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SCOPE

The following section introduces and explains the types of whipstocks available, sections of the whipstocks, and the auxiliary equipment used in conjunction with the operation of whipstocks.

WT-Master Plus Wellbore Departure Systems

The WT-Master Plus Wellbore Departure Systems represents an application specific and results-driven approach to one-trip reliability and cost optimization. The running assembly consists of a mill and whipstock assembly. The anchor sub-assembly can be a retrievable hydraulic anchor, a mechanical anchor, a permanent packer, and an open hole inflatable anchor or expandable hydraulic anchor. Cased-hole anchors, except the permanent packer and Thru-Tubing Anchor, are designed for dependable retrieval. The objective of the WT-Master Plus Wellbore Departure systems is to accomplish the following steps in a single trip:

- Run the whipstock and a milling assembly
- Orient the whipstock assembly with Measuring While Drilling (MWD) tool or Gyroscope
- Set the anchor
- Release the mill from the whip
- Mill the window
- Drill the rat-hole or lateral
- Pull out of the hole

The result is a full-size usable window achieved within a minimum of milling time with safe and easy passage for the required drilling assembly.

The whipstock assembly may be oriented and set at any depth. It should be located immediately above a casing collar to provide a smooth I.D. in which to set the anchor and mill the window. A surveying system should be run with the WT-Master Plus Wellbore Departure Systems to determine the preferred orientation for the sidetrack. When orientating in a specific direction and if a hole angle of more than two degrees exists at the setting depth, then it is recommended that the whipstock assembly is set 0 – 90 degrees to the right or left of high side of the hole. With small modifications, the WT-Master Plus Wellbore Departure Systems can be configured to exit from the low side of the hole. After setting the anchor, either hydraulically or mechanically, a load is applied to the drill string to shear the break bolt between the Mill and whip. At this point, string rotation may begin for milling of the window, followed by drilling of the rat-hole.
Innovative Features

1. Multi-Ramp Whipstock

All WT-Master plus Whipstock Systems utilize a multiple angle whip design to deliver a high-quality useable window. The combination of ramp angles maximizes milling efficiency, prolongs window mill life and produces an optimum dogleg through the window.

- Fast Cutout Ramp
  - Facilitates mill/whip hook-up point
  - Initiates rapid casing cutout
  - Produces full gauge window within a few inches of the cutout
- Full Gauge Section
  - Maintains the full gauge window section
  - Useable window length can be customized
  - Thicker cross section for optimized performance
- Mid-Ramp Section
  - Accelerates the mill past its center point
  - Improves one-trip mill performance

2. Mill/Whip Hook-up

All WT-Master plus Whipstock Systems use the latest window mill to whipstock attachment technology. The new mill/whip hook-up is designed to provide higher torque values while delivering the same reliable shear performance. This threaded retention system allows up to 3 degrees of flex between the milling assembly and the whipstock to facilitate passage through high doglegs in the wellbore.

3. Whipstock System Retrieval

Some WT-Master plus Expandable, Hydraulic, and Mechanical Anchors are retrievable. The hook retrieval system is the primary method, utilizing a retrieving tool with an integral hook geometrically matched to a slot machined in the whip.
WT-Master plus Anchor Systems

1- WT-Master Plus Hydraulic Anchor
The WT-Master Plus Hydraulic Anchor locks the whipstock assembly to the casing. It is hydraulically set with 3,000 to 3,500 psi pressure. The function of the anchor is to absorb axial and torsional loads during milling.

2- WT-Master plus Hydraulic Anchor with Pack-off Element
The WT-Master plus Hydraulic Anchor with Pack-off Element is run and set in a single trip. This system provides isolation from the lower wellbore using an integral packer. It can hold 5,000 psi in both directions.

3- WT-Master Plus Mechanical Anchor
The WT-Master Plus Mechanical Anchor requires a plug in the wellbore to initiate setting. Patented tongue-and-pocket slip design ensures full, centralized slip contact, providing superior anti-rotation and bi-directional loading capabilities.

4- WT-Master Plus Inflatable Anchor
The WT-Master Plus Inflatable Anchor is run, oriented, and hydraulically set in a single trip. Patented element design enables the anchor to set in open holes and provides adequate torque resistance needed for milling or drilling.

5- WT-Master plus Fast Track Tri-Mill
The WT-Master plus FastTrack Tri-Mill utilizes tungsten carbide cylindrical cutters and tungsten crushed tungsten carbide rather than conventional carbide inserts. The Cubic cutters are made from Cutting & Wear Company will effectively exit the casing and cut through the formation to drill the required rat-hole. This new milling structure not only reduces overall casing exit time, but it also ensures a level of performance that can be duplicated casing exit after exit. The mill provides a hydraulic path from the milling bottom hole assembly to the whip and anchor via a hydraulic hose.

6- Hydraulic Running Tool
The Hydraulic Running Tool is run directly above the mill. A floating piston inside the tool separates the clean hydraulic fluid, used for setting the anchor, from the wellbore fluid. The piston does not restrict flow after setting anchor.

7- Non-Advancing Multi-Cycle By-Pass Valve
The Non-Advancing Multi-Cycle By-Pass Valve (NAMCBPV) is run in the assembly when a hydraulic anchor is to be oriented and set in a well. It is positioned below the MWD tool. Fluid is circulated through the NAMCBPV to facilitate a MWD survey. Once the whipstock has been orientated, the tool is cycled through a predetermined sequence until a valve closes off the flow path to the annulus. Once closed, the string is pressured up to set the anchor.

8- Retrievable Features
- Hook Assembly Retrieval Tool
A whipstock assembly with a hook slot in the whip face can be retrieved with the hook assembly retrieval tool. The anchor can be a retrievable hydraulic anchor, mechanical anchor, or expandable hydraulic anchor. The tool has been designed to hook into the slot on the whip face and then a pull applied to release the assembly. A typical retrieval BHA would include a retrieval tool, full gauge stabilizer, joint of drill pipe, surveying equipment, crossover, heavyweight drill pipe, and drill pipe.

- **Die Collar Assembly Retrieval Tool**

A die collar assembly retrieval tool, consisting of a die collar section designed to pull the whip and a cut lip guide, designed to lift the whip of the casing or tubing wall. A typical bottom-hole assembly (BHA) for retrieval may consist of a retrieval tool, full gauge stabilizer, bumper sub, fishing jar, full gauge stabilizer, crossover, heavyweight drill pipe, and drill pipe. A safety joint and accelerator are used in some assemblies.

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**Equipment for Sidetrack**

1. **Well Preparation**
   - Review of collar locator log
   - Review of cement bond log
   - Casing scraper
   - Gauge ring sub/ A Full gauge Mill

2. **Sidetrack**

   - Whipstock assembly
     - WT-Master Plus Hydraulic Anchor with Pack-Off Element
     - WT-Master Plus Whipface
     - WT-Master Plus Tri Mill
Sidetracking Training Manual

Whipstock Administration

- Running Tool
- Flex Joint-Heavyweight Drill Pipe (HWDP) High Strength Drill Pipe
- Non-Advancing Multi-Cycle By-Pass Valve or Hi-Flow Bypass Valve
- MWD or UBHO Sub

3. **Retrieval**

- Retrieval tools
  - Hook assembly
  - Die collar assembly
- Fishing jars
- Bumper sub
- Stabilizers
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GENERAL INFORMATION

These forms contain critical information related to whipstock procedures which, when completed, help WOTI to maintain high professional standards in efficiency, quality control, and service to customers.

The six key information forms for whipstocks include:

1. Whipstock Job Order Form
2. Shipping Checklist (Each type of whipstock has a unique checklist.)
3. Pre-Job Location Checklist for Whipstocks
4. Whipstock Milling Report
5. Whipstock Post-Job Report
6. Disclaimer, Waiver, and Release of Liability

All information forms are to be completed by the WOTI representative.
WHIPSTOCK JOB ORDER FORM

Purpose

A Whipstock Job Order Form is used to collect as much information as possible from the customer in a consistent and timely manner. It standardizes the gathering of well and job information and allows for more comprehensive job planning with fewer errors.

Procedure

1. Collect all customer information.
2. Review the information with the customer.
3. Confirm the date needed.
4. Forward a copy of the Whipstock Job Order Form to the WOTI Operations Department so the proper whipstock can be ordered and the assigned Milling Operator can begin making preparations for the job.
5. Contact the Survey/MWD company to verify the tools that they will be using and to check the compatibility of the equipment from both companies.
6. Verify the size of the window required.

(See the Job Order Form on the following page)
# Whipstock Job Order Form

(See the Job Order Form in the Reference Section)

## Well Information
- **Well T.D.**: [Value]
- **Is H2S or CO2 Present?** [Yes/No]
- **Casing Whipstock to be set in**
  - **Size 1**: [Value] in., [Value] Wt, [Value] Ibs, [Value] Grade

## Window Information
- **Casing exit is for**: [Directional/Horizontal]
- **Are more than lateral planned for this well?** [Yes/No]
- **KOP for Window**: [Value] in., [Value] High Side Directional for casing at KOP, [Value] degree/azimuth
- **Will window be oriented?**: [Yes/No]
- **Survery/MWD company for orientation**: [Value]
- **Expected Formation at window depth**: [Value]

## Rig & Work String Information
- **Type of rig**: [Value]
- **Will rental string be required**: [Yes/No]
  - **Work string size**: [Value] in., [Value] Wt, [Value] Ibs, [Value] Grade
  - **Heavy weight Drill collar size**: [Value] in., [Value] Wt, [Value] Ibs, [Value] Grade

## Whipstock Information
- **Type of whipstock**: Mechanical whipstock, Hydraulic whipstock

## Tool & Other Equipment Needs
- **Bit Sub**: [Value]
- **Crossover subs**: [Value]
- **Ditch magnet**: [Value]
- **API bowl**: [Value]
- **Rotary slips**: [Value]
- **Safety clamps**: [Value]
- **Casing scraper**: [Value]
- **Pump joints**: [Value]

## Other Information
- **Tracking performance**: [Value]
- **Direction to location**: [Value]
- **Job order taken by**: [Value]
- **Date**: [Value]
- **Time**: [Value] AM/PM
WHIPSTOCK SHIPPING CHECKLIST

Purpose

The Whipstock Shipping Checklist is used to verify that all equipment and tools needed for the job are collected and checked before being shipped. There is a specific Shipping Checklist for each type of whipstock.

The shipping dates, time, trucking company to be used, and the estimated time of arrival (ETA) on location will be verified with the Shop Manager.

Procedure

When the ordered equipment and tools have been assembled, the Shop Foreman and the assigned Milling Operator will go through the equipment and double-check for the correct sizes, making sure all of the required equipment and tools for the job will be shipped. A copy of the original Whipstock Job Order Form will be used for reference.

The Milling Operator will also measure and record all of the dimensions for the downhole tools if time permits.
<table>
<thead>
<tr>
<th>Mechanical Set Type Whipstock Shipping Checklist</th>
<th>Hydraulic Set Type Whipstock Shipping Checklist</th>
</tr>
</thead>
<tbody>
<tr>
<td>(See the Shipping Checklist Form in the Reference Section)</td>
<td></td>
</tr>
</tbody>
</table>
REQUIRED HAND TOOLS AND EQUIPMENT CHECKLIST

Review and confirm the correct serial numbers shown on all paperwork and verify that the paperwork is shipped with the equipment.

Review the connections on all downhole tools, ensuring the compatibility of all threaded equipment connections.

The Milling Operator must check his toolbox and verify that all hand tools that may be required for this particular whipstock are available. Also check that any extras (i.e., shear bolts, shear screws, shear pins, etc.), which may be needed, are available.

Note: The API rotary table maximum ID is 10 ⅝". When using a 13⅜" OD and larger whipstock, an API bowl and slips must be used to accommodate the larger OD after pulling the master bushing.
PRE-JOB LOCATION CHECKLIST FOR WHIPSTOCKS

The Pre-Job Checklist for Whipstocks ensures certain topics are discussed on location with the Company Representative, Driller, and the Survey/MWD Company Representative (if applicable). This form covers matters that increase communication between all decision makers on location and inform everyone as to how the procedures are planned.

### Pre-Job Location Check list for Whipstocks

<table>
<thead>
<tr>
<th>DT/Job #:</th>
<th>Well Name:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Store:</td>
<td>Date:</td>
</tr>
<tr>
<td>Customer:</td>
<td>Hole Size:</td>
</tr>
</tbody>
</table>

#### Inspect all EXXON/ENA and related equipment for:

- A: Confirm correct Ods and lcs of all tools
- B: Confirm all tools received
- C: Identify any shipping damages

#### Meet with company representative, driller and survey / MWD personnel BEFORE beginning any procedures to:

##### A - Review well information:

1. Confirm well is dead: no pressure at surface.
2. Verify casing size and weight.
3. Identify all wellbore restrictions/deviations.
4. Determine wellbore fluids-type, depth.
5. Determine level of cement bond at KOP.
6. Discuss well preparation - gauge ring/scrapper run prior.
7. Determine location of casing collars near KOP.

##### B - Review drilling / rig requirements:

1. Check lcs of drilling and BHAs for compatibility with Ods of surey gyro tools.
2. Verify pumping / circulation requirements are met.
3. Review placement of UBHBO sub in BHA.

##### C - Review milled window requirements:

1. Verify KOP of window and setting depth.
2. Confirm orientation of whipstock.
3. Determine liner size, bit size (PDC), and other drilling assemblies that will be used through milled window.

##### D - Review whipstock being recommended for running / setting:

1. Discuss type of whipstock and its application.
2. Confirm whether standard concave or short radius concave required.
3. Confirm if any optional accessories (i.e. shear out assy) required.
4. Review all shear values - shear roll pin, shear stud, etc.

##### E - Review standard running / milling procedures:

1. Explain that whipstock is to be picked up only with swivel hoist ring.
2. Use safety clamp when setting whipstock in rotary / midsale.
3. Direct Driller to operate in low gear.
4. Always pick-up / set down easy in slope.
5. Proceed slowly - use caution through BOPs and restrictions.
6. Review various shear values in setting procedures.

