SW	Open	Spot Contaminated gel, 5 bbls
13	8,891	8,791	SW	10	82.6	Max Rate	-10	SW	Open	Pick-up CT 100 ft above top of Contaminated Gel
14	8,791	9,436	SW	20.3	102.9	Max Rate	45	SW	Open	RIH back to 30 ft above top of CT Packer
15	9,436	9,436	Contaminated Gel	10	112.9	Max Rate	-	SW	Open	Circulate out excess cement in Coil and Tubing. Reciprocate CT during circulate gel.
17	9,436	9,436	SW	160	272.9	Max Rate	-	SW	Open	Bottom Up until at least 2x tubing volume or clear return. Reciprocate CT during bottoms up.
18	9,436	9,436	Contaminated Gel	10	282.9	1.0	-	SW	Open	Fill up CT with Gel
19	9,436	9,436	SW	10.3	293.2	1.0	-	Contaminated Gel	Open	Fill up CT with SW and displace 0.5 gel out of nozzle
20	9,436	8,286	SW	10	303.2	0.3	-50	SW	Open	POOH CT while spot gel.
21	8,286	0	SW	-	-	Max Rate	-30	SW	Open	Continue POOH to surface

1. Actual CT string volume will be confirmed during rig up.
2. (-) refers to CT moving upward / pick up coil
3. During Pumping cement and displacement fluid, Field Engineer / Cementer / WSS / CT Supv to verify and witness the fluid level inside batch mixer
4. **DO NOT EXCEED** pumping pressure of 5,000 psi during cementing stage (CT Packer rating is 5,000 psi).

37. Proceed POOH CT to surface **(follow step 36.6)**:
 - 37.1. Pump IW with minimum rate of 0.3bpm. (Go Max rate to circulate out the fluid to surface)
 - 37.2. Maximum coil speed while POOH is 50ft/min.
 - 37.3. Slow down coil speed to 10ft/min 50ft before and after passing through completion accessories.
 - 37.4. Do not exceed CT operating limit (refer to Appendix Section: TFA simulation)
38. Once CT reaches at surface:
 - 38.1. Close master and swab valve.

DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		 PETRONAS
	DULANG D-26L	ZONE SHUT OFF	

- 38.2. Flush pumping line, CT and BHA with TIW to clean excess cement.
- 38.3. Service all BHA and prepare for next run.
- 39. Wait on cement to completely harden after 24 hours from 1st cement sack added.

CT RUN#3: POST CEMENTING CLEANOUT UNTIL MODIFIED WIDEPAK PLUG AT 2,898 M MDTHF

- 40. Make up 2-1/8" SpinCat Nozzle tool as per **BHA#1: 2-1/8" SpinCat Nozzle BHA** in **Appendix 1**.
NOTE: Take the below measurement and record in the DOR.

Prepared By: M. Ameerul Zaeem	Reviewed By: Kung Yee Han	Date: 20/10/2024	Rev. Rev0	Controlled Document DB-CT-MAZ-24004	Pg. 32
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41. Perform function test of the SpinCat Nozzle to determine the pumping parameter. Record the data in the table below, do not exceed 5,000psi.

Flow Rates (bpm)	N2 Rates (scfm)	Pressure (psi)	Remark
0.3			
0.5			
0.7			
0.8			
0.9			
1.0			
1.1			

42. Repeat step 12 till 18 in CT Run #1 prior open the well.

43. Start RIH BHA while pumping IW at 0.3bpm until 2,516 m.

43.1. Refer to CT Tubing Force simulation (Orpheus modelling), refer **Appendix III**.

43.2. Maximum coil speed running in hole is **30-50 ft/min**.

43.3. Closely observe weight indicator in control cabin while running in hole.

43.4. Conduct pull test minimum of every 300m (1,000ft) interval, use CT Fatigue graph as reference. [Record RIH, Hanging and POOH weight in treatment report.](#)

43.5. Slow down coil speed to 10 ft/min before and after passing through completion accessories.

43.6. Observe return all the times. Flowback crew to monitor & record all return from time to time in Field Data Report.

43.7. Do not exceed operating safety limits **5,000 psi**.

43.8. If the well condition differs from original job design, contact appropriate personnel in charge before proceeding.

43.9. At all time, while RIH, the injector torque control shall be set at the minimum pressure required to move the CT at specified speed.

44. Once BHA reaches 2,516 m (10m above contaminated Gel), stop CT and conduct pull test of 10m/30ft and record the pulling weight both static and dynamic in the DOR as per table below. (If encounter early HUD, Pick-up BHA and record the weight parameter)

Depth	RIH weight, lbf	Static weight, lbf	Pick up weight, lbf

45. Establish return first by pumping at 1.1 bpm prior to penetrate by pumping 80 bbls of IW or until return is established.


Notes:

- If no return, please follow pumping parameter as per CIRCA: **0.9 bpm with 300 scfm (Minimum)**

- After establish constant return at surface, divert the flow into surge tank for 15 – 30 minutes, record the volume inside the surge tank to calculate losses rate into reservoir. Repeat this step every time change in choke size (due to several reason such as high and low THP).
 - **Continuously record return volume during cleanout operation. (Record inside updated FDR)**
 - Check surface flowback back pressure. Must be less than WHP
 - Wait till system stabilizes
 - Check gas lift injection (Is it on? Injection Pressure > Wellbore Pressure?)
 - Manipulate choke size
 - If still no return at surface, pick-up BHA by stages to establish return. (Proposed to depth where returns were previously obtained).
 - If still unable to establish return, consult town. (Provide the details of THP, choke size and circulation pressure).
 - After return establish, RIH to perform cleanout.
 - At all times, monitor the return pattern, THP and debris sample at surface. (Take note if there any THP drop during penetration).
 - Pump 5 bbls gel.
 - CBU at least 2x Annulus volume at that depth.
 - After confirm there's no longer debris at that depth, proceed penetration.
 - In the event unable to penetrate due to hard solid, slowly increase jetting rate until maximum allowable during penetration (ensure the return always establish at surface), after complete 1 cycle penetration, follow rate suggest by CIRCA to lift up the debris.
46. Continue RIH at 10 ft/min while pumping IW at 1.1 bpm starting at depth 2,516 m until 2,898 m (Modified Wipepak Plug).

Note: Every 30m/100ft penetration, sweep with 5 bbls of Gel & wiper trip 10m above previous HUD before continue penetrate in tubing section.

No.	Stage	Fluid	Liquid Rate	Total Liquid	N2 Rate <i>(if require)</i>	CT Speed	Duration	Depth	Remarks
			BPM	BBL	SCF/M	ft/min	Minute	m	
1	CT at 10m above HUD	IW	1.0	0.0	300	0	0	10m above HUD (2,516 m MDTHF)	Establish return on surface
2	RIH to HUD and Penetrate HUD/Fill	IW	1.0	10.0	300	10	30	HUD + 30m	Monitor return & CT weight on surface
3	Circulate	D801 Gel	1.0	5.0	300	0	5	Stationary CT	Provide suspension to the fill and lift to surface
Wiper Trip 10m above previous HUD									
4	RIH to last HUD and Penetrate HUD/Fill	IW	1.0	10.0	300	10	10	HUD + 30m	Monitor return & CT weight on surface
5	Circulate	D801 Gel	1.0	5.0	300	0	5	Stationary CT	Provide suspension to the fill and lift to surface
Wiper Trip 10m above previous HUD and repeat step 1-5 until Modified Wipepak Plug at 2,898 m MDTHF, Flag CT at surface									
6	Hole Cleaning (Circulate)	D801 Gel	1.0	40	300	0	20	Stationary CT at 2,898 m MDTHF	Hole cleaning stage. 1.0x CT/Tubing

DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		
	DULANG D-26L	ZONE SHUT OFF	

									Annulus Volume
7	Bottoms Up (Circulate)	IW	1.0	160	300	0	300	Stationary CT at 2,898 m MDTHF	Hole Cleaning stage. As per Circa Simulation
Once completed CBU, wiper trip to surface at 10 ft/min									
8	POOH	IW	1.0	72	300	30	240	To Surface	Monitor return on surface

47. If CT encountered hard obstruction, consult town for further instruction.
48. Once CT reach 2,898 m (Modified Widepak Plug), pick up 5m from top of Modified Widepak Plug, circulate 40 bbls of Gel and perform bottoms up with IW at 1.1 bpm for 160 bbls at depth 2,893 m MDTHF as per CIRCA Simulation. Flag #1 CT at surface at depth 2,898 m MDTHF (Modified Widepak Plug).

Note: Perform pull test of CT at depth for every 30 minutes. Always monitor weight parameter.

Flag Number	Colour
Flag#1	

49. Wiper trip to surface while pumping IW at 1.1 bpm while pick up CT at 10 ft/min.
50. POOH CT to surface.
51. Once at surface, handover to slickline for TCC.

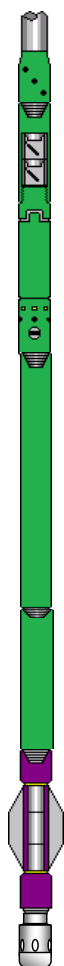
APPENDIX I – BHA SCHEMATIC

BHA#1: 2-1/8" MULTIJET NOZZLE C/W 2.75 FC BHA

DIMENSION BID

BHA DIAGRAM #2 - 2-1/8" MultiJET Nozzle c/w 2.75" Fluted Centralizer BHA

Client	Petronas Carigali	Well	D-26L
Field	Dulang D	Min Restriction	2.75"
Job Type	Zone Shut Off	BHP	
Job No.		BHT	224 F

BHA DRAWING	DESCRIPTION	CONNECTION		ID	OD	TOOL LENGTH	CUMULATIVE LENGTH
		UPHOLE	DOWNHOLE				
	External Dimple CT	1.5" CT	1.5" AMMT PIN		2.125	0.6	0.6
	MHA Disconnect drop ball 3/4" Shear pressure 5,636 psi Circulating drop ball 5/8" Shear pressure 2,520 psi Burst Disc 5000 psi	1.5" AMMT BOX	1.5" AMMT PIN		2.125	2.5	3.1
	5 FT Straight Bar	1.5" AMMT BOX	1.5" AMMT PIN		2.125	5.0	8.1
	3 FT Straight Bar	1.5" AMMT BOX	1.5" AMMT PIN		2.125	3.00	11.1
	2.75" Fluted Centralizer	1.5" AMMT BOX	1.5" AMMT PIN		2.750	1.0	12.1
	2-1/8" MultiJet Nozzle	1.5" AMMT BOX			2.125	0.8	12.9

BHA LENGTH	12.90
MAXIMUM OD	2.75
MINIMUM ID	

Prepared by:	Muhd Ameerul Zaem
Review by:	
Revision:	
Date:	

ADDITIONAL INFORMATION:

Ensure to measure length and OD of each BHA tool before makeup.

DIMENSION BID

DIMENSION BID COILED TUBING SERVICES



DULANG D-26L

ZONE SHUT OFF

BHA#2: CT PACKER BHA

DIMENSION BID

BHA DIAGRAM #3- CT Packer

Client	Petronas Carigali
Field	Dulang D
Job Type	Zone Shut Off
Job No.	

Well	D-26L
Min Restriction	2.75"
BHP	
BHT	224 F

BHA DRAWING	DESCRIPTION	CONNECTION		ID INCH	OD INCH	TOOL LENGTH FT	CUMULATIVE LENGTH FT
		UPHOLE	DOWNHOLE				
	External Dimple CT Connector (DB)	1.5" CT	1.5" AMMT PIN		2.125	1.1	0.5
	2 -1/8" MHA (Weatherford) Disconnect drop ball 0.75" Shear pressure 2 pin 2,000 psi Circulating drop ball 0.63" Shear pressure 2 pin 2,000 psi Burst Disc 6,000 psi	1.5" AMMT BOX	1.5" AMMT PIN		2.125	1.9	2.4
	Crossover	1.5" AMMT BOX	1.25 WTS 8-PIN		2.000	0.5	2.85
	Setdown Unloader	1.25 WTS 8-BOX	1.25 WTS 8-PIN		2.125	2.83	5.68
	Crossover	1.25 WTS 8-BOX	1.5 WTS 8-PIN		2.125	0.50	6.18
	Crossover	1.5 WTS 8-BOX	1.5 WTS 8-BOX		2.125	1.00	7.18
	CT Packer Each - 2,050 lbf	1.5 WTS 8-PIN	1.5 WTS 8-BOX		2.250	4.60	11.78
	Wash Nozzle	1.5 WTS 8-PIN			2.125	1.00	12.78

BHA LENGTH	12.78
MAXIMUM OD	2.250
MINIMUM ID	

Prepared by:	Muhd Ameerul Zaem
Review by:	
Revision:	
Date:	

ADDITIONAL INFORMATION:

Ensure to measure length and OD of each BHA tool & record before makeup.

BHA#3: 2-1/8" SPINCAT NOZZLE BHA

DIMENSION BID

BHA DIAGRAM #1 - 2-1/8" SpinCAT Nozzle BHA

Client	Petronas Carigali	Well	D-26L
Field	Dulang D	Min Restriction	2.75"
Job Type	Zone Shut Off	BHP	
Job No.		BHT	224 F

BHA DRAWING	DESCRIPTION	CONNECTION		ID	OD	TOOL LENGTH	CUMULATIVE LENGTH
		UPHOLE	DOWNHOLE				
	External Dimple CT	1.5" CT	1.5" AMMT PIN		2.125	0.6	0.6
	MHA Disconnect drop ball 3/4" Shear pressure 5,636 psi Circulating drop ball 5/8" Shear pressure 2,520 psi Burst Disc 5000 psi	1.5" AMMT BOX	1.5" AMMT PIN		2.125	2.5	3.1
	5 FT Straight Bar	1.5" AMMT BOX	1.5" AMMT PIN		2.125	5.0	8.1
	Downhole Filter 100 Micron Size	1.5" AMMT BOX	1.5" AMMT PIN		2.125	3.2	11.3
	2-1/8" SpinCAT Nozzle 5k psi rated Up to 390 F	1.5" AMMT BOX			2.125	1.0	12.3

BHA LENGTH	12.30
MAXIMUM OD	2.13
MINIMUM ID	

Prepared by:	Muhd Ameerul Zaem	ADDITIONAL INFORMATION: Ensure to measure length and OD of each BHA tool before makeup.
Review by:		
Revision:		
Date:		

