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**System/Building/Facility:**

200 General

**Major Assm. Dwg. No.:**

N/A

**Permit/Permit Application No.:**

N/A

**Required Response Date:**

N/A

**Signatures:**

- TD Jarecki, Originator
- J. S. Schofield, Authorized Representative for Receiving Organization
- J. S. Schofield, Signatory Manager

For more details, please refer to the document for the full text.
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This document was reviewed following the procedures described in WHC-CM-3-4 and is:

**APPROVED FOR PUBLIC RELEASE**

WHC Information Release Administration Specialist:

[Signature]

Kara M. Broz

April 26, 1995

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<td>This document gives instructions for the Operability Testing of the Rotary Mode Core Sampling (RMCS) System #3. This document is based on the Operability Test Procedure for RMCS system #2 because the basic design is the same for all three systems. Modifications have been made from the original design only when exact duplication was not feasible or design improvements could be incorporated without affecting the operation of the system.</td>
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DATE APR 26 1995

A-6400-073 (08/94) WEF124
OPERABILITY TEST PROCEDURE

for

ROTARY MODE CORE SAMPLING
SYSTEM 3

WHC-SD-WM-OTP-174, REV 0

AUTHORS

TR Parris, TD Jarecki

Characterization Plant Engineering

WESTINGHOUSE HANFORD COMPANY

APRIL, 1995

DISTRIBUTION OF THIS DOCUMENT IS UNLIMITED
ABSTRACT

This document gives instructions for the Operability Testing of the rotary mode core sampling system #3. This document is based on the Operability Test Procedure for RMCS system #2 because the basic design is the same for all three systems. Modifications have been made from the original design only when exact duplication was not feasible or design improvements could be incorporated without affecting the operation of the system.

TERMS AND DEFINITIONS

ATP - Acceptance Test Procedure
BAC - Breathing Air Compressor
CA - Change-out Assembly
COG - Core Sampling COgnizant Engineer
CPE - Characterization Plant Engineering
CW/CCW - ClockWise/Counter ClockWise
DS - Drill String
EDT - Electrical Distribution Trailer
FC - Flow Control
HBD - Hydraulic Bottom Detector
HH - Hydrostatic Head
OTP - Operability Test Procedure
OTR - Operability Test Report
PG - Purge Gas
PIC - Person In Charge
RLU - Remote Latch Unit
PGT - Purge Gas Trailer
QA - Quality Assurance
QR - Quill Rod
QRA - Quill Rod Adapter
RMCS - Rotary Mode Core SamPling
SEL - Safety Equipment List
SOV - Solenoid Operated Valve
SR - Shielded Receiver
TWRS - Tank Waste Remidiation System

Refer to the MAJOR EQUIPMENT LISTING on page 66 for a detailed description of the components associated with the sample truck.
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1.0 PURPOSE

The purpose of this Operability Test Procedure is to provide instructions for operability testing of the third core sampling system, associated components, and equipment used to drill and recover core samples from waste tanks. The procedure follows "Operability Test Procedures and Reports", contained in WHC-CM-6-1, "Standard Engineering Practices", EP-4.2, "Testing Requirements," Rev. 5.

2.0 SCOPE

Operability testing of the Rotary Mode Core Sampling System #3, will verify that functional and operational requirements have been met. Testing will be completed in two phases. The first phase of testing (section 7) will involve operating the truck equipment to demonstrate its capabilities. The second phase of testing (section 8) will take repeated samples in a simulated operation environment. These tests will be conducted at the "Rock Slinger" test site located just south of U-Plant in the 200 West Area.

Tests will be done in a simulated tank farm environment. All testing will be non-radioactive and stand-in materials shall be used to simulate waste tank conditions. Systems will be assembled and arranged in a manner similar to that expected in the field.
3.0 RESPONSIBILITIES

Safety, QA, Core Sampling Operations, Characterization Plant Engineering, and RMCS 3&4 Project Management shall approve of this procedure prior to its release. Responsibilities are identified as follows:

CPE Cognizant Engineer (Test Director)

Oberves testing to determine if equipment operates as designed. Notes exceptions to testing on "OTP Exception List". Resolves exceptions with concurrence of the assigned Quality Engineer. Prepares and releases OTR at conclusion of operability testing. Maintains configuration control during testing. Approves any changes to the OTP.

RMCS 3&4 Project Management

Reviews and approves test procedure and test report. Monitors testing to ensure tests are completed in a timely manner. Resolves any project related deficiencies.

Core Sampling Operations Management

Reviews and approves test procedure. Conducts safety meeting prior to test start. Monitors testing to extent approval may be given for satisfactory equipment performance and operator safety.

Core Sampling PIC

The PIC will be responsible for the assignment of personnel and directing the operation of the various systems. The PIC will control access to the test area in order to maintain a safe environment as well as an accurate simulation of personnel involved in these evolutions in the field. The PIC shall also aid the Cog engineer in maintaining configuration control. Any changes to the OTP in terms of operational steps or equipment configuration must be approved by the Cog engineer and the PIC in advance. The PIC shall conduct a pre-job safety meeting at the start of each shift during the performance of the OTP. The PIC will brief the personnel on testing to be performed that day and associated hazards.

Core Sampling Operators

Conduct testing according to this procedure. Notify Cognizant Engineer of concerns, exceptions and off-normal conditions during testing.

Quality Assurance

Reviews and approves test procedure to assure compliance with appropriate regulations. Resolves exceptions requiring quality verification jointly with CPE Cognizant Engineer.

Safety

Reviews and approves test procedure to assure compliance with applicable regulations. Monitors testing as appropriate.
4.0 INFORMATION

4.1 TEST GUIDANCE

Operability testing will be completed in two phases. Initial testing will confirm that the components are functional and operate over their expected range. Records for this portion of the testing will be documented in the supplied tables within the text of the procedure. The second phase of testing will involve collecting samples of differing consistencies using both push and rotary mode. The second phase of testing will follow a procedure which is similar to that currently used in the field. Portions of this procedure will be adapted and reused given the nature of the material being sampled. Pertinent operating parameters will be documented on separate "Test Sample Data Sheets" for each sample taken.

Initial instrument calibrations were conducted prior to Operability testing. Calibrations will not be reconfirmed for OTP testing as no advantage will be realized. Field validation of some Preventative maintenance and Calibration procedures may be conducted at the same time as the OTP. But, these validations will not be included as part of the formal OTP.

Discrepancies, deviations, or irregularities involving the test procedure and equipment performance are to be noted on the "OTP Exception / Resolution Data Sheet". These exceptions shall be jointly resolved between the Cognizant Engineer for CPE and the assigned Quality Assurance Representative. Project related OTP deficiencies shall be addressed by the CPE Cognizant Engineer with approval of the RMCS 3&4 Project Management. All resolutions to the exceptions must be agreed upon by the responsible personnel, documented on the exception list, and initialed.

No testing shall be done which directly involves faulty equipment. However, at the discretion of the CPE Cognizant Engineer and with approval of Core Sampling PIC, tests may proceed on equipment which is not affected by faulty equipment.

If, due to circumstances, modifications of the test procedures are warranted, written changes may be made with the concurrence of the CPE Cognizant Engineer, Core Sampling Operations Management, and Quality Assurance. Amendments shall be per instructions in WHC-CM-6-1, "Standard Engineering Practices", EP-4.2, "Testing Requirements," Rev. 5, Change 1.

4.2 REFERENCES

4.3 SAFETY ISSUES

To reduce the possibility of injury, all persons in the vicinity of the test equipment must be made aware of the following concerns:

(A Safety Awareness Session will be conducted daily at the test site prior to testing.)

**Warning** - Exercise caution concerning loose clothing and pinch points while working on or near rotating equipment.

**Warning** - Personal protective equipment should be used during testing, such as safety glasses, gloves, hearing protection and safety shoes, when appropriate.

**Warning** - At times, nitrogen gas will be supplied to the sample truck at high pressure. Breaking containment of a pressurized cavity will cause a rapid release of gas. All indicators must be observed so that each cavity is vented prior to being opened.

**Warning** - Nitrogen is stored in the PGT as a liquid. The nitrogen is stored at high pressure and extremely low temperatures (-320°F). Exposure at these conditions will freeze skin causing severe "burns".

**Warning** - Venting of the propane supply on the nitrogen trailer can occur unexpectedly. The vent line for the propane supply is the copper tubing on the right side of the trailer and the outlet is below and at the rear of the trailer. All flammability warnings posted on the nitrogen trailer must be observed.

**Warning** - If engines need fuel, refuel only when the engines are cool.

**Warning** - Stand clear of exhaust pipes on the test equipment.

**Warning** - The warning sirens on the sample truck are very loud.

**Note** - Under normal conditions, periodic venting of the nitrogen trailer will occur. Venting is automatic when excessive pressure builds in the nitrogen storage tank. The vent outlet is located near the right rear of the trailer on top of the enclosure.

4.4 RADIATION AND CONTAMINATION CONTROL

All testing will be non-radioactive and stand-in materials shall be used to simulate waste tank conditions.
4.5 QUALITY ASSURANCE

Quality Assurance shall approve of this Operability Test Procedure prior to its release. A Quality Control representative shall verify all steps requiring QC verification during testing.

4.6 SYSTEM ALARM ACTIVATION AND CANCELLATION

The sample truck is equipped with two alarm systems. The hydraulic bottom detector system prevents excessive downward force from being applied to the drill bit. The sequence of events to complete should an HBD alarm go off are described within the test procedure.

The second alarm system is computer controlled. The computer will warn the operator if conditions are not acceptable. Most of the alarms function in the same way, but because some alarms are more serious than others, the required operator response will vary. The alarms which are critical and require immediate operator action will be forced to occur during testing.

The 5 computer controlled alarm conditions are identified below:

1) NORMAL CONDITION - No lights on or flashing.
   - Continue as is.

2) UNACKNOWLEDGED ALARM - Warning light flashes fast.
   - Press ACKNOWLEDGE button.
   - Make appropriate adjustment.
   - Press RESET button.

3) ACKNOWLEDGED ALARM - Warning light stays on.
   - Unacceptable condition is still present.
   - Make appropriate adjustment.
   - Press RESET button.

4) ALARM NORMALIZED - Warning light flashes slow.
   - Unacceptable condition is gone.
   - Press RESET button.

5) FULL ALARM - Siren and Strobe both go off.
   - Unacceptable condition exists for a critical parameter.
   - Press ACKNOWLEDGE to silence horn and strobe.
   - Correct problem or truck may shut down.
   - Press RESET when condition 4 exists.
5.0 RECORDS

Pertinent operating conditions will be documented where requested in this OTP. Records for the testing of equipment, (section 7), will be recorded in the tables supplied within the procedure. The operator, (and other test personnel requested to do so), will initial in the space provided in the left-hand margin upon satisfactory completion of designated tasks.

Information whose acceptance condition is designated as "For Record Only" may vary. This information may be subject to the situation at hand therefore, it is left to the equipment operator and cognizant engineer and PIC to determine whether the equipment operates acceptably.

Operating parameters for the sample collection phase of testing, (section 8), will be recorded on a separate "Test Sample Data Sheet" for each sample. All data recorded on the data sheet is designated "For Record Only".

The CPE Cognizant Engineer shall prepare and release an Operability Test Report at the conclusion of OTP testing.
6.0 PREREQUISITES

6.1 SUPPLIES

- Rotary Mode Core Sample Truck
- Rotary Mode Core Sample Exhauster
- Purge Gas Trailer
- Portable Electric Generator
- Breathing Air Compressor
- Electrical Distribution Trailer
- Portable Nitrogen Heater
- Nitrogen Chiller Trailer
- Sample Cask Transport Truck
- Support Truck with Water Barrel, Heater and Pump
- Cask Stand
- Transport Casks with Liners
- Hand Levels
- Tape Measure
- Cask Adapters and Cap
- PVC sleeves
- Drill Rod
- Core Barrel and Rotary Drill Bit
- Riser Equipment and Gaskets
- Pneumatic Foot Clamp with Controls
- Pull Rod Container
- (50) Universal Samplers
- Cable Spray Washer and Cap
- Drill String Wrenches
- Plastic Sheeting, Sleeving and Bags
- Rubber Matting
- Kraft Paper
- Permanent Ink Fine Point Marker
- Quill Rod and Drill String Kamlok Adapters and Caps
- Jack Locks
- Cable Washer and Pump System
- Proper Waste Receptacles
- Waste simulants

6.2 PROCEDURES

TO-060-345, Liquid Nitrogen Support Trailer and Indeeco Nitrogen Heater Operations.
TO-020-900, Onan 150DGFA Generator Set Operation
TO-020-056, Operate the Aeroflow Model 2AN137 Breathing Air Compressor
TO-080-090, Load/Transport the onsite Transfer Cask
WHC-SD-WM-OTP-176, Operability Test Procedure for RMCS Exhausters 3 and 4

6.3 CONDITIONS

The Job Hazard Analysis must be complete prior to testing.
Daily Pre-job meeting
7.0 TEST PROCEDURE (EQUIPMENT)

Refer to following figures for the location of the system controls addressed within the remainder of this document.

