



The Basics of **RIGGING UP**

Setting up safely over a borehole is an essential skill for logging engineers, as every borehole is different and presents its own challenges which must be overcome.

The principal components of any setup are the winch plus tripod or sheave(s) and in all cases engineers should be familiar with the relevant product manuals.

The Basics of RIGGING UP

Included in the scope here are land based boreholes and jack-up platform based boreholes. Specialised setups such as for heave compensated drill ships, horizontal and raise boreholes are not covered here.

Objectives

- Engineer a stable platform for the wheel conveying the probe into the borehole.
- Provide accurate depth registration.
- Position the winch correctly to achieve good spooling on the drum.
- Ensure the setup is safe for efficient probe handling for ingress and egress.
- Establish an exclusion zone around the whole logging setup.

Configurations and Environments

Boreholes may be drilled, and logged, in almost any environment, some of which present special challenges. The depth of the borehole and the weight of the heaviest probe are also significant factors for setting up. There are four basic setup configurations, each with variations which are dependent on the environment and the logging requirement.

Tripod

The simplest and most common setup is to use a tripod (with integral depth wheel) directly over the borehole, *see Figure 1*. This is suitable for shallow and medium depth boreholes (typically geotechnical or water well applications). If the winch is mounted in a vehicle and is self-spooling then the vehicle should always be parked so that the centre of the drum aligns with the borehole. The distance to the borehole should ideally be around 10m (paces) or more and where possible the vehicle should be parked keeping the winch drum level to achieve accurate spooling.

If there is casing sticking up, the gap between the casing and the depth wheel, if too small, risks the cablehead wrapping around the depth wheel upon retrieval which will invariably damage the cablehead. The solution is to

Figure 1: Tripod Setup.

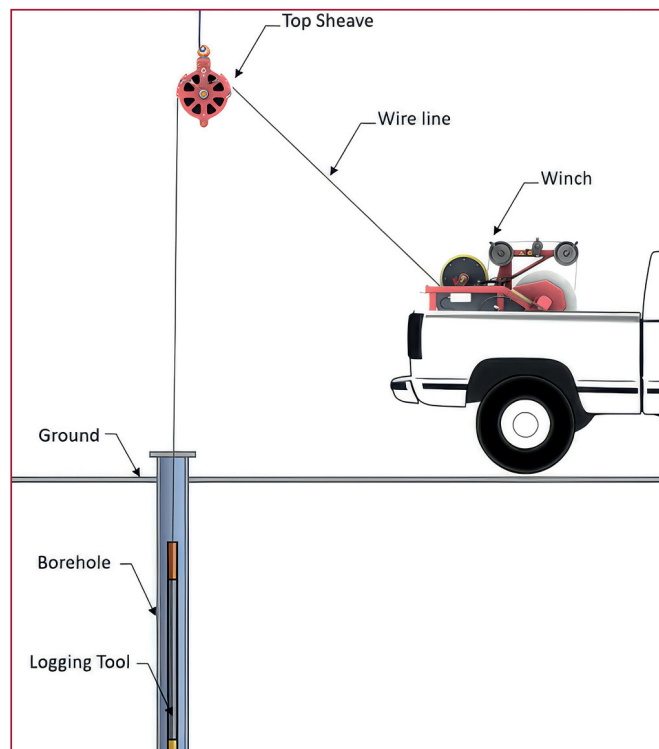
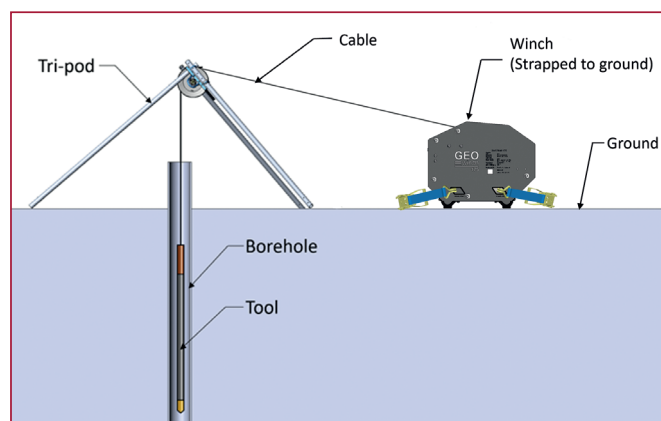


Figure 2: Top Mounted Sheave Only Setup.