DIMENSION BID

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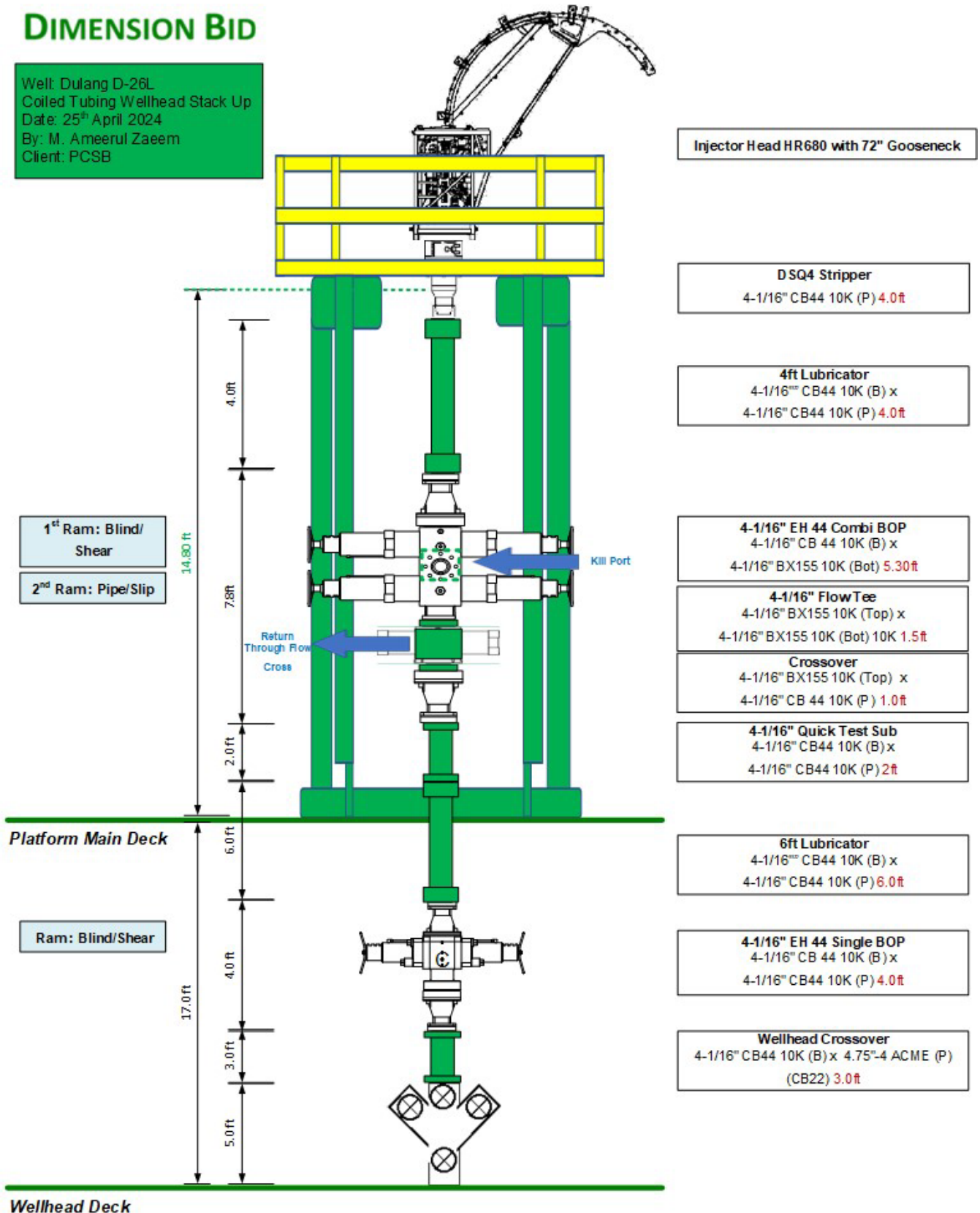
DULANG D-26L

ZONE SHUT OFF

APPENDIX II – CT STACK UP

DIMENSION BID

Well: Dulang D-26L
Coiled Tubing Wellhead Stack Up
Date: 25th April 2024
By: M. Ameerul Zaeem
Client: PCSB



Injector Head HR680 with 72" Gooseneck

D SQ4 Stripper
4-1/16" CB44 10K (P) 4.0ft

4ft Lubricator
4-1/16" CB44 10K (B) x
4-1/16" CB44 10K (P) 4.0ft

4-1/16" EH 44 Combi BOP
4-1/16" CB 44 10K (B) x
4-1/16" BX155 10K (Bot) 5.30ft

4-1/16" Flow Tee
4-1/16" BX155 10K (Top) x
4-1/16" BX155 10K (Bot) 10K 1.5ft

Crossover
4-1/16" BX155 10K (Top) x
4-1/16" CB 44 10K (P) 1.0ft

4-1/16" Quick Test Sub
4-1/16" CB44 10K (B) x
4-1/16" CB44 10K (P) 2ft

6ft Lubricator
4-1/16" CB44 10K (B) x
4-1/16" CB44 10K (P) 6.0ft

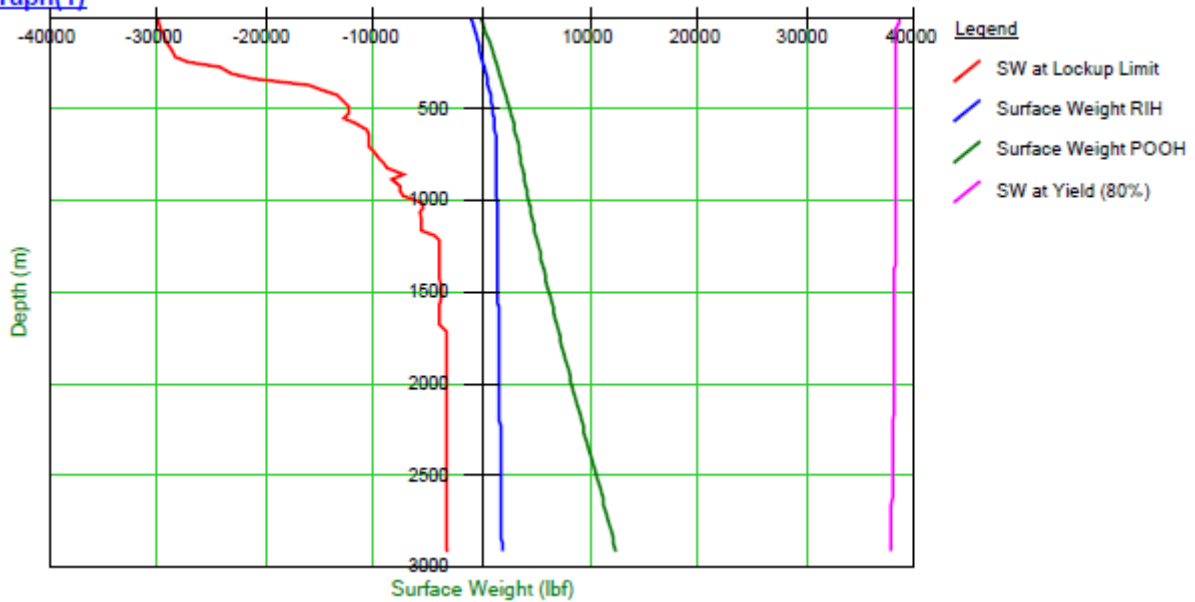
4-1/16" EH 44 Single BOP
4-1/16" CB 44 10K (B) x
4-1/16" CB44 10K (P) 4.0ft

Wellhead Crossover
4-1/16" CB44 10K (B) x 4.75"-4 ACME (P)
(CB22) 3.0ft

APPENDIX III – ORPHEUS SIMULATIONS

TUBING FORCE ANALYSIS AT 2,908 M MDTHF

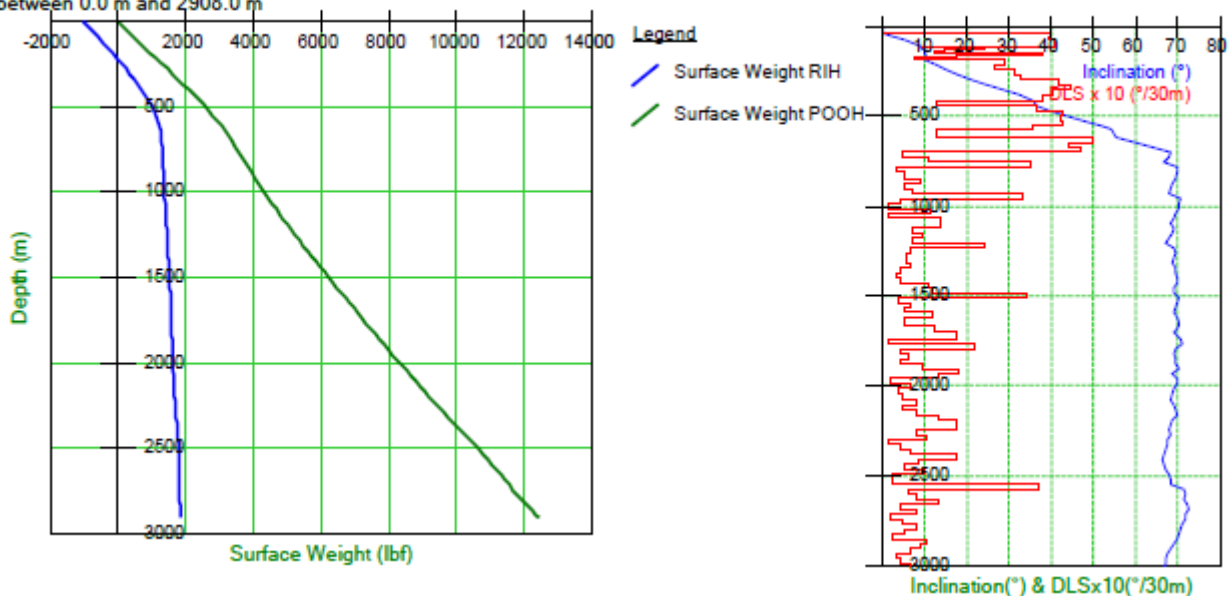
Graph(1)



RIH & POOH WEIGHT

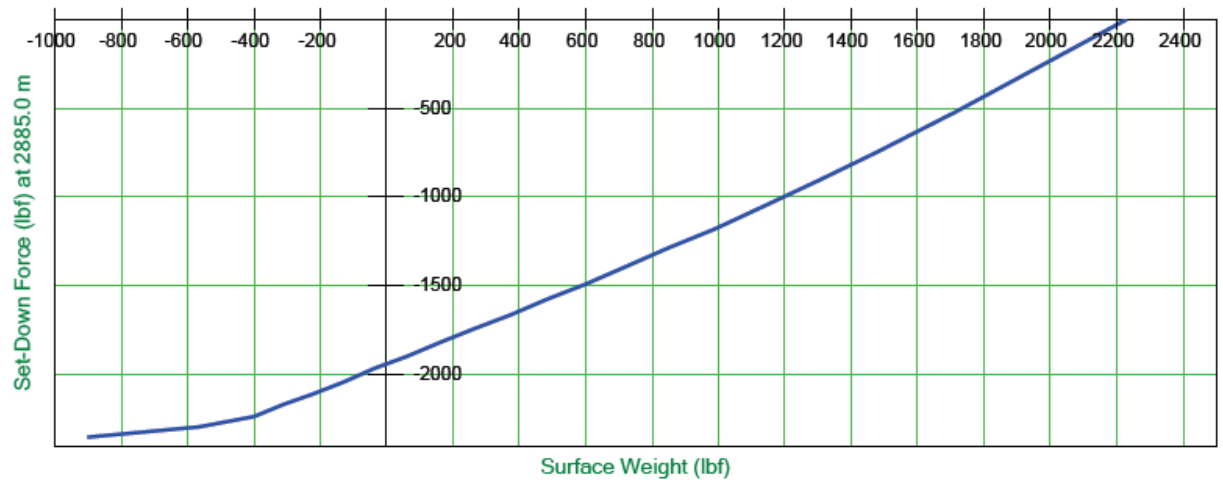
RIH and POOH

between 0.0 m and 2908.0 m



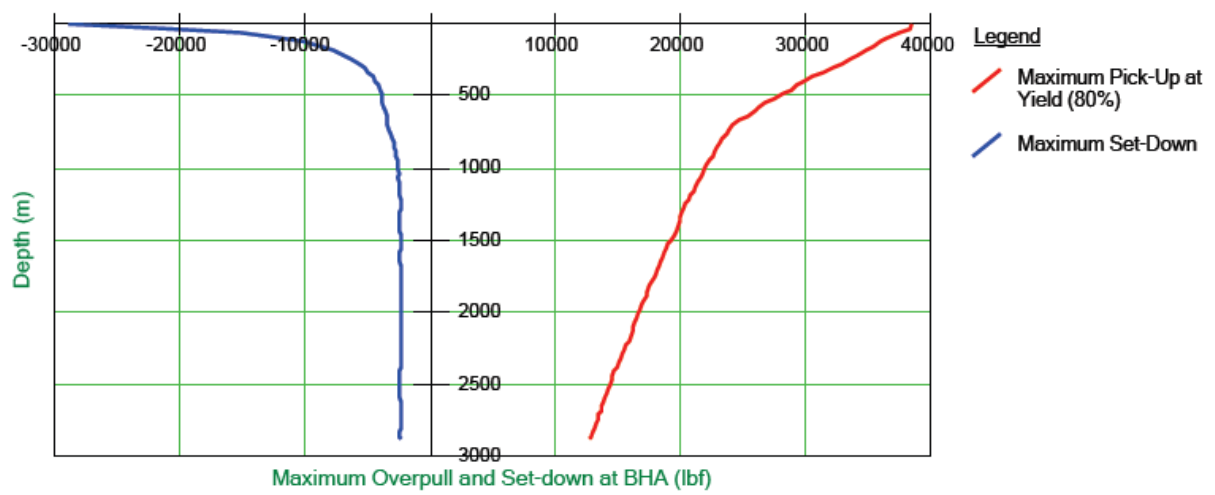
MAXIMUM STRING SET DOWN LIMIT

MD3 ■ The available set-down force at 2885.0 m is -2353 lbf at the end of the string.
 The weight indicator reading will be -901 lbf on surface.
 The minimum available set-down force is -2297 lbf at 1952.0 m.



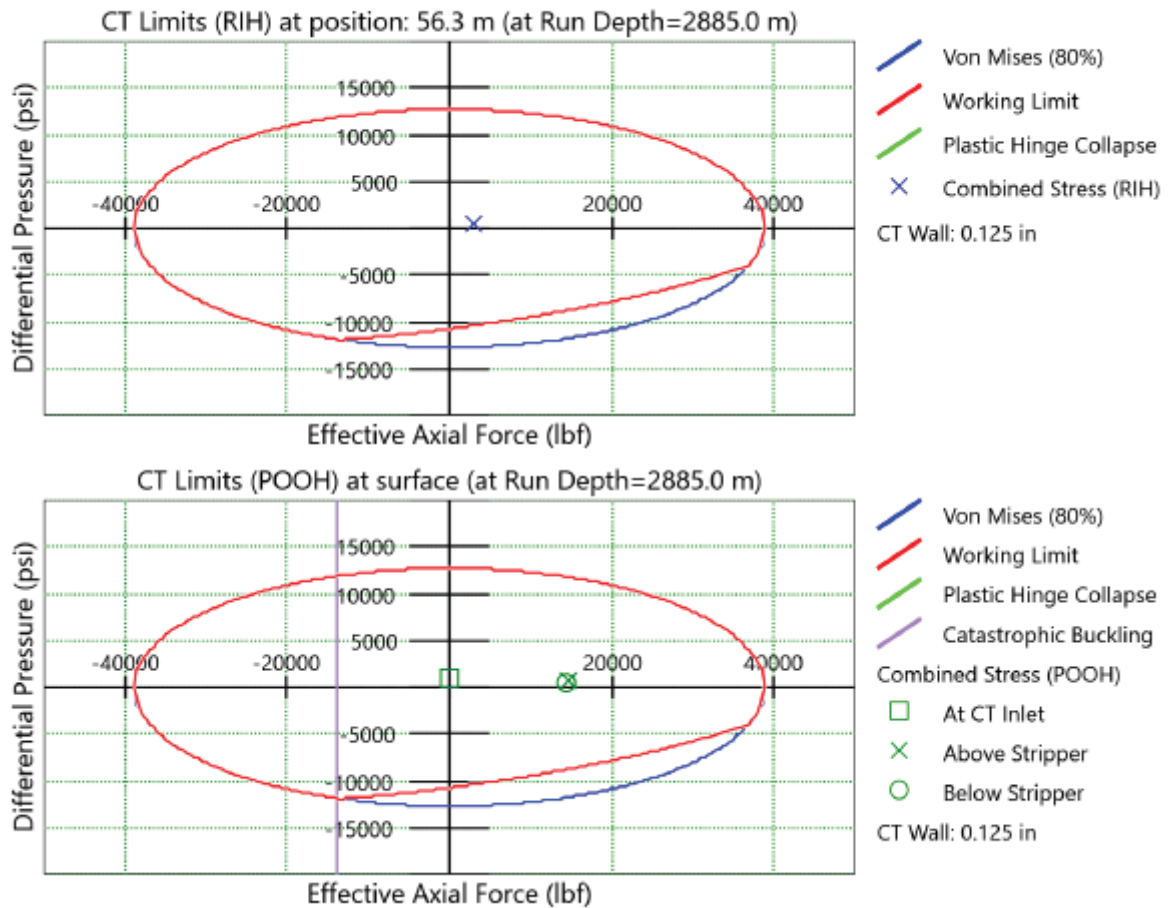
MAXIMUM STRING PICK UP LIMIT

MD1 ■ The available pick-up at 2885.0 m based on 80% of yield strength is 12739 lbf.
 The weight indicator reading will then be 38374 lbf.