Figure 1) System Controls and Alarms (Passenger Side).
Figure 2) System Controls and Alarms (Driver Side). Note: Drawing is of system 2, an accurate drawing for systems 3&4 is not available and Minor difference from systems 3 and 4 exist.
7.1 EQUIPMENT IDENTIFICATION

7.1.1 PIC or Cog Engineer, RECORD the identification numbers for the major components to be tested with this procedure in the below table.

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>IDENTIFICATION NUMBER</th>
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<tr>
<td>Core sample Truck (CST)</td>
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</tr>
<tr>
<td>Exhauster</td>
<td></td>
</tr>
<tr>
<td>PGT</td>
<td></td>
</tr>
<tr>
<td>Breathing Air Compressor</td>
<td></td>
</tr>
<tr>
<td>Portable Nitrogen Chiller <strong>SEE SECTION 7.6.11</strong></td>
<td></td>
</tr>
<tr>
<td>Portable Generator</td>
<td></td>
</tr>
<tr>
<td>Electrical Distribution Trailer</td>
<td></td>
</tr>
<tr>
<td>Crew Support Trailer</td>
<td></td>
</tr>
<tr>
<td>Support Truck</td>
<td></td>
</tr>
<tr>
<td>Cask Truck</td>
<td></td>
</tr>
</tbody>
</table>
7.2 ENGINE / AIR / HYDRAULIC / RELATED TESTING

7.2.1 POSITION the generator, electrical distribution trailer (EDT), nitrogen supply trailer and core sample truck in a convenient location to allow testing.

7.2.2 VERIFY that the sample truck engine operates acceptably (not drill engine).

7.2.3 VERIFY that the sample truck backup alarm functions.

7.2.4 CONNECT the EDT to the generator using the cable reel on the EDT.

7.2.5 CONNECT the 120/240 volt power cable to the sample truck from the EDT. The receptacle is on the driver’s side of the truck, near the ladder on the stationary platform.

7.2.6 CONNECT the breathing air compressor to EDT with the 480 volt power cable located on the EDT.

7.2.7 CONNECT the air compressor to the EDT. The air compressor is attached to the core sample truck frame on the passenger side beneath the rotating platform.

7.2.8 CONNECT the service trailer to the EDT with the cable located on the EDT.

7.2.9 CONNECT the PGT to the generator with an 120V cable. There is no cable reel for this connection.

7.2.10 CONNECT the electrical grounding wires from the generator and EDT to an acceptable ground.

7.2.11 OPERATE the generator as required throughout testing. (See operating procedure).

7.2.12 ACTIVATE all breakers on the INSTRUMENT CORE SAMPLER POWER panel, (see Figure 3 and Figure 4 below), of the control console.

NOTE: Whenever truck electronics are powered up, a 20 min warm up period is required prior to operation.

![Figure 3) Instrument Core Sampler Power](image-url)
CONTROL CONSOLE

<table>
<thead>
<tr>
<th>Panel</th>
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<tbody>
<tr>
<td>VENT PANEL</td>
</tr>
<tr>
<td>LOADCELL READOUT</td>
</tr>
<tr>
<td>DISPLAY PANEL</td>
</tr>
<tr>
<td>ENCODER ASSY</td>
</tr>
<tr>
<td>LATCHING CONTROL</td>
</tr>
<tr>
<td>MOTOR CONTROL</td>
</tr>
<tr>
<td>HYDRAULIC CONTROLS</td>
</tr>
<tr>
<td>SAMPLE ACTUATOR</td>
</tr>
<tr>
<td>BLOWER PANEL</td>
</tr>
<tr>
<td>INSTRUMENT CORE SAMPLE</td>
</tr>
<tr>
<td>PANEL</td>
</tr>
</tbody>
</table>

Figure 4) Control Console Panels.

7.2.13
TURN ON the power to the shielded receiver ENCODER ASSEMBLY, LATCHING CONTROL, and MOTOR CONTROL panels.

7.2.14 TEST the air compressor as directed below:

7.2.14.1 TURN the air compressor ON and allow it to run until it automatically shuts off.

7.2.14.2 RECORD the maximum tank pressure in the table below.

7.2.14.3 BLEED air from the tank until the compressor turns ON, then RECORD the minimum tank pressure below.

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Condition</th>
<th>Value</th>
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<tr>
<td>Maximum Supply Pressure</td>
<td>90 psig ± 10 psig</td>
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</tr>
<tr>
<td>Minimum Supply Pressure</td>
<td>70 psig ± 10 psig</td>
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</tr>
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7.2.15 Refer to Figure 5 on page 14, then START and TEST the drill rig engine as directed below (operate the drill engine as required throughout testing):

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>VALUE</th>
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<tbody>
<tr>
<td>Drill Engine Water Temperature (0~250 °F)</td>
<td>For Record Only</td>
</tr>
<tr>
<td>Drill Engine Oil Pressure (0~100 psig)</td>
<td>For Record Only</td>
</tr>
<tr>
<td>Alternator Current (-60~+60 amps)</td>
<td>For Record Only</td>
</tr>
<tr>
<td>Hydraulic Supply Pressure (0~3000 psig)</td>
<td>For Record Only</td>
</tr>
<tr>
<td>Drill Engine Hours (Hobbs gage)</td>
<td>See note below.</td>
</tr>
<tr>
<td>Wash Water Operating Temperature</td>
<td>130 ± 5 °F</td>
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</table>

NOTE: There are two hour meters on the drill engine. The Hobbs gage records actual run time for the engine. The hour meter on the tachometer records the time the key is turned on. They may differ. The desired reading is the Hobbs gage.

7.2.16 TURN ON the wash water barrel heaters. RECORD the operating temperature of the wash water in the table above when convenient to do so, then TURN OFF the wash water heaters.
Figure 5) Longyear Controls and Gages. Note: Drawing is of system 2, an accurate drawing for systems 3&4 is not available and Minor difference from systems 3 and 4 exist.
7.3 TRUCK LIFTING / DRILL RIG MANEUVERING / ROTATION

The sample truck is raised by three (3) hydraulic rams located at both ends of the truck and is leveled using portable hand levels. Two additional rams, located on each side of the truck are used to stabilize the truck during platform rotation. The hydraulic controls associated with leveling are the 4-way manual control valve and the turn valves which control flow to each of the jacks (see Figure 6 below).

![HYDRAULIC JACKS Diagram](image)

Figure 6) Leveling Controls.

NOTE - The center jacks are used for stabilization of the truck and are not designed to withstand heavy loads. Lower these jacks after lowering the front and rear lifting jacks. When leveling the truck, lower the rams slowly so that the truck is lifted uniformly.

OPICE ///// 7.3.1 PLACE the 4-way control valve in the FLOAT position. (See Figure 5)

OPICE ///// 7.3.2 CONNECT the hydraulic leveling hoses from the main reservoir to the leveling system. The hoses are stored and coupled near the right rear leveling ram.

OPICE ///// 7.3.3 PLACE the 4-way control valve in the RAISE position. (See Figure 5)

OPICE ///// 7.3.4 LOWER the front and rear lifting jacks to the ground using the control valves. (See Figure 6)

OPICE ///// 7.3.5 RAISE the truck by fully extending the leveling rams.

OPICE ///// 7.3.6 ENSURE that the HYDRAULIC JACK control valves are closed. (See Figure 6)

OPICE ///// 7.3.7 PLACE the 4-way control valve in the LOWER position. (See Figure 5)

OPICE ///// 7.3.8 LOWER and LEVEL the truck as low as is practical.

OPICE ///// 7.3.9 LOWER the two side stabilizer jacks to the ground.

OPICE ///// 7.3.10 INSTALL the jack locks on each jack.

OPICE ///// 7.3.11 PLACE the 4-way control valve in the FLOAT position. (See Figure 5)

OPICE ///// 7.3.12 DISCONNECT and STORE the hydraulic leveling hoses.
Figure 7) Hydraulic Positioning Controls

Figure 8) Pendant Controls and Control Select Panel
The platform was designed with 400° rotation capability as in Figure 9 below.

Figure 9) Platform Rotation from Home Position.

NOTE - When practical, the drill rig and **SR should be in the up position** and traversely centered before making any rotation.

NOTE - For the below steps (7.3.13 to 7.3.21), when testing the pendant or control console Hydraulic controls, if the control being tested is not selected on the Control Select Panel, the correct response is no movement.

**OPICE____/____ 7.3.13** VERIFY the SLOW ROTATION mode for both the console and pendant in both the CW and CCW directions. Rotation should automatically stop at the limits.

<table>
<thead>
<tr>
<th>MODE SELECTED ON CONTROL SELECT PANEL</th>
<th>Condition</th>
<th>PENDANT CW ROTATION</th>
<th>PENDANT CCW ROTATION</th>
<th>CONSOLE CW ROTATION</th>
<th>CONSOLE CCW ROTATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Console Control</td>
<td>OK/BAD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pendant Control</td>
<td>OK/BAD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**OPICE____/____ 7.3.14** VERIFY the FAST ROTATION mode for both the console and pendant in both the CW and CCW directions. Rotation should automatically stop at the limits.

<table>
<thead>
<tr>
<th>MODE SELECTED ON CONTROL SELECT PANEL</th>
<th>Condition</th>
<th>CONSOLE CW ROTATION</th>
<th>CONSOLE CCW ROTATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Console Control</td>
<td>OK/BAD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pendant Control</td>
<td>OK/BAD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Second Time Delay</td>
<td>OK/BAD</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Audible alarm</td>
<td>OK/BAD</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**OPERATION 7.3.15**

**ROTATE** the platform so that the SR is at the rear of the truck.

**OPERATION 7.3.16**

**HOLD** the console TRAVERSE switch to FORWARD to fully extend the SR then **RETRACT**. (SR should extend 18 inches beyond the platform edge) Also **VERIFY** operation of the pendant TRAVERSE controls.

<table>
<thead>
<tr>
<th>MODE SELECTED ON CONTROL SELECT PANEL</th>
<th>Condition</th>
<th>PENDANT TRAVERSE IN</th>
<th>PENDANT TRAVERSE OUT</th>
<th>CONSOLE TRAVERSE IN</th>
<th>CONSOLE TRAVERSE OUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Console Control</td>
<td>OK/BAD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pendant Control</td>
<td>OK/BAD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**OPERATION 7.3.17**

**EXTEND** the SR over the edge of the platform. **TEST** the SR UP/DOWN functions on the control panel and pendant.

<table>
<thead>
<tr>
<th>MODE SELECTED ON CONTROL SELECT PANEL</th>
<th>Condition</th>
<th>PENDANT RECEIVER UP</th>
<th>PENDANT RECEIVER DOWN</th>
<th>CONSOLE RECEIVER UP</th>
<th>CONSOLE RECEIVER DOWN</th>
</tr>
</thead>
<tbody>
<tr>
<td>Console Control</td>
<td>OK/BAD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pendant Control</td>
<td>OK/BAD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**OPERATION 7.3.18**

**ROTATE** the platform to position the drill rig to the rear.

**OPERATION 7.3.19**

Verify SR is in the up position.

**OPERATION 7.3.20**

**TEST** the slew function for both console and pendant controls. (The drill should slide about 4 inches from center each way.)

<table>
<thead>
<tr>
<th>MODE SELECTED ON CONTROL SELECT PANEL</th>
<th>Condition</th>
<th>PENDANT SLEW RIGHT</th>
<th>PENDANT SLEW LEFT</th>
<th>CONSOLE SLEW RIGHT</th>
<th>CONSOLE SLEW LEFT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Console Control</td>
<td>OK/BAD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pendant Control</td>
<td>OK/BAD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**OPICE 7.3.21**

**HOLD** the console TRAVERSE switch in the REVERSE position to extend the drill rig then **RETRACT**. (The drill rig should extend 18 inches) Also **VERIFY** operation of the pendant TRAVERSE controls.

<table>
<thead>
<tr>
<th>MODE SELECTED ON CONTROL SELECT PANEL</th>
<th>Condition</th>
<th>PENDANT TRAVERSE IN</th>
<th>PENDANT TRAVERSE OUT</th>
<th>CONSOLE TRAVERSE IN</th>
<th>CONSOLE TRAVERSE OUT</th>
</tr>
</thead>
<tbody>
<tr>
<td>Console Control</td>
<td>OK/BAD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pendant Control</td>
<td>OK/BAD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**WARNING:** Do not open the chuck while it is rotating nor start rotation while the chuck is open. Keep the chuck closed except when connecting to or from the drill string.

**NOTE -** Since purge gas flow is required for extended rotation, either temporarily use purge gas or **ACKNOWLEDGE** and **RESET** the alarm as it sounds.

**OPICE 7.3.22**

**ENSURE** that the chuck is CLOSED. **PLACE** the transmission in gear, **ENGAGE** the clutch, and the drill should rotate.

**OPICE 7.3.23**

**ADJUST** engine speed to idle (minimum) and **RECORD** in table below. **ADJUST** engine speed to maximum RPM. **RECORD** drill string RPM in table below.

**OPICE 7.3.24**

**REPEAT** steps 7.3.22 and 7.3.23 for all gears. IF gear has been physically locked-out note in table in place or RPM value.

**OPICE 7.3.25**

**ENSURE** that the chuck is CLOSED. **PLACE** the transmission in gear, **ENGAGE** the clutch, and the drill should rotate.