##### F - Review each Company responsibilities during Setting / milling procedures.

##### G - Conduct safety meeting on location.

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Whipstock Pre-Job Location Checklist Form
(See the Job Order Form in the Reference Section)
WHIPSTOCK MILLING REPORT

The Whipstock Milling Report allows for review of milled window requirements, the whipstock being recommended for running/setting, standard running/milling procedures, and each company's responsibilities during running/setting/milling procedures. The Whipstock Milling Report also provides verification that a safety meeting was conducted on location.
WHIPSTOCK POST-JOB REPORT

It is mandatory that a Whipstock Post-Job Report is filled out at the completion of every job.

The Whipstock Post-Job Report establishes a database to be used for:

- selling future whipstock jobs
- planning future whipstock jobs
- identifying training needs
- identifying potential problems for correction
- making intelligent, informed plans for the future

Whipstock Post-Job Report Distribution:

- One copy placed in the Job File
- One copy retained by the Milling Supervisor
- One copy with the Monthly Bonus Day Summary
DISCLAIMER, WAIVER, AND RELEASE OF LIABILITY

Whenever the customer requests a deviation from WOTI’s published procedures or directs WOTI personnel to perform duties that may be unsafe or could jeopardize the operation, the Milling Supervisor must contact his immediate supervisor. If the immediate supervisor is unavailable, contact the Milling Center for authorization to follow the customer’s request.

Any such deviation should be noted on the Milling Report and a signature solicited from the customer or his representative (whoever made the original request) acknowledging such deviation.

In extreme cases, and only with PRIOR approval of the Milling Supervisor’s immediate supervisor, WOTI Milling Supervisors may request that the customer sign the Disclaimer, Waiver, and Release of Liability Form. (See Report Forms for the Disclaimer, Waiver, and Release of Liability in Reference Section).

*Note: The Disclaimer, Waiver, and Release of Liability form may be used only with management's approval.*
Sidetracking Training Manual

Mechanical Set Whipstock System

Operations Procedure
**SCOPE**

The following procedures are intended to provide concise but definitive steps to follow in operations involving the milling of lateral hole sections from a parent well using the Mechanical Set Whipstock System.

The Mechanical Set Whipstock System is a mechanically set whipstock that requires a footing in the wellbore to “trip” from, setting itself in the casing. The wellbore footing can be anything that will support 15,000 lb for 5”, 20,000 lb for 7” & 30,0000 for 9¾” weight, such as a cement plug, Bridge plug, fish, or liner.

Milling a window in casing using a whipstock usually consists of one run for setting the Whipstock in place and milling and completing the window through the casing wall and into the formation, while dressing the window to eliminate drag.

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*Note: If discrepancies are found in this procedure or any other, please discuss the matter with a WOTI Supervisor.*
EQUIPMENT REQUIRED

Hole Preparation Run Equipment

- A Full Gauge Drift Mill
- Casing Scraper
- Cross Over Sub
- String Stabilizer
- Pony Drill Collar or 1 Joint of Drill collar
- String Stabilizer
- Drill Collars
- Drilling Jar
- Drill Collars
- HWDP’s
- Balance Of Drill Pipes To Surface

The stiffness of this assembly will serve to identify any problem doglegs or restrictions in the hole that may hamper running of the whipstock assembly.

Whipstock Run Equipment

- Mechanical Set Whipstock
- Tri-Mill (Optional Bi-Mill or a combination of Rugby/Back/Window Mill)
- Flex Joint (1 joint of HWDP)
- Universal Bottom Hole Orientation Sub (UBHO sub) or MWD
- Pup joints (for space-out if necessary)
- Tool kit
PRE-OPERATIONAL PROCEDURES

Collar Log
WOTI strongly recommends that a collar log is run prior to running any whipstock. The whipstock should be positioned so that the window is milled through the wall of the casing joint and not across a casing collar/connection. This milling practice will help avoid the possibility of the casing string parting in case the cement behind the casing is poorly set and unconsolidated.

CAUTION
Omission of the collar log run could cause damage to the structure of the well.

Pre-Run Checklist
As part of the Pre-operational Procedures, all whipstock jobs should include a completed Pre-Run Preparation Checklist.

<table>
<thead>
<tr>
<th>Pre-Run Preparation Checklist</th>
</tr>
</thead>
<tbody>
<tr>
<td>D The anchor slip is in place, is in good condition, and is the correct size for the casing size and weight and the Allen screws are tight.</td>
</tr>
<tr>
<td>D The shear pins are properly installed and in good condition.</td>
</tr>
<tr>
<td>D The whipstock has not been tripped.</td>
</tr>
<tr>
<td>D The shear screw is the proper size, and it will make up into the Whipface.</td>
</tr>
<tr>
<td>D The shear screw will fit through the Rugby Mill hole.</td>
</tr>
<tr>
<td>D All mills are on location and the OD’s are correct for the casing’s size/weight. (Check mill OD’s with a gauge ring that is OD + 1/32”).</td>
</tr>
<tr>
<td>D All downhole equipment has been properly measured and OD’s, ID’s, and lengths have been properly recorded.</td>
</tr>
<tr>
<td>D The slots on the gyro match and are compatible with the lug assembly on the orientation sub.</td>
</tr>
<tr>
<td>D The survey tools will pass through all drill string tool joints and drill collar ID’s.</td>
</tr>
<tr>
<td>D All rotary connections are compatible.</td>
</tr>
<tr>
<td>D All rotary shouldered connections are made up to the recommended torque.</td>
</tr>
</tbody>
</table>

Note: Any deviation from established running or milling procedures must be approved by WOTI Management, PRIOR to changing any procedures.
Making the Hole Preparation Run

1. Make a run to ensure that the casing is clean and there is a strong enough setting place for setting the anchor. The run should include the following (from the bottom):

   • A Full Gauge Drift Mill
   • Casing Scraper (Do not run casing scrapers across open perforations.)
   • Cross Over Sub (Bit Sub with Float)
   • String Stabilizer
   • Pony Drill Collar or 1 Joint of Drill collar
   • String Stabilizer
   • Drill Collars
   • Drilling Jar
   • Drill Collars
   • HWDP’s
   • Balance of Drill Pipes To Surface

   The stiffness of this assembly will serve to identify any problem doglegs or restrictions in the hole that may hamper running of the whipstock assembly.

   **Note:** The wellbore must be clean and free of any obstruction to the desired setting depth for the Whipstock. The omission of this gauge run could result in the premature setting of the Whipstock later.

2. Run this assembly in the well to the depth of the plug (eg. Cement Plug).
3. Tag the plug (Whipstock setting depth) two or more times with 15,000 lb for 5”, 20,000 lb for 7” & 30,000 for 9¾” Casing to verify that it is strong enough to withstand the weight.
4. Tally the pipe while running in or out of the well to get an accurate measurement to the plug.
5. Record the measurements to ensure that:
   • the whipstock can be run and set at the desired depth
   • the depth measurement to the plug is accurate
   • the plug is solid in place
   • the casing wall is clean where the whipstock is to be set

   **NOTE:** Scrape anchor setting depth twice.

   **Note:** It is very important to get an accurate measurement for the plug so the Whipstock will be oriented as to setting depth as possible. Using this measurement facilitates proper placement of the Whipstock.
Hole Preparation Run BHA Assembly

Balance of Drill Pipes to Surface

HWDPs

Drill Collars

Drilling Jar

Drill Collars

String Stabilizer

1 joint of Pony Drill Collar or Drill Collar

String Stabilizer

Bit Sub with Float

Casing Scrapper

Full Gauge Mill
Test the MWD tool prior, to running the assembly in the hole.

1. Pick up the following assembly:
   - Blank Sub or Kelly Valve (valve to be closed and run pin-up)
   - Crossover Sub
   - One joint of S-135 Drill Pipe
   - Flow Through Valve
   - One joint of S-135 Drill Pipe
   - 6 joints of HWDP
   - MWD
   - One joint of S-135 Drill Pipe
   - Crossover Sub
   - Kelly or Top Drive

2. RIH to top of Drill Pipe. With top drive or Kelly connected, record the flow rate required to obtain a survey. The Flow-Through Valve will remain open.
Preparing the Milling Equipment

1. Lay the whipstock on the catwalk, face up, with the top of the whipstock pointing toward the rig.

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Never use a nylon sling to lift or move a Whipstock because nylon may be cut. Always use a wire sling or wire rope to lift or move a Whipstock.</em></td>
</tr>
</tbody>
</table>

2. Complete the whipstock assembly, checking all OD’s, ID’s, and descriptions.

3. Pick up a joint of HWDP (FLEXJOINT) and make up the UBHO or Measurement While Drilling (MWD) sub to the top of the drill pipe.

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Be careful not to damage the setscrews on the OD of the UBHO of the sub when using the tongs.</em></td>
</tr>
</tbody>
</table>

4. Using a Bit Sub of minimum length and bored for float assembly, make up the Bit Sub to the bottom of the drill pipe joint. Discuss the use of a float with the Company representative and install one if required.

   Note: The UBHO or MWD sub is placed one joint above the Bit Sub and Lead Mill to ensure that:
   * trash or scale from the drill’s pipe string does not plug the UBHO or MWD sub
   * as much flexibility as possible is maintained at the Mill.

5. Make up the Mills.

   Note: If the window is exiting through two or more strings of the casing or into a known hard formation, exclude the Watermelon Mills (Back Mill and Window Mill in the case of using combination mills), using only the Rugby Mill below the single joint of HWDP. Depending on the casing size and grade, more than one Rugby Mill may be required to make multiple exits.

   Once the casing string(s) has been exited into the formation, pull out of the hole. Make up the Back Mill (and Window Mill) in the assembly as described above and run in the hole, reaming through the window with the Watermelon Mills.

6. Make up all connections to the recommended torque.

7. Ensure that everything is properly made up before continuing (see Figure).
Preparing the Milling Equipment BHA

UBHO Sub

Bit Sub w/Float Assy (use if only dictated by client, use a drilled float sub assembly).

Crossover sub (double pin)

1 joint of S-135 DP

Tri-Mill
8. There is a hole in one of Rugby Mill blades for screwing the shear screw and attaching Rugby Mill to the Whipface. Mark the opposite blade of the blade with a shear screw hole on the Rugby Mill and scribe a line from this blade, up the Back Mill (and Window Mill), Bit Sub, and the single joint of HWDP to the top of the UBHO Sub.

9. Have the survey company representative back out the set screws that hold the internal key in the UBHO Sub, and rotate the key until it is aligned with the scribed line. After it is in position, tighten the setscrews to lock the key in alignment with the scribed line.

10. Run the Mill assembly through the BOP stack and into the casing liner/hanger (being careful not to damage the wear bushings or strike any closed BOP rams) to ensure that the whipstock’s OD is compatible with the drift diameter of the casing.

11. Pull the assembly out of the hole.

12. Secure a safety clamp around the whipstock body about halfway down the face of the Whipface while the whipstock is lying on the pipe deck/catwalk.

13. Pick up the Whipstock with tugger from the catwalk. A whip handling device is provided which is bolted onto the back of whipstock. This is to be used as a false rotary to support the assembly in the Rotary Table when making up the mill to whip via the shear screw. Assist with a crane as necessary.


15. Lower the whipstock into the mouse hole (or another suitable work hole on the drill floor), allowing both the safety clamp and the winch/tugger line to support the whipstock’s weight.
Note: Larger Whipstocks (9½ to 20 inches) are usually too big for the mouse hole and must be set in the rotary to attach to the Mill assembly. Properly sized rotary slips must be used. The 13⅜” whipstock will not fit through the standard rotary (10½” ID) and the rotary bushing, in this event must be pulled. Use of an API bowl and slips to hold the whipstock in the rotary is required.

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>• close the BOP Shear/Blind ram when working on Whipstock.</td>
</tr>
<tr>
<td>• Do not drop anything in the wellbore when working over the wellbore.</td>
</tr>
<tr>
<td>• Use extreme caution when handling the whipstock, setting drill collar slips, safety clamps, etc. to prevent dropping the whipstock in the hole.</td>
</tr>
<tr>
<td>• Run the draw works in low. Pick up and set down the whipstock easily in the slips to prevent damage or premature setting.</td>
</tr>
<tr>
<td>• Ensure the lead tongs have most of the slack out of the snub line to prevent jerking against the back-up tongs.</td>
</tr>
</tbody>
</table>

16. Put a light amount of thread compound on the shear screw, adjust Rugby Mill hole and Whipface and connect the whipstock assembly to the mill assembly with a shear screw.

Shear screws with a higher value should be considered when:

- running the whipstock in a highly deviated hole
- heavy mud is in the well
- other wellbore restrictions such as a liner hanger may be encountered

Shear screws with a lower shear value should be considered when:

- whipstock is being set shallow (less than 1500 m)
- running and setting Whipstock with coiled tubing

17. Pick up the Milling/whipstock assembly.

18. Install the rotary table cover.

19. Remove the safety clamp and whip handling device which is bolted onto the back of whipstock.

20. Remove the rotary table cover.
21. Lower the whipstock slowly into the well, setting the rotary slips on the single joint of HWDP.

22. Check the orientation of the key in the UBHO sub, make any adjustments necessary, and tighten the setscrews again.

*Note: For safety purposes, install a drill pipe wiper to prevent dropping the Allen wrench in the hole.*

**CAUTION**

*Run the draw works in low. Pick up and set down the whipstock gently in the slips to prevent damage or premature setting. Make sure the lead tongs have most of the slack out of the snub line to prevent jerking against the back-up tongs.*
RUNNING PROCEDURE

Running and Orienting the Whipstock

1. Lower the whipstock assembly slowly into the wellbore to prevent premature setting of the whipstock.

2. Run the whipstock slowly, like a packer assembly, at a rate of 2 to 3 minutes per stand.

3. Do not turn string.

4. **Do not set down more than 4 K/LBS.**

5. Fill the drill string every 5 strands.

6. Run slowly into the hole until approximately 30 feet off the bottom.

7. Slowly move the whipstock assembly up and down from 5 to 20 feet to remove all trapped torque from the drillstring.

8. Record up and down free weights.

9. Run survey tools on wireline to the UBHO sub if using a survey.

---

**CAUTION**

*Do not alter the orientation of the UBHO sub to the Whipface's face when making the first connection. Do not let the UBHO sub turn or move, or the direction of the milled window could be affected.*

---

**CAUTION**

*Proceed slowly and with caution while running the whipstock assembly through the BOPs, wellhead, liner top, and any other restrictive sections to prevent damage or premature setting. The difference between the whipstock OD and the casing ID is minimal, making it similar to a piston, so lower the assembly very slowly in these small bypass areas. DO NOT SET DOWN MORE THAN 6 K/LBS. IF TAKING WEIGHT CALL WHIPSTOCK SUPERVISOR.*

---

**CAUTION**

*Do not tag bottom until the following steps have been completed and the proper direction has been established. Tagging bottom too soon can cause premature setting of the whipstock.*
10. Take survey readings.