STRING LIMIT

CT Limits

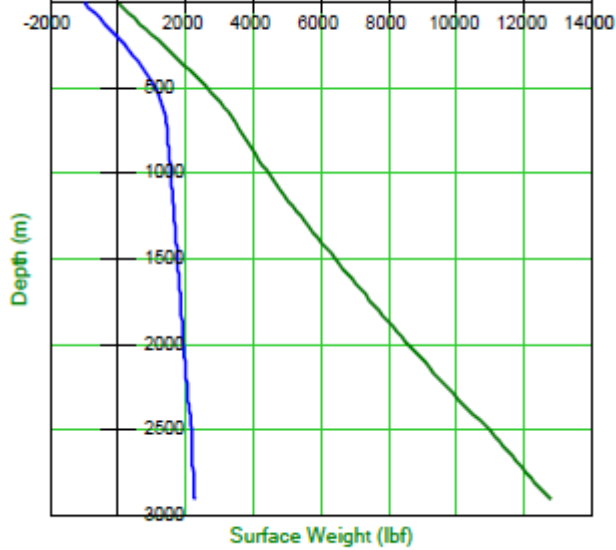


SENSITIVY ANALYSIS TFA

Without Pumping (0 bpm)

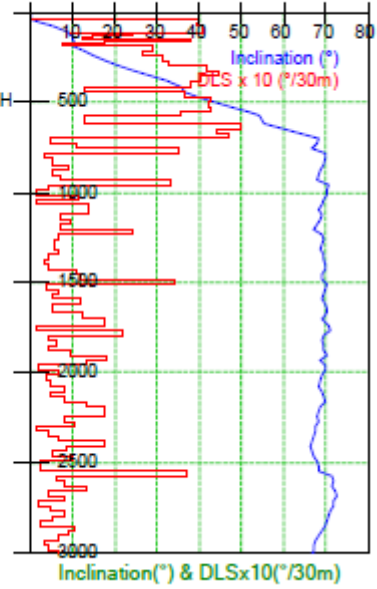
RIH and POOH

between 0.0 m and 2908.0 m



Legend

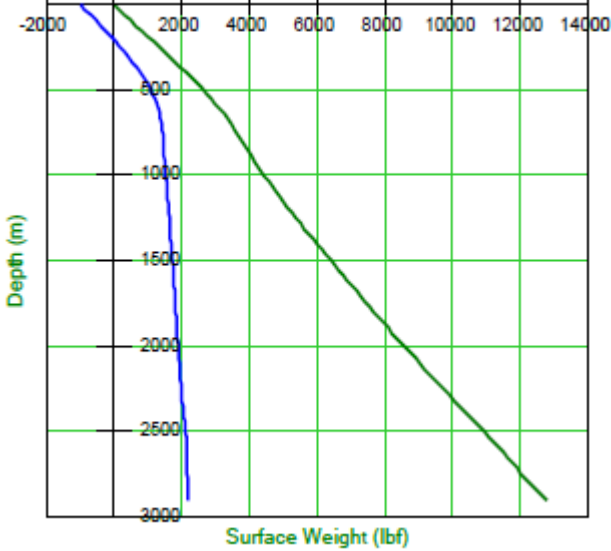
- Surface Weight RIH
- Surface Weight POOH



Idle Rate (0.3 bpm)

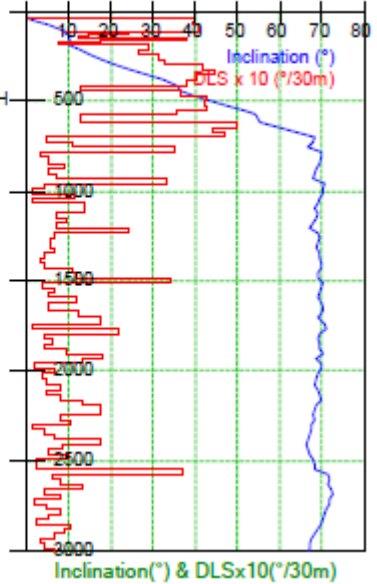
RIH and POOH

between 0.0 m and 2908.0 m



Legend

- Surface Weight RIH
- Surface Weight POOH



DIMENSION BID

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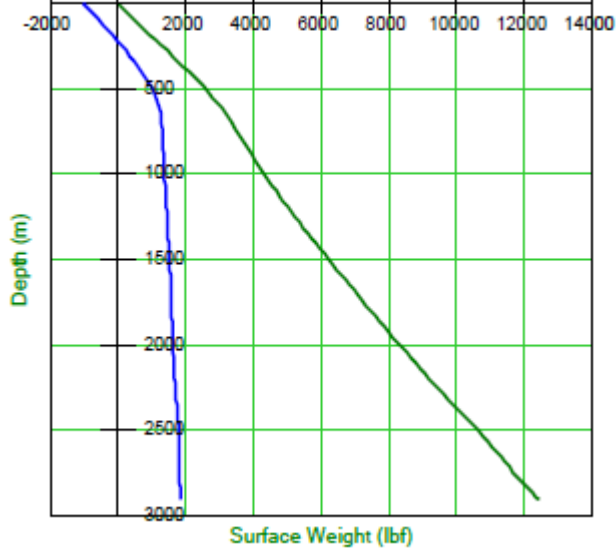
DULANG D-26L

ZONE SHUT OFF

High Rate (1.1 bpm)

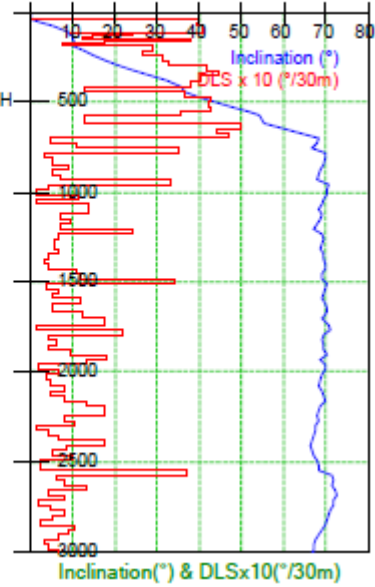
RIH and POOH

between 0.0 m and 2908.0 m



Legend

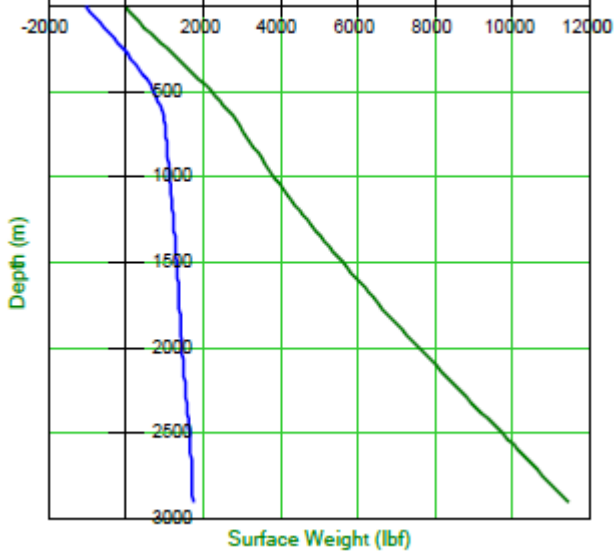
- Surface Weight RIH
- Surface Weight POOH



Nitrified (0.9 bpm 300 scf)

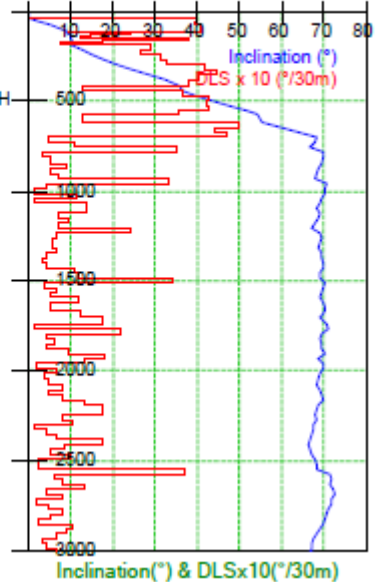
RIH and POOH

between 0.0 m and 2908.0 m

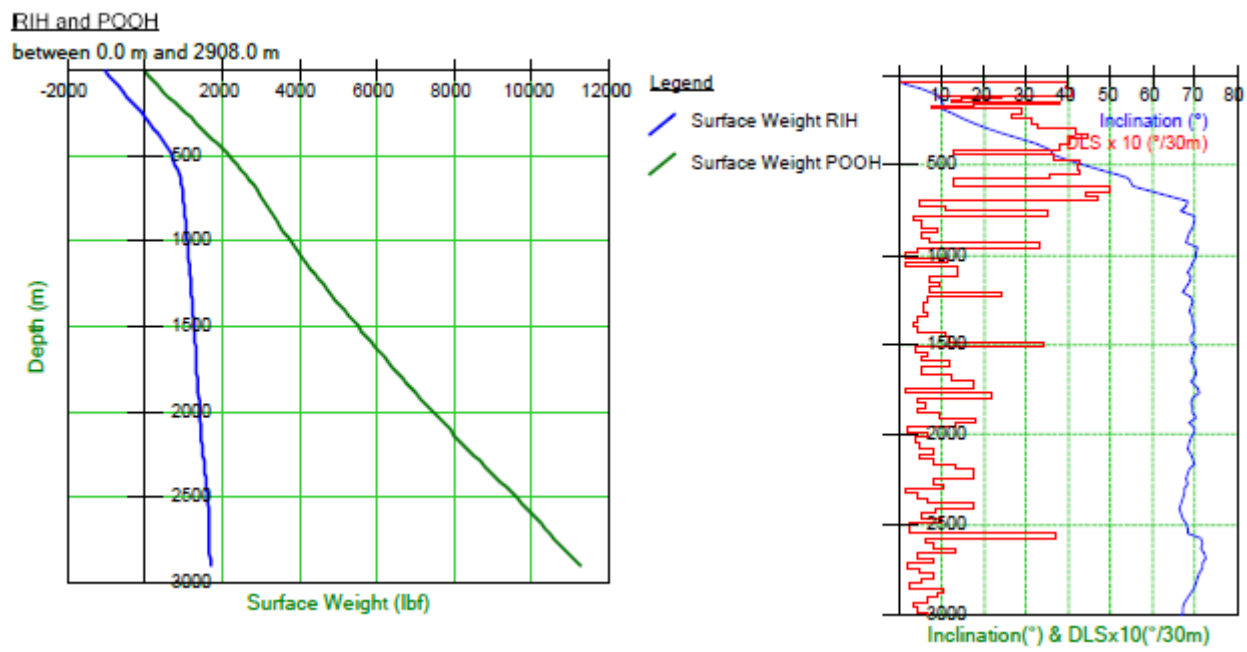


Legend

- Surface Weight RIH
- Surface Weight POOH

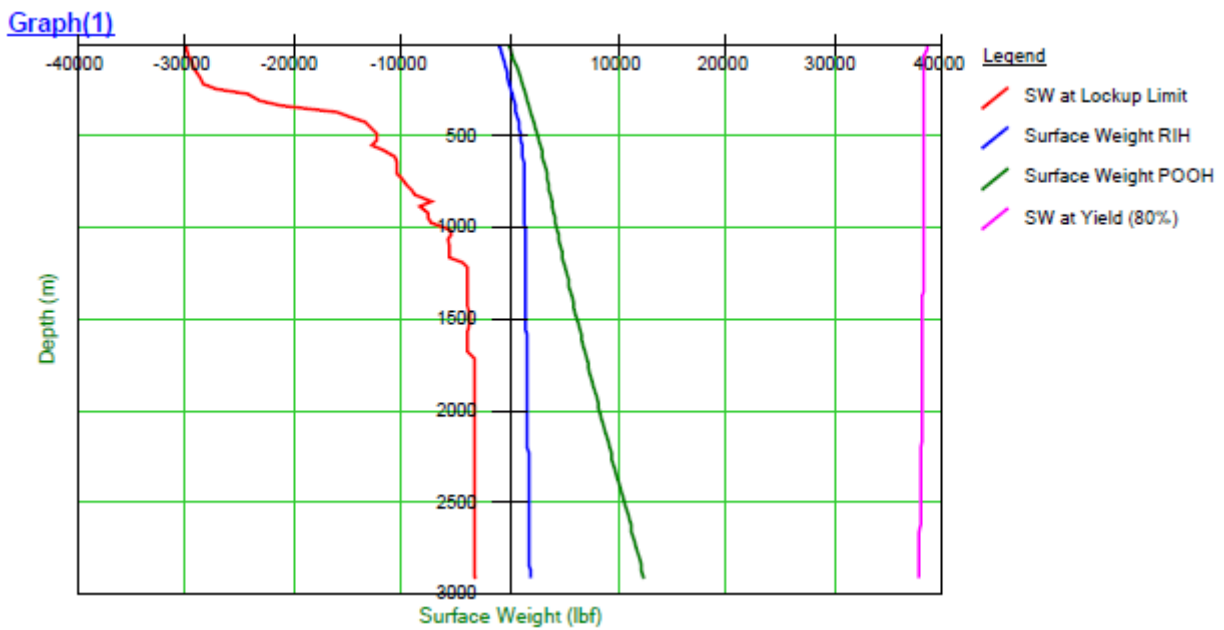


Nitrified (0.9 bpm 400 scf)



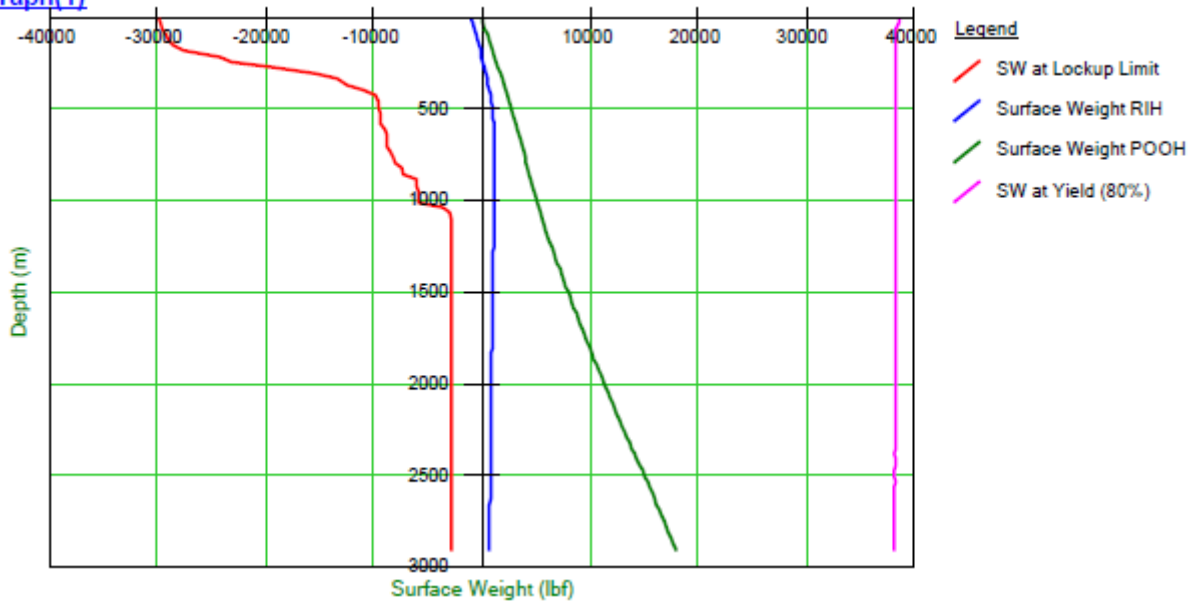
SENSITIVY ANALYSIS FRICTION FACTOR

Friction Factor 0.3 (Default Value)