<table>
<thead>
<tr>
<th>GEAR</th>
<th>RPM at idle</th>
<th>RPM at maximum throttle</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>High Range</td>
<td>Low Range</td>
</tr>
<tr>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
</tr>
<tr>
<td>REVERSE</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**OPICE 7.3.26**

**DISENGAGE** the clutch.
7.4 SAMPLE ACTUATOR / HBD (HYDRAULIC BOTTOM DETECTOR)

7.4.1 POSITION the platform to allow actuator testing.

7.4.2 PLACE the mode switch to GRAPPLE LOWER and HOLD the HOIST switch in the DOWN position to lower the grapple through the quill rod adapter.

7.4.3 TEST the hoist speed control at various settings, then SET a moderate hoist speed for further testing.

7.4.4 PLACE the grapple mode switch to GRAPPLE LOWER, then HOLD the HOIST switch in the DOWN position to lower the grapple until slack in the cable automatically stops the hoist motor.

7.4.5 REMOVE the slack by placing the mode switch to SAMPLING POSITION and holding the HOIST switch to UP until the hoist stops when slack is removed.

7.4.6 PLACE the grapple mode switch to GRAPPLE LOWER then HOLD the HOIST switch to UP to raise the grapple into the quill rod.

7.4.7 INSERT a pintle rod into the grapple.

7.4.8 HOLD the HOIST switch in the UP position to raise the grapple until the pre-pintle release switch stops the hoist.

Figure 10) Drill Rig Actuator Controls

NOTE: This figure is for information only. The configuration of the actual controls is slightly different.
CAUTION: Downward movement of the ram, while the grapple is in the UP position, can destroy the actuator system if the hydraulic interlock does not function properly. **DO NOT** lower the rams if the **HYDRAULIC INTERLOCK** light turns ON.

OPICE____ 7.4.9 **VERIFY** that the **HYDRAULIC INTERLOCK** light is ON.

OPICE____ 7.4.10 **HOLD** the pintle release switch to the **UP LIMIT BYPASS** position and the **HOIST** switch to UP until the pintle rod releases.

OPICE____ 7.4.11 **DEPRESS** the **DOWN BYPASS** button then **HOLD** the **HOIST** switch to DOWN to lower the grapple until the **HYDRAULIC INTERLOCK** light goes out.

**Figure 11** Video Graphic Recorder and HBD Instrumentation Controls
TEST the HBD (see Figure 12) as directed below:

NOTE - On the final sample, when the full ram stroke is complete or should the drill bit contact the bottom of the tank, the HBD alarm will go off and flow to the rams will automatically be reversed; thus separating the drill bit from the bottom of the tank.

![HYDRAULIC BOTTOM DETECTOR ALARM PANEL]

Figure 12) Hydraulic Bottom Detector Controls.

7.4.12.1 POSITION a clean empty drum beneath the drill head for testing.

7.4.12.2 PLACE the 4-way valve in the HEAD position.

7.4.12.3 ENSURE that the DOWN hydraulic control valve is CLOSED.

7.4.12.4 OPEN the UP ram control about 1/3 of a turn.

NOTE - Set the set point pressure about 20% below the lower ram pressure of the previous segment. For this test the previous segment will be that indicated while moving through air. The alarm set point pressure will be shown on channel 11 of the recorder and will be displayed on the LOWER RAM PRESSURE readout in the instrumentation enclosure.

7.4.12.5 TURN the LOWER RAM PRESSURE/SET POINT switch on the instrumentation enclosure to SET POINT, then ADJUST the LOWER RAM PRESSURE SET POINT dial as directed by the PIC/COG.

7.4.12.6 RECORD the set point pressure, as indicated on the LOWER RAM PRESSURE/SET POINT readout, in the table below.

7.4.12.7 PUSH and HOLD the START BYPASS button on the HBD Panel.(see Figure 12)

7.4.12.8 PLACE the 4-way control valve in the LOWER position.

7.4.12.9 When the UP and DOWN ram gage pressures stabilize, TURN the HBD DRILL key ON then RELEASE the START BYPASS button.(see Figure 12)
7.4.12.10 TURN the LOWER RAM PRESSURE/SET POINT switch to PRESSURE.

7.4.12.11 LOWER the drill head until the alarms activate as the pressure is reached. (SEE Figure 11, Figure 12)

7.4.12.12 TURN the HORN knob to SILENCE (see Figure 12) to quiet the siren, POSITION the 4-way valve to FLOAT to stop the rams, and ROTATE the DRILL key on the HBD panel to OFF to stop the strobe and disable the HBD.

7.4.12.13 DOCUMENT, in the table below, whether the HBD alarms activate at the recorded pressure or not.

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>CONDITION</th>
<th>TRIAL 1</th>
<th>TRAIL 2</th>
<th>TRAIL 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>HBD Set Point Pressure</td>
<td>psig</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HBD Horn &amp; Strobe Activation</td>
<td>OK/BAD</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

7.4.12.14 RETURN to step 7.4.12 and REPEAT process at two additional set point pressures.
7.5 SHIELDED RECEIVER / REMOTE LATCH UNIT

7.5.1 ROTATE the platform to allow RLU testing.

NOTE: Refer to Figure 12 and Figure 14 for the RLU controls addressed below.

Figure 13) Shielded Receiver Hoist Motor Panel.

Figure 14) Encoder Panel.
7.5.2 **PERFORM** the following steps to test the load cell:

- **OPICE**  ______
  - **7.5.2.1** LOWER the RLU through the SR.
- **OPICE**  ______
  - **7.5.2.2** RECORD the load-cell weight in the table below.
- **OPICE**  ______
  - **7.5.2.3** ATTACH an empty sampler to the RLU.
- **OPICE**  ______
  - **7.5.2.4** RECORD the load-cell weight in the table below.
- **OPICE**  ______
  - **7.5.2.5** CALCULATE and RECORD below the sampler weight.

### Table: Load Condition and Expected Weight

<table>
<thead>
<tr>
<th>Loading</th>
<th>Condition</th>
<th>Load-Cell Weight</th>
<th>Expected Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>RLU + Sampler Weight</td>
<td>For Record Only</td>
<td></td>
<td>55 lbs.</td>
</tr>
<tr>
<td>RLU Weight</td>
<td>For Record Only</td>
<td></td>
<td>45 lbs.</td>
</tr>
<tr>
<td>Sampler Weight</td>
<td>For Record Only</td>
<td></td>
<td>10 lbs.</td>
</tr>
</tbody>
</table>

7.5.3 **TEST** the latch unit (see Figure 15) as directed below:

- **OPICE**  ______
  - **7.5.3.1** RAISE the RLU and sampler into the SR, then ATTACH a core barrel and drill bit to the SR.

![Latching Control Diagram](image)

*Figure 15) Shielded Receiver RLU Controls.*

- **OPICE**  ______
  - **7.5.3.2** LOWER the sampler into the core barrel.
- **OPICE**  ______
  - **7.5.3.3** PRESS and RELEASE the START button on the latch panel.
- **OPICE**  ______
  - **7.5.3.4** VERIFY that the MOTOR ON light comes ON.
- **OPICE**  ______
  - **7.5.3.5** After about 1 minute 45 seconds, VERIFY that the OPEN light remains ON and the MOTOR ON light turns OFF.
- **OPICE**  ______
  - **7.5.3.6** RAISE the RLU into the sight glass and VERIFY that the sampler is not attached.
- **OPICE**  ______
  - **7.5.3.7** PRESS and RELEASE the START button on the latch panel.
7.5.3.8 Verify that the MOTOR ON light comes ON.

7.5.3.9 After about 1 minute 45 seconds, verify that the CLOSED light remains ON and the MOTOR ON light turns OFF.

7.5.3.10 Lower the RLU to pick up the sampler.

7.5.3.11 Raise the sampler about 1 foot, then remove the core barrel and sampler.

7.5.3.12 Raise the RLU into the SR.

7.5.4 Test the SR cable counters as directed below:

Note - Testing of the SR cable counters should only be done where the RLU can be kept clean and where a continuous load can be applied to the SR cable.

7.5.4.1 Set the SR hoist motor speed at 100.

7.5.4.2 Lower the RLU until it is below the SR.

7.5.4.3 Attach a 50 foot tape measure to the RLU.

7.5.4.4 Record in the table below, the initial mechanical and digital values and the initial tape value at a reference on the SR.

7.5.4.5 Discharge about 20 feet of cable.

7.5.4.6 Record below, the final mechanical and digital cable counter values and the final cable measurement at the same reference, then compute the difference for each.

7.5.4.7 Raise the RLU to the SR, then remove the tape measure.

7.5.4.8 Raise the RLU into the SR.

<table>
<thead>
<tr>
<th>DESCRIPTION</th>
<th>CONDITION</th>
<th>Tape Measure</th>
<th>Encoder</th>
<th>Mechanical</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final Value</td>
<td>For Record Only</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Initial Value</td>
<td>For Record Only</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Difference</td>
<td>For Record Only</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
7.6 NITROGEN SUPPLY SYSTEM

Refer to Figure 16, Figure 17, and Figure 18 to identify the instrumentation displays and controls and the purge gas controls referenced throughout the remainder of this test procedure.

Figure 16) Instrumentation Display Panel.
Figure 17 Video Graphic Recorder and HBD Instrumentation Controls

Figure 18 Purge Gas Controls.
7.6.1 CONNECT the nitrogen supply line from the PGT to the sample truck. The receptacle on the truck is located below the platform by the driver's door.

7.6.2 CONNECT the VENT TO TANK line to an acceptable vent device.

7.6.3 FOLLOW the operating procedures to set up and start the PGT systems.

7.6.4 TEST the hydrostatic head system as directed below:

7.6.4.1 VERIFY that the DS and SR pressure regulators are set to 35 ± 2.5 psi.

7.6.4.2 CONNECT the sampler CA, cable spray washer and core barrel with sampler and bit to the SR.

7.6.4.3 CLOSE the isolation valve on the sampler CA and SR ball valve.

7.6.4.4 VERIFY that the green DS PRESSURE (DS VENTED light) indicators are ON.

7.6.4.5 CONNECT the SUPPLY DRILL STRING line from the right rear of the truck to the sampler CA.

7.6.4.6 SUBMERGE the bit in 1 to 2 feet of water.

7.6.4.7 VERIFY that the DRILL STRING FLOW control is CLOSED.

7.6.4.8 PLACE the purge gas MODE switch to SAMPLE REC and the DS GAS switch in the ON position.

7.6.4.9 OPEN the DS FLOW control to establish minimum flow (about 0.3 scfm) flow through the DS.

7.6.4.10 VERIFY that the SR flow control is CLOSED.

7.6.4.11 POSITION the SR GAS switch to ON.

7.6.4.12 OPEN the SR FLOW control valve. As the SR PRESSURE approaches the DS pressure, REDUCE the SR flow to a minimum (about 0.3 scfm).

7.6.4.13 With the SR ball valve and isolation valve closed, RECORD the SR and DS pressures, green light status in the table below.

7.6.4.14 OPEN the sampler CA isolation valve and SR ball valve.

7.6.4.15 With the valves open, RECORD the SR and DS pressures and green light status in the table below.

7.6.4.16 RAISE the sampler from the core barrel into the SR using the RLU.

7.6.4.17 RECORD the SR and DS pressures and green light status in the table below.

7.6.4.18 CLOSE the sampler CA isolation valve.
STOP flow to the SR by placing the SR GAS FLOW switch to the OFF position.

When the green SR PRESSURE (SR VENTED) indicators turn ON, CLOSE the SR flow control.

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>CONDITION</th>
<th>Pressure (psi)</th>
<th>Green Lights (ON/OFF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.6.4.13 VALVES CLOSED</td>
<td>DS</td>
<td>For Record Only</td>
<td>SR end</td>
</tr>
<tr>
<td></td>
<td>SR</td>
<td>For Record Only</td>
<td>N/A</td>
</tr>
<tr>
<td>7.6.4.15 VALVES OPEN</td>
<td>DS</td>
<td>For Record Only</td>
<td>SR end</td>
</tr>
<tr>
<td></td>
<td>SR</td>
<td>For Record Only</td>
<td>N/A</td>
</tr>
<tr>
<td>7.6.4.17 SAMPLER OUT</td>
<td>DS</td>
<td>For Record Only</td>
<td>SR end</td>
</tr>
<tr>
<td></td>
<td>SR</td>
<td>For Record Only</td>
<td>N/A</td>
</tr>
<tr>
<td>7.6.4.21 SAMPLER CA CLOSED</td>
<td>DS</td>
<td>For Record Only</td>
<td>SR end</td>
</tr>
<tr>
<td></td>
<td>SR</td>
<td>For Record Only</td>
<td>N/A</td>
</tr>
<tr>
<td>7.6.4.25 SAMPLER IN</td>
<td>DS</td>
<td>For Record Only</td>
<td>SR end</td>
</tr>
<tr>
<td></td>
<td>SR</td>
<td>For Record Only</td>
<td>N/A</td>
</tr>
<tr>
<td>7.6.4.30 SAMPLER CA CLOSED</td>
<td>DS</td>
<td>For Record Only</td>
<td>SR end</td>
</tr>
<tr>
<td></td>
<td>SR</td>
<td>For Record Only</td>
<td>N/A</td>
</tr>
<tr>
<td>7.6.4.33 DS FLOW OFF</td>
<td>DS</td>
<td>For Record Only</td>
<td>SR end</td>
</tr>
<tr>
<td></td>
<td>SR</td>
<td>For Record Only</td>
<td>N/A</td>
</tr>
<tr>
<td>7.6.4.35 DS VENTED</td>
<td>DS</td>
<td>For Record Only</td>
<td>SR end</td>
</tr>
<tr>
<td></td>
<td>SR</td>
<td>For Record Only</td>
<td>N/A</td>
</tr>
</tbody>
</table>

RECORD the SR and DS pressures and green light status in the table above.