11. To orient, the whipstock, rotate the drill pipe to the right in ¼ turn increments (no more that ½ turn at a time) until the whipstock assembly is oriented in the correct position.

12. Take another survey, making additional corrections as needed and lowering 4 to 5 feet after each increment.

**CAUTION**

A crooked hole may require several readings and corrections to remove all of the trapped torque from the drill string. Work slowly and carefully in order to achieve proper orientation.

**CAUTION**

This Model of Whipstock, because it is hinged, must be set within 30° on either side of the low side to prevent the whipstock’s whipface from falling across the wellbore.

13. Continue taking readings until 3 sequential reading are within a 5° range before assuming the direction is correct.

14. After reaching and verifying the proper direction, call a meeting with the customer, driller, and survey/MWD company representative to review the orientation of the whipstock’s Whipface once more.

15. Continue the procedure if everyone is in agreement.

16. Raise the survey tools at least 150 feet up the drill string to be above the recoil shock.

17. Lower the whipstock assembly slowly to the setting depth.

18. Continue lowering the whipstock until the required weight is reached to shear the shear pin. This shearing releases the trip bar and compressed spring, which in turn drives the slip up into the setting position between the casing wall and whipstock.

19. Apply weight 15,000 lb for 5”, 20,000 lb for 7” & 30,0000 lb for 9⅝” on the anchor to prove that it is set.

20. After the whipstock has set, **continue slacking off** while adding weight to shear the shear screw on the Rugby Mill. A sharp drop in the pipe occurs when the shear screw shears.
Shear Screw

Shear Pins

Shearing Sequence
21. Raise the drill string approximately 1 to 2 feet.

22. Set the drill string back down to make sure the shear screw has sheared. Repeat if necessary.

23. Mark the depth on the pipe each time. It should read the same each time.

24. Set the pipe back down with approximately 10,000 lb of pressure to ensure that the Whipface is over against the casing wall.

25. Raise the drill string so that the Rugby Mill is 5 to 10 feet above the top of the whipstock.

26. Lay down the necessary drill pipe to pick up the kelly.

27. Displace the Mud in the well (if needed) and check mud properties for proper rheology for steel removal.

28. The milling operation can now begin.
Running Milling Assembly and Opening the Window

This section assumes that the Rugby Mill has been sheared from the whipstock and raised 5 to 10 feet above the whipstock.

NOTE: Install Ditch Magnets

1. Make up the kelly to the drill string.
2. Record string weight up and down.
3. Engauge the pumps, slowly increasing to the planned circulation rate, and record pump pressure and rate.
4. Engauge the rotary and slowly increase the speed between 20 and 40 RPM.
5. After the rotary has stabilized, slowly increase between 50 and 75 RPM (depending on the mill size).
6. Record the following information:
   - Free rotary torque
   - Pump pressure
   - Pump rate
   - Free weight – up and down (string weight with zero weight on the mill)
7. While rotating, slowly lower the drill string until the Rugby Mill contacts the whipstock and the casing wall, causing an immediate and substantial increase in rotary torque.
8. Mark the kelly. This is the starting point for the Rugby Mill run.
9. After making the initial mark on the kelly, raise the Starting Mill 3 to 5 feet.
10. While rotating, slowly lower the drill string again to see if the increase in rotary torque is indicated at the same place. Work slowly and carefully; repeat if necessary.
11. After marking the kelly with the correct starting point for the Mill, begin milling, using light weights on the Mill (1,000 to 3,000 lb depending on the size of the mill and grade of the casing). As the window milling process begins, an increase in torque and decrease in weight will be indicated.
12. As the torque increases, increase the rotary speed to the recommended RPM (based on the mill size).
13. Continue milling with constant rotary torque and weight (1,000 to 3,000 lb) on the mill. Additional weight may be required if the rate of penetration (ROP) begins to slow.
Use the recommended parameters as follows.

<table>
<thead>
<tr>
<th>Casing Size (in)</th>
<th>Weight on Mill (klb)</th>
<th>Milling RPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 ¾”</td>
<td>2-15</td>
<td>60-120</td>
</tr>
<tr>
<td>7”</td>
<td>2-12</td>
<td>60-120</td>
</tr>
<tr>
<td>5”</td>
<td>1-7</td>
<td>60-120</td>
</tr>
</tbody>
</table>

14. Monitor returns for cuttings during milling operations and *pump high viscosity sweeps* as needed to remove cuttings from the well. This practice is especially important if the window is being milled in a lateral section.

15. The Window Mill run is completed after milling down the Whipface’s face into the formation AND when the Dress Mill is centered at the bottom of the window.

16. Ream back and forth through the window until no signs of additional torque or drag are indicated.

17. Stop the rotary and slide the Mill assembly through the window several times. If any weight or drag is indicated, start the rotary and ream back and forth through the window until weight or drag is eliminated.

18. Stop the rotary and check for weight or drag again. Repeat this process as necessary.

19. Once the window is complete, stop the rotary, *clean the hole of cuttings with high viscosity sweeps*, and pull out of the hole without rotating.

20. Closely inspect and gauge all mills for wear using a gauge ring of OD + 1/32”

21. Determine the estimated size of the window.

22. Review the window requirements with the customer to determine if the Elongation Run is required.

**Note:** The Elongation run is recommended if:

- You have run a bi-Mill Assembly for opening the Window and:
- The customer requests it.
- PDC bit will be used through the window for additional drilling
- Drill collars and stabilizers will be used through the window for additional drilling
- Liner will be installed through the window
- Double bent sub and PDM assembly will be used through the window for additional drilling
- Unusual wear is indicated on the Rugby Mill, resulting in an under-gauge hole

**CAUTION**

*When using a 3° whipface whipstock, do not run the Elongation assembly until AFTER the casing is fully exited. Otherwise, excessive torque will be encountered as the two Watermelon Mills begin elongating the top of the window.*
Elongation run

1. Assemble the Elongation run components
   - Balance of drill string
   - One or more drill collars or heavyweight
   - Bit Sub (minimum length, bored for float assembly)
   - Crossover sub (double pin, if Bit sub is used)
   - Tri-Mill

Note: Be sure to eliminate the one joint of drill pipe above the Bit Sub and replace it with one or more drill collars/heavy weight to provide “stiffness” to the milling assembly.
2. Lower the Elongation run assembly into the hole, stopping 5 to 10 feet above the whipstock.

3. Make up the kelly to the drill string.

4. Engauge the pumps and slowly increase to the desired circulation rate.

5. Engauge the rotary and slowly increase to between 50 and 75 RPM (depending on the mill size).

6. Record the following information:
   - Free rotary torque
   - Free weight – up and down (string weight with zero weight on the mill)
   - Pump pressure
   - Pump rate

7. While rotating, slowly lower the drill pipe string and ream back into the window.

8. As the torque increases, increase the rotary speed to the recommended RPM (based on the mill size).

9. Continue milling with constant rotary torque and weight on the mill.

Note: While milling down the Whipface, if the ROP decreases rapidly, and additional weight does not increase ROP, pull out of the hole, make up a new Rugby Mill, and re-enter the well.

10. Monitor returns for cuttings during milling operations. Pump high viscosity sweeps as needed to remove cuttings from the well.

11. Continue milling down the Whipface, elongating the milled window at the top with the two Watermelon Mills.

12. The Elongation run is complete (unless directed otherwise by the customer) when the TOP Watermelon Mill is centered at the bottom of the window.
Elongation Run is Completed
13. While rotating, ream back and forth through the window until no additional weight or drag is indicated.

**Note:** If using stabilizers for additional drilling through the window, it is recommended to drill enough hole into the formation to accommodate the stabilizers. The additional rathole should allow the stabilizers to be in the formation BEFORE drilling commences. Rotating the stabilizers or drill bits while on the Whipface can damage the Whipface and the window.

14. Stop the rotary and slide the Mill assembly through the window several times. If any weight or drag is indicated, start the rotary and ream back and forth through the window until weight or drag is eliminated.

15. Circulate the hole clean with **one or more high viscosity sweeps** to remove all cuttings from the well.

16. When circulation is complete, stop the rotary and pull out of the hole without rotating.

17. Inspect and gauge all mills using a gauge ring of OD + 1/32", to determine wear to the mill and to estimate window/hole size. Review signs of wear with the customer. Repeat Run #3 if the hole appears to be undersized.

18. Lay down the Elongation Run assembly.

**Final Procedures**

1. Personally meet with the customer and the driller and give them the following cautions regarding the whipstock and the milled window.

   **CAUTION**

   *Be careful when approaching the whipstock to avoid damaging it.*

   *Do not rotate stabilizers, bits, or BHA’s through the window to avoid damaging the whipstock and or the window.*

2. When the window is complete, ask the customer if he would prefer you to stay on location until the next BHA is run through the window. Stay if required.

3. Complete one copy of the Approximate Window Location form for the Customer’s well files (see Figure). (Make sure all dimensions, approximate location, and orientation of the milled window are shown).
Approximate Window Location Form
(See Technical Data in the Reference Section)
4. Account for all mills and other accessory items that are to be returned and contact the WOTI store to make arrangements for the mills to be picked up.

5. E-mail or Fax one copy of the Whipstock Post Job Report form to the appropriate WOTI supervisor for entry into the whipstock database.

6. The whipstock window milling job is now complete.

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**BHA for Problems**

The recommended BHA when Milling is slowed or stopped less than 7 ft down the Whipface.

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**Alternative First Run BHA**

Alternative first run BHA for a 1-trip whipstock operation.  
*Note: Please check with WOTI Engineering before running this assembly.*
Hydraulic Set Whipstock System

Operations Procedure
SCOPE

The following procedures are intended to provide concise but definitive steps to follow in operations involving the milling of lateral hole sections from a parent well using the Hydraulic Set Whipstock System.

The Hydraulic Set Whipstock System is a hydraulically set whipstock that requires a hydraulic force to activate the packer assembly, setting itself in the casing.

Milling a window in casing using a whipstock usually consists of one run for setting the Whipstock in place and milling and completing the window through the casing wall and into the formation, while dressing the window to eliminate drag.

*Note: If discrepancies are found in this procedure or any other, please discuss the matter with an WOTI Supervisor.*
EQUIPMENT REQUIRED

Hole Preparation Run Equipment

- A Full Gauge Drift Mill
- Casing Scraper
- Cross Over Sub
- String Stabilizer
- Pony Drill Collar or 1 Joint of the Drill collar
- String Stabilizer
- Drill Collars
- Drilling Jar
- Drill Collars
- HWDP’s
- Balance Of Drill Pipes To Surface

The stiffness of this assembly will serve to identify any problem doglegs or restrictions in the hole that may hamper running of the whipstock assembly.

Whipstock Run Equipment

- Hydraulic Set Whipstock
- Tri-Mill (Optional Bi-Mill or a combination of Rugby/Back/Window Mill)
- Running Tools
- Nuzzle plug Assembly
- Flex Joint (1 joint of HWDP)
- Universal Bottom Hole Orientation Sub (UBHO sub) or MWD
- Pup joints (for space-out if necessary)
- Tool kit
PRE-OPERATIONAL PROCEDURES

Collar Log
WOTI strongly recommends that a collar log is run prior to running any whipstock. The whipstock should be positioned so that the window is milled through the wall of the casing joint and not across a casing collar/connection. This milling practice will help avoid the possibility of the casing string parting in case the cement behind the casing is poorly set and unconsolidated.

**CAUTION**

Omission of the collar log run could cause damage to the structure of the well.

Pre-Run Checklist
As part of the Pre-operational Procedures, all whipstock jobs should include a completed Pre-Run Preparation Checklist.

<table>
<thead>
<tr>
<th>Pre-Run Preparation Checklist</th>
</tr>
</thead>
<tbody>
<tr>
<td>D The Packer slip is in place, is in good condition, and is the correct size for the casing size and weight and the Allen screws are tight.</td>
</tr>
<tr>
<td>D The shear pins are properly installed and in good condition and the Number of Shear pins are enough.</td>
</tr>
<tr>
<td>D The shear screw is the proper size, and it will make up into the Whipface.</td>
</tr>
<tr>
<td>D The shear screw will fit through the Rugby/Lead Mill hole.</td>
</tr>
<tr>
<td>D Running Tools, Nuzzle plug Assembly and Hydraulic Lines and Fittings are in good condition and properly installed.</td>
</tr>
<tr>
<td>D All mills are on location and the OD’s are correct for the casing’s size/weight. (Check mill OD’s with a gauge ring that is OD + 1/32”).</td>
</tr>
<tr>
<td>D All downhole equipment has been properly measured and OD’s, ID’s, and lengths have been properly recorded.</td>
</tr>
<tr>
<td>D The slots on the gyro match and are compatible with the lug assembly on the orientation sub.</td>
</tr>
<tr>
<td>D The survey tools will pass through all drill string tool joints and drill collar ID’s.</td>
</tr>
<tr>
<td>D All rotary connections are compatible.</td>
</tr>
<tr>
<td>D All rotary shouldered connections are made up to the recommended torque.</td>
</tr>
<tr>
<td>D Enough Pump Pressure is available on Site for setting the Packer.</td>
</tr>
</tbody>
</table>

*Note: Any deviation from established running or milling procedures must be approved by WOTI Management, PRIOR to changing any procedures.*
Making the Hole Preparation Run

1. Make a run to ensure that the casing is clean and there is a smooth and clean place for setting the packer. The run should include the following (from the bottom):

   • A Full Gauge Drift Mill
   • Casing Scrapper (Do not run casing scrapers across open perforations.)
   • Cross Over Sub (Bit Sub with Float)
   • String Stabilizer
   • Pony Drill Collar or 1 Joint of the Drill collar
   • String Stabilizer
   • Drill Collars
   • Drilling Jar
   • Drill Collars
   • HWDP’s
   • Balance of Drill Pipes To Surface

   The stiffness of this assembly will serve to identify any problem doglegs or restrictions in the hole that may hamper running of the whipstock assembly.