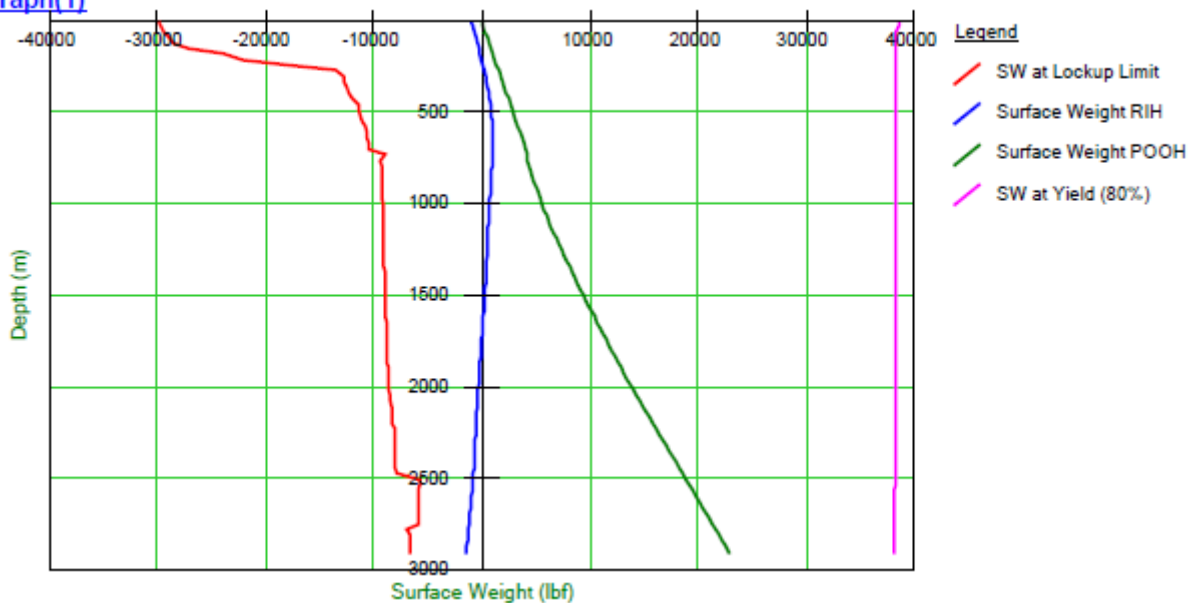
Friction Factor 0.4

Graph(1)



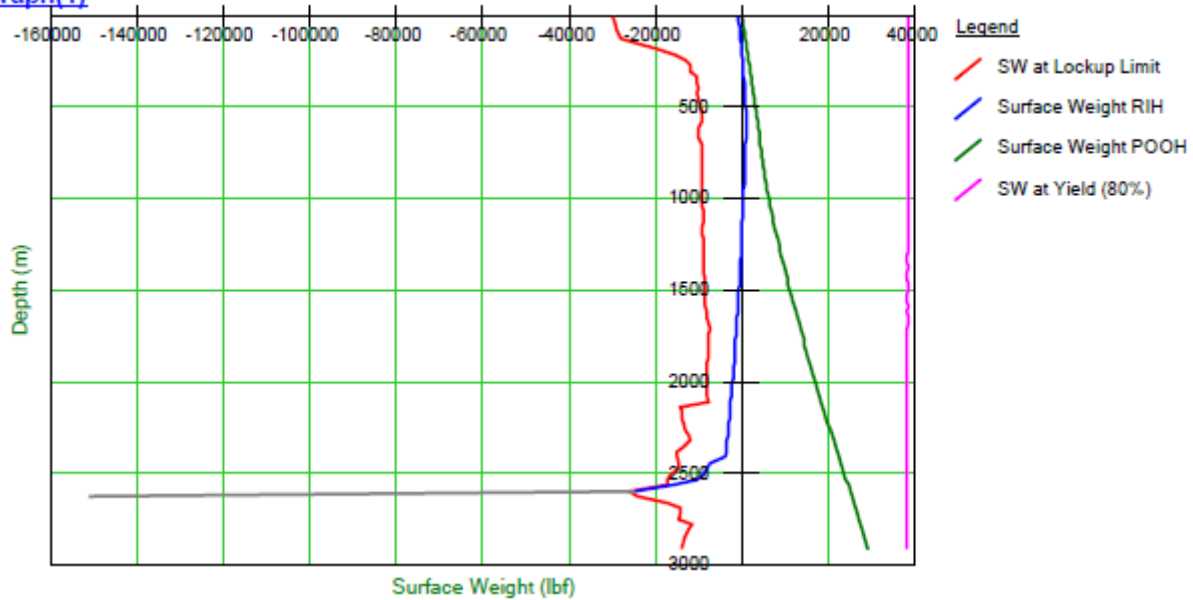
Friction Factor 0.5

Graph(1)




Friction Factor 0.6 (Lock up detected at depth 2,592 m MDTHF)

Graph(1)



SUMMARY OF TUBING FORCE ANALYSIS AT DEPTH 2,908 M MDTHF (NIPPLELESS PLUG)

Parameter	Maximum set down weight (lbf)	Surface weight reading (lbf)	Maximum pick up weight (lbf)	Surface weight reading (lbf)
0 BPM	-2,343	-660	14,868	38,297
0.3 BPM	-2,333	-735	14,885	38,300
1.1 BPM	-2,268	-3,210	14,834	37,829
Nitrified (0.9 BPM & 300 SCF/M)	-2,149	-1,326	15,205	37,669
Nitrified (0.9 BPM & 400 SCF/M)	-2,125	-1,320	15,197	37,513

DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		
	DULANG D-26L	ZONE SHUT OFF	

APPENDIX IV – EMERGENCY PROCEDURE

EMERGENCY BOP OPERATIONS

In the event of an emergency arising and the well having to be secured, the following steps should be taken:

1. Stop CT movement, close the Slip and Pipe rams and slack off string weight to ensure slips are holding. If time permits, review all options with the client representative. (Ensure that rams with guides are activated first to avoid damaging the CT).

Note: The decision to proceed past the above step should normally be made after consultation with the client representative unless there is an immediate and serious danger to personnel and/or equipment and the client representative is not immediately available to be involved in the decision.

2. Stop pumping.
3. Close the upper Shear Seal rams to cut the CT.
4. Set up to circulate well to kill fluid through the CT remaining in the well.
5. Make arrangements necessary to fish the CT from the BOP.

Note: When actuating any ram in the BOP system, the corresponding manual lock should be closed behind it to prevent accidental release in the event of total loss of hydraulic power. The force required to close the rams manually against pressure cannot be supplied by turning in the locks. Use of a pipe wrench, cheater bars or snipes will damage the internal workings of the ram actuators. Some form of hydraulic power is required to operate the actuators. This pressure can be supplied via a hand pump or a hydraulic pump from any other piece of equipment on location, including a fluid pumper.


Actuating the BOP System Hydraulic Controls

1. Remove locks on control panel
2. Move the control lever to the desired position.
3. Push the BOP activate button supplying pressure to the circuit.
4. Observe the pressure drop in the hydraulic circuit and subsequent pressuring back up to system pressure as ram opens or closes completely.
5. Observe the ram indicator pins to verify the operation of the ram.
6. Close in the manual locks if required. (Flag system to indicate position of rams.)

The connections below the CT BOP must be all flanged. Should one of these connections start leaking, the following steps should be taken in consultation with the client representative:

1. Call local alert and ensure all personnel are removed from the wellhead area.
2. Notify the client representative of the problem and determine the best method to make the area safe.
3. If the leak is minor, it may be possible to continue to pull the CT to surface. Assess the scenario and consider all the risks associated then proceed to pull the CT to surface. Once at surface, close available valves below the leak point.
4. If the leak is more severe, initiate a well kill through the well kill line and continue to pull the CT to surface.
5. If the leak is catastrophic, run the CT to HUD; pick up sufficient so that after the CT is cut at surface by CT BOP shear; the top of the CT falls below the X-mass Tree. Once the end of the CT is off bottom, proceed to cut the cut the CT with the shear RAM then close the available valves below the leak point. A well kill operation can be started through the kill line if requested by the client representative.

Prepared By: M. Ameerul Zaeem	Reviewed By: Kung Yee Han	Date: 20/10/2024	Rev. Rev0	Controlled Document DB-CT-MAZ-24004	Pg. 48
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DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		
	DULANG D-26L	ZONE SHUT OFF	

LEAK IN CT AT SURFACE

In the event of a leak in the CT occurring at surface, the following steps should be taken:

1. Call local alert and ensure all personnel are removed from the operational area. In particular make sure all personnel remain clear of the area between the Injector Head and the CT reel.
2. If the leak is small or a pinhole leak, POOH and position the leak on the lower part of the CT reel as soon as possible. Be careful when area of leak is bent onto the reel as failure may occur. Make arrangements to have a water hose present to wash away any fluid from the reel which may be hazardous. Make arrangements to start pumping water through the CT reel. Depressurize reel as much as conditions allow without exceeding collapse limitations of CT.
3. Notify client representative of problem and determine best method to make area safe. If leak is minor and water can be displaced to leak, continue to POOH and change reel.
4. If leak is considered to be too serious to displace to water and POOH, or serious and uncontrolled leakage of hydrocarbon or hazardous materials prevents this, (i.e. check valves not holding, lost BHA, parted CT) set the CT slips and pipe rams. Activate the upper Shear Seal rams on either the triple or quad BOP and manually lock in place.
5. Depressurize the CT reel and flush through the reel. If hydrocarbons are present in the reel, displace the reel with water and empty the contents to specified safe disposal area.


LEAK IN CT BELOW SURFACE

If a leak occurs in the CT below the Stuffing Box during down hole operations (usually indicated by a drop in pump pressure or loss of string weight), suspend CT operations and alert the client representative.

Note: If indications are that the BHA has been lost in hole then revert to section 0.

1. Once the client representative has been alerted, clear all personnel from the immediate area of the CT around the Injector Head and between the Injector Head and the CT reel.
2. Displace the CT to water and commence to POOH at not more than 20 ft per minute (5 meters/min). Ensure at all times that all personnel are clear of the immediate area as the possibility exists to pull the CT out of the Stuffing Box. Continue pumping water at a slow rate through the CT.
3. When the leak in the CT appears above the Stuffing Box, stop the injector and hold the leaking section of CT between the chains and the Stuffing Box.
4. Inspect leak. If leak is minor continue to POOH.
5. If leak is major, or CT is actually severed or well bore fluids are escaping through the CT, continue as per Section 09.2.

Prepared By: M. Ameerul Zaeem	Reviewed By: Kung Yee Han	Date: 20/10/2024	Rev. Rev0	Controlled Document DB-CT-MAZ-24004	Pg. 49
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DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		
	DULANG D-26L	ZONE SHUT OFF	

LEAK IN SURFACE PRESSURE CONTROL EQUIPMENT

Stuffing Box

1. **Stop** CT movement and close both sets of pipe rams to seal CT annulus. Set manual lock.
2. On semi-submersible operations this will be a set of pipe rams and pipe/slip rams.
3. Notify Client representative.
4. Ensure the injector is in neutral and that the brake is engaged.
5. Bleed off pressure above pipe rams
6. Set reel brake. On Semi-Submersible jobs the CT should be clamped at the level wind and CT run out of hole until enough slack between the injector and reel is obtained to cope with the heave from the rig, prior to setting reel brake.
7. Bleed off closing pressure on Stuffing Box. Open side doors and apply pressure to retract piston. Replace packer elements and then re-apply pressure to Stuffing Box. Close side doors.
Note: 3" side door Stuffing Boxes first bleed off closing pressure. Remove hoses from pack and retract piston and connect to open and close on side door. Open door and replace packer element. Close door, bleed off pressure and connect to pack and retract piston.
8. Slowly open both equalizing valve on pipe rams and check that stripper is holding pressure.
9. If stripper is holding pressure, undo manual locks and open pipe rams or pipe slip rams. When using pipe/slip rams the depth that they were set on the CT must be recorded. Release reel brake and continue operations.


Surface Leaks Other Than Stuffing Box

1. If leak is minor and a relatively short length of CT is in the hole and the Shear Seal safety head is **below the leak**:
2. Call local alert and notify the client representative.
3. Clear all non-essential personnel away from the area
4. Continue POOH and monitor situation closely
5. Hook up kill line to BOP and pump water slowly down annulus.

Note: Avoid collapse situation

1. Close swab valve and Shear Seal once CT is in riser and repair leak
2. Perform reinstatement test on surface equipment after leak has been repaired
3. If CT is in the well to a considerable depth and leak is considered serious:
4. Call local alert and notify Client representative.
5. Ensure all non-essential personnel are removed from the area.
6. Ensure that CT is sufficiently off bottom so that when the Shear Seal safety head is activated the pipe will drop below the Xmas tree manual master valve. If the CT is stuck down hole, pull to 80% of operating limit before activating Shear Seal BOP, thus allowing the CT to drop below the Xmas tree manual master valve. If the CT is attached to a fish, packer etc pull to 80% of operating limit (if possible) or maximum weight possible before activating Shear Seal BOP, thus allowing the CT to drop below the Xmas tree manual master valve. **If at all possible**, the decision to cut the CT and activate the system will be taken by the Client representative in charge of the operation. This may not always be possible. If the situation is extremely dangerous and requires a fast decision, the Supervisor in charge will take this decision.

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DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		
	DULANG D-26L	ZONE SHUT OFF	

7. Close the Shear Seal rams in the safety head to cut the pipe and allow it to drop. (If the safety head has separate shear and blind rams, close the shear rams to cut the pipe, pull up the CT and close the blind rams).
8. Close the swab valve on the Xmas tree.
9. Close the master valve on the Xmas tree
10. Repair leak and pressure test riser.
11. Plan for fishing operations.

Rotating Joint Leak

Eliminate the potential for reel movement by securing the reel with turnbuckles and set reel brake. On Semi-Submersible jobs the CT should be clamped at the level wind and CT run out of hole until enough slack between the injector and reel is obtained to cope with the heave from the rig. Close the reel isolation valve inside the reel and repair or replace the rotating joint as required. Re-test and resume operations.

CT RUNS AWAY INTO WELL


If the inside chain tension system on the Injector Head should fail for any reason, and CT is pulled into the well under its own weight with no control, the procedure should be as per the following:

1. Call a local alert.
2. Attempt to speed the injector up to match the speed of the descending CT.
3. Increase inside chain tension to increase friction on CT.
4. Increase stripper pressure to exert more friction on CT.
5. If these actions fail to make any difference, reduce injector hydraulic pressure to zero.
6. In the event that there is insufficient CT on the reel to reach bottom close CT slips. This action may damage or break the CT. This is the preferred option to using the pipe rams as these will become damaged and a primary well control system will be lost.
7. If the CT is not too far off bottom it may be practical to let it fall to bottom then investigate the causes and repair. This can only be done if there is sufficient CT on the reel to reach bottom.

Note: CT may helix when hitting bottom making it difficult to pull into tail pipe.

8. Once CT has been controlled, examine Injector Head for damage including chains and POOH.
9. The CT run away may be caused by the injector becoming overloaded with the weight of the CT and fluid in the CT. This situation should not occur if proper pre job planning is done. Correct selection of Injector Head or ensuring CT is full of Nitrogen would prevent this situation from occurring.
10. If a runaway situation occurs, reduce the injector hydraulic pressure to zero. This may cause the safety brake in the motors to actuate and counter balance valves to close, stopping the injector.
11. Under certain circumstances if the runaway CT is at a speed above the critical speed, the back pressure created by the circulating hydraulic fluid may prevent the injector motor brakes from actuating. If this situation occurs, select the pull mode for the injector and increase system hydraulic pressure until the CT comes to a standstill.

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DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		
	DULANG D-26L	ZONE SHUT OFF	

CT IS PULLED OUT OF STUFFING BOX

This situation is most likely to occur when the CT is being pulled into the riser section. If the BHA is lost including the End Connector there will be no external upset to prevent the CT from passing through the Stuffing Box. If this situation occurs, stop injector before CT passes through the chains and shut in Shear Seal rams on upper BOP's.

If it is thought that the BHA may be lost while down hole, stop the CT at 300ft from surface. Slowly close in the swab valve counting the number of turns. If the CT is still deemed to be across the wellhead, POOH the CT no more than the distance between the top of the wellhead and the top of the CT BOP's. Repeat this step until the swab valve can be fully shut. Once the swab valve is shut, bleed off the pressure in riser.