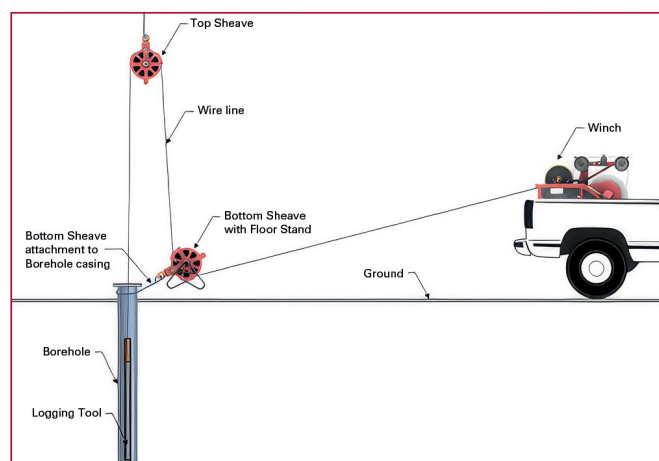


Figure 3: Top and Bottom Sheave Setup.

raise the tripod, reduce the height of the casing or use a different configuration.

When logging vertical boreholes on steeply inclined terrain or angled borehole on flat terrain the winch should be positioned so that there is a minimum 90° cable wrap on the tripod depth wheel. In practice this means positioning the winch down slope from the borehole for inclined terrain or opposite to the borehole direction for angled boreholes.

Where there is a rig over the borehole it may be possible to use a tripod but the gap between any casing and the depth wheel needs to be considered.

Sheave

When there is a drill rig over the borehole a sheave arrangement is often the best option, especially if there are multiple probes or casing pulls (casing withdrawn incrementally between runs). Safe arrangements can be engineered using a single top mounted sheave or top and bottom mounted sheaves, *see Figures 2 and 3*. For deep boreholes (typically for mining), the two sheave arrangement is recommended. For bottom mounted sheaves, a floor stand accessory is available, useful for keeping the bottom sheave clear of soil and mud on the ground.

Crane or A-Frame

Suspending a sheave from an A-frame or crane, once set up, should provide a stable arrangement that makes swapping probes in and out simple. Often there will not be a substantial fixture to attach a bottom sheave to, therefore a top only sheave arrangement will be required.

To stabilise an A-frame configuration the resultant force on the top sheave (bisection of the cable angle on the sheave) should point to the ground inside the confines of the three legs, otherwise the arrangement is unstable and could collapse.

Vehicle Mounted Boom

Robertson Geo Services (RGS) use large vans for much of their logging, each of which is equipped with an internal frame, level wind winch with integral depth wheel and roof mounted boom, *see Figure 4*. This arrangement requires the van to be parked adjacent to the borehole or requires an additional tripod or sheave(s).

The RGS arrangement had to be rigorously designed and engineered to support the heaviest probes at 2000m depth with a suitable safety factor to cope with transient loads. Configuring a vehicle this way is capital intensive and time consuming but once complete the result is a superbly efficient logging vehicle. Robertson Geo can provide advice for clients wishing to consider this approach.

Equipment

The tripod supplied by Robertson Geo is extremely versatile and lightweight and works well for many logging jobs, providing the weight of the probe and cable deployed is not too great. For heavy probes and deep boreholes a sheave arrangement is recommended.

Two sheave wheels are manufactured by Robertson Geo, with different wheel sizes and load capacities. The GEO Sheave 2k is designed to accommodate all Robertson Geo slimline probes to depths of 2000m and is sold as a pair, with optional floor stand.

The type of winch used is also a consideration as only 2000m Winches have an integral depth wheel. All other winches require an external depth wheel in the arrangement, invariably that on the tripod head.

Complex or constrained setups using a tripod, such as

with a drill rig in place, often require some trial and error to achieve a stable setup. To facilitate this, small ratchet straps and tie down straps are extremely useful for stabilising the tripod head but should never be used for bearing the downhole weight.

Ground anchors or ground spikes may be required to secure a winch in portable arrangements where there are no fixed attachment points available. Securing the winch is equally as important as securing the tripod or sheave wheel. For vehicle mounted winches the weight of the vehicle is normally sufficient to prevent the winch moving.



Figure 4: Van and Boom Arrangement.

Operations

Long before arriving on site to rig up there a few things that should be done before leaving for the job. Ensure that all the advance information from the client/site has been reviewed, as this may include constraints that may affect the setup. Once armed with all the information make sure everything needed for the job is taken, and if in doubt take it.