Note: The wellbore must be clean and free of any obstruction to the desired setting depth for the Whipstock. The omission of this gauge run could result in the failure of setting the Whipstock later.

2. Run this assembly in the well to the Packer setting depth.
3. Tally the pipe while running in or out of the well to get an accurate measurement to the Packer setting depth.
4. Record the measurements to ensure that:
   • thewhipstock can be run and set at the desired depth
   • the depth measurement to the Packer setting depth is accurate
   • the casing wall is clean where the whipstock is to be set

NOTE: Scrape Packer setting depth twice.

Note: It is very important to get an accurate measurement for the packer setting depth so the Whipstock will be oriented as to setting depth as possible. Using this measurement facilitates proper placement of the Whipstock.
Hole Preparation Run BHA Assembly

- Balance of Drill Pipes to Surface
- HWDPs
- Drill Collars
- Drilling Jar
- Drill Collars
- String Stabilizer
- 1 joint of Pony Drill Collar or Drill Collar
- String Stabilizer
- Bit Sub with Float
- Casing Scraper
- Full Gauge Mill
Test the MWD tool prior, to running the assembly in the hole.

1. Pick up the following assembly:
   - Blank Sub or Kelly Valve (valve to be closed and run pin-up)
   - Crossover Sub
   - One joint of S-135 Drill Pipe
   - Flow Through Valve
   - One joint of S-135 Drill Pipe
   - 6 joints of HWDP
   - MWD
   - One joint of S-135 Drill Pipe
   - Crossover Sub
   - Kelly or Top Drive

2. RIH to top of Drill Pipe. With top drive or Kelly connected, record the flow rate required to obtain a survey. The Flow-Through Valve will remain open.
Preparing the Milling Equipment

1. Lay the whipstock on the catwalk, face up, with the top of the whipstock pointing toward the rig.

<table>
<thead>
<tr>
<th>WARNING</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Never use a nylon sling to lift or move a Whipstock because nylon may be cut. Always use a wire sling or wire rope to lift or move a Whipstock.</em></td>
</tr>
</tbody>
</table>

2. Complete the whipstock assembly, checking all OD’s, ID’s, and descriptions.

3. Pick up a joint of S-135 Drill Pipe (FLEXJOINT) and make up the **Flow Through Valve** to the top of the drill pipe and make up the Mill Assembly covered with Running Tool to the bottom of Drill Pipe.

   *Note: If the window is exiting through two or more strings of the casing or into a known hard formation, exclude the Watermelon Mills (in the case of using combination mills), using only the Rugby Mill below the single joint of DP. Depending on the casing size and grade, more than one Rugby Mill may be required to make multiple exits.*

   *Once the casing string(s) has been exited into the formation, pull out of the hole. Make up the Back Mill (and Window Mill) in the assembly as described above and run in the hole, reaming through the window with the Watermelon Mills.*

4. Makeup one joint of S-135 Drill Pipe (with cone type DP strainer installed) to the top of Flow Through Valve and makeup MWD to the top of Drill Pipe. (or Makeup UBHO Sub to the top of Flow Through Valve).

5. If a bit float has to be used, place the bit float sub above the Flow Through Valve and beneath the UBHO sub.

6. Make up all connections to the recommended torque.

7. Ensure that everything is properly made up before continuing (see Figure).
Preparing the Milling Equipment BHA

UBHO Sub
Bit Sub w/Float Assy (use if only dictated by client, use a drilled float sub assembly).
Crossover sub (double pin)
Flow Through Valve
1 joint of S-135 DP
Running Tools
Tri-Mill
8. There is a hole in one of Rugby/Lead Mill blades for screwing the shear screw and attaching Rugby Mill to the Whipface. Mark the opposite blade of the blade with a shear screw hole on the Rugby Mill and scribe a line from this blade, up the Back Mill (and Window Mill), Bit Sub, and the single joint of HWDP to the top of the UBHO Sub.

9. Have the survey company representative back out the set screws that hold the internal key in the UBHO Sub, and rotate the key until it is aligned with the scribed line. After it is in position, tighten the setscrews to lock the key in alignment with the scribed line.

10. Run the Mill assembly through the BOP stack and into the casing liner/hanger (being careful not to damage the wear bushings or strike any closed BOP rams) to ensure that the whipstock’s OD is compatible with the drift diameter of the casing. Remove wear bushing if necessary.

11. Pull the assembly out of the hole.

12. Secure a safety clamp around the whipstock body about halfway down the face of the Whipface while the whipstock is lying on the pipe deck/catwalk.

13. Pick up the Whipstock with tugger from the catwalk. A whip handling device is provided which is bolted onto the back of whipstock. This is to be used as a false rotary to support the assembly in the Rotary Table when making up the mill to whip via the shear screw. Assist with a crane as necessary.


15. Lower the whipstock into the mouse hole (or another suitable work hole on the drill floor), allowing both the safety clamp and the winch/tugger line to support the whipstock’s weight.
**Note:** Larger Whipstocks (9% to 20 inches) are usually too big for the mouse hole and must be set in the rotary to attach to the Mill assembly. Properly sized rotary slips must be used. The 13⅜” whipstock will not fit through the standard rotary (10⅝” ID) and the rotary bushing, in this event must be pulled. Use of an API bowl and slips to hold the whipstock in the rotary is required.

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Close the BOP Shear/Blind ram when working on Whipstock.</td>
</tr>
<tr>
<td>• Do not drop anything in the wellbore when working over the wellbore.</td>
</tr>
<tr>
<td>• Use extreme caution when handling the whipstock, setting drill collar slips, safety clamps, etc. to prevent dropping the whipstock in the hole.</td>
</tr>
<tr>
<td>• Run the draw works in low. Pick up and set down the whipstock easily in the slips to prevent damage or premature setting.</td>
</tr>
<tr>
<td>• Ensure the lead tongs have most of the slack out of the snub line to prevent jerking against the back-up tongs.</td>
</tr>
</tbody>
</table>

16. Put a light amount of thread compound on the shear screw, adjust Rugby Mill hole and Whipface and connect the whipstock assembly to the mill assembly with a shear screw.

Shear screws with a **higher** value should be considered when:

- running the whipstock in a highly deviated hole
- heavy mud is in the well
- other wellbore restrictions such as a liner hanger may be encountered

Shear screws with a **lower** shear value should be considered when:

- whipstock is being set shallow (less than 1500 m)
- running and setting Whipstock with coiled tubing

17. Attach the Hydraulic Line to the connection on the bottom of the Milling Assembly and back of whipstock.

18. Fill Whipstock and Mill Assembly / Running Tool with Hydraulic Oil, allow air to bleed out, fit piston ensuring the top of the piston is below the top running tool box connection.

19. Run the Whipstock & Mill Assembly below the rotary table to the top of UBHO sub, Break the connection and top-up with Hydraulic Oil.

20. Pick up the Milling/whipstock assembly.

21. Install the rotary table cover.
22. Remove the safety clamp and whip handling device which is bolted onto the back of whipstock.

23. Remove the rotary table cover.

24. Lower the whipstock slowly into the well, setting the rotary slips on the DP.

25. Check the orientation of the key in the UBHO sub, make any adjustments necessary, and tighten the setscrews again.

Note: For safety purposes, install a drill pipe wiper to prevent dropping the Allen wrench in the hole.

<table>
<thead>
<tr>
<th>CAUTION</th>
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<tbody>
<tr>
<td>Run the draw works in low. Pick up and set down the whipstock gently in the slips to prevent damage or premature setting. Make sure the lead tongs have most of the slack out of the snub line to prevent jerking against the back-up tongs.</td>
</tr>
</tbody>
</table>
RUNNING PROCEDURE

Running and Orienting the Whipstock

1. Lower the whipstock assembly slowly into the wellbore and do not pump anything in the well to prevent premature setting of the whipstock.

CAUTION

Do not alter the orientation of the UBHO sub to the Whipface's face when making the first connection. Do not let the UBHO sub turn or move, or the direction of the milled window could be affected.

2. Refer to dogleg checklist for doglegs greater than 4 degrees. Watch the weight indicator carefully and record up-weights regularly.

3. Monitor trip-tank for proper fill up.

4. Run the whipstock slowly, like a packer assembly, at a rate of 2 to 3 minutes per stand.

5. Do not turn string.

6. Do not Pump in the Well (unless an open Flow Through Valve is Run above the Running Tools).

7. Fill the drill string every 5 strands.

CAUTION

Proceed slowly and with caution while running the whipstock assembly through the BOPs, wellhead, liner top, and any other restrictive sections to prevent damage or premature setting. The difference between the whipstock OD and the casing ID is minimal, making it similar to a piston, so lower the assembly very slowly in these small bypass areas. DO NOT PUMP IN THE WELL. IF TAKING WEIGHT CALL WHIPSTOCK SUPERVISOR.

8. Run slowly into the hole until approximately 30 feet off the bottom.

9. Slowly move the whipstock assembly up and down from 5 to 20 feet to remove all trapped torque from the drillstring.

10. Record up and down free weights.

11. Run survey tools on wireline to the UBHO sub if using a survey.

12. Take survey readings.
13. To orient, the whipstock, rotate the drill pipe to the right in ¼ turn increments (no more than ½ turn at a time) until the whipstock assembly is oriented in the correct position.

14. Take another survey, making additional corrections as needed and lowering 4 to 5 feet after each increment.

CAUTION

A crooked hole may require several readings and corrections to remove all of the trapped torque from the drill string. Work slowly and carefully in order to achieve proper orientation.

CAUTION

This Model of Whipstock, because it is hinged, must be set within 30° on either side of the low side to prevent the whipstock’s whipface from falling across the wellbore.

15. Continue taking readings until 3 sequential reading are within a 5° range before assuming the direction is correct.

16. After reaching and verifying the proper direction, call a meeting with the customer, driller, and survey/MWD company representative to review the orientation of the whipstock’s Whipface once more.

17. Continue the procedure if everyone is in agreement.

18. POOH the survey tools and make a mark on the rotary table and the Drill Pipe, make up the Kelly (or Top Drive), DO NOT ALTER THE ORIENTATION WHILE MAKING UP THE KELLY.

19. Lower the whipstock assembly slowly to the setting depth.

20. Start pump and increase pressure until the packer shear pins are sheared and the packer sets in place (at 1200-1400 psi), hold pressure for 10 minutes to confirm the setting.

Note: In case of Using MWD and Flow Through Valve, increase pump rate until the Flow Through Valve shear pins are sheared and the valve closes, then continue pumping until the packer shear pins are sheared and the packer sets in place.
21. Slack off 10-15klbs and over pull 10-15k lbs to prove packer is set.

22. Pick-up 35,000-55,000 lbs (Depend on whipstock size) over pull, continue over pull on the screw as required to initiate the shear. A sharp drop in the pipe occurs when the shear screw shears.

23. Raise the drill string approximately 1 to 2 feet.

24. Set the drill string back down to make sure the shear screw has sheared. Repeat if necessary.

25. Mark the depth on the pipe each time. It should read the same each time.

26. Set the pipe back down with approximately 20,000 lb of pressure to ensure that the Whipface is over against the casingwall.

27. Raise the drill string so that the Rugby Mill is 5 to 10 feet above the top of the whipstock.

28. Lay down the necessary drill pipe to pick up the kelly.

29. Start pump with maximum allowable GPM (According to the standpipe pressure). Engauge with Whipface with Reduced RPM (20-30). Monitor pressure drop due to breaking Nozzle plugs.

*Note: Do not Mill and work on Nozzle plugs more than One min with low GPM which leads to Mill burning.*

30. Displace the Mud in the well (if needed) and check mud properties for proper rheology for steel removal.

31. The milling operation can now begin.
Running Milling Assembly and Opening the Window

This section assumes that the Rugby Mill has been sheared from the whipstock and raised 5 to 10 feet above the whipstock.

NOTE: Install Ditch Magnets

1. Make up the kelly to the drill string.
2. Record string weight up and down.
3. Engage the pumps, slowly increasing to the planned circulation rate, and record pump pressure and rate.
4. Engage the rotary and slowly increase the speed between 20 and 40 RPM.
5. After the rotary has stabilized, slowly increase between 50 and 75 RPM (depending on the mill size).
6. Record the following information:
   - Free rotary torque
   - Pump pressure
   - Pump rate
   - Free weight – up and down (string weight with zero weight on the mill)
7. While rotating, slowly lower the drill string until the Rugby Mill contacts the whipstock and the casing wall, causing an immediate and substantial increase in rotary torque.
8. Mark the kelly. This is the starting point for the Rugby Mill run.
9. After making the initial mark on the kelly, raise the Mill 3 to 5 feet.
10. While rotating, slowly lower the drill string again to see if the increase in rotary torque is indicated at the same place. Work slowly and carefully; repeat if necessary.
11. After marking the kelly with the correct starting point for the Mill, begin milling, using light weights on the Mill (1,000 to 3,000 lb depending on the size of the mill and grade of the casing). As the window milling process begins, an increase in torque and decrease in weight will be indicated.
12. As the torque increases, increase the rotary speed to the recommended RPM (based on the mill size).
13. Continue milling with constant rotary torque and weight (1,000 to 3,000 lb) on the mill. Additional weight may be required if the rate of penetration (ROP) begins to slow.
Use the recommended parameters as follows.

<table>
<thead>
<tr>
<th>Casing Size (in)</th>
<th>Weight on Mill (klb)</th>
<th>Milling RPM</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 ⅝”</td>
<td>2-15</td>
<td>60-120</td>
</tr>
<tr>
<td>7”</td>
<td>2-12</td>
<td>60-120</td>
</tr>
<tr>
<td>5”</td>
<td>1-7</td>
<td>60-120</td>
</tr>
</tbody>
</table>

14. Monitor returns for cuttings during milling operations and pump high viscosity sweeps as needed to remove cuttings from the well. This practice is especially important if the window is being milled in a lateral section.