CT COLLAPSED AT SURFACE

Collapsed CT at surface will be obvious by escape of well bore fluids from the Stuffing Box, as the strippers will no longer seal round the deformed pipe. In addition to this the collapsed pipe will not allow the Injector Head to grip the CT due to its change in shape. Usually collapsed CT will not pull through the bottom brass bushings on the Stuffing Box.

1. If POOH, immediately run CT back in well a sufficient distance to make sure round pipe is in contact with the Stuffing Box.
2. Call alert and notify client representative.
3. Ensure that all non-essential personnel are cleared from the immediate area.
4. Immediately reduce well head pressure by all safe means possible; either flow well through choke at a higher rate or stop annular fluid injection if reverse circulating.
5. Increase CT internal pressure by circulating.
6. Once pressure conditions inside and outside the CT have been optimized, a decision can be taken on how to proceed. If it is not possible to position un-collapsed pipe across the stripper rubbers, i.e., well contents are escaping from stripper rubbers:
7. Call alert and notify client representative.
8. Close pipe rams in an effort to reduce flow of fluid/gas around CT.

Note: If it is not possible to control the well, the slips will have to be set, and the CT cut using the Shear Seal rams.

9. Arrange for clamps to be fitted to CT above Injector Head.
10. Remove all non-essential personnel from immediate area
11. Under authority from client representative, kill well.
12. Release pressure from Stuffing Box and remove bushings.
13. Open pipe rams.
14. Attempt to pull CT from the well using the Injector Head.
15. Cut CT at the gooseneck and use the rig or a crane to pull the CT through the injector. Re-clamp the CT above the Injector Head and cut off in thirty-foot sections (or as appropriate to the crane or rig)
16. Continue pulling and cutting CT until the CT pulled to surface can be pulled by the Injector Head.
17. Once CT in good condition (i.e. not collapsed) is at surface, set CT slips and pipe rams and make up roll-on connector to CT on reel.
18. Continue POOH.

If the leak is too serious and cannot be controlled and well fluids are escaping, continue as per Section 9.2.

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CT BREAKS AT SURFACE

If CT breaks at surface into two separate sections:

1. Stop the injector and set the slips.
2. Stop pumping operations.
3. Call alert and notify client representative. Ensure all non-essential personnel are cleared from the area and that the area is secure.
4. Secure CT reel.
5. If the reel capacity is insufficient to hold all of the CT remaining in the well due to uneven spooling resulting from the CT failure, it may be necessary to obtain another reel with sufficient capacity to hold the CT remaining in the well.
6. After consulting with client representative, remove damaged section of CT and insert in line roll-on connector and continue to POOH.
7. If this course of action is considered inappropriate or dangerous due to well conditions or condition of CT still in the well, continue as per Section 0.

BUCKLED TUBING

Should the CT hit an obstruction down hole while RIH with the thrust pressure set too high or running speed too fast, the CT will buckle in a 'Z' shape (plastically hinged).

CT being run inside CT and through small ID BOP's/lubricators will normally buckle between the Stuffing Box and the chains.

CT being run through casing or open hole will normally break below the BOP, usually somewhere around the largest ID.

- The CT will generally buckle several times.
- This type of failure is a little more difficult to detect.

If the CT is being run into casing and a large amount of weight is lost suddenly, there is a very good possibility that the CT is buckled somewhere down hole. Indications of this could be:

- An increase in pump pressure as fluid or gas is now being pushed through an additional restriction created by a hinge.
- A decrease in pump pressure as the CT may have broken removing a restriction such as a BHA.
- A loss of string weight due to the CT breaking and falling off.
- An increase in string weight while pulling out of the hole as the buckled portion of CT creates additional drag or needs to be straightened to get through a restricted ID.

In the event CT buckling is suspected, the CT movement should be stopped and the pump pressure kept within operating limits allowing the situation to be analyzed and determine the correct action to be taken for existing conditions.

If there is an increase in pump pressure or an increase in string weight:

1. Stop the pumps and pick up slowly.
2. POOH slowly (10 to 20 feet per minute) watching the weight indicator carefully.
3. If the CT is buckled close to surface, the buckled CT will pull into the bottom of the Stuffing Box and stop.
4. Close and lock the slip and pipe rams.
5. If the ram indicators show that the rams are not completely closed, there may be more than one piece of CT inside the BOP. In this event, open the rams and try to put undamaged CT across the pipe and slip rams.


6. Make arrangements to kill the well and retrieve the remaining CT from the well.
7. If the buckled CT is down hole and cannot be pulled free, consult the client representative as he may want the CT left at TD prior to being hung off in the slip and CT rams.
8. Arrangements should be made to run CT cutter on wireline to retrieve the CT above stuck point.

If there is a decrease in pump pressure or a loss of string weight:

1. It must be assumed that the CT has parted somewhere down hole.
2. Calculate from the remaining string weight approximately how much CT is left in the well.
3. Stop the pumps and POOH slowly.
4. Should the CT come out of the Stuffing Box, the blind rams should also be closed in.

If the CT is buckled above the Stuffing Box, the following steps should be taken:

1. Stop the injector as quickly as possible.
2. Close the slip and pipe rams and manually lock them.
3. If the down hole check valves are holding, bleed the pressure in the CT down to zero and monitor for 15 minutes for pressure build up.
4. Consider at this stage whether to kill the well.
5. Use a hacksaw to start the cut until you are sure there is no trapped pressure in the CT.
6. Cut the CT
7. Remove as much of the buckled CT as possible leaving any undamaged CT showing above the Stuffing Box intact so that it may be rejoined later.
8. Bleed the pressure from above the CT rams and undo the connection below the injector.
9. Slowly raise the injector until it is clear of the damaged CT.
10. Cut away any damaged CT, dress the CT and install an inline connector.
11. Run some fresh CT down through the injector until it is just out of the Stuffing Box.
12. Lower the injector until immediately over the pipe sticking out of the BOP.
13. Attach the pipe to the inline connection attached to the pipe sticking up out of BOP.
14. Pump off the inside chain tension and rotate the chains slowly in the OOH direction, while lowering the injector until the connection below the injector can be fastened.
15. Pump up the inside chain tension and pull weight equal to the weight of the CT suspended below the slips plus 2,000 lbf for friction or CERBERUS prediction, whichever is greatest.
16. Equalize the pressure across the CT rams.
17. Unlock the pipe and slip rams.
18. Open the slip and pipe rams and POOH.
19. If the down hole check valves do not hold then the CT will have to be cut.

DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		
	DULANG D-26L	ZONE SHUT OFF	

CT STUCK IN HOLE PROCEDURES

There are various scenarios by which CT can be deemed as a stuck in hole situation. The following procedures are to be used as generic guidelines prior to the compilation of a signed off chemical cutting program applicable to the current situation.

In the event of being stuck in hole, several factors would have to be taken into consideration, the first of which would be whether the CT is stuck in hole on a platform, or a semi-submersible, as the procedures to be followed may vary greatly between the two options.

Other factors to be considered are:

- Type of well, i.e., flowing oil or gas well, water injector etc.
- The type of BHA being used, i.e., perforating guns, milling assembly, plug etc.
- The type of operation being carried out when the CT became stuck.

In all of the above cases, the CT would be defined as being “stuck” when the pipe cannot be retrieved from the well bore without the pipe exceeding its 80% minimum yield rating, or without exceeding 80% stress of the weak link release rating. The lower of these two factors should always be used when attempting large pulls.


Regardless of the specifics involved, the following procedures should be adopted:

1. Inform the client representative of the situation.
2. Inform the Onshore Engineer.
3. From the information available, and taking into account the well conditions, try to determine the reason for the pipe/BHA being stuck.
4. Attempt to pull free by applying a steady pull to a maximum of 80% of the CT yield. If in doubt as to what this figure is, consult Engineering Department before proceeding.
5. When applying the maximum pull, hold the maximum value for a minimum of 10 minutes and observe the trend (if any) on the weight indicator and chart. Measure the amount of pipe extension that is required when this pull is applied. The figure can be used to determine where the CT is stuck. As a rule of thumb, the depth that the pipe is held at will be the extension of the CT (in feet) when pulled to 80% of yield divided by 0.002. This can be determined using CERBERUS.

The following are options that may be appropriate depending on the particular circumstances:

1. If possible, flow the well, or increase well flow in an effort to remove debris in the well bore that may be holding the CT/BHA. Maintain maximum circulation through the CT at the same time. This is particularly relevant if well cleanout or drilling operations have been performed.
2. Circulate acid across the BHA in an attempt to remove any acid soluble material that may be holding the CT.
3. Pump fluid down the backside of the CT to the formation in an attempt to dislodge debris from around the BHA. Potential CT collapse must be considered if engineering this scenario.
4. Displace CT contents to a lighter fluid (base oil) or gas (Nitrogen) to increase buoyancy and allow greater end force to be applied at BHA.
5. Underbalance the well in the case of differentially stuck CT.
6. Cool the well if the CT is helically stuck in corkscrewed Production Tubing.
7. Pump down the CT / completion annulus to try and move the source of hold-up.
8. Displace slugs of Nitrogen with water to create a surge effect at the BHA.
9. Pump friction reducer, IM Lube in seawater at 2-3% by volume, down the CT and into the well. Ideally, one well volume will be pumped.

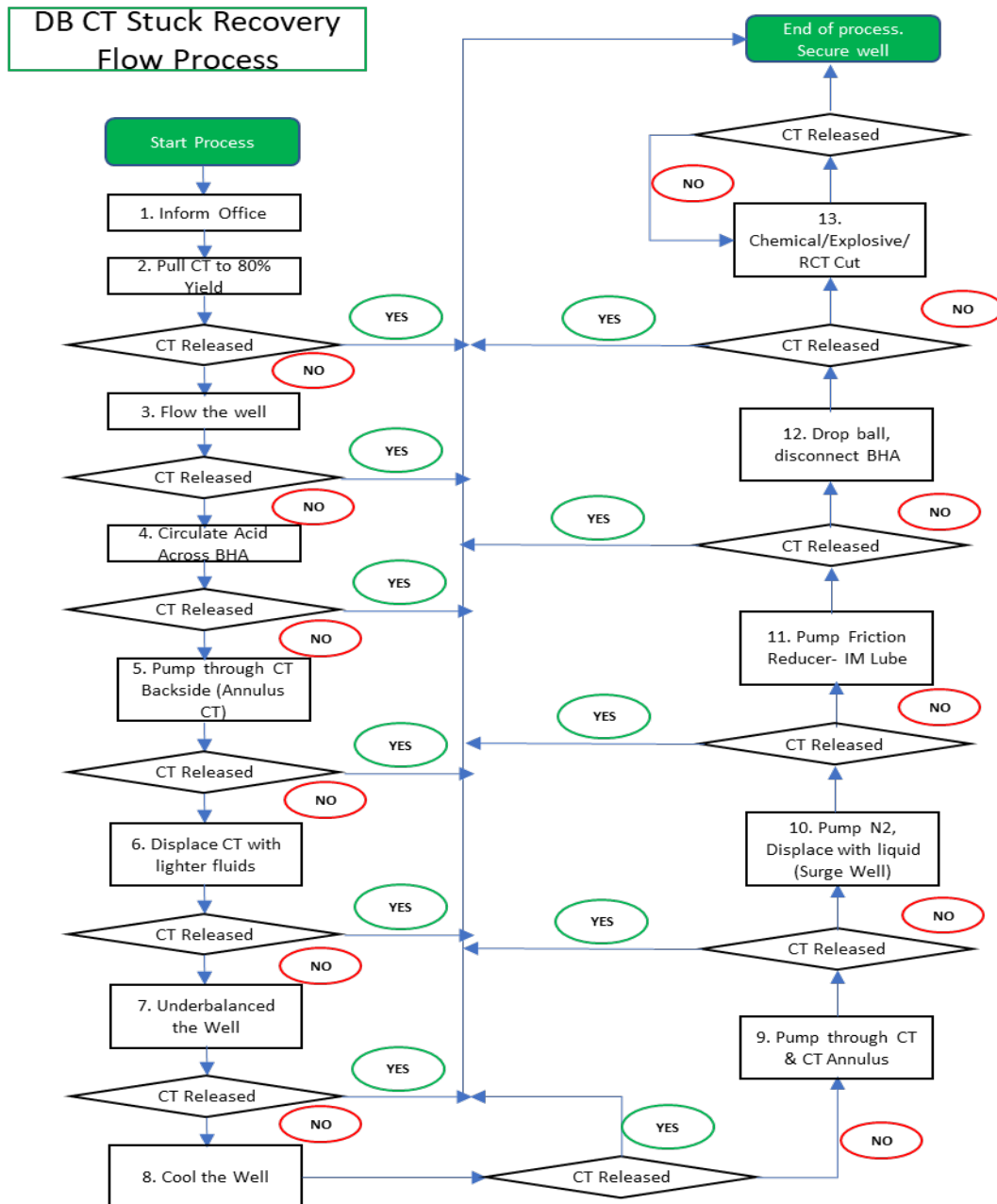
Prepared By: M. Ameerul Zaeem	Reviewed By: Kung Yee Han	Date: 20/10/2024	Rev. Rev0	Controlled Document DB-CT-MAZ-24004	Pg. 55
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DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		
	DULANG D-26L	ZONE SHUT OFF	

10. After consultation with the client representative and the on-call Engineer, activate the emergency disconnect mechanism in the BHA to allow the CT to be released. The release mechanism should only be implemented after all avenues have been explored.
11. When attempting maximum pull, do not work the CT violently across the gooseneck by frequent intervals.
12. The number of cycles across the gooseneck must be logged, and if in doubt of the CT fatigue condition, the Engineer must be consulted and the cycles entered into the CERBERUS FATIGUE program, to determine the number of cycles left available.

After consultation with the client representative, kill the well and commence preparations for chemical cutting operations.

STUCK CT COIL RECOVERY PROCESS



Precautionary Steps to avoid Stuck while Cleanout in Dual string Completion:

- 1) To monitor pressure trending all the times during operation and record for any abnormalities. If there is continue pressure increasing trend during cleanout, proceed to pick up coil to the previous pull test depth and perform flow rate test.
- 2) In the event of coil entangle on the Long string, proceed to pick up coil and simulate pumping lost prime scenario to create vibration and tip of coil wobble to release from entanglement.

APPENDIX V – DOWNHOLE TOOL SPECS

2-1/8” SpinCat Nozzle




SC-212™ Overall Length: 12.3 in — 31.2 cm

Outside Diameter: 2.12 in 5.4 cm

STONEAGE SPINCAT™ SC-212 SHARE

The StoneAge SpinCat™ SC-212 can be used at operating pressures of 1000 to 5000 psi and flow rates of 0.8 to 2 bpm (32 to 80 gpm). It has a 1 1/2" AMMT inlet thread.

Tool Family	StoneAge SpinCat™	
Tool Model	SC-212	
Pressure Range	1-5k psi	70-340 bar
Flow Range	0.8-2.0 bpm	32-80 gpm
Flow Rating	4.6 Cv	
Rotation Speed	150-200 rpm	
Inlet Connection	1-1/2" AMMT	
PSI Loss (@ 1 bpm)	83 psi	6 bar
Tension (pull)	Safe load to 15000 lbs	6804 kg
Compression (set down)	Safe load to 21000 lbs	9525 kg
Outside Diameter	2.12 in.	5.4 cm
Overall Length	12.3 in.	31.2 cm
Weight	8.9 lbs	4 kg
Maximum Temperature	390° F	200° C

DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		
	DULANG D-26L	ZONE SHUT OFF	

CT PACKER

CT (Coiled Tubing) Packer

Weatherford’s CT packer is ideal for use on coiled tubing (CT) in straight-hole or deviated well conditions. The packer is set and released by reciprocation of the CT, allowing the packer to to be set and un-set multiple times in a single run.

The single piece mandrel design increases the durability of the packer, allowing it to be used in applications with high tailpipe loads and minimizes potential leak paths through the tool.