Following site inductions, upon arrival at the borehole, park up and assess the site so that the best setup can be achieved. If there are drillers, geologists or geotechnical engineers present liaise with them as they may have relevant information about the drill site and borehole which could affect the setup.

Although risk assessments and method statements may have been prepared in advance, conduct a point of work risk assessment (POWRA) to identify any local safety concerns.

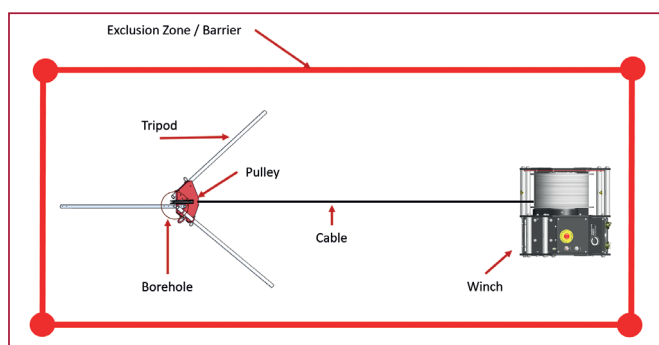


Figure 5: Operational Exclusion Zone.

Assess the options for setting up over the borehole and whether a tripod or sheave arrangement will work. Consider the weight and length of the probes to be run and how many times the probes will be required to be swapped. If casing pulls are required (rig will be over the borehole) then there could be multiple runs for each probe and the setup may need to be adjusted/dismantled each time.

If the winch is vehicle mounted, line up the centre of the winch drum with the borehole and park the vehicle where the logging engineer will have line of sight on the top of the borehole. In some cases there may be very limited space, for example on a building site or inside a fenced compound, where there are limited options for the setup.

If the borehole is inaccessible to the logging vehicle a portable setup will be required. Liaise with the site personnel to establish how best to transport the equipment to the borehole, as specialised vehicles may be available for this purpose. Hand carrying a lot of equipment over distance, especially in difficult terrain, should be minimised. The winch will also need to be anchored for portable setups. Take advantage of any fixed points that are usable, for example trees or posts. The winch needs to be placed so that the anchor point(s) is behind the winch as it faces the borehole. Two anchor points behind the winch work best as this prevents winch body rotation.

When placing a tripod over the borehole line up the far edge of the depth wheel with the centre line of the borehole to facilitate probe ingress and egress. Orientate the tripod head so that the depth wheel is in line with the centre line of the winch drum. Connect the depth cable.

For a borehole with the rig in place requiring multiple probes or multiple runs a sheave hung from the drill rig is always the simplest option if a level wind winch is being used. For portable and self-spooling winches a tripod/depth wheel will be required in the setup for depth control either alone or in combination with top and bottom sheaves.

Setting a tripod up while the drill rig is in place can be complicated and may require some initial trial and error. The tripod legs may need to be length adjusted to fit in and around the rig and the back of the depth wheel must be aligned close to the borehole centre line. Once a suitable position is found for the tripod head it needs to be secured for every run. One or more ratchet straps or tie down straps will usually be required to stabilise the depth wheel. When complete, the tripod head should be under some tension and not move when shaken.

Whether using a tripod or sheave over a rig consider the headroom required to insert and remove the longest probes.

Working from a jack up platform is essentially the same as logging on land and there will be a drill rig permanently over the boreholes. The normal practice and best arrangement is to hang a sheave off the drill rig for borehole access. The main difference from on land is that data will usually be referenced to seabed level which the vessel personnel will provide in the form of a seabed to drill deck height measurement.

When satisfied with the setup, an exclusion zone must be established around the whole logging setup to prevent accidents to unauthorised personnel, *see Figure 5*.

The following checklist items for rigging up should be considered before commencing logging operations:

- **Is the setup stable?**
- **Can the setup support the anticipated loads?**
- **Does the winch operator have line of sight on the borehole?**
- **Are all the pulleys in line?**
- **Can all the pulley wheels rotate freely?**
- **Has good communication been established with the driller (if present or required)?**
- **Has an exclusion zone been set up?**
- **Is the correct PPE being worn?**
- **Has the correct depth wheel size been entered into all the acquisition software?**

Conclusions

Setting up over a borehole is an art that largely benefits from experience. Familiarity with the equipment and manuals, combined with a good training regime (formal or “on-the-job”), are prerequisites for effectively rigging up over a borehole.

Comprehensive training, including rigging up, is available through the RG Academy® and is conducted by experienced logging engineers.