15. The Window Mill run is completed after milling down the Whipface’s face into the formation AND when the Dress Mill is centered at the bottom of the window.

16. Ream back and forth through the window until no signs of additional torque or drag are indicated.

17. Stop the rotary and slide the Mill assembly through the window several times. If any weight or drag is indicated, start the rotary and ream back and forth through the window until weight or drag is eliminated.

18. Stop the rotary and check for weight or drag again. Repeat this process as necessary.

19. Once the window is complete, stop the rotary, clean the hole of cuttings with high viscosity sweeps, and pull out of the hole without rotating.

20. Closely inspect and gauge all mills for wear using a gauge ring of OD + 1/32".

21. Determine the estimated size of the window.

22. Review the window requirements with the customer to determine if the Elongation Run is required.

Note: The Elongation run is recommended if:

- You have run a bi-Mill Assembly for opening the Window and:
- The customer requests it.
- PDC bit will be used through the window for additional drilling
- Drill collars and stabilizers will be used through the window for additional drilling
- Liner will be installed through the window
- Double bent sub and PDM assembly will be used through the window for additional drilling
- Unusual wear is indicated on the Rugby Mill, resulting in an under-gauge hole

CAUTION

When using a 3° whipface whipstock, do not run the Elongation assembly until AFTER the casing is fully exited. Otherwise, excessive torque will be encountered as the two Watermelon Mills begin elongating the top of the window.
Window Mill Run is Completed
**Elongation run**

1. Assemble the Elongation run components
   - Balance of drill string
   - One or more drill collars or heavy weight
   - Bit Sub (minimum length, bored for float assembly)
   - Crossover sub (double pin, if Bit sub is used)
   - Tri-Mill

---

*Note: Be sure to eliminate the one joint of drill pipe above the Bit Sub and replace it with one or more drill collars/heavy weight to provide “stiffness” to the milling assembly.*
2. Lower the Elongation run assembly into the hole, stopping 5 to 10 feet above the whipstock.

3. Make up the kelly to the drill string.

4. Engauge the pumps and slowly increase to the desired circulation rate.

5. Engauge the rotary and slowly increase to between 50 and 75 RPM (depending on the mill size).

6. Record the following information:
   - Free rotary torque
   - Free weight – up and down (string weight with zero weight on the mill)
   - Pump pressure
   - Pump rate

7. While rotating, slowly lower the drill pipe string and ream back into the window.

8. As the torque increases, increase the rotary speed to the recommended RPM (based on the mill size).

9. Continue milling with constant rotary torque and weight on the mill.

10. Monitor returns for cuttings during milling operations. Pump high viscosity sweeps as needed to remove cuttings from the well.

11. Continue milling down the Whipface, elongating the milled window at the top with the Dress Mill.

12. The Elongation run is complete (unless directed otherwise by the customer) when the Dress Mill is centered at the bottom of the window.
Elongation Run is Completed
13. While rotating, ream back and forth through the window until no additional weight or drag is indicated.

**Note:** If using stabilizers for additional drilling through the window, it is recommended to drill enough hole into the formation to accommodate the stabilizers. The additional rathole should allow the stabilizers to be in the formation BEFORE drilling commences. Rotating the stabilizers or drill bits while on the Whipface can damage the Whipface and the window.

14. Stop the rotary and slide the Mill assembly through the window several times. If any weight or drag is indicated, start the rotary and ream back and forth through the window until weight or drag is eliminated.

15. Circulate the hole clean with one or more high viscosity sweeps to remove all cuttings from the well.

16. When circulation is complete, stop the rotary and pull out of the hole without rotating.

17. Inspect and gauge all mills using a gauge ring of OD + 1/32", to determine wear to the mill and to estimate window/hole size. Review signs of wear with the customer. Repeat Run #3 if the hole appears to be undersized.

18. Lay down the Elongation Run assembly.

**Final Procedures**

1. Personally meet with the customer and the driller and give them the following cautions regarding the whipstock and the milled window.

<table>
<thead>
<tr>
<th>CAUTION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Be careful when approaching the whipstock to avoid damaging it. Do not rotate stabilizers, bits, or BHA’s through the window to avoid damaging the whipstock and or the window.</td>
</tr>
</tbody>
</table>

2. When the window is complete, ask the customer if he would prefer you to stay on location until the next BHA is run through the window. Stay if required.

3. Complete one copy of the Approximate Window Location form for the Customer’s well files (see Figure). (Make sure all dimensions, approximate location, and orientation of the milled window are shown).
4. Account for all mills and other accessory items that are to be returned and contact the WOTI store to make arrangements for the mills to be picked up.

5. E-mail or Fax one copy of the Whipstock Post Job Report form to the appropriate WOTI supervisor for entry into the whipstock database.

6. The whipstock window milling job is now complete.

**BHA for Problems**

The recommended BHA when Milling is slowed or stopped less than 7 ft down the Whipface.

**Alternative First Run BHA**

Alternative first run BHA for a 1-trip whipstock operation.

*Note: Please check with WOTI Engineering before running this assembly.*
Whipstock Retrieval Procedures Overview
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WOTI Whipstock Die Collar Retrieval 3
Conventional Overshot on Shear out Assembly 3
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GENERAL INFORMATION

The Customer may want to retrieve a previously set whipstock in order to regain access to the original wellbore below the whipstock. This may be due to:

1. A multi-lateral application whereby several whipstocks are set and retrieved in one wellbore
2. The set whipstock may have become damaged and must be retrieved
3. Access to a zone below the set whipstock may be desired

RETRIEVAL METHODS

WOTI has developed several methods for retrieving whipstocks from the wellbore which include:

WOTI Whipstock Retrieval Hook
If the whipstock was manufactured by WOTI and it has a retrieval slot machined into the Whipface, then the first method of choice is the use of the WOTI Whipstock Retrieval Hook. (see Whipstock Retrieval Hook Operating Procedures).

WOTI Whipstock Die Collar Retrieval
If attempts with the Retrieval Hook are unsuccessful, the next recommended method in retrieving WOTI whipstocks is the WOTI Whipstock Die Collar. The threads in the Die Collar engage with the top of the whipface. The matching thread profiles will facilitate proper makeup when engaged (see Die Collar Retrieval Procedures).

Conventional Overshot on Shear Out Assembly
If the whipstock to be retrieved was manufactured by WOTI and has the optional Shear out Assembly installed between whipface and the anchor, a conventional fishing overshot can be run to catch the exposed fishing neck after the whipface section has been retrieved from the wellbore. This situation may occur if the whipstock anchor section has become stuck due to cuttings falling around the slips and preventing its release.
Using the Retrieving Hook or the Die Collar, the whipface section can be gauged and sheared from the stuck anchor section. This feature leaves the whipstock anchor section in the wellbore with a known and undamaged fishing neck exposed at the top. Conventional fishing overshots and jarring assemblies are then run to retrieve the stuck anchor section (see Conventional Overshot on Shear out Assembly Procedures).

Burnover Technique and Overshot Retrieval
If the whipstock becomes severely damaged, preventing it from being retrieved by one of the previous methods, or the whipface does not have the WOTI retrieval slot, then the only alternative to retrieve the whipstock is to burnover the whipstock’s whipface using wash pipe and a properly dressed milling shoe.
After the whipstock’s OD has been burned (milled) over, leaving a fishing neck exposed with a known OD, then the whipstock is retrieved using conventional fishing overshot and jarring assembly (see Burnover Technique and Overshot Retrieval Procedures).
Whipstock Retrieval Hook Procedures
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All WOTI whipstocks have a retrieval slot machined into the whipface. The first retrieval method to use is the Whipstock Retrieval Hook (see Figure 1).

CAUTION

When retrieving a whipstock from a lower multi-lateral application, or from below a perforated zone, the Retrieval Hook should NOT be used. The top of the retrieved whipstock must be protected to avoid pulling it through an upper window or perforated section. Once the whipstock’s top is pulled out of the window, the slips may prevent the whipstock from being “pushed” back down the hole where it could become permanently lodged across the wellbore. The Whipstock Die Collar should be used to retrieve whipstocks in these instances since the die collar will protect the top of the whipstock as it is retrieved past upper windows and perforated sections.
PRE - OPERATIONAL PROCEDURES

Preplanning

Review all well and whipstock information, including:

- Depth of whipstock
- Orientation of whipstock
- Any diagrams of the set whipstock
- Size/type of whipstock
- Whipstock dimensions
- Load capacity of retrieval hook
- Maximum pull of work string
- Recommendation to remove the wear bushing from the rotary before retrieving the whipstock through the rotary

Equipment Inspection

1. Verify that all tools are correct sizes as ordered.
2. Inspect all tools for any shipping damages.
3. Verify that all connections are compatible.
4. Record measurements of all tools.

Making up the Retrieval Equipment

1. Assemble the retrieving assembly (see Figure 2). The BHA consists of (from the top):
   - Balance of drill pipe string
   - UBHO sub (optional)
   - Drill Collars, 4 to 6 (optional)
   - Oil Jar (optional)
   - One joint drill pipe
   - Bit Sub
   - Retrieval Hook
Balance of drill pipe string

UBHO sub (optional)

Drill Collars, 4 to 6 (optional)

Oil Jar (optional)

One joint drill pipe

Bit Sub

Retrieval Hook

Figure 2. Whipstock Retrieval Hook BHA Assembly
2. Go over work string calculations
   • Determine 80% of the yield of weakest component of work string
   • Available overpull ___________
   • Maximum pull (Retrieval Hook capacity) ___________

---

**Note:** If the UBHO sub is used for MWD measurements, then remove all jets from the Retrieval Hook so enough flow can be established to assist MWD in operating correctly.

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## CAUTION

*Do not bend, weld, or otherwise alter the Retrieval Hook. Any modifications may result in the failure of the Retrieval Hook. The bend at the hook’s head is specifically engineered to match the angle of the retrieval slot.*

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## RUNNING PROCEDURE

1. Run, WITHOUT ROTATING, in the hole with the Retrieving Hook assembly, stopping approximately 30 feet above the top of the whipstock.

2. Record the pick-up and slack-off string weights.

3. Engauge the mud pumps and increase to full circulation rate.

4. Record the pick-up and slack-off string weights again.

5. Orient the Retrieval Hook to the whipstock’s whipface face if required.

6. Lower to the approximate retrieval depth, marking the pipe with the dimensions for the following:
   • Top of the window
   • Top of the whipstock
   • Top of the retrieval slot (Also, mark the pipe approximately 6 feet above and below the mark for the retrieval slot, providing a window for finding the retrieval slot.)

7. Slowly lower the Retrieval Hook assembly past the top of the whipstock and the top of the retrieval slot while circulating (see **Figure 3**). If weight is rapidly lost, the Retrieval Hook may have entered the retrieval slot.

**Note:** The Retrieval Hook and retrieval slot are designed so that the Retrieval Hook will enter the retrieval slot within a 40° alignment range.
If the weight rapidly increases after lifting approximately 2 to 6 feet, but there is no weight loss when lowering, then the Retrieval Hook has POSSIBLY hooked into the top of the window. If this occurs, lower the Retrieval Hook and rotate 75° to 110° to release from the window. Then raise the Retrieval Hook back into the casing, re-orient the retrieval tool, and slowly lower the Retrieval Hook to the retrieval slot again.
8. Slowly raise the Retrieval Hook assembly. If weight is rapidly gained, the Retrieval Hook is engaged in the retrieval slot.

9. To determine whether the hook is properly engaged in the retrieval slot, lower the assembly again to see if weight is rapidly lost. (This indicates the hook is resting at the bottom of the retrieval slot.)

10. Raise the assembly again to see if weight is rapidly gained again. Re-check once or twice to verify the Retrieval Hook is properly engaged in the retrieval slot.

11. Mark the pipe and rotary to record depth and direction to assist in re-hooking the whipface if, for some reason, the Retrieval Hook comes free from the whipface. If the Retrieval Hook fails to hook the retrieval slot, then:
   - Position the jets on the Retrieval Hook at the whipstock’s retrieval slot while circulating through the Retrieval Hook. Raise and lower the Retrieval Hook across the retrieval slot while pumping at circulation rates.
   - This jet action usually washes out any debris or cuttings that may have packed in the retrieval slot preventing the Retrieval Hook from engaging. Try to hook the retrieval slot again.

12. When the Retrieval Hook has properly engaged the retrieval slot, start retrieving the whipstock from the wellbore. DO NOT SLACK OFF. This could cause the Retrieval Hook to disengage from the whipstock’s retrieval slot.

13. Pull up on the whipstock to approximately 10,000 lb over the string weight and hold long enough for the oil jars to bleed off.

14. After the oil jars bleed off, begin pulling the whipstock from the wellbore.

15. If the whipstock does not release, slowly slack off the string, re-cocking the jars.

16. Pick up 20,000 lb over string weight and allow the jars to hit.

17. Repeat the previous two steps in 10,000 lb increments (up to 80,000 lb over string weight) until the whipstock is jarred loose.

CAUTION

**DO NOT** set down more than 3,000 lb once the hook has engaged the retrieval slot or the Retrieval Hook may become bent and unusable.

DO NOT set down more than 3,000 lb once the hook has engaged the retrieval slot or the Retrieval Hook may become bent and unusable.

CAUTION

Do not exceed the maximum pull limits for the Retrieval Hook as indicated in the Technical Data portion of the Reference section. Exceeding the pull limits could result in material failure of the Retrieval Hook.
18. If the whipstock does not release, rotate the string 75° to 110° to the right and lower the string, causing the hook to disengage.

Note: Do not exceed 3,000 lb slack off weight.

19. When the whipstock pulls free, pull the whipstock out of the well. There will normally be 15,000 to 20,000 lb drag after the whipstock begins moving up the hole.