POSITION the SR GAS switch to ON.

OPEN the SR FLOW control valve. As the SR PRESSURE approaches the DS pressure, REDUCE the SR flow to a minimum (about 0.3 scfm)

OPEN the sampler CA isolation valve and LOWER the sampler into the core barrel.

With the valves open, RECORD the SR and DS pressures and green light status in the table above.
RAISE the RLU into the SR.

CLOSE the sampler CA isolation valve.

STOP flow to the SR by placing the SR GAS switch to the OFF position.

When the green SR PRESSURE (SR VENTED) indicators turn ON, CLOSE the SR flow control valve.

RECORD the SR and DS pressures and green light status in the table above.

CUT-OFF the flow to the drill string by placing the DS GAS switch to the OFF position.

PLACE the gas supply MODE switch to the DRILL position.

RECORD the SR and DS pressures and green light status in the table above.

OPEN the manual DRILL STRING VENT valve until the DS PRESSURE (DS VENTED) light turns ON, then close the valve.

RECORD the SR and DS pressures and green light status in the table above.

CLOSE the DS flow control valve.

REMOVE the equipment from the SR.

ROTATE the platform to position the drill head to the rear.

ATTACH a core barrel with sampler and drill bit to the QR.

VERIFY that the PG pressure regulator is set to 85 ± 5 psi.
7.6.8 PRESSURIZE the DS as directed below.

7.6.8.1 VERIFY that the PG FLOW control valve is CLOSED.

7.6.8.2 PLACE the MODE switch in the DRILL position.

7.6.8.3 POSITION the PURGE GAS switch to ON.

NOTE - At this point, the SR is vented and PG flow may be started past the bit.

7.6.8.4 VERIFY that the green PG PRESSURE (PG VENTED) indicator is ON.

7.6.8.5 OPEN the PG FLOW control to medium flow (about 30 scfm).

7.6.8.6 RECORD the pressure, flow rate, and temperature in the table below.

7.6.8.7 VERIFY that the green PG PRESSURE (PG VENTED) indicator is OFF.

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>CONDITION</th>
<th>Disp:</th>
<th>Gage:</th>
<th>N/A</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEDIUM Pressure (psig)</td>
<td>For Record Only</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flow Rate (scfm)</td>
<td>For Record Only</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CONDITIONS Temperature (°F)</td>
<td>For Record Only</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>MAXIMUM Pressure (psig)</td>
<td>For Record Only</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flow Rate (scfm)</td>
<td>For Record Only</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>CONDITIONS Temperature (°F)</td>
<td>For Record Only</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

7.6.8.8 Fully OPEN the PG FLOW control to obtain maximum flow.

7.6.8.9 RECORD the pressure, flow rate, and temp. in the table above.

7.6.8.10 PLACE the PURGE GAS switch to OFF, then CLOSE the PURGE GAS flow control valve when the green light turns ON.

7.6.9 REMOVE the equipment from the quill rod.
7.6.10 TEST Nitrogen Heater unit as directed below:

NOTE - If ambient temperature is greater than 50F, install and operate the nitrogen chiller upstream of the Heater unit.

- OPERATE CST as necessary to achieve maximum purge gas flow for this test.
- CONNECT hose from PGT to heater.
- CONNECT hose from heater to CST.
- CONNECT power cable from EDT to heater.
- TURN on power to heater.
- ADJUST temperature set-point on heater, per cog engineer direction.
- RECORD the input, output and set-point temperatures in the below table.
- RECORD the PGT of gas on CST with maximum purge gas flow.

<table>
<thead>
<tr>
<th>FOR RECORD ONLY</th>
</tr>
</thead>
<tbody>
<tr>
<td>INPUT TEMPERATURE</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

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### 7.6.11 TEST

Nitrogen chiller unit as directed below:

**NOTE** - If ambient temperature is less than 90F, install and operate the nitrogen heater upstream of the chiller unit.

**OPICE**

7.6.11.1 OPERATE CST as necessary to achieve maximum purge gas flow for this test.

7.6.11.2 Record Identification number from chiller unit in here.

7.6.11.3 CONNECT hose from PGT to chiller.

7.6.11.4 CONNECT hose from chiller to CST.

7.6.11.5 CONNECT power cable from EDT to chiller.

7.6.11.6 TURN on power to chiller.

7.6.11.7 ADJUST temperature set-point on chiller, per cog engineer direction.

7.6.11.8 RECORD the input, output and set-point temperatures in the below table.

7.6.11.9 RECORD the PGT of gas on CST with maximum purge gas flow.

<table>
<thead>
<tr>
<th>FOR RECORD ONLY</th>
</tr>
</thead>
<tbody>
<tr>
<td>INPUT TEMPERATURE</td>
</tr>
</tbody>
</table>

7.6.12 SHUT DOWN the nitrogen trailer per operating instructions.
7.7 CRITICAL ALARM CHECKS

The sample truck computer continuously monitors several conditions during operation of the truck. Some of the information is monitored to warn the operator of abnormal conditions which may be easily corrected. The most severe result of abnormal conditions of this sort is a frequent sounding of the horn and strobe. These alarm conditions have been thoroughly tested during acceptance testing and are described below. Should an alarm of this nature occur during testing, the operator should simply take action to correct the situation.

The ENCLOSURE TEMPERATURE alarms are described below:

The operating temperature of the instrumentation assembly must be maintained in order to provide accurate data. To accomplish this, the enclosure is equipped with an air conditioner and heater. If the enclosure temperature is above 90°F or below 50°F, the panel light will flash fast. If the condition persists for 60 seconds, the horn and strobe will go off.

The PURGE GAS TEMPERATURE alarms are described below:

Due to various reasons, purge gas temperatures which are too low or too high may be present given certain atmospheric conditions. If purge gas temperatures below 35°F or above 100°F are detected, the horn and strobe will go off and the panel light will flash fast.

The HYDROSTATIC HEAD DS ALARM is described below:

In order to maintain hydrostatic head in the drill string, a steady flow must be maintained. The mechanical flow valves have a continuous minimum flow rate of approximately 0.3 scfm as long as the supply pressure is at least 35 psig. If the main supply pressure drops below 60 psig, the horn and strobe will go off and the panel light will flash fast.

The HYDROSTATIC HEAD SR ALARM is described below:

In order to assure flow into the SR, if the supply pressure drops below 60 psig the horn and strobe will go off and the panel light will flash fast.

The function of the green pressure indicators is as follows:

The green SR PRESSURE (SR VENTED), DS PRESSURE (DS VENTED), and PURGE GAS PRESSURE (PG VENTED) indicators enable ground operators to know whether a valve can be opened safely. The SR PRESSURE (SR VENTED) and DS PRESSURE (DS VENTED) lights turn ON when no pressure (less than 0.1 psi) is detected. The PURGE GAS PRESSURE (PG VENTED) light turns ON when the grapple box is not pressurized (less than 0.3 psi). The platform operator must verify the "GREEN" condition by observing the pressure displays and the gages within the purge gas cabinet prior to signaling the ground operators to open the valves.
If the computer detects an operating condition which may indicate equipment failure or other unacceptable condition which may require immediate attention, the operator will be warned of the situation. If not corrected, the drill engine will shut down. These alarms are simulated below.

**OPICE** 7.7.1 **POSITION** the drill head for drilling into simulant.

**OPICE** 7.7.2 **ATTACH** a core barrel and bit to the QR.

**OPICE** 7.7.3 **PLACE** the nitrogen MODE switch to the DRILL position and the PURGE GAS switch to ON.

**OPICE** 7.7.4 **SET** PURGE GAS flow to near 40 scfm.

**OPICE** 7.7.5 **VERIFY** that the chuck is CLOSED.

**OPICE** 7.7.6 **PLACE** the transmission in gear and **ENGAGE** the clutch.

**OPICE** 7.7.7 **ADJUST** the engine throttle to set a drill speed near 45 rpm.

**OPICE** 7.7.8 **COMPLETE** the steps below to test the HIGH DRILL SPEED ALARM:

Drill bit rotation is a critical operating parameter. The bit speed is limited to 55 rpm. If the rpm exceeds 55 for 10 seconds, the horn and strobe will go off. If not corrected within 45 seconds, the truck will shut down.

**OPICE** 7.7.8.1 **SET** the drill speed to 60 rpm for at least 10 seconds. **OBSERVE** that the HORN sounds, the STROBE flashes, and the HIGH RPM light flashes fast.

**OPICE** 7.7.8.2 **PRESS** the ALARM ACKNOWLEDGE button. **OBSERVE** that the HIGH RPM light stops blinking and remains lit.

**OPICE** 7.7.8.3 **REDUCE** the drill speed to near 45 rpm. **OBSERVE** that the HIGH RPM light flashes slowly.

**OPICE** 7.7.8.4 **PRESS** the ALARM RESET button. **OBSERVE** that the HIGH RPM light goes out.

**OPICE** 7.7.8.5 **INCREASE** the drill speed to near 60 rpm. After 45 seconds, **OBSERVE** that the truck automatically shuts down (acknowledge the alarm as it sounds.)

**OPICE** 7.7.8.6 **DISENGAGE** the clutch and restart the engine.

**OPICE** 7.7.8.7 **COMPLETE** the steps below to test the high RPM ALARM LOGIC:

**OPICE** 7.7.8.7.1 Have instrument tech. **DISCONNECT** the power cable to one of the RPM sensors.

**OPICE** 7.7.8.7.2 Have the instrument tech. **CONNECT** the test plug to the power cord to indicate zero flow.
7.7.8.7.3** ENGAGE** the clutch and increase the RPM to near 60 RPM. **VERIFY** alarm sounds for high RPM.

7.7.8.7.4 After 45 seconds, **OBSERVE** that the truck automatically shuts down (acknowledge the alarm as it sounds).

7.7.8.7.5 **DISENGAGE** clutch and **RESTART** equipment.

7.7.8.7.6 **ACKNOWLEDGE** and **RESET** alarm.

7.7.8.7.7 **REMOVE** plug from RPM sensor cord and reconnect power cord. **REMOVE** power cord for other sensor and install test plug for cord.

7.7.8.7.8 **INCREASE** the drill speed to near 60 rpm. After 45 seconds, **OBSERVE** that the truck automatically shuts down (acknowledge the alarm as it sounds).

7.7.8.7.9 **RESTART** equipment.

7.7.8.7.10 **DISENGAGE** clutch, **ACKNOWLEDGE** and **RESET** alarm.

7.7.8.7.11 **REMOVE** plug from RPM sensor cord and reconnect power cord.

7.7.8.7.12 **ENGAGE** clutch and throttle engine to set low RPM (10-30 RPM).

7.7.9 COMPLETE the steps below to test the PURGE GAS FLOW ALARMS:

Adequate purge gas flow must be maintained to cool the rotating drill bit. A flow of at least 30 scfm is required to keep the bit cool. If insufficient flow is detected for more than 10 seconds, the horn and strobe will go off. If this situation is not corrected within 35 seconds, the drill engine will shut down.

If a flow in excess of 100 scfm is detected for more than 10 seconds, the operator must be made aware of a possible problem with the purge system, so the horn and strobe will go off. If deemed necessary by the operator, the truck must be manually shut down.

7.7.9.1 **SET** PURGE GAS flow to greater than 100 scfm for 10 seconds. **OBSERVE** that the HORN sounds, the STROBE flashes, and the PURGE GAS FLOW HIGH light flashes fast.

7.7.9.2 **PRESS** the ALARM ACKNOWLEDGE button. **OBSERVE** that the PURGE GAS FLOW HIGH light stops blinking and remains lit.

7.7.9.3 **REDUCE** the PURGE GAS flow to near 50 scfm. **OBSERVE** that the PURGE GAS FLOW HIGH light flashes slowly.

7.7.9.4 **PRESS** the ALARM RESET button. **OBSERVE** that the PURGE GAS FLOW HIGH light goes out.
7.7.9.5 SET PURGE GAS flow near 25 scfm for 10 seconds. **OBSERVE** that the HORN sounds, the STROBE flashes, and the PURGE GAS FLOW LOW light flashes fast.

7.7.9.6 PRESS the ALARM ACKNOWLEDGE button. **OBSERVE** that the PURGE GAS FLOW LOW light stops blinking and remains lit.

7.7.9.7 INCREASE the PURGE GAS flow near 50 scfm. **OBSERVE** that the PURGE GAS FLOW LOW light flashes slowly.

7.7.9.8 PRESS the ALARM RESET button. **OBSERVE** that the PURGE GAS FLOW LOW light goes out.

7.7.9.9 SET PURGE GAS flow near 25 scfm. **OBSERVE** that after 35 seconds the truck automatically shuts down (acknowledge the alarm as it sounds).