Applications

- Ideal for treating and testing applications.
- Can also be used for velocity string hang-offs and as the lower packer in patch applications.

Features, Advantges, and Benefits

- Set and release by reciprocating motion facilitates use on CT.
- New drag spring design offers improved drag and stronger springs for reliable setting in deep wells, minimizing misruns.
- High per formancece packing elements provide high differential pressu ratings
- Sealed J-Slot housing prevents debris from hampering setting and releasing, minimizing misruns.
- Increased tensile strength handles heavier tail-pipe loads for heavy velocity string hang-offs.
- Large-bore mandrels provide larger flow area for increased production.
- Double J-Slot requires two reciprocations before setting, preventing premature setting during weight checks and when entering liner tops, minimizing misruns.



DIMENSION BID

DIMENSION BID COILED TUBING SERVICES



DULANG D-26L

ZONE SHUT OFF

TUBING TALLY FOR WELL DULANG D-26L

PAGE 01 OF 02



CAMCO MALAYSIA SDN. BHD.

TUBING & COMPLETION EQUIPMENT SUMMARY

WELL D-26L FIELD DULANG COMPANY ENGINEER _____ DATE 23.10.2024

NOTE: Item No. 1 is On Bottom

DISTANCE: Rotary Kelly Bushing to: LONG STRING psi WP FLANGE EL: 14.630(m)
3 1/2" TUBING 7.2 P.P.F. 80 - NK 358

ITEM NO.	DESCRIPTION	LENGTH meter		DEPTH SET FROM RKB (m)	
	END OF TUBING			2973	739
	3 1/2" OTIF CONICAL MULE SHOES	0	210	2973	529
	1 EA PUP JOINT	0	705	2972	824
	3 1/2" CAMCO 'D' NO-60 NIPPLE 2.750" I.D. HKN 414	0	330	2972	494
	1 EA X-OVER PUP NSCI BOX X TUC 4040 PIN	1	000	2971	494
	BOTTOM TO ELEMENT	1	494		
	7" CAMCO HRP-4-SF SINGLE HYD. PACKER - BIP 326			2970	000
	ELEMENT TO TOP PACKER	1	030	2968	970
	1 EA X-OVER PUP NSCI X TUC 4040 BOX	1	000	2967	970
	3 1/2" CAMCO WP-1 SELECTIVE NIPPLE 2.812" I.D. HKN 413	0	765	2967	205
	1 EA 20 FT BLAST JOINT X 10 FT BLAST JT	8	971	2958	234
	1 EA 20 FT BLAST JOINT X 10 FT BLAST JT	8	972	2949	262
	1 EA 20 FT BLAST JOINT X 10 FT BLAST JT	9	004	2940	258
	1 EA 10 FT BLAST JOINT	2	952	2937	306
	1 EA X-OVER PUP TUC 4040 PIN X NK 358 BOX	0	792	2936	514
	1 EA PUP X-OVER NK 358 PIN X TUC 4040 BOX	2	410	2934	104
	3 1/2" CAMCO C810-10-1 SLIDING SLEEVE 2.812" I.D.	2	354	2930	286
	22755-000-00002 S/N HMO 183				
	1 EA PUP X-OVER TUC 4040 PIN X NK 358 BOX	3	004	2927	282
	1 EA PUP X-OVER NK 358 PIN X TUC 4040 BOX	2	435	2924	847
	BOTTOM TO ELEMENT	1	765		
	9 5/8" CAMCO HRP-4-SF HYD. SINGLE PACKER BIP 322			2923	082
	ELEMENT TO TOP	1	100	2921	982
	1 EA PUP X-OVER TUC 4040 PIN X NK 358 BOX	3	065	2918	917
	1 EA X-OVER PUP NK 358 PIN X TUC 4040 BOX	0	885	2918	032
	3 1/2" CAMCO WP-1 SELECTIVE NIPPLE 2.812" I.D. HKN 412	0	765	2917	267
	1 EA PUP TUC 4040 BOX X PIN	0	792	2916	475
	2 EA 20 FT BLAST JOINT	12	050	2904	425
	1 EA X-OVER PUP TUC 4040 PIN X NK 358 BOX	0	927	2903	498
	1 TUBING	8	850	2894	648
	1 EA PUP X-OVER NK 358 PIN X TUC 4040 BOX	2	330	2892	318
	3 1/2" CAMCO C810-10-1 SLIDING SLEEVE 2.812" I.D. HKN 570	1	464	2890	854
	1 EA PUP X-OVER TUC 4040 PIN X NK 358 BOX	2	378	2888	476
	1 EA PUP	2	995	2885	481
	1 TUBING	8	820	2876	461
	1 EA PUP X-OVER NK 358 PIN X TUC 4040 BOX	3	030	2873	631
	BOTTOM TO ELEMENT	2	645		
	9 5/8" CAMCO HSD-3-SFS DUAL PACKER - BIP 283			2870	988
	ELEMENT TO TOP	1	050	2869	936
	1 EA PUP X-OVER TUC 4040 PIN X NK 358 BOX	2	881	2867	555
	3 TUBING	26	540	2841	015

Modified widepak plug at 2,913m

CT Packer at 2,900m

DIMENSION BID

DIMENSION BID COILED TUBING SERVICES



DULANG D-26L

ZONE SHUT OFF

For Internal Use - For Internal Distribution Only

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CAMCO MALAYSIA SDN. BHD.

TUBING & COMPLETION EQUIPMENT SUMMARY

WELL D-26 FIELD DULANG COMPANY ENGINEER DATE 23-10-96

NOTE: Item No. 1 is On Bottom

DISTANCE: Rotary Kelly Bushing to: LONG GRING
3 1/2" TUBING 9.2 P.P.F.(N) 80. NK 35B. PAL WP FLANGE ELE: 14.630(m)

ITEM NO.	DESCRIPTION	LENGTH meter	DEPTH SET FROM RKB (m)	
1	EA PUP X-OVER NK 35B PIN X TKC 4040 BOX.	2	344	2838 671
	3 1/2" CAMCO CW-10-T SLIDING SLEEVE 2.812" I.D. HKN 516	1	464	2837 207
1	EA PUP X-OVER TKC 4040 PIN X NK 35B BOX.	2	377	2834 830
1	EA PUP	2	990	2831 840
6	TUBING	53	365	2778 475
3	TUBING	26	875	2751 600
1	EA PUP X-OVER NK 35B PIN X TKC 4040 BOX.	3	630	2747 970
	3 1/2" CAMCO KBMM GASLIFT MANDREL C/W 1075 PSI VALVE. S/N. HKN 294.	1	970	2746 000
1	EA PUP X-OVER TKC 4040 PIN X NK 35B BOX.	3	474	2742 526
	107 TUBING	949	940	1792 586
1	EA PUP X-OVER NK 35B PIN X TKC 4040 BOX.	3	458	1789 133
	3 1/2" CAMCO KBMM GASLIFT MANDREL C/W 1150 PSI VALVE. S/N. HKN 817.	1	970	1787 163
1	EA PUP X-OVER TKC 4040 PIN X NK 35B BOX.	3	632	1783 531
	165 TUBING	1467	408	316 123
1	EA PUP X-OVER NK 35B PIN X TKC 4040 BOX.	2	895	313 228
	3 1/2" CAMCO WP-1 SELECTIVE NIPPLE 2.812" I.D. HKN 397.	0	765	312 463
1	EA PUP X-OVER TKC 4040 PIN X NK 35B BOX.	2	355	310 108
1	EA PUP	2	990	307 118
	16 TUBING	142	400	164 718
1	EA PUP X-OVER NK 35B PIN X TKC 4040 BOX.	2	352	162 366
	FLM COUPLING	0	843	161 523
	3 1/2" CAMCO TRDP-4A-L5- SAFETY VALVE. HMS 602.	1	340	160 183
	22883-000-00002.			
	FLM COUPLING	0	850	159 333
1	EA PUP-TKC 4040 PIN X NK 35B BOX.	3	014	156 319
	15 TUBING	132	920	23 399
1	EA PUP	3	000	20 399
1	EA PUP	2	410	17 989
1	EA X-OVER PUP NK 35B PIN X TKC 4040 BOX.	0	824	17 165
1	EA PUP	2	310	14 855
	INGRAM CACIUS DUAL SPLIT HANGER	0	225	14 630
	ELEVATION	14	630	- 0 -

Prepared By:
M. Ameerul Zaem

Reviewed By:
Kung Yee Han

Date:
20/10/2024

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Rev0

Controlled Document
DB-CT-MAZ-24004

Pg.
61

APPENDIX VI – CIRCA SIMULATION

Cleanout from depth 2,535 m MDTHF to 2,885 m MDTHF (Cement Retainer)

SUMMARY OF FLOW RESULTS

Produced Fluids

Pressure known at:
Production Mode:
Fluid Composition:

Reel Injection
Not Perforated
Not Perforated

Circulated Fluids

Fluid Composition:

Liquid:
Solids:
Circulation Point:
HHP Required :

Water
1.10 bbl/min
0.00 bbl/min
2885.00 m
86.71 KW

COMPLETION:

Wellhead Pressure.....	1072.4 psi g
Hydrostatic pressure loss.....	1986.7 psi
Friction pressure loss.....	584.4 psi
Kinetic pressure loss.....	-19.1 psi
Equivalent Circulation Density[ECD]...	10.89 lb/gal (US)

Bottom Hole Pressure.....	3824.4 psi g
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FROM CIRCULATION POINT TO WELLHEAD:

Liquid transit time.....	48 min
Annular volume.....	61.6 bbl
Volume below circulation point.....	2.1 bbl
Total liquid volume.....	63.7 bbl

WORKSTRING:

Liquid:	1584.0 bbl/day
Pressure at reel rotating joint.....	4300.0 psi g
Friction pressure loss on reel.....	915.5 psi
Pressure inside WS at Gooseneck.....	3384.5 psi g
Hydrostatic pressure loss.....	-1887.6 psi
Friction pressure loss.....	1644.7 psi
Equivalent Circulation Density[ECD]...	1.08 lb/gal (US)

SUMMARY OF HOLE CLEANING RESULTS

Initial Condition:

% of fill interval occupied by solids before cleanout ...	75.0 %
Top of fill	2534.99 m
Deepest Circulation point	2884.99 m
Bottom of fill	2884.99 m
Initial Volume of Solids.....	7.5 bbl
Initial Mass of Solids.....	5249.9 lb
Solids type:	20/40 Bauxite Proppant
Fluid Description:	Water

Penetration Hole Cleaning Mode:

Penetration rate.....	10.0 ft/min
Penetration time.....	1.91 hr
Solids volume in the well after penetration	7.5 bbl
Solids mass in the well after penetration	5249.9 lb

Circulation Hole Cleaning Mode:

Hole circulation time	1.00 hr
Solids volume in the well after circulation.....	7.5 bbl
Solids mass in the well after circulation.....	5249.9 lb

Wiper Trip Hole Cleaning Mode:

Wiper Trip Scheme:	User Specified rate, Tornado not
Wiper trip time	15.17 hr
Solids volume in the well after wiper trip	0.0 bbl
Solids mass in the well after wiper trip	0.0 lb

Volume of Fluids Pumped During Penetration, Circulation & Wiper Trip:

Liquid Volume	1193.3 bbl
Penetration, Circulation & Wiper Trip time	18.08 hr

DIMENSION BID

DIMENSION BID COILED TUBING SERVICES



DULANG D-26L

ZONE SHUT OFF

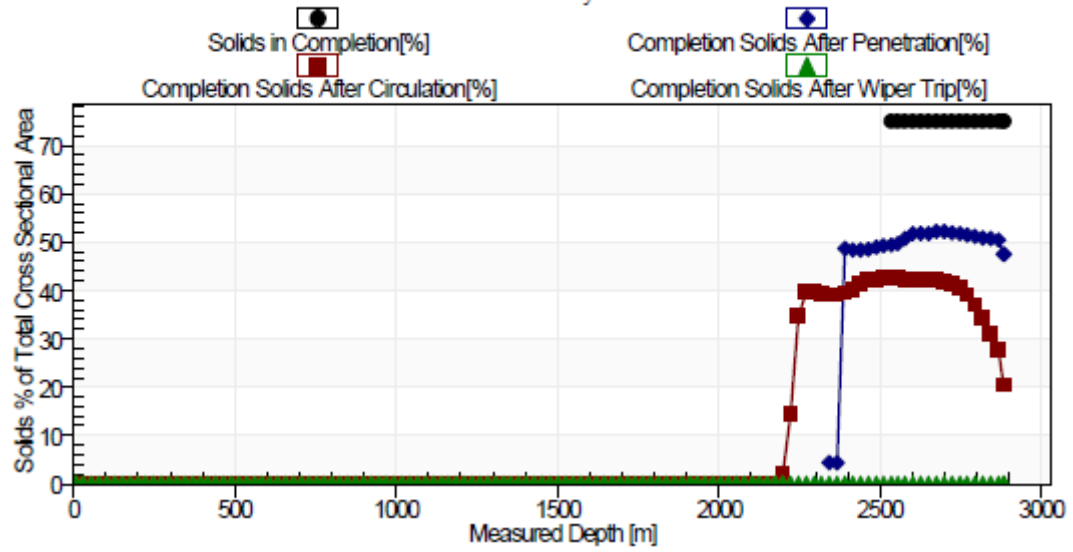
Flow State

Measured Depth[Flow] <i>m</i>	Temperature	Completion Pressure	Workstring Pressure	Concentric Pressure	Completion Liquid Velocity <i>hr</i>	Workstring Liquid Velocity <i>m</i>	Concentric Liquid Velocity <i>ft/min</i>
0.0	60.0	1072.4	3384.5	0.0	169	722	0
6.7	60.8	1082.1	3389.9	0.0	169	722	0
30.8	63.7	1117.2	3409.5	0.0	169	722	0
54.8	66.5	1152.2	3429.2	0.0	169	722	0
78.9	69.4	1187.1	3448.9	0.0	169	722	0
103.0	72.3	1221.9	3468.5	0.0	169	722	0
127.1	75.1	1256.4	3488.0	0.0	169	723	0
151.2	77.9	1290.9	3507.5	0.0	169	723	0
175.2	80.8	1325.3	3527.0	0.0	169	723	0
199.3	83.6	1359.7	3546.5	0.0	169	723	0
223.4	86.4	1393.7	3565.8	0.0	169	724	0
247.5	89.2	1427.5	3584.8	0.0	169	724	0
271.6	91.9	1460.8	3603.4	0.0	169	725	0
295.6	94.6	1493.7	3621.6	0.0	169	725	0
319.7	97.3	1525.9	3639.3	0.0	170	726	0
343.8	99.9	1557.4	3656.2	0.0	170	726	0
367.9	102.4	1587.9	3672.1	0.0	170	727	0
392.0	104.8	1617.4	3687.2	0.0	170	727	0
416.0	107.2	1646.0	3701.3	0.0	170	728	0
440.1	109.5	1674.1	3714.9	0.0	170	728	0
464.2	111.8	1701.5	3727.9	0.0	170	729	0
488.3	113.9	1727.8	3739.8	0.0	170	729	0
512.3	116.0	1752.8	3750.3	0.0	171	730	0

Flow State (continued)

