HALLIBURTON

Part Number: 101544635
Document Number: D00265538
Rev. D 03/02/2018

Obsidian® PLUG OPERATING INSTRUCTIONS

SETTING PROCEDURES

Electric Wireline

The Obsidian® plugs are designed to have a compatible setting procedure with commonly available powder type setting tools (HES, Baker, etc.). An adapter kit is needed to adapt the plug to the setting tool.

Special Considerations:

- Always use the maximum number of pins when setting the Obsidian plug except with Baker 10 setting tools. See Baker setting instructions below.
- It is recommended to apply the Loctite provided with the Obsidian plug to the shear screws when making up to the adapter kit.
- Always use a powder charge that sustains a burn longer than 15 seconds. Slow burning charges are available for most setting tools.
- Always run a gage ring and junk basket before setting the first plug.
- When landing a ball on Obsidian frac plugs the max rate is 12 BPM to seat the ball.
- All Obsidian frac plugs can be run with the frac ball in place with an appropriate wireline adapter kit. Running the frac ball in place must be done when plugs are run in a dry well.
- Document all tool OD's, ID, lengths, shop dates, and shear screw or shear screw data prior to tool make-up and running in hole.

Special Instructions for Baker Setting Tools

The following procedures should be followed when running Obsidian plugs with the Baker powder charge type setting tools.

* Expose oil chamber; hold in vertical position & tap down on piston, make sure it is down against shoulder.
* Fill chamber to corresponding mark on Baker oil level gauge in relation to temperature with 30W oil and reassemble setting tool.
* Use a slow set charge (slow set charges are blue, fast set charges are black)
* Note: *Baker 10 only* Prior to installing the Obsidian plug, back the lower portion of the setting tool off enough to expose the air relief holes in the side of the chamber. Install the Obsidian plug and re-tighten the lower portion of the setting tool. This makes installing the plug easier because the set screw holes are totally exposed. This also reduces the gap between the outer sleeve of the adapter kit and the top shoulder of the plug thus conserving stroke.

Note: *Baker 10 only* used to set Obsidian Plugs and Bridge Plugs. Install 5 shear screws only in the tool instead of 6 when using a Baker 10 setting tool. This is approximately 25,000 lbs. and is adequate setting force to set and shear off the tool effectively.

Setting Procedure

1. Make up the coupling ring/tension mandrel and setting sleeve on setting tool. Tighten thread breaks (See Table below) between the adapter kit parts and the setting tool. Some adapter kits require the coupling ring/tension mandrel be shoved through the setting sleeve and made up on the setting tool mandrel before the setting sleeve is made up. Use clean - suitable API thread compound or grease on the mandrel and setting sleeve threads when making up to the setting tool.

Kit Size	Recommended Torque
2 ½ GO and smaller	80 to 100 lbf-in (9.04 to 11.30 N-m)
3 ½" GO and larger Baker 10 & 20	100 to 175 lbf-in (11.30 to 19.77 N-m)

2. Inspect plug for visual defects such a broken slips, damaged rubber, broken slip retaining bands, etc. Measure the plug OD above the top slips (Upper slip support) and below the lower slips (lower slip support) to ensure the proper plug is being run.
3. Slide the coupling ring and setting sleeve over the top of the plug.
4. Lower the setting tool/adapter kit over the top of the packer or plug so that the coupling ring/tension mandrel fully slides over the top and aligns the threaded holes with the holes in the mandrel. Ensure the setting sleeve does not contact the upper spacer ring, this could result in pre-loading of plug or packer components.
5. It is recommended to apply Loctite to the shear screws. Thread the shear screws through the coupling ring/tension mandrel into the holes in the mandrel. Holes in the setting sleeve allow access to the coupling ring/tension mandrel. Insert the screws into the coupling ring/tension mandrel and mandrel using a star pattern. Do not tighten the screws until all shear screws have been inserted. Tighten shear screws until the screws bottom out using the following table for recommended torque values.

Screw Size	Recommended Torque
3/8" 16 UNC	30 to 40 lbf-in (3.39 to 4.52 N-m)

6. Check the gap between the setting sleeve and the upper slip support.
   - For Baker setting tools this gap must be no less than 1/4" and no more than 3/4". If the gap falls outside this range, check the setting tool and/or the adapter kit to see where the error lies. .
   - For HES (GO) setting tools, rotate the setting sleeve down toward the upper slip support until a 1/16" gap exists between the sleeve and upper spacer ring. Tighten the jam nut against the setting sleeve to lock the setting sleeve in place.
7. Confirm pump rates and associated running speeds on the pump down calculator. Running speeds are only dictated by the rate allowed to stay below the fluid by-pass rating of individual plug assemblies.
   Composite Pump Down Plug Calculator
8. Set the plug.

Slickline

The Obsidian plugs are designed to be set with the HES Downhole Power Unit on slickline. The DPU is a battery operated setting tool that requires no external pressure source or forces to set the plug. Further details of the DPU's operation are available from the slickline engineering group in Carrollton, Texas. An adapter kit is needed to adapt the plugs to the DPU.

Setting Procedure
Follow the first five (5) steps in the Setting Procedure of the Electric Wireline Section of this document before completing the following steps:

6. Check the gap between the setting sleeve and the upper slip support. A minimum gap of 1/16" (2 mm) must be maintained between the setting sleeve and upper slip support. This gap can be adjusted by rotating the packer or plug.
7. Confirm setting depth with customer.
8. Confirm pump rates and associated running speeds on the pump down calculator. Running speeds are only dictated by the rate allowed to stay below the fluid by-pass rating of individual plug assemblies.
   Composite Pump Down Plug Calculator
9. Set the packer or plug.

Coiled Tubing

Two methods exist for setting Obsidian plugs on coiled tubing, hydraulically and pressure activated firing system. All the systems listed below can also be run on jointed tubing or drillpipe.

Pressure Activated Firing System
The Obsidian plugs can be set on coiled tubing using an HES or Baker wireline powder type setting tool and a Pressure Activated Firing Head (PAFH). This system allows operators to use readily available setting tools and adapter kits with coiled tubing. Details of the system and its operation are outlined in the Coiled Tubing Tools Manual 101335389. Setting procedures are identical to the Electric Wireline section of this document.

Hydraulically
The Obsidian plugs can be set on coiled tubing using a hydraulic setting tool and tubing pressure. The BP Hydraulic Setting Tool is designed to provide a setting tool that does not need a ball to operate. The HCT Hydraulic Setting Tool is designed to operate with a pumped down ball. Both systems set the Obsidian plugs but their different operating methods make each better for certain operating conditions.

Mechanical Setting Tool

It is not recommended to set any Obsidian plugs with a mechanical setting tool due to the setting loads required to set the plugs.