**Note:** The below steps are to test the situation when one meter is not functioning and a low flow situation exists.

7.7.9.10 COMPLETE the steps below to test the low flow alarm logic:

**7.7.9.10.1** With the drill rotating and flow near 50 SCFM, **TURN OFF** the power to flow meter #1.

**7.7.9.10.2** DECREASE flow to near 20 SCFM and **OBSERVE** low flow alarm sounds.

**7.7.9.10.3** INCREASE flow to near 50 SCFM, **ACKNOWLEDGE** and **RESET** alarm.

**7.7.9.10.4** **TURN ON** power for flow meter #1.

**7.7.9.10.5** With the drill rotating and flow near 50 SCFM, **TURN OFF** the power to flow meter #2.

**7.7.9.10.6** DECREASE flow to near 20 SCFM and **OBSERVE** low flow alarm sounds.

**7.7.9.10.7** INCREASE flow to near 50 SCFM, **ACKNOWLEDGE** and **RESET** alarm.

**7.7.9.10.8** **TURN ON** power for flow meter #2.

**7.7.9.10.9** With the drill rotating and flow near 50 SCFM, **TURN OFF** the power to flow meter #3.

**7.7.9.10.10** DECREASE flow to near 20 SCFM and **OBSERVE** low flow alarm sounds.

**7.7.9.10.11** INCREASE flow to near 50 SCFM, **ACKNOWLEDGE** and **RESET** alarm.

**7.7.9.10.12** **TURN ON** power for flow meter #3.
The below steps are to test the situation when one meter is not functioning and a low flow situation exists.

7.7.9.10.13 With the drill rotating and flow near 50 SCFM, TURN OFF the power to flow meters #1 and #2.

7.7.9.10.14 OBSERVE low flow alarm sounds.

7.7.9.10.15 TURN ON power for flow meters #1.

7.7.9.10.16 ACKNOWLEDGE and RESET alarm.

7.7.9.10.17 With the drill rotating and flow near 50 SCFM, TURN OFF the power to flow meter #3.

7.7.9.10.18 OBSERVE low flow alarm sounds.

7.7.9.10.19 TURN ON power for flow meter #2.

7.7.9.10.20 ACKNOWLEDGE and RESET alarm.

7.7.9.10.21 With the drill rotating and flow near 50 SCFM, TURN OFF the power to flow meter #1.

7.7.9.10.22 OBSERVE low flow alarm sounds.

7.7.9.10.23 TURN ON power for flow meters #3 and #1.

7.7.9.10.24 ACKNOWLEDGE and RESET alarm.
7.7.10 COMPLETE the steps below to test the BIT DOWN FORCE ALARM:

Drill bit downward force is a critical operating parameter. The down force limit is 1170 pounds. If an excessive force is maintained for 5 seconds, the horn and strobe will go off. If the situation is not corrected within 45 seconds, the drill engine will shut down.

<table>
<thead>
<tr>
<th>Step</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>7.7.10.1</td>
<td>PLACE hard saltcake simulant drum under drill head.</td>
</tr>
<tr>
<td>7.7.10.2</td>
<td>ATTACH core barrel and bit.</td>
</tr>
<tr>
<td>7.7.10.3</td>
<td>ADJUST the engine throttle to idle speed.</td>
</tr>
<tr>
<td>7.7.10.4</td>
<td>ENGAGE clutch on drill engine.</td>
</tr>
<tr>
<td>7.7.10.5</td>
<td>LOWER the rams until the bit contacts the drilling surface.</td>
</tr>
<tr>
<td>7.7.10.6</td>
<td>MONITOR the downward force. OPEN the DOWN ram hydraulic valve to increase the force beyond 1170 pounds for at least 5 seconds. OBSERVE that the HORN sounds, the STROBE flashes, and the DOWN FORCE HIGH light flashes fast.</td>
</tr>
<tr>
<td>7.7.10.7</td>
<td>PRESS the ALARM ACKNOWLEDGE button. OBSERVE that the DOWN FORCE HIGH light stops blinking and remains lit.</td>
</tr>
<tr>
<td>7.7.10.8</td>
<td>DECREASE the drill bit down force below the 1170 pound limit. OBSERVE that the DOWN FORCE HIGH light flashes slowly.</td>
</tr>
<tr>
<td>7.7.10.9</td>
<td>PRESS the ALARM RESET button. OBSERVE that the DOWN FORCE HIGH light goes out.</td>
</tr>
<tr>
<td>7.7.10.10</td>
<td>MONITOR the downward force. OPEN the DOWN ram hydraulic valve to increase the force beyond 1170 pounds. OBSERVE that after 45 seconds the drill automatically shuts down (acknowledge the alarm as it sounds).</td>
</tr>
<tr>
<td>7.7.10.11</td>
<td>DISENGAGE the clutch.</td>
</tr>
<tr>
<td>7.7.10.12</td>
<td>PLACE PURGE GAS switch to OFF.</td>
</tr>
<tr>
<td>7.7.10.13</td>
<td>CLOSE the PURGE GAS flow control.</td>
</tr>
</tbody>
</table>
7.8 CONNECTION VERIFICATION TEST

NOTE: This test is intended to verify all fittings and receptacles mate properly. If a connection was made in a previous section VERIFY connection and initial step.

OPICE __/__  7.8.0.1 CONNECT the 120/240 volt power cable to the sample truck.
OPICE __/__  7.8.0.2 CONNECT the 240 volt power cable to the air compressor.
OPICE __/__  7.8.0.3 CONNECT the 240 volt power cable to the water heater receptacle on the support truck.
OPICE __/__  7.8.0.4 CONNECT the power cable from the service trailer to the generator.
OPICE __/__  7.8.0.5 CONNECT the 480 volt power cable from the generator to the exhauster.
OPICE __/__  7.8.0.6 CONNECT the 120 volt power cable from the PGT to the diesel generator (do not use the propane generator on the PGT for this test).
OPICE __/__  7.8.0.7 CONNECT the 480 volt power cable between the breathing air compressor and the generator.
OPICE __/__  7.8.0.8 PLUG IN the 480 volt space heater to the EDT.
OPICE __/__  7.8.0.9 CONNECT the electrical grounding wire from the generator an acceptable ground at the test site.
OPICE __/__  7.8.0.10 CONNECT the electrical grounding wire from the service trailer to an acceptable ground at the test site.
OPICE __/__  7.8.0.11 CONNECT the electrical grounding wire from the exhauster to an acceptable ground at test site.
OPICE __/__  7.8.0.12 CONNECT the exhauster interlock cable from the exhauster to the sample truck.
OPICE __/__  7.8.0.13 CONNECT the nitrogen supply line from the PGT to the sample truck. The receptacle on the truck is located below the platform by the driver's door.
OPICE __/__  7.8.0.14 CONNECT the nitrogen supply line from the PGT to the exhauster. The receptacle on the exhauster is on pre-filter inlet.
OPICE __/__  7.8.0.15 CONNECT the nitrogen VENT TO TANK line to the vent port on the drill rod washer.
7.9 SYSTEM START UP / POWER LOADING TEST

NOTE: The purpose of this test is to verify that the generator is capable of supplying enough power to run equipment when fully loaded.

OPICE_1_ 7.9.1 START the diesel generator.

OPICE_1_ 7.9.2 START the Breathing Air Compressor (operate the compressor so that the pump motor cycles frequently, i.e. vent the tank).

OPICE_1_ 7.9.3 START the air compressor on the sample truck (operate the compressor so the pump motor cycles frequently, i.e. vent the tank).

OPICE_1_ 7.9.4 START the exhauster using cold start-up sequence. Do not calibrate Rosemont hydrocarbon analyzer or wait two hours for unit to stabilize. (Exhauster heater should cycle frequently.)

OPICE_1_ 7.9.5 TURN ON the water heater on the support truck. (The heater should be heating throughout this test. If necessary, remove the heat blankets from the exterior of the water drum.)

OPICE_1_ 7.9.6 TURN ON the water pump on the PGT. (Power should be supplied to the heater from the large generator not the one attached to the PGT).

OPICE_1_ 7.9.7 TURN ON flood lights on the service trailer.

OPICE_1_ 7.9.8 TURN ON the 480 volt space heater.

OPICE_1_ 7.9.9 TURN ON the power to all breakers on the sample truck console.

OPICE_1_ 7.9.10 START the drill engine on the sample truck.

OPICE_1_ 7.9.11 TURN ON the air conditioner in the service trailer (allow the AC to operate for 10 minutes then TURN ON the heater in the service trailer. After 10 minutes TURN ON the air conditioner back on and run system for an additional 10 minutes.
### 7.10 EXHAUSTER TEST

<table>
<thead>
<tr>
<th>OP/CE</th>
<th>7.10.1</th>
<th>CONDUCT exhauster test per WHC-SD-WM-OTP-176.</th>
</tr>
</thead>
<tbody>
<tr>
<td>OP/CE</td>
<td>7.10.2</td>
<td>VERIFY exhauster test has been completed and all exceptions documented.</td>
</tr>
</tbody>
</table>
7.11 **EXHAUSTERS ALARM TEST**

**OPICE ____/____ 7.11.1** START the Exhauster. Calibration of instruments is not necessary for this section.

**OPICE ____/____ 7.11.2** PLACE the Exhauster Interlock Override switch to OFF position.

**OPICE ____/____ 7.11.3** COMPLETE the steps below to test the EXHAUSTERS INTERLOCK ALARM:

**NOTE:** The exhauster is tied to the truck via an interlock cable. This interlock is intended to prevent the sample truck from pressurizing the tank in the event the exhauster fails. The operator will be warned via the horn and strobe 5 seconds prior to the interlock shutting down the truck. There is also a 5 second pre-alarm delay for temporary signal loss.

**OPICE ____/____ 7.11.3.1** With the drill engine running TURN ON the PURGE GAS and increase the flow to approx 40 scfm.

**OPICE ____/____ 7.11.3.2** ENGAGE the clutch and bring the drill string RPM to 40.

**OPICE ____/____ 7.11.3.3** SHUT OFF the fan on the exhauster. OBSERVE that after 5 seconds the HORN sounds, the STROBE flashes, and the EXHAUSTERS SHUTDOWN light flashes fast.

**OPICE ____/____ 7.11.3.4** After 5 additional seconds, OBSERVE that the truck automatically shuts down (acknowledge the alarm as it sounds).

**OPICE ____/____ 7.11.3.5** VERIFY that the purge gas is automatically cut off when the truck shuts down.

**OPICE ____/____ 7.11.3.6** DISENGAGE the clutch.

**OPICE ____/____ 7.11.3.7** PLACE PURGE GAS switch to OFF.

**OPICE ____/____ 7.11.3.8** CLOSE the PURGE GAS flow control.

**OPICE ____/____ 7.11.3.9** START exhauster fan and ACKNOWLEDGE exhauster alarms.

**OPICE ____/____ 7.11.3.10** CLEAR the EXHAUSTERS SHUTDOWN alarm by pressing RESET.
8.0 TEST PROCEDURE (SAMPLING)

This portion of the OTP is intended to be generic and flexible. As the sample medium changes, different portions of this test procedure will be used and others will be skipped entirely. It is left to the PIC/COG's discretion to use appropriate methods to obtain samples as the equipment operating parameters will depend upon the characteristics of the waste being sampled. At a minimum 5 segments will be taken with the entire complement of equipment running as detailed in section 7.9.

8.1 PREPARE TO SAMPLE

**WARNING**

Contact with rotating equipment may cause severe bodily injury.

8.1.1 IF drill engine is shutoff for any reason during the performance of this work procedure, VERIFY clutch is disengaged prior to restarting.

8.1.2 POSITION sample truck and support vehicles for sampling.

8.1.3 ENSURE rotating platform edge is within 18 inches of riser center.

8.1.4 PIC REQUEST Electrician ground generator and service trailer/auxiliary power distribution trailer.

8.1.5 PIC VERIFY generator and service trailer/auxiliary power distribution trailer are grounded.

8.1.6 VERIFY disconnect for 480 volt service trailer/auxiliary power distribution trailer receptacle on generator is OFF.

8.1.7 VERIFY the 480V power cable from the service trailer/auxiliary power distribution trailer to the portable generator is connected.

8.1.8 VERIFY the 120/240V power cable is connected from the service trailer/auxiliary power distribution trailer to the sample truck.

8.1.9 VERIFY the air compressor switch on the truck is OFF.

8.1.10 VERIFY the 240V power cable is connected as follows:

- From the service trailer/auxiliary power distribution trailer to the air compressor on the sample truck.

8.1.11 VERIFY the service trailer main disconnect switch is ON.

8.1.12 IF exhauster is to be used, ENSURE interlock cable to exhauster is connected.

8.1.13 ENSURE electrical cables are protected from vehicle or other mechanical damage.
8.1.14 START portable standby generator per operating procedure

8.1.15 VERIFY the 480V disconnect from the portable generator to the service trailer/auxiliary power distribution is CLOSED.

**WARNING**

Contact with rotating equipment may cause severe bodily injury.