**CAUTION**

*Do not rotate out of the well or slack off to set the slips or install pipe wipers. Any of these practices could cause the whipstock to become disengauged.*

**CAUTION**

*Use extreme caution when pulling the whipstock through the BOPs and the rotary table to avoid getting hung up.*

20. As the whipstock is pulled through the rotary, install plastic tie wraps around the top of the whipface and the Retrieval Hook to prevent the Retrieval Hook from disengaging from the retrieval slot.

21. Immediately install a hoisting swivel ring on the back of the whipface (see Figure 4).

22. Install a safety clamp around the whipstocks body, halfway down the whipface.

23. Attach an air hoist line to the hoisting swivel ring and USE CAUTION when laying down the whipstock.
Figure 4. Safety clamp on whipface
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The Die Collar is the next method to be used to retrieve the whipstock if the Retrieval Hook attempts are unsuccessful (see Figure 1). The Die Collar is specifically designed for the WOTI whipstock whipface.
PRE - OPERATIONAL PROCEDURES

Preplanning

Review all well and whipstock information. This includes:

- Depth of whipstock
- Any diagrams of the set whipstock
- Size/type of whipstock
- Whipstock dimensions
- Maximum pull of work string
- Recommendation to remove the wear bushing from the rotary before retrieving the whipstock through the rotary.

Equipment Inspection

1. Verify that all tools are correct sizes as ordered.
2. Inspect all tools for any shipping damages.
3. Verify that all connections are compatible.
4. Verify the OD and ID of the Die Collar.
5. Check the pins in the safety joint.
6. Record the measurements of all tools.

Making up the Retrieval Equipment

Assemble and prepare the proper tools required for BHA retrieval (see Figure 2). The BHA consists of (from the top):

- Balance of drill pipe string
- Accelerator
- Drill collars (4 to 6)
- Oil Jar
- One drill collar
- Safety joint
- Die collar
Figure 2. Die Collar BHA Assembly

- Balance of drill pipe string
- Accelerator
- Drill collars (4 to 6)
- Oil Jar
- One drill collar
- Safety joint
- Die collar
Running Procedure

1. Run the retrieving assembly in the hole WITHOUT ROTATING. Stop approximately 30 feet above the top of the whipstock.

2. Record the pick-up and slack-off string weights.

3. Engauge the mud pumps and increase to the full circulation rate.

4. Record the pick-up and slack-off string weights again.

5. Lower the retrieving assembly to 5 feet above the top of the whipstock.

6. Before landing the Die Collar, turn the rotary 4 to 5 revolutions to the right. Slack off and watch for any "return" rounds that give an indication of possible “trapped” rotary torque in the drill pipe string.

7. Mark the pipe with the dimensions for:
   - Top of the window
   - Top of the whipstock

8. Slowly lower the Die Collar assembly while circulating until contact is made with the top of the whipstock.

9. Stop pumping immediately upon making contact.

10. Slowly begin rotating the Die Collar to the right with approximately 2,000 lb of weight down, thereby making up the Die Collar to the whipstock whipface.

   *Note: Makeup one round of rotation per 1,000 feet of the drill string in the well. For maximum makeup, tighten until the same number of rounds returns (i.e., 8,000 feet in the well make up until eight rounds of torque get eight rounds back).*

11. When the Die Collar is made up properly, mark the pipe.

12. Pull up on the whipstock with approximately 10,000 lb above the string weight and hold long enough for the oil jars to bleed off.

13. After the oil jars bleed off, begin pulling the whipstock from the well bore.

14. If the whipstock does not release, slowly slack off on the string, re-cocking the jars.

15. Pick up 20,000 lb over string weight and allow the jars to hit.

16. Repeat the previous two steps in 10,000 lb increments (up to 80,000 lb over string weight to fire jars) until the whipstock is jarred loose.
Note: If the whipstock fails to pull free, consult with the customer representative and WOTI manager BEFORE shearing at the safety joint.

17. When the whipstock pulls free, pull the whipstock out of the well. There will normally be 15,000 to 20,000 lb drag after the whipstock begins moving up the hole.

CAUTION

Do not rotate out of the well or slack off to set the slips or install pipe wipers. Any of these practices could cause the whipstock to become disengaged.

18. Immediately install a new hoisting swivel ring on the back of the whipface as the whipstock is pulled through the rotary (see Figure 3).

19. Install a safety clamp around the whipstock’s body, halfway down the whipface.

20. Attach an air hoist line to the hoisting swivel ring and, USE CAUTION when laying down the whipstock.

CAUTION

Use extreme caution when pulling the whipstock through the BOPs and the rotary table to avoid getting hung up.
Figure 3. Safety clamp on whipface
Conventional Overshot on Shear out Assembly
Retrieval Procedures
SCOPE

Occasionally, during a whipstock retrieval operation, the whipstock anchor section may become stuck, due to milled cuttings that have fallen around the slips and prevent its release. If the whipstock to be retrieved has the optional Shear out Assembly installed between the whipface and the body, conventional fishing overshot and jarring assembly can be run to latch onto the exposed fishing neck of the Shear out Assembly (see Figure 1).
PRE - OPERATIONAL PROCEDURES

Preplanning

1. Review all well and whipstock information. This includes:
   • Depth of whipstock
   • Any diagrams of the set whipstock
   • Size/type of whipstock
   • Whipstock dimensions
   • Maximum pull of work string
   • Recommendation to remove the wear bushing from the rotary before retrieving the whipstock through the rotary

2. Determine the approximate depth of the fishing neck on the whipstock anchor section.

3. Confirm the dimensions of the fishing neck for the size whipstock in the hole.

Equipment Inspection

1. Account for all tools and correct sizes as ordered.

2. Check basket grapple for the correct size.

3. Inspect tools for any shipping damages.

4. Verify that all connections are compatible.

Making up the Retrieval Equipment

Assemble the retrieving assembly (see Figure 2). The Shear out Assembly consists of (from the top):
   • Balance of drill pipe string
   • Accelerator
   • Drill collars (4 to 6)
   • Oil Jar
   • Bumper jar
   • Drill collar
   • Overshot
Figure 2. Overshot BHA Assembly

- Balance of drill pipe string
- Accelerator
- Drill collars (4 to 6)
- Oil Jar
- Bumper jar
- Drill collar
- Overshot
**Running Procedure**

1. Run the retrieving assembly in the hole WITHOUT ROTATING, stopping approximately 30 feet above the top of the Shear out Assembly.

2. Record the pick-up and slack-off weights.

3. Engauge the mud pumps and increase to the full circulation rate.

4. Record up and down string weights.

5. Lower the overshot assembly to just above the top of the Shear out Assembly.

6. Slowly rotate to the right while lowering onto the Shear out Assembly.

7. When the pump pressure increases rapidly, signifying the overshot has engaged, IMMEDIATELY turn the mud pumps off to keep from pumping back off the Shear out Assembly.

8. Stop rotating and set down on the overshot with 5,000 to 10,000 lb to land the overshot firmly on the Shear out Assembly.

9. Once the Shear out Assembly is fully engaged, pull up with approximately 10,000 lb over the string weight and hold long enough for the oil jars to bleed off.

10. After the oil jars bleed off, begin pulling the whipstock anchor from the wellbore.

11. If the whipstock anchor does not release, slowly slack off on the string, allowing the jars to re-cock.

12. Pick up 20,000 lb over string weight and allow the jars to hit.

13. Repeat the previous two steps in 10,000 lb increments (up to 80,000 lb over string weight to fire jars) until the whipstock anchor is jarred loose.

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**CAUTION**

*Do not rotate out of the well or slack off to set the slips or install pipe wipers. Any of these practices could cause the whipstock to become disengaged.*

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14. When the whipstock anchor pulls free, pull it out of the well. There will normally be 15,000 to 20,000 lb drag after the whipstock begins moving up the hole.

15. Immediately install a new hoisting swivel ring on the back of the whipface as the whipstock is pulled through the rotary (see Figure 3).
16. Install a safety clamp around the whipstock’s body, halfway down the whipface.

**CAUTION**

*Use extreme caution when pulling the whipstock through the BOPs and the rotary table to avoid getting hung up.*
Burnover Technique and Overshot Retrieval Procedures
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SCOPE

If the whipstock becomes severely damaged, preventing it from being retrieved by one of the other retrieval methods, or the whipface does not have a retrieval slot, then the only alternative for retrieval is to burnover the whipstock’s whipface using washpipe and a properly dressed milling shoe (see Figure 1). After the whipstock’s OD has been burned (milled) over, leaving fishing neck exposed with a known OD, then the whipstock is retrieved using conventional fishing overshot and jarring assembly.

PRE-OPERATIONAL PROCEDURES
Preplanning

1. Review all well and whipstock information. This includes:
   • Depth of whipstock
   • Any diagrams of the set whipstock
   • Size/type of whipstock
   • Whipstock dimensions
   • Recommendation to remove the wear bushing from the rotary before retrieving the whipstock through the rotary

Equipment Inspection

1. Account for all tools and correct sizes as ordered.
2. Inspect tools for any shipping damages.
3. Verify that all connections are compatible.
4. Record the measurements of all tools.

Making up the Milling Equipment

Assemble the burnover assembly for the first trip. The BHA consists of (from the top):
   • Balance of drill pipe string
   • Drill collars (4 to 6)
   • Stabilizer
   • Oil jar
   • Bumper jar
   • Crossover sub
   • Joint of washpipe (f/max. clearance)
   • Burnover shoe

Burnover Procedure

1. Run the burnover assembly in the hole WITHOUT ROTATING. Stop approximately 30 feet above the top of the whipstock.
2. Record the pickup and slack-off weights.
3. Makeup the kelly and engauge the mud pumps, increasing to the full circulation rate.
4. Record the pickup and slack-off weights again.
5. Mark the kelly with the dimensions for the top of the whipstock.
6. Begin rotating at 60 to 70 RPM and slowly lower until the burnover shoe comes into contact with the top of the whipstock.

7. Burnover and mill down a minimum of 7 feet from the top of the whipstock with a standard whipface (a minimum of 5 feet for a short-radius or a 3° whipface).

8. When the milling is complete, pull the burnover assembly from the hole.

9. Caliper the ID of the burnover shoe to determine the OD of the fishing neck on the whipstock section left in the hole.

**Overshot Retrieval Procedure**

1. Assemble the final retrieval assembly consisting of:
   - Balance of drill pipe string
   - Accelerator
   - Drill collars (4 to 6)
   - Oil Jar
   - Bumper jar
   - Drill collar
   - Overshot (dress with a doughnut guide)

2. Run the retrieving assembly in the hole WITHOUT ROTATING. Stop approximately 30 feet above the top of the whipstock body/fishing neck.

3. Record the pick-up and slack-off weights.

4. Make up the kelly and engauge the mud pumps, increasing to the full circulation rate.

5. Record the pick-up and slack-off weights again.

6. Lower the overshot assembly to 5 feet above the fish.

7. Slowly rotate to the right while lowering to the fish.

8. When the pump pressure increases rapidly, signifying that the overshot has engauged the fish, IMMEDIATELY turn the pumps off to keep from pumping off the fish.

9. Stop rotating and land the overshot on the fish with 5,000 to 10,000 lb to set the fish firmly in the overshot.

10. Pick up with approximately 10,000 lb above the string weight and hold long enough for the oil jars to bleed off.

11. After the oil jars bleed off, begin pulling the whipstock from the wellbore.

12. If the whipstock does not release, slowly slack off on the string, re-cocking the jars.
13. Pick up 20,000 lb over string weight and allow the jars to hit.

14. Repeat the previous two steps in 10,000-lb increments (up to 80,000 lb over string weight to fire jars) until the whipstock anchor is jarred loose.

15. When the whipstock anchor pulls free, pull it out of the well. There will normally be 15,000 to 20,000 lb drag after the whipstock begins moving up the hole.

6. Immediately install a new hoisting swivel ring on the back of the whipface (if possible after the burnover) as the whipstock is pulled through the rotary.

17. Install a safety clamp around the whipstock body, halfway down the whipface (see Figure 2).
## Contents

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Approximate Whip and Window Location Form  17
REPORT FORMS

These forms are representative of all whipstock forms. Individual jobs may require specialized (modified) forms due to the specific needs at the job site.
## Well Information

<table>
<thead>
<tr>
<th>Field</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Well T.D.</td>
<td>m</td>
</tr>
<tr>
<td>Is Hi/SorCO2 Pres. set?</td>
<td>Ye or Nye</td>
</tr>
<tr>
<td>Casing Whipstock to be set in</td>
<td></td>
</tr>
<tr>
<td>Size (I)</td>
<td>in.</td>
</tr>
<tr>
<td>Other Casing Above KOP</td>
<td></td>
</tr>
<tr>
<td>Size</td>
<td>in.</td>
</tr>
</tbody>
</table>

## Deviation

<table>
<thead>
<tr>
<th>Degree</th>
<th>Depth</th>
<th>ID</th>
<th>Depth</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1</td>
<td>m</td>
<td>1</td>
<td>m</td>
</tr>
<tr>
<td>2.1</td>
<td>m</td>
<td>2</td>
<td>m</td>
</tr>
<tr>
<td>3.1</td>
<td>m</td>
<td>3</td>
<td>m</td>
</tr>
<tr>
<td>4.1</td>
<td>m</td>
<td>4</td>
<td>m</td>
</tr>
</tbody>
</table>

## Window Information

<table>
<thead>
<tr>
<th>Plan</th>
<th>Valve</th>
</tr>
</thead>
<tbody>
<tr>
<td>KOP for Window</td>
<td>m</td>
</tr>
<tr>
<td>Window Direction</td>
<td>m</td>
</tr>
<tr>
<td>Well Window Orientation</td>
<td>m</td>
</tr>
<tr>
<td>Size of Bit</td>
<td>in.</td>
</tr>
</tbody>
</table>

## Rig & Work string information

<table>
<thead>
<tr>
<th>Rig</th>
<th>Work string required?</th>
<th>Yes or No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size of Rig</td>
<td>in.</td>
<td>lbs.</td>
</tr>
</tbody>
</table>

## Whipstock Information

<table>
<thead>
<tr>
<th>Whipstock Type</th>
<th>Mechanical Whipstock</th>
<th>Hydraulic Whipstock</th>
</tr>
</thead>
<tbody>
<tr>
<td>Size</td>
<td>in.</td>
<td>lbs.</td>
</tr>
</tbody>
</table>