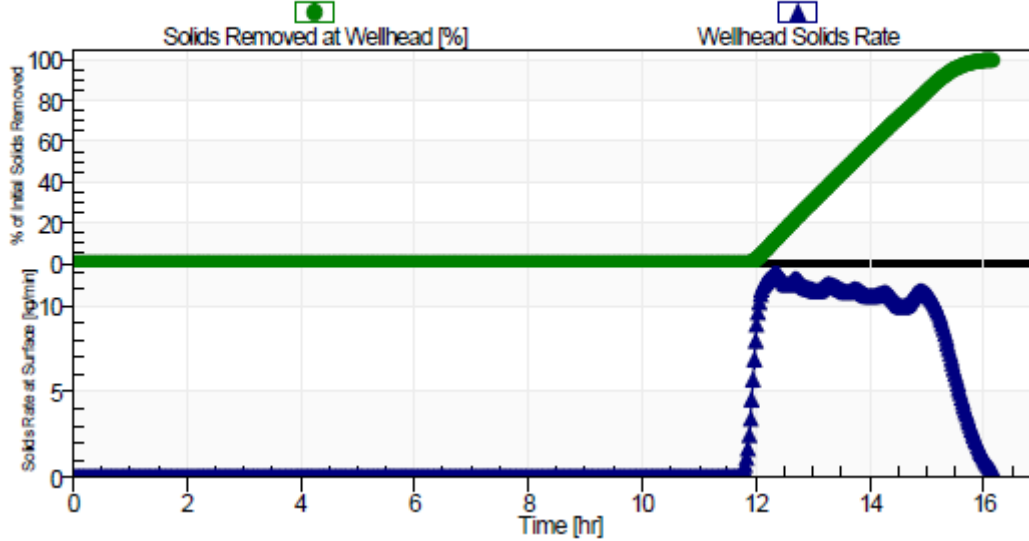
Measured Depth[Flow] <i>m</i>	Temperature	Completion Pressure	Workstring Pressure	Concentric Pressure	Completion Liquid Velocity <i>hr</i>	Workstring Liquid Velocity <i>m</i>	Concentric Liquid Velocity <i>ft/min</i>
2745.8	215.1	3388.4	3641.4	0.0	634	755	0
2769.9	216.0	3406.7	3638.4	0.0	628	756	0
2794.0	216.9	3446.0	3635.6	0.0	620	756	0
2818.1	217.9	3484.5	3633.1	0.0	611	756	0
2842.1	218.9	3522.5	3630.8	0.0	605	756	0
2866.2	219.9	3559.7	3628.6	0.0	709	757	0
2882.8	220.6	3584.6	3627.4	0.0	589	757	0
2883.0	220.6	3584.2	3625.6	0.0	647	1182	0
2883.7	220.6	3585.1	3622.4	0.0	647	1460	0
2884.7	220.7	3586.5	3622.5	0.0	647	1183	0
2885.0	220.7	3586.5	3622.1	0.0	646	3127	0

Solids Bulk Cross Sectional Area
Cran Analysis



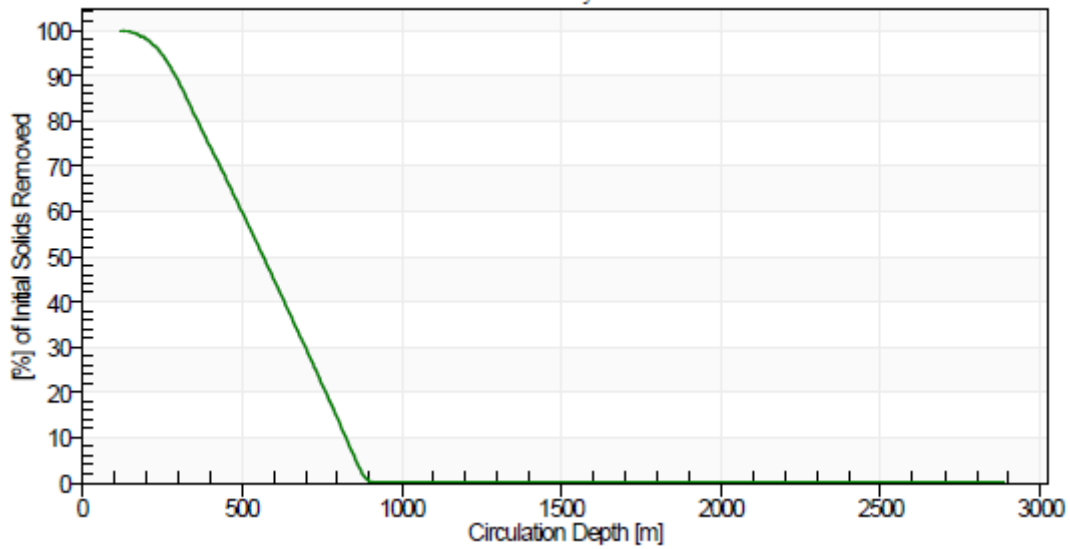
Solids Removal after Penetration to Target Depth

CTran Analysis [Transient response during Circulation and Wiper Trip]



Solids Removed versus Circulation point

CTran Analysis



DIMENSION BID

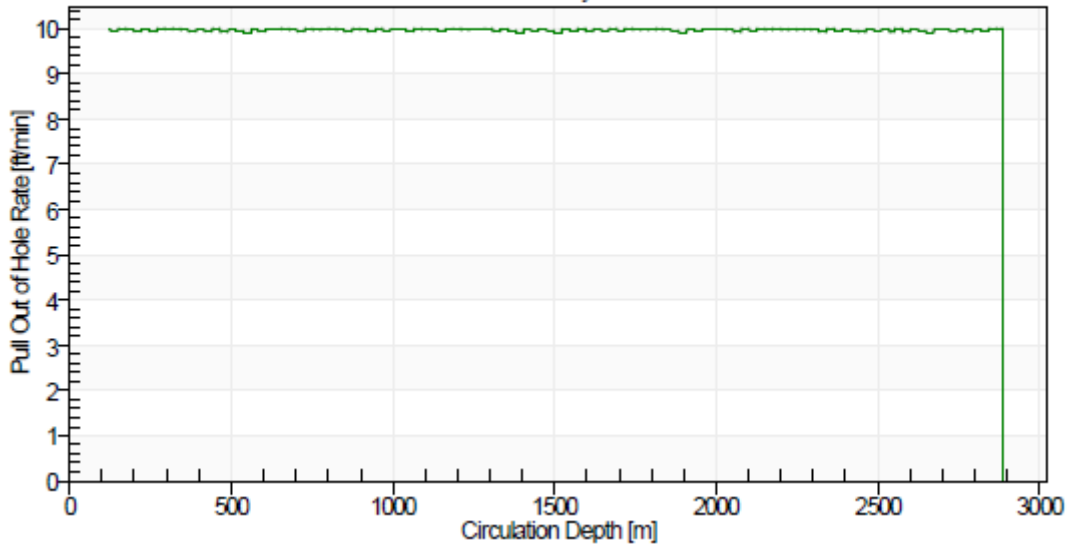
DIMENSION BID
COILED TUBING SERVICES



DULANG D-26L

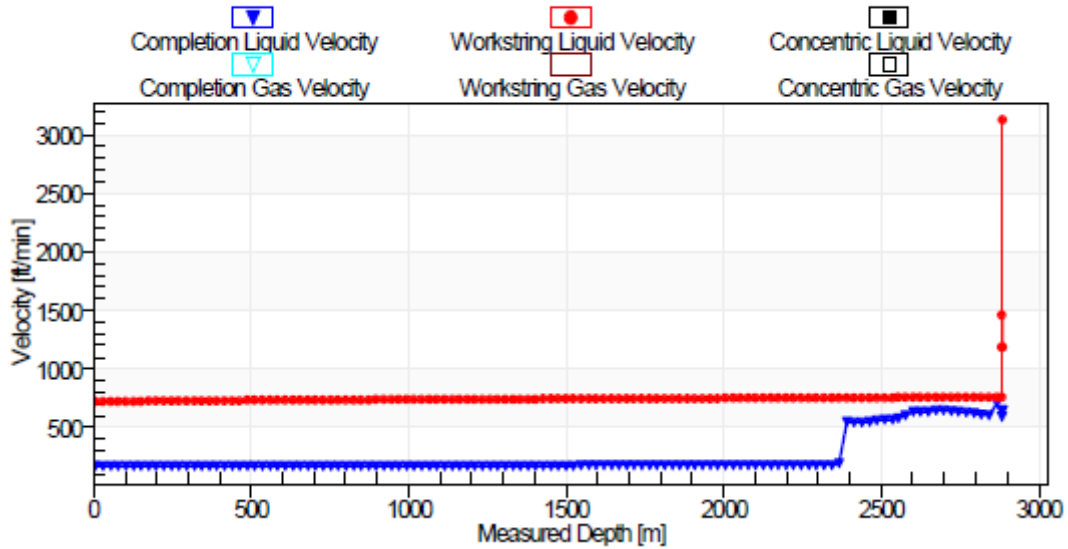
ZONE SHUT OFF

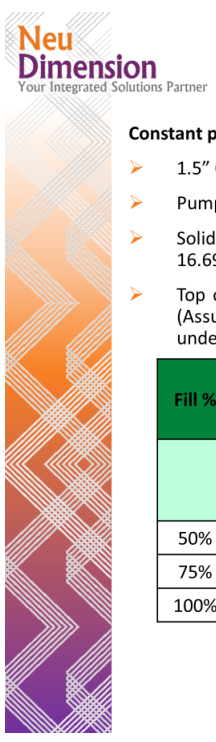
Tripping Speed to be used while Pulling Out of Hole C/Tran Analysis



In Situ Velocities along each Flow Path

Depth = 2884.9 m WHP = 1072 psi g Circulated Fluid: Water Circ Liquid = 1.10 Mm/min WS Lq Fric Mod=1.00 Circ Gas = 0 scfm/min Well Fluid: Not Perforated, No Production





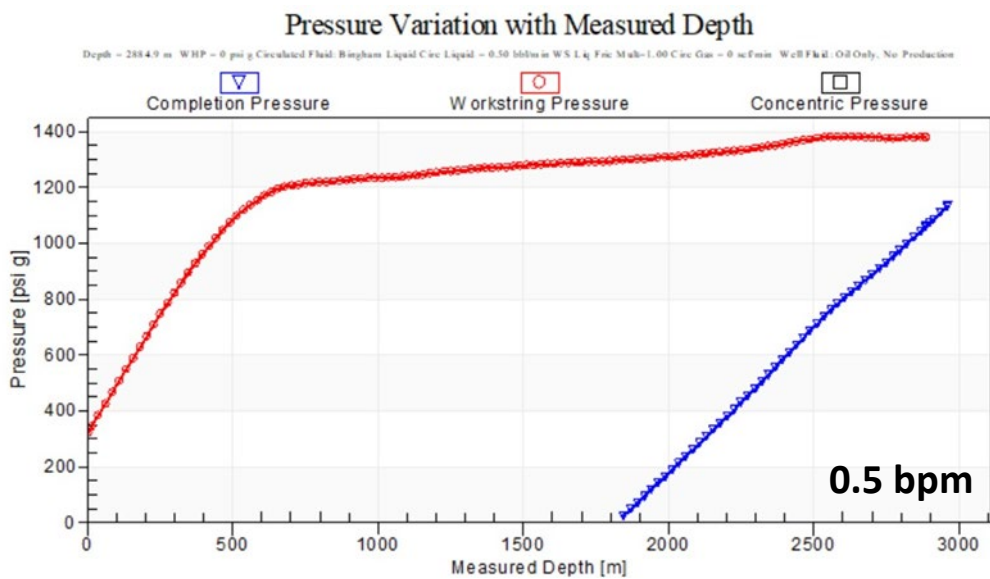
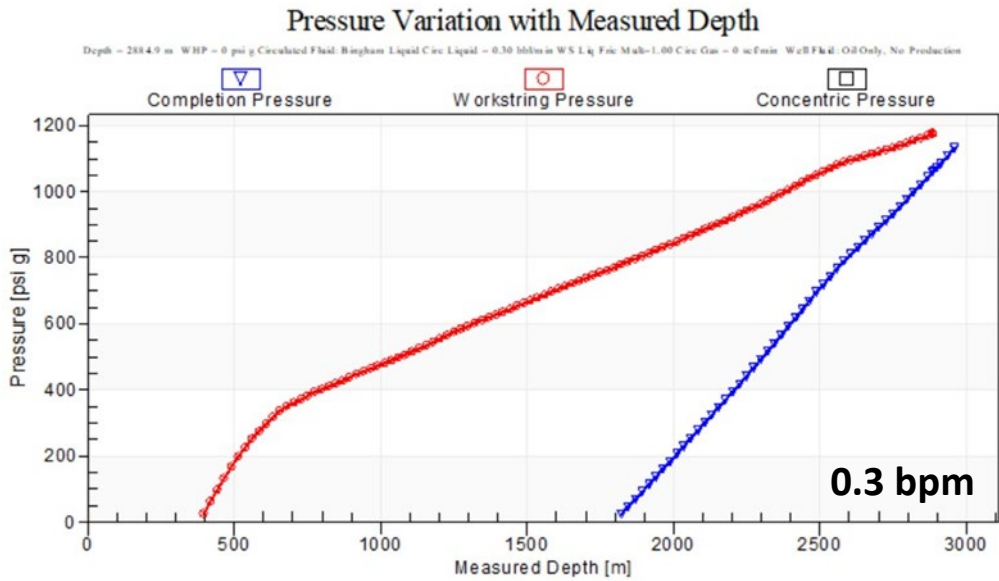
Sensitivity Analysis – Fill %

Constant parameter

- 1.5" CT String
- Pump Rate = 1.1 bpm
- Solid Type (Heaviest density 20/40 Bauxite proppant with 16.69 ppg)
- Top of fill= 2,535 m MDTHF, Bottom of fill= 2,885 m MDTHF (Assume 10 bbls of cement left on top of CR due to underdisplace)
- Penetration Rate: 10 ft/min
- Circulation Time: 1 hrs
- Wiper Trip Rate: 10 ft/min until surface

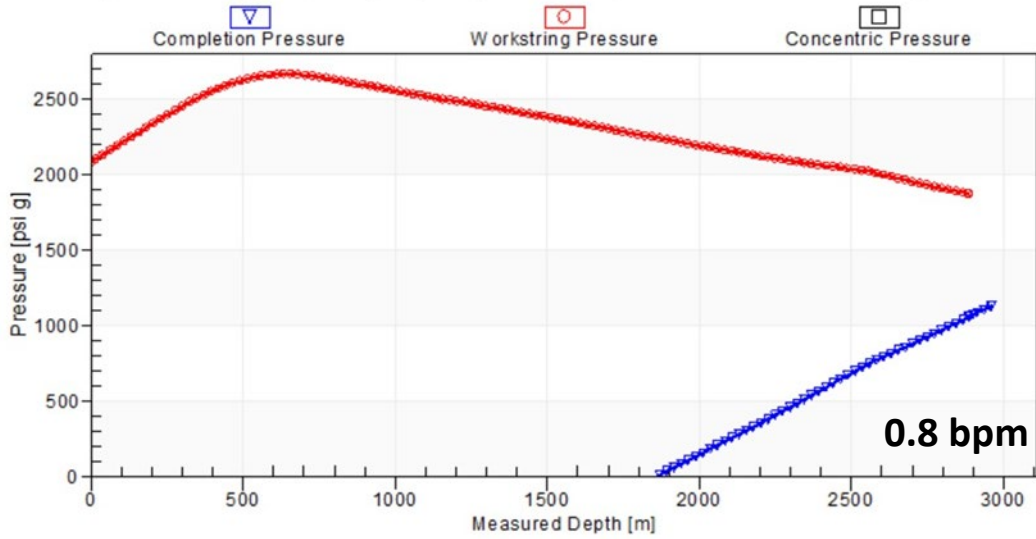
Fill %	Cleanout Time				Wiper Trip Depth (m)	Solid left in completion %	Remarks
	Penetration Hour	Circulation Hour	Wiper trip Hour	Total Hours			
50%	1.91	1	15.14	18.05	0	0	Able to cleanout
75%	1.91	1	15.17	18.08	0	0	Able to cleanout
100%	1.91	1	15.21	18.12	0	0	Able to cleanout