8.1.16 ENSURE clutch is disengaged before starting drill engine.

**CAUTION**

Do not operate drill engine at low idle speed while hydraulics are in use.

**WARNING**

Do not refuel Longyear engine until engine has cooled.

8.1.17 START and OPERATE the drill engine and air compressor as required.

**NOTE:**
The center of the cask sleeves should be within 18 inches of the platform edge for access by SR. The top of the cask stand frame should be no more than 56 inches below the top of the rotating platform.

8.1.18 POSITION the cask stand near the truck as shown below.
8.1.19 LEVEL cask stand.

8.1.20 PREPARE casks and samplers per operating procedure.

8.1.21 MEASURE the QUILL ROD ADAPTER to RISER FLANGE distance (as shown below), with the drill rams in the DOWN position.

![Diagram of Quill Rod Adapter to Riser Flange Distance](image)

NOTE: Typically, final distance is at least 32 inches.

8.1.22 ADD an additional six inches to allow for jack collar height.

8.1.23 REPORT measurement to the Cog Engineer.

8.1.24 WHEN drill string calculations have been completed by engineering and verified by the PIC, OBTAIN drill rod lengths as specified by the Cog engineer.

8.1.25 ENSURE drill rod sections are clean, damage free, and have intact O-rings.

8.1.26 ENSURE the quill rod is in the full down position.

8.1.27 LEVEL the truck height at the FINAL QUILL ROD TO RISER FLANGE DISTANCE specified by Cog engineer, by PERFORMING the following:

8.1.27.1 REMOVE top retaining pin from each jack.

8.1.27.2 ENSURE each jack has a foot installed (utilize wood pads as required).

8.1.27.3 ENSURE all five jack controls are CLOSED.

8.1.28 ENSURE both drill ram control valves are CLOSED.

8.1.29 PLACE 4-way valve in FLOAT position.

8.1.30 CONNECT hydraulic hoses to the leveling system on core sample truck.

8.1.31 PLACE 4-way valve in RAISE position.
NOTE: Center jacks are used for stabilization of truck only. Lower these jacks after lowering front and rear lifting jacks. Lower front and rear jacks slowly so truck is lifted uniformly at all points.

8.1.32 RAISE and LEVEL truck to height specified by Cog Engineer, by using front and rear jacks only.

8.1.33 LOWER stabilizers to ground.

8.1.34 INSTALL jack collars.

8.1.35 POSITION 4-way valve in FLOAT.

8.1.36 DISCONNECT and STORE hydraulic hoses.

Note: Step 8.1.37 shall be repeated at the beginning of every shift and whenever power to instrument enclosure is interrupted.

8.1.37 TEST visual and audible alarm indicators as follows:

8.1.37.1 PUSH Alarm Test button (third from the left on bottom row of instrument panel).

8.1.37.2 VERIFY all red alarm light indicators on the instrument inclosure panel are ILLUMINATED.

8.1.37.3 VERIFY audible horn and blue strobe are functioning.

8.1.37.4 IF any of the above conditions are not met, NOTIFY PIC.

8.1.38 TEST Hydraulic Bottom Detector (HBD) by performing the following:

8.1.38.1 RAISE rams approximately 1 inch above bottom of stroke, so HBD testing may be performed.

8.1.38.2 PLACE 4-way valve in HEAD position.

8.1.38.3 ENSURE DOWN ram hydraulic control valve is CLOSED.

8.1.38.4 OPEN UP ram control valve approximately 1/3 of a turn.

8.1.38.5 PIC TURN Lower Ram switch on instrumentation enclosure to SET POINT position, then ADJUST Lower Ram Pressure Set Point dial as necessary to adjust set point pressure to 50 psi.

8.1.38.6 TURN Lower Ram Pressure/Set Point switch to PRESSURE.

8.1.38.7 PIC ENSURE HBD switch in NORMAL position.

8.1.38.8 PIC DEPRESS and HOLD Start Bypass button on HBD Panel.

8.1.38.9 PLACE 4-way control valve in LOWER position.
8.1.38.10  PIC TURN HBD Drill key ON, then RELEASE Start Bypass button when UP and DOWN ram gage pressures stabilize.

8.1.38.11  OPEN DOWN flow control valve to lower rams.

8.1.38.12  PIC TURN HBD Drill key OFF to disable HBD when HBD alarms have triggered.

8.1.38.13  PLACE 4-way valve to HEAD, then CLOSE both flow control valves.

**CAUTION**

*Do not exceed 500# load capacity on platform hoist.*

8.1.39  INSTALL riser assembly. **IF** equipment weight is unknown, USE load cell when installing equipment.

8.1.40  INSTALL sampler into core barrel.

8.1.41  PUSH core barrel through frisbee, then CLOSE foot clamp.

**NOTE:** Use electric winch and foot clamp as required.

**CAUTION**

*Do not exceed 500# load capacity on platform hoist.*

**NOTE:** If equipment weight is unknown, Use load cell when installing equipment.

**NOTE:** The first 19 inch section will be installed in Section 8.2.

8.1.42  INSTALL drill rods per Cog engineer direction.

8.1.43  CLOSE foot clamp.

**NOTE:** Steps 8.1.44 through 8.1.46 may be performed together.

8.1.44  CONNECT nitrogen supply from nitrogen trailer to receiving port near driver's door on truck.

8.1.45  ENSURE nitrogen trailer is in **OPERATION** (see operating procedure)

8.1.46  **IF** required, PLACE Rotary Sampling System Exhauster in service (See Exhauster OTP)

8.1.47  ENSURE Purge Gas, SR Gas, and DS Gas switches are OFF and Purge Gas Mode switch to DRILL.

8.1.48  ENSURE Drill String, SR, and PG flow control valves within PG enclosure are CLOSED.
8.1.49 OPEN Vent Drill String valve.

8.1.50 VERIFY from drill string pressure gage, drill string display, and green Drill String Vented indicator light that Vent To Tank line is VENTED.

WARNING
Disconnecting equipment that is pressurized may result in severe personnel injury.

8.1.51 CONNECT vent line (Vent To Tank) at left rear of truck to vent port on drill rod washer.

8.1.52 CLOSE Vent Drill String valve.
8.2 PERFORM CORE SAMPLING

8.2.1 Cog Engineer, INITIATE remote data collection with the Video Graphics Recorder. The table below identifies the parameters recorded. Data collection will continue at the discretion of the Cog Engineer.

<table>
<thead>
<tr>
<th>Channel</th>
<th>Parameter Monitored (units)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Purge Gas Flow Rate (scfm)</td>
</tr>
<tr>
<td>2</td>
<td>Purge Gas Pressure (psi)</td>
</tr>
<tr>
<td>3</td>
<td>Drill Ram Stroke (inches)</td>
</tr>
<tr>
<td>4</td>
<td>Grapple Holst Load Cell (lbs)</td>
</tr>
<tr>
<td>5</td>
<td>Not Used</td>
</tr>
<tr>
<td>6</td>
<td>Shielded Receiver Nitrogen Pressure (psi)</td>
</tr>
<tr>
<td>7</td>
<td>Drill String Nitrogen Pressure (psi)</td>
</tr>
<tr>
<td>8</td>
<td>Drill Bit Rotational Speed (rpm)</td>
</tr>
<tr>
<td>9</td>
<td>Drill Bit Penetration Rate (rpm)</td>
</tr>
<tr>
<td>10</td>
<td>Drill Bit Down Force (lbs)</td>
</tr>
<tr>
<td>11</td>
<td>Lower Ram Pressure Set Point (psi)</td>
</tr>
<tr>
<td>12</td>
<td>Lower Ram Pressure (psi)</td>
</tr>
</tbody>
</table>

8.2.2 ATTACH a 19 inch drill rod to the assembled drill string.

CAUTION

Do not lower rams too far with chuck open as anti-rotation bracket stud may unseat from retaining groove.

8.2.3 LOWER quill rod, OPEN chuck, and CONNECT to drill string.

8.2.4 RAISE chuck to contact quill rod stop, then CLOSE chuck.

8.2.5 OPEN foot clamp (raise rams if necessary to release).

8.2.6 TURN Purge Gas switch to ON.

8.2.7 IF sampling in push mode, PERFORM the following:

8.2.7.1 ADJUST ram for 19 inch travel.
8.2.7.2 SET Lower Ram Set-point to limit force applied to bit per Cog engineer.

8.2.8 IF sampling in rotary mode, PERFORM the following:

8.2.8.1 PLACE exhauster override switch to INTERLOCK.

8.2.8.2 SET Lower Ram Set-point to within 100 PSI of Ram Pressure Down per Cog engineer.

8.2.8.3 ESTABLISH PG flow of approximately 40 scfm or as necessary.

8.2.9 IF this is the first segment AND segment is to be taken in rotary mode, PERFORM the following:

8.2.9.1 SET Recorder Mode switch to OPERATE position.

8.2.9.2 LOWER rams until a rise of approximately 100 pounds is observed on downward force display, then CLOSE Down ram control valve.

8.2.9.3 ENGAGE clutch to begin drill string rotation at 10 rpm or as necessary.

8.2.9.4 PLACE 4-way valve in RAISE position.

8.2.9.5 ADJUST Down ram control valve to obtain 1-2 ipm penetration rate for approximately 2.5 inches, then CLOSE Down ram control valve.

8.2.9.6 DISENGAGE clutch.

8.2.10 IF not taking first sample, adjust ram for 19 inch travel.

8.2.11 LOWER grapple until hoist motor automatically stops.

8.2.12 PLACE actuator mode switch in SAMPLING position then HOLD hoist directional switch in UP position. WHEN hoist motor stops, RELEASE hoist switch.

8.2.13 IF this is not the final sample, PLACE the 4-way valve in the RAISE position.

8.2.14 IF obtaining final sample, ACTIVATE hydraulic bottom by performing the following.

8.2.14.1 PLACE 4-way valve in HEAD position.

8.2.14.2 ENSURE DOWN ram hydraulic control valve is CLOSED.

8.2.14.3 OPEN UP ram control valve approximately 1/3 of a turn.

8.2.14.4 PIC TURN Lower Ram switch on instrumentation enclosure to SET-POINT position then adjust Lower Ram Pressure Set Point dial as necessary (see Section 5.9).

8.2.14.5 RETURN Lower Ram switch to PRESSURE.

8.2.14.6 PIC ENSURE HBD switch set to NORMAL.
8.2.14.7 PIC DEPRESS and HOLD Start Bypass button on hydraulic bottom detector panel.

8.2.14.8 PLACE 4-way control valve in LOWER position.

8.2.14.9 PIC TURN HBD Drill key ON then RELEASE Start Bypass button when UP and DOWN ram gage pressures stabilize.

8.2.15 IF sampling in rotary mode, ENGAGE clutch to begin drill string rotation at approximately 15 rpm or as necessary.

NOTE: Push mode operating limit is 2000 lbs downward force.

### Suggested Drilling Parameters

<table>
<thead>
<tr>
<th>Material</th>
<th>Penetration Rate (in/min)</th>
<th>Downforce (lbs)</th>
<th>RPM</th>
<th>Gas Flow (scfm)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>ROTARY MODE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hard Salt Cake</td>
<td>2 - 7</td>
<td>500 - 1000</td>
<td>50</td>
<td>50</td>
</tr>
<tr>
<td>Medium Salt Cake</td>
<td>6 - 10</td>
<td>300 - 500</td>
<td>50</td>
<td>40</td>
</tr>
<tr>
<td>Soft Salt Cake</td>
<td>6 - 10</td>
<td>100 - 300</td>
<td>50</td>
<td>30</td>
</tr>
<tr>
<td><strong>PUSH MODE</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sludges</td>
<td>1 - 4</td>
<td>100 - 500</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Liquids</td>
<td>1 - 4</td>
<td>Below 100</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

8.2.16 ADJUST DOWN ram control valve to obtain appropriate penetration rate (per above table).

NOTE: Steps 8.2.17 and 8.2.18 are performed together.

8.2.17 IF sampling in rotary mode and transition zone is noted due to large drop in force (more than 300 lbs), OR total downward force is less than 300 lbs, CONTINUE DRILLING for 1-2 inches.

8.2.18 IF force remains low and push mode conditions are suspected, change to push mode by performing the following:

8.2.18.1 DISENGAGE clutch.

8.2.18.2 TURN Purge Gas switch to OFF.

8.2.18.3 CLOSE the Purge Gas flow control valve.

8.2.18.4 SET Lower Ram Set-point to limit force applied to bit (per Cog engineer).

8.2.18.5 RESUME penetration.
8.2.19 IF sampling in push mode and downward force increases to approximately 500 lbs and rotary mode conditions are suspected, ESTABLISH rotary mode by performing the following:

8.2.19.1 STOP penetration.

8.2.19.2 SET Lower Ram Setpoint to within 100 PSI of Ram Pressure Down.

8.2.19.3 ADJUST Purge Gas Flow control to establish flow of approximately 40 scfm or as necessary.

8.2.19.4 ENGAGE clutch to establish drill string rotation at approximately 15 RPM or as necessary.

8.2.19.5 RESUME penetration.

8.2.20 WHEN 19 inch travel is completed, PERFORM the following:

8.2.20.1 CLOSE ram control valves.

8.2.20.2 POSITION 4-way valve to FLOAT.

8.2.20.3 IF rotating, DISENGAGE clutch, and REDUCE Purge Gas Flow to 5 scfm or as necessary.

NOTE: HBD alarms may have triggered.