## Tool & other equipment needs

<table>
<thead>
<tr>
<th>Tool</th>
<th>Use</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit Sub</td>
<td>Crossover Subs</td>
</tr>
</tbody>
</table>

## Other Information

<table>
<thead>
<tr>
<th>Information</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trucking preference</td>
<td></td>
</tr>
<tr>
<td>Drilling location</td>
<td></td>
</tr>
<tr>
<td>Job order token</td>
<td></td>
</tr>
</tbody>
</table>

## WOTI Petroleum Technologies
<table>
<thead>
<tr>
<th>Customer:</th>
<th>Date:</th>
</tr>
</thead>
<tbody>
<tr>
<td>We e Name:</td>
<td></td>
</tr>
</tbody>
</table>

**WHIPFACE section**
- Correct OD for Casing size/WT: Yes [ ] No [ ]
- Correct whipface angle: Yes [ ] No [ ]
- Whip face is straight: Yes [ ] No [ ]
- Retrieve at slot machined: Yes [ ] No [ ]
- Whip face was matched with packer: Yes [ ] No [ ]
- Whip face was matched w/mill: Yes [ ] No [ ]

**Slips Section**
- Correct by directional slips installed: Yes [ ] No [ ]
- Shear pin's slips in ok: Yes [ ] No [ ]
- Correct size & No.: Yes [ ] No [ ]
- Correct serial # recorded: Yes [ ] No [ ]
- Measurement's recorded: Yes [ ] No [ ]

**Trip bar section**
- Shear pin or trip bar is ok: Yes [ ] No [ ]
- Trip bar is ready by spring: Yes [ ] No [ ]
- Projector on trip bar ins. labeled: Yes [ ] No [ ]

**Rugby mill (Lead Mill)**
- Correct OD for casing size and WT: Yes [ ] No [ ]
- Correct insert arrangement: Yes [ ] No [ ]
- Correct OD for whipstock OD: Yes [ ] No [ ]
- Correct insert arrangement: Yes [ ] No [ ]
- Correct inspection report included: Yes [ ] No [ ]
- Correct serial # and recorded: Yes [ ] No [ ]
- Measurement's recorded: Yes [ ] No [ ]

**Window Mill (Watermelon type)**
- Correct OD for casing size and WT: Yes [ ] No [ ]
- Correct insert arrangement: Yes [ ] No [ ]
- Inspection report included: Yes [ ] No [ ]
- Correct serial # and recorded: Yes [ ] No [ ]
- Measurement's recorded: Yes [ ] No [ ]

**Retrieving Hook**
- Correct size for whipstock OD: Yes [ ] No [ ]
- Jet inste dle d-front or back: Yes [ ] No [ ]
- Blowing caps inst all-lno or back: Yes [ ] No [ ]
- Proper angle on hook: Yes [ ] No [ ]
- Inspection report included: Yes [ ] No [ ]
- Correct serial # and recorded: Yes [ ] No [ ]
- Measurement's recorded: Yes [ ] No [ ]

**Die Collar**
- Correct size for whipstock OD: Yes [ ] No [ ]
- Inspection report included: Yes [ ] No [ ]
- Correct serial # and recorded: Yes [ ] No [ ]
- Measurement's recorded: Yes [ ] No [ ]

**General inspection**
- Rota ry slip id r conn. Compatible: Yes [ ] No [ ]
- Overall appearance of tools satisfactory: Yes [ ] No [ ]
- OD's proper size - casing size - WT: Yes [ ] No [ ]
- Back up/ special item included: Yes [ ] No [ ]

**Paperwork to be included**
- Copy of order form: Yes [ ] No [ ]
- Copy of inspection report: Yes [ ] No [ ]
- Copy of location checklist: Yes [ ] No [ ]
- Copy of dimension data sheet: Yes [ ] No [ ]
- Copy of window data sheet: Yes [ ] No [ ]

Shipping checklist completed by: 

Date:
## Whipstock Shipping Checklist - Whipback Hydraulic

### Whispface Section
- **Correct OD for Casing size WT**: Yes □ No □
- **Correct Whispface angle**: Yes □ No □
- **Whispface is straight**: Yes □ No □
- **Hole, eval slot machine d**: Yes □ No □
- **Control line pro-tector plate**: Yes □ No □
- **Slot of whipface back**: Yes □ No □
- **Whispface was m.ched w/ packer**: Yes □ No □
- **Whipf. ce w. m.ched w/ mill**: Yes □ No □
- **Con tro line in stall on back of whipface and check its length**: Yes □ No □
- **Hydraulic hose shm /l for connection mill 1 o control line and fitting**: Yes □ No □
- **Hydraulic hose shm /l for connection packer 1 r e a l line and fitting**: Yes □ No □

### Slips section
- **Correct slip installed**: Yes □ No □
- **Bore spring ins r / screw tight**: Yes □ No □
- **Assembly has been pressure tested**: Yes □ No □
- **Correct size & Nr.**: Yes □ No □
- **Correct serial no11’s recorded**: Yes □ No □
- **Assurance’s recorded**: Yes □ No □

### Running tool section
- **Correct OD for casing sale and WT**: Yes □ No □
- **Pistion was m.ched wil h running r t r /J**: Yes □ No □
- **It's the east ok**: Yes □ No □

### Rugby Mill (Lead Mill)
- **Correct OD for casing size. and WT**: Yes □ No □
- **Pro per hole sizes for r shear screw and hydraulic fitting**: Yes □ No □
- **Correct inset arr. ngement**: Yes □ No □
- **Correct control line size**: Yes □ No □
- **Conn. Undamaged a / ed or**: Yes □ No □
- **sped on report included**: Yes □ No □
- **Correct seri / I I I and recorded**: Yes □ No □
- **Assurance’s recorded**: Yes □ No □

### Back Mill (Waterme ont ion)
- **Correct OD for casing s. and WT**: Yes □ No □
- **Correct inset arr. ngement**: Yes □ No □
- **Section report included**: Yes □ No □
- **Conn. Undamaged w protector**: Yes □ No □
- **Correct serial II and recorded**: Yes □ No □
- **Assurance’s recorded**: Yes □ No □

### Window M ill (watermelon type)
- **Correct OD for casing size. and WT**: Yes □ No □
- **Correct in sert arrangement**: Yes □ No □
- **Inspection report included**: Yes □ No □
- **Conn. Undamaged aw /protector**: Yes □ No □
- **Correct serial II and Recorded**: Yes □ No □
- **Mesurne nr. % recorded**: Yes □ No □

### Ret riving Hook
- **Correct I size for r whipstock k**: Yes □ No □
- **Jet installed frnt r back**: Yes □ No □
- **Blan ing caps install /front r back**: Yes □ No □
- **Proper angle r, n hook**: Yes □ No □
- **Inspection report included**: Yes □ No □
- **Conn. Undamaged w /protec tor**: Yes □ No □
- **Correct serial II and record ed**: Yes □ No □
- **Mesh. T/r ement’s recorded**: Yes □ No □

### Die Collar
- **Correct size for whip, tool 00**: Yes □ No □
- **Inspector n rep ort included**: Yes □ No □
- **Conn. Undamaged w /protector**: Yes □ No □
- **Correct serial II and recorded**: Yes □ No □
- **Mesh. T/r ement’s recorded**: Yes □ No □

### Flow Through Valve (CIRC, Vale)

### General inspection
- **Rooly shoulder conn. C omp atable**: Yes □ No □
- **Overall app earance of tools s, is factory**: Yes □ No □
- **overall appea rance of tools s, is factory**: Yes □ No □
- **OD’s proper s, e. casing s. I I I**: Yes □ No □
- **Bck ups! special I tems in cluded**: Yes □ No □

### Paperwork to be included
- **Copy of order for m**: Yes □ No □
- **Copy of insp. ect, Rq.; as Req**: Yes □ No □
- **Copy of lo, f on checklist**: Yes □ No □
- **Copy of dimen sion n ral dat a shK**: Yes □ No □
- **Copy of w indow dat a sh**: Yes □ No □

---

**Shipping checklist completed by:** [Name]

**Date:** [Date]
Pre-Job Location Check list for Whipstocks

**Inspect all WOTI and related equipment for:**

A - □ Verify correct Od's and ID's of all tools
B - □ Confirm all tools received
C - □ Identify any shipping damages

Meet with company representatives, driller and survey/ MWD personnel before beginning any procedures to:

A - Review well information
   1) □ Confirm well is dead: no pressure at surface?
   2) □ Verify casing size and weight.
   3) □ Identify all wellbore restrictions/ deviations.
   4) □ Determine wellbore fluids-type, depth
   5) □ Determine level of cement bond at KOP.
   6) □ Discuss well preparation - gauge ring/scaper run prior
   7) □ Determine location of casing collars near KOP.

B - Review drilling / rig requirements:
   1) □ Check ms of drillstr in g and BH'As for compatibility with Od's of survey gyro tools
   2) □ Verify pump ing / circula tion require ments are met
   3) □ Review placement of UBHO sub in BHA.

C - Review milled window requirements
   1) □ Verify KOP of window and setting depth.
   2) □ Confirm or orientation of whipstock
   3) □ Determine liner size, bit size (PDC?), and other drilling assembly that will be used through milled window

D - Review whipstock being recommended for running / setting :
   1) □ Discuss type of whipstock and its application
   2) □ Confirm if any optional accessories(i.e.shear out assy.) required
   4) □ Review shear values - shear roll pin, shear stud, etc...

E - Review standard running/ milling procedures
   1) □ Explain that whipstock is to be picked up only with swivel hoist ring
   2) □ Use safety clamp when setting whipstock in rotor / mousehole
   3) □ Direct Driller to operate in low gear
   4) □ Always pick - UP / set down easy in slips
   5) □ Proceed slowly - use caution through BOPs and restrictions.
   6) □ Review various shear values in setting procedures.
   7) □ Discuss standard milling RPMs and weight on mill.

F - Review each Company responsibilities during setting / milling procedures.

G - Conduct safety meeting on location.

---

**WOTI Supervisor**

**Company Representative**
# Milling Diagram & Record

<table>
<thead>
<tr>
<th>Trip#</th>
<th>Time</th>
<th>WOP</th>
<th>RPM</th>
<th>Torque</th>
<th>SPM</th>
<th>PSI</th>
<th>Drawing</th>
<th>Ft/min</th>
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</thead>
<tbody>
<tr>
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</tr>
</tbody>
</table>

Custone:  
Operator:  
Location:  
W/STCC#:  
Milt Type:  
Casing Size:  
Casing Wt:  
Rig:  
W#:  
Formation:
<table>
<thead>
<tr>
<th>Custom er:</th>
<th>Date:</th>
<th>PU assembly time:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Well:</td>
<td>Casing Size:</td>
<td>Jod down A. Bly</td>
</tr>
<tr>
<td>Rig:</td>
<td>Casing #/ft:</td>
<td>Entir ear</td>
</tr>
<tr>
<td>Start time:</td>
<td>Job Number:</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Time</th>
<th>Elapsed Time</th>
<th>Depth</th>
<th>Cum. ROP</th>
<th>ROP</th>
<th>Weight on</th>
<th>RPM</th>
<th>Flow rate</th>
<th>Pump pressure</th>
<th>Torque</th>
<th>Remark</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Upper String MIU gauge was measured at:</th>
<th>ID. D.</th>
<th>Other mid damage</th>
</tr>
</thead>
</table>

- Hole Angle: __________
- Orient IOC W/S Face: __________
- Depth In: __________
- Depth Out: __________
- Total Milled: __________
- Total hours: __________

Ave. ga: __________
Hole: __________

Flow rate: __________
Pump pressure: __________
Torque: __________

---

(Units: meters, (gpm), Bar, Ft.lbs, 1,000 Enaleneer to indicate units used in this line)
# Whipstock Job Report Form

## Well Information
- **Setting Job Number:**
- **Retrieval Job Number:**
- **Mill Supervisor:**
- **Milling Supervisor:**
- **Job Date:**

## Whipstock Information
- **Customer:**
- **Lease:**
- **Well Number:**
- **File Id:**

## Milling Information
- **Country:**
- **State/Province:**
- **Well Inclination:**
- **Well String:**

## Work String Information
- **Liner String 1:**
- **String 2:**
- **String 3:**
- **OD (in):**
- **Pipe Size:**
- **Grade:**
- **Top (ft):**
- **Coil OD (in):**
- **Coil OD (cm):**

## Retrieval Information
- **Retrieval Method:**
- **Type Mill:**
- **Retreived Date:**
- **Condition:**
- **Type Cutting:**
- **Wear:**
- **Missing Insert:**

## BHA/Run Information
- **Type Mill:**
- **Type Cutting:**
- **Wear:**
- **Missing Insert:**

## Performace Information
- **Setting Depth:**
- **Type Mill:**
- **Retrieved Date:**
- **Condition:**
- **Type Cutting:**
- **Wear:**
- **Missing Insert:**

## Fluid Properties
- **Viscosity:**
- **Yield Stress:**
- **Temp (°F):**
- **LaPM:**

## Torque/Weight
- **Distance Milled:**
- **Milling Time:**
- **Run:**
- **BHA:**
- **RPM:**
- **Distance Milled (ft/lbs):**
- **Weight (lbs):**
- **GPM:**
- **Date:**
- **Hrs:**
- **Min:**

## Comments

---

Please e-mail this form to info@xerox.com for instructions of how to complete this form. Refer to the back of the form at page 2.
Whipstock post job Report Form

Casing Information

All numbers will be in decimal for m

Whipstock Information

<table>
<thead>
<tr>
<th>Type</th>
<th>Abb.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hydraulic Set Permanent</td>
<td>HPW</td>
</tr>
<tr>
<td>Mechanical Set Permanent</td>
<td>MPW</td>
</tr>
<tr>
<td>Mechanical Set Retrievalable</td>
<td>MRW</td>
</tr>
</tbody>
</table>

Max Dog leg Past Thru

Degrees per 100 ft (if other, explain in comment box)