APPENDIX VII – CERBERUS CEMENT PUMPING SIMULATION



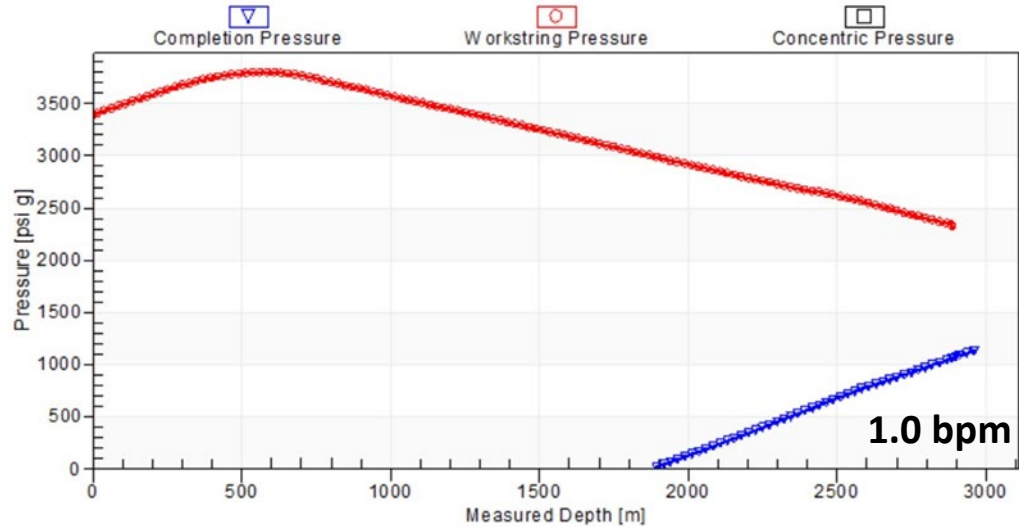
Pressure Variation with Measured Depth

Depth - 2884.9 m WHP - 0 psi g Circulated Fluid: Bingham Liquid Circ Liquid - 0.80 bbl/min WS Lq Fric Mult-1.00 Circ Gas - 0 scf/min Well Fluid: O2 Only, No Production



Pressure Variation with Measured Depth

Depth - 2884.9 m WHP - 0 psi g Circulated Fluid: Bingham Liquid Circ Liquid - 1.00 bbl/min WS Lq Fric Mult-1.00 Circ Gas - 0 scf/min Well Fluid: O2 Only, No Production



APPENDIX VIII – CEMENT LAB REPORT

Slurry Design

SLURRY: 48.274% Sea Water + 0.05 gal/sack FP-32L + 0.022 gal/sack ASA-304L + 0.55 gal/sack BA-58L + 0.45 gal/sack FL-70L + 0.12 gal/sack CD-38L + 0.13 gal/sack R-21LSG + 1%BWOC EC-4 + 12.25%BWOC S-8, Silica Flour + 100% Blast Furnace Slag-Cementing Process (BASE ONLY)

Type	Component	Concentration	Lot/Batch	Mixing Order/Source
Water	Sea Water	48.274 %	N/A	1. DULANG
Additive	FP-32L	0.05 gal/sack	IM23386 (ND)	2. LOADING
Additive	ASA-304L	0.022 gal/sack	102239762 (ND)	3. LOADING
Additive	BA-58L	0.55 gal/sack	LOT 216 (ND)	4. LOADING
Additive	FL-70L	0.45 gal/sack	LA07CQ880M	5. LOADING
Additive	CD-38L	0.12 gal/sack	IM 23334 (ND)	6. LOADING
Additive	R-21LSG	0.13 gal/sack	R21173G (ND)	7. LOADING
Additive	EC-4	1 %BWOC	IM23388	8. LOADING
Additive	S-8, Silica Flour	12.25 %BWOC	N/A	9. LOADING
Base	Blast Furnace Slag-Cementing Process (BASE ONLY)	100 %	SL24003 (ND)	9.1 LOADING


Slurry Properties	Fluid Loss Test	Free Fluid Test	SGS
Density: 15 ppg Yield: 1.369 ft ³ /sack Mix Water: 4.913 gal/sack Mix Fluid: 6.235 gal/sack	Test Temp: 228 °F Liq Vol(30min): 25 cc Cal API Fluid Loss (30min): 50 cc	Test Temp: 190 °F Free Fluid (2hr): 0 cc % Free Fluid: 0 % Deviation Angle: 45°	Time to 100lb/100ft ³ : 14:42 hh:mm Time to 500lb/100ft ³ : 14:51 hh:mm Time to 100-500lb/100ft ³ : 0:09 hh:mm

Rheology:		300 rpm	200 rpm	100 rpm	60 rpm	30 rpm	6 rpm	3 rpm	PV	YP	Gel Strength	
		10 sec	10 min									
@80.0 °F		137.0	100.0	59.5	39.0	23.5	7.0	5.0	133	9	5.0	9.0
@190.0 °F		92.0	70.0	45.0	30.0	20.0	9.0	6.5	86	10	6.0	13.0

Thickening Time:				40 bc		70 bc	100 bc	Mix Time
@228 °F				16:32 hh:mm		16:40 hh:mm	16:42 hh:mm	26 sec

Compressive Strength:									
Temp.	15:53 hh:mm	17:03 hh:mm					24 hours		
@228 °F	50 psi	500 psi					2168 PSI		

- Lab Notes**
1. Water temperature 81 degF
 2. Cement blend temperature 81 degF
 3. Mixing time 26 seconds @ <35 sec in 600ml blender.
 4. Yield calculation is based on 1 cuft of neat slag 87 lbs/sack.

DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		
	DULANG D-26L	ZONE SHUT OFF	

387988-001 | SLURRY

Profile:	Thickening Time	Description:	
Start	End	Time To	

Results:	Thickening Time	Analyst:	AZIZMOH
		Equipment:	N/A
	Test Temperature		228.0 °F
	Test Pressure		2200 psi
	40 Bc		16:32 hh:mm
	70 Bc		16:40 hh:mm
	100 Bc		16:42 hh:mm
	Mix Time - Seconds		28 sec
	Final Pressure		2200 PSI

387988-001 | SLURRY

Results:	Compressive Strength - Non Destructive	Analyst:	AZIZMOH
		Equipment:	N/A
	24 hr		2166 PSI
	Final Strength		2166 psi
	50 psi		15:53 hh:mm
	500 psi		17:03 hh:mm
	Final Time		24:08 hh:mm
	Test Temperature		228.0 °F
	Test Pressure		2200 PSI

387988-001 | SLURRY

Results:	Fluid Loss - Static Cell (Screw-in End Caps)	Analyst:	AZIZMOH
		Equipment:	N/A
	Liquid Volume		25.0 cc
	Test Time		30:00:00 mm:ss
	Test Temperature		228.0 °F
	API Fluids Loss Calculated		50.0 cc

DIMENSION BID

DIMENSION BID COILED TUBING SERVICES



DULANG D-26L

ZONE SHUT OFF

387988-001 | SLURRY

Results:	Free Fluid	Analyst:	AZIZMOH
		Equipment:	N/A
	Test Temperature		190.0 °F
	Deviation Angle		45°
	Sample Volume		250 cc
	Liquid Volume		0.0 cc
	% Free Fluid		0.0 %
	Channeling		NO
	Settling		NO


387988-001 | SLURRY

Results:	Static Gel Strength	Analyst:	AZIZMOH
		Equipment:	N/A
	Test Temperature		228 °F
	Test Pressure		2200 psi
	Time to reach 100 lb/100ft ²		14:42 hh:mm
	Time from 100 to 500 lb/100ft ²		0:09 hh:mm
	Time to reach 500 lb/100ft ²		14:51 hh:mm

387988-001 | SLURRY

Results:	Rheology - Temp 1	Analyst:	AZIZMOH
		Equipment:	
	Test Temperature		80.0 °F
	API PV		133 cP
	API YP		9 lbf/100ft ²
	10 sec Gel Strength		5.0 FDR
	10 min Gel Strength		9.0 FDR

RPM	300	200	100	60	30	6	3
Up	137.0	101.0	61.0	40.0	24.0	7.0	5.0
Dwn		99.0	58.0	38.0	23.0	7.0	5.0
Avg		100.0	59.5	39.0	23.5	7.0	5.0

DIMENSION BID	DIMENSION BID COILED TUBING SERVICES		
	DULANG D-26L	ZONE SHUT OFF	

387988-001 | SLURRY

Results:	Rheology - Temp 2	Analyst:	AZIZMOH
		Equipment:	
Test Temperature		190.0 °F	
API PV		88 cP	
API YP		10 lbf/100ft ²	
10 sec Gel Strength		6.0 FDR	
10 min Gel Strength		13.0 FDR	

RPM	300	200	100	60	30	6	3
Up	92.0	74.0	50.0	33.0	22.0	11.0	8.0
Dwn		66.0	40.0	27.0	18.0	7.0	5.0
Avg		70.0	45.0	30.0	20.0	9.0	6.5

LAB NOTES

1. Water temperature 81 degF
2. Cement blend temperature 81 degF
3. Mixing time 26 seconds @ <35 sec in 600ml blender.
4. Yield calculation is based on 1 cuft of neat slag 87 lbs/sack.
5. Mixing Sequences as per below :
 - i. FP-32L
 - ii. ASA-304L
 - iii. BA-58L
 - iv. FL-70L
 - v. CD-38L
 - vi. R-21LSG
 - vii. EC-4
 - viii. Blended Slag

EXPANSION TEST

DULANG D

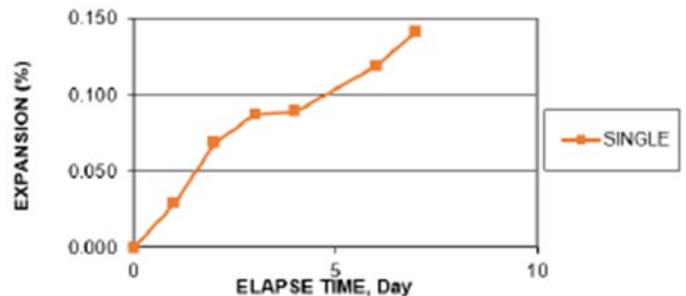
DESIGN : SLAGMENT + 12.25% S-8(BWOC) + 1% EC-4 (BWOC) + 0.05GPS FP-32L + 0.017 GPS ASA-304L + 0.55GPS BA-58L + 0.45GPS FL-70L + 0.18GPS CD-38L + 0.12GPS R-21LS @ 15.0PPG

Curing Temperature: 228 degF

Curing Pressure: 3000psi

SINGLE SLURRY

Day	Date	Reading (in)	Expansion (%)
0	31/3/2024	0.4476	0.000
1	1/4/2024	0.45070	0.028
2	2/4/2024	0.4516	0.068
3	3/4/2024	0.45365	0.087
4	4/4/2024	0.4538	0.088
6	6/4/2024	0.4571	0.118
7	7/4/2024	0.45965	0.141



DIMENSION BID

DIMENSION BID COILED TUBING SERVICES

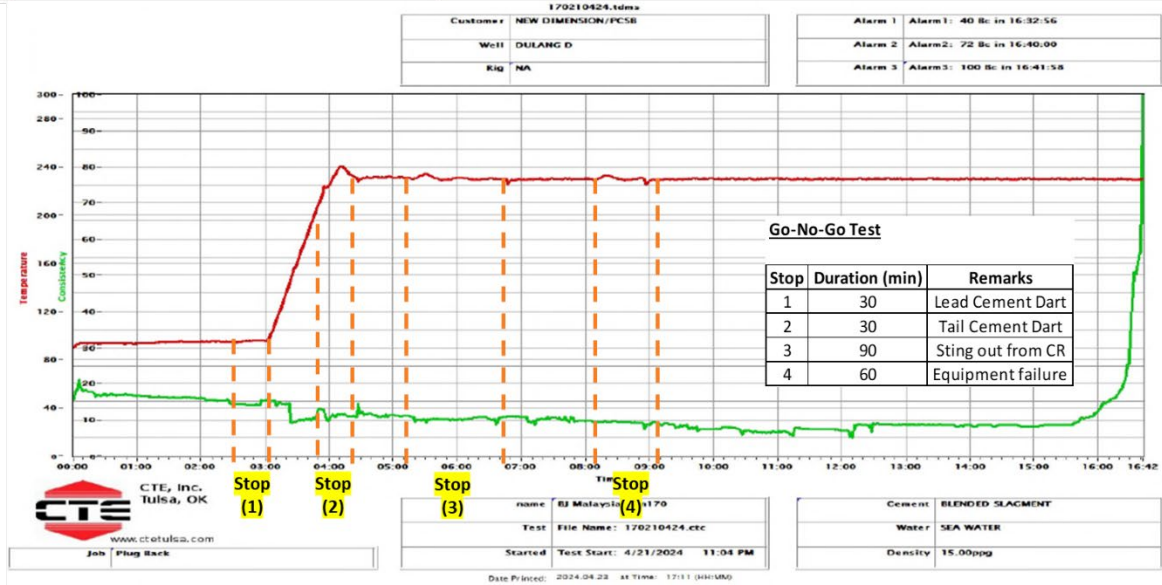


DULANG D-26L

ZONE SHUT OFF

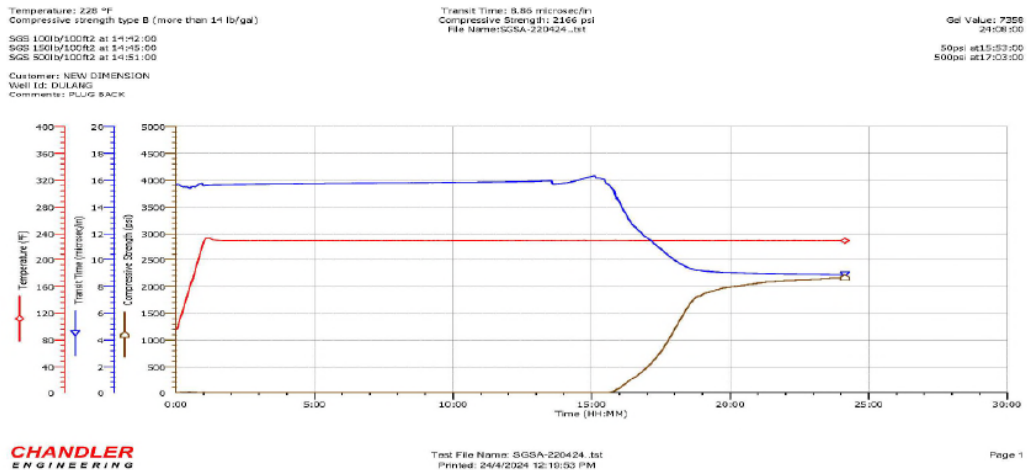
387987-001 | SLURRY

Profile: Thickening Time	Description:
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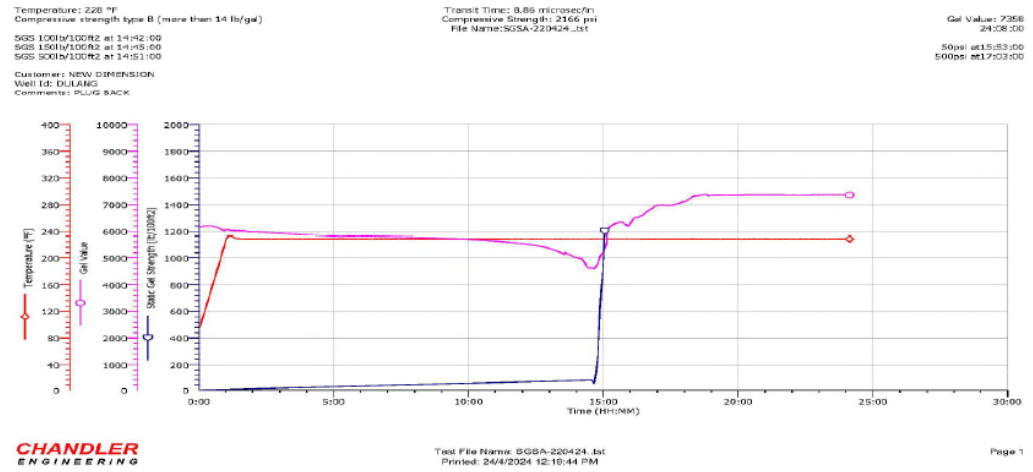
387988-001 | SLURRY

Profile: Compressive Strength - Non Destructive	Description:
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387988-001 | SLURRY

Profile: Static Gel Strength	Description:
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DISCUSSION

APPENDIX

ACRONYMS AND DEFINITIONS

- GG Geothermal Gradient
- WD Water Depth
- TVD True Vertical Depth
- MD Measured Depth
- BHST Bottom Hole Static Temperature

APPENDIX IX – DECISION TREE