8.2.20.4 IF hydraulic bottom detector was active, PIC TURN HBD Drill key OFF to disable the HBD.

8.2.21 RECORD typical Down Force used, as indicated on the instrumentation display, on TEST SAMPLE DATA SHEET.

8.2.22 RECORD typical Purge Gas Pressure and Purge Gas Flow rate used, as indicated on the instrumentation display, on item the TEST SAMPLE DATA SHEET.

8.2.23 RECORD Drill String RPM used, in the TEST SAMPLE DATA SHEET.

8.2.24 RAISE grapple and pintle rod by PERFORMING the following:

8.2.24.1 POSITION Grapple switch to GRAPPLLE LOWER.

8.2.24.2 HOLD Hoist switch in UP position to close sampler valve and separate pintle rod from sampler.

8.2.24.3 VERIFY grapple load cell indicates approximately 25 lbs and proper separation has occurred after grapple has sheared wire.

8.2.24.4 IF separation has not occurred, NOTIFY PIC.

8.2.24.5 HOLD Hoist switch in UP position to raise grapple and pintle rod to approximately 0.4 revolutions on the cable counter.
8.2.25 RAISE DS about 1 inch to ensure trouble-free installation of the next sampler.

8.2.26 CLOSE foot clamp.

8.2.27 DE-PRESSURIZE grapple box by performing the following:

8.2.27.1 PLACE Purge Gas switch in OFF position.

8.2.27.2 VERIFY from Purge Gas Pressure gauge, PG Pressure display, and green PURGE GAS VENTED light that the grapple box is vented.

8.2.27.3 CLOSE PG Flow control valve.

8.2.28 OPEN the chuck.

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**WARNING**

Disconnecting equipment that is pressurized may result in severe personnel injury.

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8.2.29 UNTHREAD and RAISE quill rod adapter from drill string.

8.2.30 CLOSE the chuck.

8.2.31 ROTATE platform and ATTACH pintle/pull-rod overpack to quill rod adapter.

8.2.32 PRESSURIZE drill string to maintain hydrostatic head by performing the following:

8.2.32.1 CONNECT cable spray washer and change-out assembly with cap to drill string.

8.2.32.2 ENSURE change-out assembly isolation valve is CLOSED.

8.2.32.3 VERIFY from DS Pressure gage, DS Pressure display, and green DRILL STRING VENTED light that Supply DS line is vented.

8.2.32.4 IF not vented, OPEN manual Vent Drill String valve until green DRILL STRING VENTED light comes on, then CLOSE valve.

8.2.32.5 ENSURE DS Flow control valve is CLOSED.

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**WARNING**

Disconnecting equipment that is pressurized may result in severe personnel injury.

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8.2.32.6 CONNECT Supply Drill String line from right rear of truck to change-out assembly.
8.2.32.7  **PLACE** PG Mode switch to SAMPLE RECOVERY and DS Gas Flow switch in ON position.

**NOTE:** Gas should flow steadily. If sampling liquid or saltcake, the pressure should stabilize quickly. If sampling sludge, the pressure will likely build then may or may not drop off.

8.2.32.8  **OPEN** DS Flow control valve to allow approximately 1.5 scfm if rotation was used, or to a minimum (about 0.3 scfm) if sample was pushed.

8.2.32.9  **IF** green Drill String Vented light comes on, increase drill string flow as necessary to extinguish light.

8.2.33  **HOLD** Sample Actuator Hoist switch in UP position to raise grapple and pintle rod to the pre-pintle release.

8.2.34  **REDUCE** grapple speed to approximately 20% to drop pintle.

8.2.35  **ENGAGE** Up Limit Bypass switch and **HOLD** Hoist switch in UP position until pintle releases (audibly verify).

8.2.36  **DETACH** pintle rod overpack from quill rod adapter and **VERIFY** pintle is in the overpack.

8.2.37  **HOLD** Sample Down Bypass button and **HOLD** Hoist switch in DOWN position to lower grapple to about 0.4 revolutions on the cable counter.

8.3  **RECOVER SPENT SAMPLER FROM DRILL STRING**

8.3.1  **POSITION** SR over drill string.

8.3.2  **CONNECT** SR to change-out assembly.

8.3.3  **OPEN** SR ball valve.

8.3.4  **PRESSURIZE** SR to recover sampler by performing the following:

8.3.4.1  **POSITION** SR Gas switch to ON.

8.3.4.2  **OPEN** SR flow control valve, then **REDUCE** flow to a minimum (about 0.3 scfm) when SR pressure is greater than drill string pressure.

8.3.4.3  **OPEN** isolation valve on change-out assembly.

8.3.4.4  **ADJUST** SR and drill string flows as necessary to extinguish green lights.

8.3.5  **ENSURE** RLU is in CLOSED position.

8.3.6  **RAISE** RLU to full UP position, then **ENSURE** mechanical and digital SR cable counters are zeroed.

8.3.7  **LOWER** RLU at full speed until slack in cable stops the motor.
8.3.8 **UNSEAT** and **RAISE** sampler by performing the following:

8.3.8.1 **SET** speed control on motor control panel to 0.

**NOTE:** If excessive pressure is not vented through SR, it may vent through drill bit when sampler is lifted. This may disturb the waste below the bit.

8.3.8.2 **IF** Drill String pressure is more than 0.5 psi x Sample #, temporarily **PLACE** SR Gas switch to OFF to vent excess pressure. (e.g: On sample #3, Drill String pressure should be no more than 0.5 x 3 = 1.5 psi.)

8.3.8.3 **PLACE** hoist directional switch in UP position.

**NOTE:** Hoist speed should not exceed 40%.

8.3.8.4 **OBSERVE** Loadcell Readout on the Control Console and slowly **INCREASE** hoist speed to unseat sampler from core barrel.

**NOTE:** Readout of ≥ 150# may indicate waste accumulating in core barrel.

**NOTE:** Loadcell reading will normally be 48-55# if sampler is attached.

8.3.8.5 **RECORD** maximum loadcell reading, on TEST SAMPLE DATA SHEET.

8.3.8.6 **INCREASE** speed to 100% to raise sampler up drill string.

8.3.8.7 **INSPECT** sampler in sight glass for cleanliness.

8.3.9 **IF** excessive material is observed on the sampler, **WASH** sampler by performing the following:

8.3.9.1 **CONNECT** hot water line to cable spray washer.

8.3.9.2 **LOWER** sampler below cable spray washer.

8.3.9.3 **START** water pump and **OPEN** water flow control valve approximately 1/4 turn.

8.3.9.4 **RAISE** the sampler at 50% speed. After sampler passes cable spray washer, **CLOSE** flow control valve and **STOP** the pump.

8.3.9.5 **DISCONNECT** water line from cable spray washer.

8.3.9.6 **WAIT** approximately two minutes to allow water to drain.

8.3.10 **RAISE** sampler into SR until the 0.4 ft position is reached, then **STOP** SR hoist.

8.3.11 **CLOSE** isolation valve on change-out assembly.

8.3.12 **DEPRESSURIZE** SR by performing the following:

**NOTE:** SR nitrogen supply will be stopped and SR will vent.

8.3.12.1 **TURN** SR Gas switch to OFF.
8.3.12.2 VERIFY SR is vented by observing SR pressure assembly gages, SR pressure display and green SR Vented light is ON.

**WARNING**

Disconnecting equipment that is pressurized may result in severe personnel injury.

8.3.12.3 CLOSE SR flow control valve.

8.3.13 CLOSE ball valve on SR.

8.3.14 DISCONNECT and RAISE SR away from change-out assembly.

8.3.15 POSITION SR over receiving cask.

8.3.16 LOWER and CONNECT the SR to the cask.

8.3.17 OPEN the ball valve on SR.

8.3.18 LOWER sampler into cask until slack cable is indicated.

8.3.19 UNLATCH RLU from sampler by performing the following:

8.3.19.1 ENSURE Ready light is ON.

8.3.19.2 PUSH then RELEASE START button. After approximately 1 minute, 45 seconds the Open light will turn ON.

8.3.19.3 RAISE RLU away from sampler.

8.3.19.4 PUSH START button on Latching Control panel to attain CLOSED position.

8.3.20 RAISE RLU into SR until 0.4 ft position is reached, then STOP SR hoist.

8.3.21 CLOSE ball valve on SR.

8.3.22 DISCONNECT and RAISE the SR away from the cask.

8.3.23 If this is the final sample, GO TO Section 8.5.
8.4 INSERT EMPTY SAMPLER INTO DRILL STRING

8.4.1 ENSURE RLU is in CLOSED position.

8.4.2 POSITION SR to retrieve the next empty sampler.

8.4.3 CONNECT SR to cask.

8.4.4 VERIFY segment number, sampler serial number, on TEST SAMPLE DATA SHEET.

8.4.5 OPEN ball valve on the SR.

8.4.6 LOWER RLU at full speed until slack cable is indicated.

8.4.7 RAISE RLU and VERIFY sampler is attached.

8.4.8 ZERO mechanical and digital cable counters at full up position, if necessary.

8.4.9 CLOSE ball valve on the SR.

8.4.10 DISCONNECT then RAISE SR away from cask.

8.4.11 POSITION SR over drill string.

8.4.12 LOWER and CONNECT SR to change-out assembly.

8.4.13 OPEN SR ball valve.

8.4.14 PRESSURIZE SR by performing the following:

8.4.14.1 POSITION SR Gas Flow switch to ON.

8.4.14.2 OPEN SR flow control, then REDUCE flow to 0.3 scfm when SR pressure is slightly greater than drill string pressure.

8.4.14.3 OPEN isolation valve on change-out assembly.

8.4.15 LOWER RLU and sampler until slack cable is indicated.

8.4.16 DISCONNECT and RAISE RLU from sampler by performing the following:

8.4.16.1 ENSURE Ready light is ON.

8.4.16.2 PUSH then RELEASE START button. After about 1 minute, 45 seconds the OPEN light will turn ON.

8.4.16.3 RAISE RLU about 1 foot and VERIFY by observing load cell display that sampler is not attached.

NOTE: RLU loadcell should indicate approximately 40 lbs without sampler or 50 lbs if sampler has not been released.

8.4.16.4 PUSH START button on latching panel to CLOSE RLU.
8.4.16.5 RAISE RLU into SR until 0.4 ft position is reached, then STOP SR hoist.

8.4.17 CLOSE change-out assembly isolation valve.

8.4.18 DEPRESSURIZE SR by performing the following:

NOTE: SR should vent automatically.

8.4.18.1 POSITION SR Gas switch to OFF.

8.4.18.2 VERIFY SR is vented by observing SR pressure gages, SR pressure display, and the green SR Vented light.

WARNING
Disconnecting equipment that is pressurized may result in severe personnel injury.

8.4.18.3 CLOSE SR flow control valve.

8.4.19 CLOSE SR ball valve.

8.4.20 DISCONNECT and RAISE SR away change-out assembly.

8.4.21 POSITION the quill rod to the truck rear.

8.4.22 DEPRESSURIZE drill string by performing the following:

8.4.22.1 PLACE DS Gas Flow switch in OFF position.

8.4.22.2 OPEN manual Drill String Vent valve.

8.4.22.3 PLACE PG Mode switch in DRILL position.

8.4.22.4 VERIFY from drill string pressure gauge, drill string pressure display, and green Drill String Vented light that drill string is vented.

WARNING
Disconnecting equipment that is pressurized may result in severe personnel injury.

8.4.22.5 CLOSE DS Gas Flow control valve.

8.4.22.6 CLOSE manual Drill String Vent valve.

8.4.22.7 DISCONNECT Supply Drill String line from change-out assembly.

8.4.23 DISCONNECT change-out assembly and cable spray washer from drill string.
8.4.24 **ATTACH** a 19 inch drill rod to the assembled drill string.

8.5 **WASH EQUIPMENT AND RECOVER DRILL STRING**

**NOTE:** Prior to recovery of the drill string, the PG system, combined with hot water supplied through the cable spray washer, will be used to clean the inside of drill string and bit.

8.5.1 **REMOVE** cap from kamlock adapter and **CONNECT** drillhead to change-out assembly.

8.5.2 **ENSURE** wash water heaters on support truck are **ON** and warmed up (approximately two hours required).

8.5.3 **CONNECT** water hose to cable spray washer.

8.5.4 **TURN DS Gas** switch to OFF, and **MODE switch** to DRILL.

8.5.5 **OPEN** change-out assembly isolation valve.

8.5.6 **WASH** the grapple by performing the following:

8.5.6.1 **PLACE** PG switch to ON.

**NOTE:** PG flow assists grapple cleaning.

8.5.6.2 **IF** exhauster is not in service, **OPEN** PG flow control valve to obtain less than 10 scfm flow.

8.5.6.3 **IF** exhauster is in service, **OPEN** PG flow control valve to obtain maximum flow.

8.5.6.4 **POSITION** actuator mode switch to GRAPPLE LOWER and **HOLD** Hoist switch to DOWN. **LOWER** grapple until hoist is approximately at last recorded depth.