Well Ind in. ft. 1
Oriention
Method
Cement
Multistring

MWD Information

<table>
<thead>
<tr>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bit Sub</td>
</tr>
<tr>
<td>Bit Sub w/loot Assy</td>
</tr>
<tr>
<td>Cordraver Sub</td>
</tr>
<tr>
<td>Die Collar</td>
</tr>
<tr>
<td>Drill Collar</td>
</tr>
<tr>
<td>Fill Sub</td>
</tr>
<tr>
<td>Fill Sub w/loot</td>
</tr>
<tr>
<td>Float S1.1</td>
</tr>
<tr>
<td>He11 t waste</td>
</tr>
<tr>
<td>Hook</td>
</tr>
<tr>
<td>Joint of Drill Pipe</td>
</tr>
<tr>
<td>Laced Cbl</td>
</tr>
<tr>
<td>Mud Motor</td>
</tr>
<tr>
<td>Orienting Sub</td>
</tr>
<tr>
<td>RA Sub</td>
</tr>
<tr>
<td>Water m ello-n Type M ill</td>
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<tr>
<td>Rig M ill</td>
</tr>
<tr>
<td>R11mm in Tool</td>
</tr>
<tr>
<td>Se tting Tool</td>
</tr>
<tr>
<td>Skirt ed Mill</td>
</tr>
<tr>
<td>Spacer ed Mill</td>
</tr>
<tr>
<td>Spacer Sub</td>
</tr>
<tr>
<td>Taper Mill</td>
</tr>
<tr>
<td>Bit Mil</td>
</tr>
<tr>
<td>Tntil Mill</td>
</tr>
<tr>
<td>Whipstock o/dk</td>
</tr>
</tbody>
</table>

Retrieval Information

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<thead>
<tr>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barge</td>
</tr>
<tr>
<td>Coil Unit</td>
</tr>
<tr>
<td>Drill Ship</td>
</tr>
<tr>
<td>Jac k Up</td>
</tr>
<tr>
<td>Land Drilling</td>
</tr>
<tr>
<td>Land Workover</td>
</tr>
<tr>
<td>Piatto rm Coil</td>
</tr>
<tr>
<td>Piatto rm Drillin g</td>
</tr>
<tr>
<td>Piatto rm Snubbing</td>
</tr>
<tr>
<td>Piatto rm Workover</td>
</tr>
<tr>
<td>Slexible, uformersible</td>
</tr>
<tr>
<td>Snubbing Unit</td>
</tr>
</tbody>
</table>

Carbide Performance

<table>
<thead>
<tr>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type Cuttings</td>
</tr>
<tr>
<td>I nches W ear</td>
</tr>
<tr>
<td>Comd ill on</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Check box if retrieved</td>
</tr>
<tr>
<td>Hook / Die Collar / Other (if Other, explain in comment box).</td>
</tr>
<tr>
<td>Good (not milled on) / Milled on (if other, explain in comment box).</td>
</tr>
</tbody>
</table>

Retrieval Information

<table>
<thead>
<tr>
<th>Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>Barge</td>
</tr>
<tr>
<td>Coil Unit</td>
</tr>
<tr>
<td>Drill Ship</td>
</tr>
<tr>
<td>Jac k Up</td>
</tr>
<tr>
<td>Land Drilling</td>
</tr>
<tr>
<td>Land Workover</td>
</tr>
<tr>
<td>Piatto rm Coil</td>
</tr>
<tr>
<td>Piatto rm Drillin g</td>
</tr>
<tr>
<td>Piatto rm Snubbing</td>
</tr>
<tr>
<td>Piatto rm Workover</td>
</tr>
<tr>
<td>Slexible, uformersible</td>
</tr>
<tr>
<td>Snubbing Unit</td>
</tr>
</tbody>
</table>
# Whipstock Retrieval Report Form

<table>
<thead>
<tr>
<th>Add ress:</th>
<th>st r:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phone:</td>
<td>Fax:</td>
</tr>
<tr>
<td>mob ile:</td>
<td>supe rvisor:</td>
</tr>
<tr>
<td>field</td>
<td>OCIG:</td>
</tr>
<tr>
<td>start date:</td>
<td></td>
</tr>
</tbody>
</table>

## Well Information

<table>
<thead>
<tr>
<th>Well ID:</th>
<th>ID We llbore fl uid:</th>
<th>Is H2S or SO2 pr esent?</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>Casing size whipstock set in</td>
<td>lws</td>
<td>rad e:</td>
<td>norm ID</td>
<td>in</td>
</tr>
<tr>
<td>Other casing size above whipstock</td>
<td>lws</td>
<td>rad e:</td>
<td>norm ID</td>
<td>in</td>
</tr>
</tbody>
</table>

## Deviations

<table>
<thead>
<tr>
<th>any restrictions above window?</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>ID</th>
<th>Depth:</th>
<th>ID</th>
<th>pe of:</th>
<th>ID</th>
<th>in</th>
<th>ID</th>
<th>Depth:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Are there any perforations?</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>any other milled window in casing string?</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>any problem encountered when pulling whipstock or milled window?</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>

## Rig & Work String Information

<table>
<thead>
<tr>
<th>Type of rig:</th>
<th>Well rental string be required?</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Work string size:</th>
<th>int wt:</th>
<th>lb</th>
<th>Trade:</th>
<th>form action:</th>
<th>norm ID:</th>
</tr>
</thead>
</table>

| collars available | split | int connections. | int om ID | in |

## Whipstock Information

<table>
<thead>
<tr>
<th>Whipstock ID:</th>
<th>OD:</th>
<th>for casing size:</th>
<th>in.</th>
<th>lws</th>
<th>Date whipstock set?</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Type of whipstock:</th>
<th>Mechanical whipstock</th>
<th>Hydraulic whipstock</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Type of concave?</th>
<th>stand ard</th>
<th>short degree</th>
<th>shear out assembly inst alled</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>whipstock oriented?</th>
<th>Yes</th>
<th>No</th>
<th>or oriented to:</th>
<th>set to shear at:</th>
<th>lbs</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>debies brushed</th>
<th>Yes</th>
<th>No</th>
<th>fishing neck expaded</th>
<th>in</th>
<th>OD by:</th>
<th>in</th>
</tr>
</thead>
</table>

## Estimated Measurement

<table>
<thead>
<tr>
<th>measure ment based on elevation of:</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>measures</th>
<th>to o f wel nd w:</th>
<th>to p of whi ps k k:</th>
<th>Cl top of retrieving slot:</th>
<th>D) bottom of retrieving slot:</th>
<th>E) top of fishing neck for shear out assembly:</th>
</tr>
</thead>
</table>

## Retrieval Information

<table>
<thead>
<tr>
<th>method used:</th>
<th>retrieving hook</th>
<th>die coll ar</th>
<th>shear out/overshot</th>
<th>other</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>retrieving assembly oriented?</th>
<th>Yes</th>
<th>No</th>
<th>oriented to:</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>jets installed in retrieving hook backside:</th>
<th>opposite sid e o f hoo k e:</th>
<th>Ye s</th>
<th>No</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>jar used in BHA:</th>
<th>Yes</th>
<th>No</th>
<th>Type:</th>
<th>size:</th>
<th>Quantity:</th>
</tr>
</thead>
</table>

## Bottom Hole Retrieving Assembly

<table>
<thead>
<tr>
<th>attempt 1</th>
<th>attempt 2</th>
<th>time in:</th>
<th>hours</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>time in jarr in:</th>
<th>hours</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>time in out:</th>
<th>hours</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>retrieval hook</th>
<th>time</th>
<th>hours</th>
</tr>
</thead>
</table>

## Disposition of Retrieved Whipstock

<table>
<thead>
<tr>
<th>job successful - whipstock retrieved</th>
<th>Yes</th>
<th>No</th>
<th>0verpull required to retrieve whipstock: k</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>relating by custody:</th>
<th>Yes</th>
<th>No</th>
<th>Other</th>
</tr>
</thead>
</table>

<p>| concave condit ion: | J/OD | missed | sour | I ancho r condition: | good | Poor |</p>
<table>
<thead>
<tr>
<th>OT/job#</th>
<th>Well name</th>
</tr>
</thead>
<tbody>
<tr>
<td>Store</td>
<td>Date</td>
</tr>
<tr>
<td>Customer</td>
<td>Hole size</td>
</tr>
</tbody>
</table>

Progress since last report:

Current operation:

Future plans:

Special problems:

Additional tools required:

Other information:
Equipment / Supervisor’s Performance Evaluation

DT/ job # ________________________________________________
Store _________________________________________________
Customer name _________________________________________
Date __________________________________________________
Hole Size _____________________________________________

Performance evaluation

1. WOTI Equipment delivered on time
2. Correctness and quality of WOTI equipment
3. General appearance of Exxon equipment
4. Services provided by WOTI supervisor
5. Equipment knowledge of WOTI supervisor
6. Communications with Exxon supervisor
7. Overall satisfaction of WOTI equipment & supervisor

Other comments:

Thank you for your business and time to complete the above performance evaluation. We appreciate your help in providing the best services in the oil field today.

Customer name: _________________________________________
Please fax to: WOTI Attn: ____________________________
Or Mail to: Exxon Attn: ____________________________
## Selective Re-entry System Post-job Report

<table>
<thead>
<tr>
<th>Customer:</th>
<th>Company Phone:</th>
<th>Well Name:</th>
<th>Well Number:</th>
<th>State:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Casing Size:</th>
<th>Company Fax:</th>
<th>Hole Angle:</th>
<th>Depth of KOP:</th>
<th>Hole Size:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Casing ID:</th>
<th>Casing Grade:</th>
<th>System Con. Size:</th>
<th>Service District:</th>
<th>Packer Bore ID:</th>
<th>District Phone:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Packer Depth</th>
<th>Debris Sub</th>
<th>Lanch Assembly</th>
<th>Shear Sub</th>
<th>Extension # 1</th>
<th>Extension # 2</th>
<th>Extension # 3</th>
<th>Extension # 4</th>
<th>Extension # 5</th>
<th>Extension # 6</th>
<th>Spline Sub</th>
<th>W/S Extra</th>
<th>W/S Slide</th>
<th>Packer Azimuth</th>
<th>Window Azimuth</th>
<th>Top of Window</th>
<th>Top of W/S</th>
<th>Kick Out Point</th>
<th>Milling Time</th>
<th>Date Completed</th>
<th>Date Retrieved</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
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</tr>
</tbody>
</table>


Disclaimer, Waiver, Release of liability

Disclaimer, Waiver and Release of liability

WOTI has developed certain procedures relating to the operation of WOTI's tools and equipment. These procedures have been taught to WOTI's fishing tools and milling supervisors with respect to job quality and performance. Any change from these procedures requested to ordered by ------------------------[the company(operator)] violates any WOTI warranty, whether expressed or implied, relating to the tools and equipment used by WOTI, Inc. and the services provided by WOTI, and (2) release WOTI from the entire responsibility, risk of loss and any and all liability relating, but not limited to, job failure, excessive cost, loss of hole, property damage, injury, etc. that results in any way from any change in WOTI's procedures requested or ordered by company(operator). The company (operator) waives all rights it may have against WOTI. In this regard irrespective of whether such injury, death, damage or loss is occasioned by or resulting from the negligence, strict liability, statutory fault or breach of warranty of WOTI or any of its employees, invitees, subcontractors or the employees of any subcontractor, in whole or in part, whether sole, joint, active or passive.

As a duly authorized representative of the company (operator), I have read and understood the above and have been informed by WOTI's supervisor that the job procedures that are commencing are contrary to WOTI's policy.

In consideration of WOTI proceeding with the operations as requested or ordered by the company(operator), the company(operator) assumes the entire responsibility and liability relating to the performance of WOTI's tools and equipment and all consequences of any and all acts arising out of or relating to WOTI following any procedure requested or ordered by the company(operator) that is different from or in addition to WOTI standard procedures, irrespective of whether such injury, death, damage or loss is subcontractor, in whole or in part, whether sole, joint, or passive.

To the extent, the provisions of this agreement are different from the provisions of any other agreement between the company (operator) and WOTI inc. this agreement shall control. All other terms of any existing master service or any other agreement between these parties shall survive, including the requirements for maintenance of insurance in support the obligations assumed by the parties, which are hereby modified to provide for the applicability of insurance coverage pursuant to the obligations assumed herein.

Company: ____________________________
Representative: Date: ________________________

WOTI:
Representative: ____________________________
Date: ____________________________
Dimensional Data Forms
DIMENSIONAL DATA FORMS
Mechanical Set Whipstock 3
Hydraulic Set Whipstock 4
Openhole Expandable Anchor Whipstock 5
Whipstock Milling BHAs 6
Whipstock Retrieving Hook and Die Collar 7
Approximate Whipstock Window Location 8
DIMENSIONAL DATA FORMS
Mechanical Set Whipstock

Whipstock
Csg Size: 
Grade: 
Depth: 
Inclination: 

High Side: Yes / No
Degrees: Right 
Degrees: Left 

Low Side: Yes / No
Degrees: Right 
Degrees: Left 

Job #: 
Customer: 
Well: 
Field: 
Date: 

DIMENSIONAL DATA FORMS
Openhole Expandable Anchor Whipstock

Job #: 
Customer: 
Well: 
Field: Date: 

Whipstock
Csg Size: 
Grade: 
Depth: 
Inclination: 

High Side: Yes / No
Degrees: Right
Degrees: Left

Low Side: Yes / No
Degrees: Right
Degrees: Left

[Diagram of Openhole Expandable Anchor Whipstock]

[Sections for dimensions and measurements are labeled with 'O.D.']
# DIMENSIONAL DATA FORMS

**Whipstock Mills**

<table>
<thead>
<tr>
<th>Job# :</th>
<th>Well :</th>
</tr>
</thead>
<tbody>
<tr>
<td>Customer :</td>
<td>Field :</td>
</tr>
<tr>
<td>Csg Size :</td>
<td>Date :</td>
</tr>
</tbody>
</table>

![Diagram of Rugby Mill](image1)

- O.D.

![Diagram of Running Tool](image2)

- O.D.

![Diagram of Back Mill](image3)

- O.D.

![Diagram of Window Mill](image4)

- O.D.
Approximate Window Location Form