8.5.6.5 **SET** grapple speed to near 70.

8.5.6.6 **TURN** water pump ON.

8.5.6.7 **OPEN** water flow control valve approximately 1/4 turn.

8.5.6.8 **HOLD** Hoist switch to UP and **RAISE** grapple to 0.4 revolutions on the counter.

8.5.6.9 **TURN** water pump OFF and **CLOSE** water flow control valve.

8.5.6.10 **CONTINUE** PG flow for approximately 2 minutes after water pump is shut off.

8.5.6.11 **CLOSE** change out assembly isolation valve.

8.5.6.12 **PLACE** PG switch to OFF.
8.5.7 VERIFY PG is vented by observing PG assembly gauges, PG instrumentation pressure and green PURGE GAS VENTED light.

**WARNING**

Disconnecting equipment that is pressurized may result in severe personnel injury.

8.5.8 CLOSE PG flow control valve.

8.5.9 DISCONNECT quill rod from change out assembly.

8.5.10 POSITION SR over drill string.

8.5.11 LOWER and CONNECT SR to change-out assembly.

8.5.12 WASH the RLU by performing the following:

8.5.12.1 POSITION nitrogen Mode switch to SAMPLE RECOVERY.

8.5.12.2 POSITION DS Gas switch to ON.

8.5.12.3 IF exhauster is not in service, OPEN drill string flow control to obtain less than 5 scfm flow.

8.5.12.4 IF exhauster is in service, OPEN drill string flow control to obtain maximum flow.

8.5.12.5 OPEN SR ball valve.

8.5.12.6 POSITION SR Gas Flow switch to ON.

8.5.12.7 IF exhauster is not in service, OPEN SR flow control to obtain less than 5 scfm flow.

8.5.12.8 IF exhauster is in service, OPEN SR flow control valve to obtain maximum flow.

8.5.12.9 OPEN change-out assembly valve.

8.5.12.10 LOWER RLU to last recorded depth.

8.5.12.11 START wash water pump and OPEN water flow control valve approximately 1/4 turn.

8.5.12.12 SET SR hoist speed to 100.

8.5.12.13 HOLD hoist directional switch in UP position.

8.5.12.14 STOP wash water pump and CLOSE flow control valve after RLU passes cable spray washer.
8.5.12.15 RAISE RLU into SR until UP limit switch is reached and SR hoist automatically stops.

8.5.12.16 CONTINUE SR gas flow for approximately 2 minutes after RLU is in SR.

8.5.12.17 PLACE SR Gas and DS Gas Flow switches to OFF.

8.5.13 CLOSE change-out assembly isolation valve.

8.5.14 OPEN manual Vent Drill String valve.

8.5.15 VERIFY SR is vented by observing SR pressure assembly gages, SR pressure display and green SR Vented lights.

**WARNING**

Disconnecting equipment that is pressurized may result in severe personnel injury.

8.5.16 CLOSE drill string and SR Flow control valves.

8.5.17 CLOSE ball valve on SR.

8.5.18 START wash water pump.

8.5.19 ADD quantity of water specified by Cog Engineer.

8.5.20 STOP wash water pump.

8.5.21 DISCONNECT and RAISE SR away from change-out assembly.

8.5.22 POSITION hoist over drill string.

8.5.23 VERIFY from drill string pressure gauge, drill string pressure display, and green Drill String Vented light that drill string is vented.

**WARNING**

Disconnecting equipment that is pressurized may result in severe personnel injury.

8.5.23.1 CLOSE DS Gas Flow control valve.

8.5.23.2 CLOSE manual Drill String Vent valve.

8.5.23.3 DISCONNECT Supply Drill String line from change-out assembly.

8.5.24 DISCONNECT change-out assembly and cable spray washer from drill string.
CAUTION

Do not exceed 500# load capacity on platform hoist.

8.5.25 IF waste is other than liquid, USE load cell to lift drill string until force is known.
8.5.26 IF load is more than 500#, lift DS using drill head until hoist is usable.
8.5.27 ATTACH lifting bail to top of drill string.
8.5.28 CONNECT drill rod hoist to drill string and PREPARE to lift.
8.5.29 OPEN the foot clamp.
8.5.30 START wash water pump and OPEN flow control valve approximately 1/2 turn.
8.5.31 LIFT drill rod from riser.
8.5.32 CONTINUE lifting drill rod until desired length is obtained.
8.5.33 STOP wash water pump and CLOSE flow control valve when lift is complete.
8.5.34 ENSURE foot clamp is CLOSED before disconnecting drill rod.
8.5.35 REMOVE lifting bail from drill rod.
8.5.36 REPEAT steps 8.5.25 through 8.5.35 as needed to recover entire drill string.
8.5.37 COVER top opening in drill rod washer assembly seal with plug AFTER first section of drill rod is removed.
8.5.38 DISCONNECT water hose to drill rod washer assembly.
8.6 TESTING FINALE

8.6.1 REMOVE the drill rod washer assembly and riser adapter.

8.6.2 PLACE the core sample truck in traveling mode as directed below:

NOTE - Before electrical disconnect, the core sample truck should be placed in the traveling mode.

8.6.2.1 CENTER the drill rig and SR on the platform.

8.6.2.2 POSITION the SR to the front of the truck.

8.6.2.3 LOWER the SR and drill as low as is practical.

8.6.2.4 RAISE the leveling jacks on the core sample truck.

8.6.2.5 DISCONNECT and STORE the hydraulic leveling hoses.

8.6.2.6 TURN the drill rig engine off.

8.6.2.7 TURN OFF all console power controls.

8.6.2.8 SHUT off the gas to the drill rig engine.

8.6.3 STORE the tools and various sampling equipment as appropriate.

8.6.4 RESTORE the work area to original condition.
## Major Equipment Components

<table>
<thead>
<tr>
<th>ITEM</th>
<th>PURPOSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cable Counter (Mechanical)</td>
<td>Digital revolution counter. (Attached to cable sheave inside shielded receiver.)</td>
</tr>
<tr>
<td>Cable Counter (Electronic)</td>
<td>Digital readout in control console that tells how much cable has been lowered down drill string.</td>
</tr>
<tr>
<td>Cable Spray Washer</td>
<td>Used in drill string to wash internal cables. (Shielded receiver and sample actuator winch cables.)</td>
</tr>
<tr>
<td>Core Barrel/Bit Assembly</td>
<td>Holds sampler during sampling (Is Drill string Section #1).</td>
</tr>
<tr>
<td>Drilling Unit</td>
<td>Longyear(^1) Model 34 drill rig which applies rotary motion and downward force to the drill string.</td>
</tr>
<tr>
<td>Drill Rod Hoist</td>
<td>Hoist mounted on the rotary platform that provides on-site method to handle equipment up to 500 lbs.</td>
</tr>
<tr>
<td>Drill Rod Washer Assembly</td>
<td>Spray washes and wipes drill rod after during retrieval. Provides seal between tank and environment. Is location of vent port for all gases from sampling.</td>
</tr>
<tr>
<td>Drill String</td>
<td>Transmits power from drill unit to drill bit. Composed of various lengths of drill rod.</td>
</tr>
<tr>
<td>Foot Clamp</td>
<td>Holds drill string when shielded receiver and quill rod are disconnected.</td>
</tr>
<tr>
<td>Grapple</td>
<td>Holds sampler piston in place while sampler descends, providing suction to retain liquids in sampler.</td>
</tr>
<tr>
<td>Grapple Box</td>
<td>Contains hoist for lowering and raising grapple.</td>
</tr>
<tr>
<td>Kamlok Adapters</td>
<td>Provides quick connection of drilling components.</td>
</tr>
<tr>
<td>Load Cell</td>
<td>Electronic scale used to weigh RLU. (Attached to cable sheave on SR.)</td>
</tr>
</tbody>
</table>

\(^1\) LONGYEAR IS A TRADEMARK OF THE LONGYEAR COMPANY.
## Major Equipment Components (cont)

<table>
<thead>
<tr>
<th>ITEM</th>
<th>PURPOSE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen Supply System</td>
<td>Provides drill bit cooling and cleaning during rotary drilling. Provides method of maintaining a suppressed liquid level within the drill string.</td>
</tr>
<tr>
<td>PVC Sleeves</td>
<td>Disposable plastic tube inserts for cask adapters to prevent excessive contamination.</td>
</tr>
<tr>
<td>Pressure Bellows</td>
<td>Collapsible steel bellows. Allows drill string to be pressurized through full ram stroke.</td>
</tr>
<tr>
<td>Quill Rod</td>
<td>A section of drill rod which remains in the drill head and is used to transfer power from the drilling unit to the drill string. The quill rod also has a quick disconnect feature to allow addition of hydrostatic head fluid to the drill string.</td>
</tr>
<tr>
<td>Remote Latch Unit</td>
<td>Means to retrieve and release samplers. (Raised and lowered by shielded receiver winch.)</td>
</tr>
<tr>
<td>Riser Adapters</td>
<td>Provides means to connect spray washer to various sizes of risers.</td>
</tr>
<tr>
<td>Rotary Drilling Platform</td>
<td>Supports core drill and auxiliary equipment.</td>
</tr>
<tr>
<td>Sampler Change-Out Assembly</td>
<td>Provides means to maintain pressure within the drill string while samplers are exchanged.</td>
</tr>
<tr>
<td>Shielded Receiver</td>
<td>Retrieves sample from drill string by an internal power winch and cable. Provides interim sample shielding, and deposits sample in transfer cask; also removes clean sampler from cask and transfers it to drill string for next sample.</td>
</tr>
<tr>
<td>Transfer Cask</td>
<td>Provides shielding and containment for core sample during shipment to laboratory; also used to transport empty sampler to sample site.</td>
</tr>
<tr>
<td>Universal Sampler</td>
<td>Collects and retains multimedia samples to be transported to lab.</td>
</tr>
</tbody>
</table>
# Test Sample Data Sheet

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
<th>Condition</th>
<th>Response</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Description of Test Medium</td>
<td>Salin載/Sludge/Water</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Universal Sampler Number</td>
<td>For Record Only</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Segment Number</td>
<td>For Record Only</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Date of Sampling / Start Time</td>
<td>For Record Only</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Encoder Values of Previous Segment at Bottom of Drill String</td>
<td>Mechanical feet</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Digital feet</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Encoder Values at Bottom of Drill String</td>
<td>Mechanical feet</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Digital feet</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Grapple Counter at Bottom of Drill String</td>
<td>revolutions</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Purge Gas Display</td>
<td>Pressure psig</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Flow scfm</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>Drill Speed</td>
<td>rpm</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Predicted Spent Sampler Location</td>
<td>Mechanical feet</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Digital feet</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Indicated Spent Sampler Location</td>
<td>Mechanical feet</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Digital feet</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Maximum Force to Unseat Sampler</td>
<td>lbs</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Loadcell Weight with Sampler Attached</td>
<td>lbs</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Cleanliness of Sampler</td>
<td>For Record Only</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>Drill String Hydrostatic Head - with sampler removed</td>
<td>Flow Rate scfm</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pressure psig</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>Sample Characteristics</td>
<td>Volume For Record Only</td>
<td></td>
</tr>
<tr>
<td></td>
<td>When convenient to do so, each sample should be analyzed to determine the characteristics of the waste collected in the sampler.</td>
<td>Weight For Record Only</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Length For Record Only</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>Down Force</td>
<td>lbs</td>
<td></td>
</tr>
</tbody>
</table>

**COMMENTS:**

Records contained on this data sheet are for reference only. Operability of the equipment may be determined based on this data, however, judgement of the operators and PIC/COG should be used to determine if the equipment performs adequately.

WHC-SD-WM-OTP-174, REV 0
# OTP Exception / Resolution Data Sheet

<table>
<thead>
<tr>
<th>STEP #</th>
<th>DESCRIPTION OF PROBLEM</th>
<th>RESOLUTION TO PROBLEM</th>
<th>INITIALS</th>
</tr>
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<tbody>
<tr>
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</tbody>
</table>
Test Completion Sign-Off Sheet

All tests have been completed as delineated in this OTP. All exceptions have been documented and resolved as indicated on a "OTP Exception / Resolution Sheet". The core sample truck and associated equipment can be operated in a safe manner and pose no unacceptable hazards to the operator.

<table>
<thead>
<tr>
<th>Signature</th>
<th>Date</th>
</tr>
</thead>
<tbody>
<tr>
<td>J. S. LEE</td>
<td></td>
</tr>
<tr>
<td>Core Sampling Operations</td>
<td></td>
</tr>
<tr>
<td>Quality Assurance</td>
<td></td>
</tr>
<tr>
<td>Safety</td>
<td></td>
</tr>
<tr>
<td>T. D. JARECKI/T. R. FARRIS</td>
<td></td>
</tr>
<tr>
<td>CPE Cognizant Engineer</td>
<td></td>
</tr>
<tr>
<td>J. S. SCHOFIELD</td>
<td></td>
</tr>
<tr>
<td>CPE Engineering</td>
<td></td>
</tr>
<tr>
<td>J. V. JOHNSTON</td>
<td></td>
</tr>
<tr>
<td>RMCS 3&amp;4 Project Management</td>
<td></td>
</tr>
</tbody>
</table>