

## Drilling with the Xs / Xs T casing system.

### Preparing the equipment

Place the casing crown over the end of the casing taking care to align the crown to the square edge of the casing. Tack weld in three places to hold the crown in position then weld around the upper edge of the crown using an electrode approx 3/32" diameter at 85Amps. Grind the weld after welding to minimise interference between crown and the drilled hole. In cold weather it is recommended that the components to be welded should be preheated.

Insert the Driver/Bit into the DTH Hammer in the conventional manner, and if a short starter tube is to be used, attach it to the DTH hammer at this time.

### Starter Casing.

The crown and first casing assembly should be cut to match the length of the DTH Hammer (or DTH Hammer and starter tube) minus 8" this should put the top of the casing to approximately 2"- 3" below the top wrench flats. This will allow access to the wrench flats and enable the adding and removal of drill tubes as drilling progresses.

### Casing length.

Ideally subsequent casing should match the length of each drill pipe. However many casings are of random length, and care should be taken when adding random casings, not to cover the top wrench flat of the drill pipe, or be too low for the reach of the diverter. It is desirable to measure each casing and record the length on it so that it is known before adding to the column. Occasionally a casing can be cut to offset these discrepancies.

### Assembling the Driver and Crown.

Locate the Diverter into the raised position by raising the control handle.

With the winch raise the driver/bit, DTH hammer and starter tube assembly and attach it to the thread of the saver sub on the rotation head. Raise the assembly and rotation head high into the drill mast to allow the casing to be positioned. With the winch, lift the starter casing with the crown onto the drill table, and secure. Slowly guide the driver bit into the starter casing and feed it all the way to the crown. By lifting the driver up and down and turning the driver a few degrees each time, locate the driver through the crown. The driver is in position when the driver protrudes through the crown approximately 2". Turn the driver slowly in the normal drilling direction and the crown will lock onto the driver. Lower the diverter by operating the up/down lever until the diverter locates on top of the casing.

### **Starting to Drill.**

Drilling is started by lowering the starter casing with the driver to the ground whilst slowly rotating with the hammer air supply partially on. As the driver bit closes into the DTH hammer, it will start to drill.

Note (it is easier to start a casing hole with an air pressure of less than 200psi) It is imperative that the operator monitors the discharge pipe to verify a good flow of debris, once the casing is penetrating the ground, it is advisable to commence water or foam injection When the casing is level with the drill casing, drilling is stopped and the hammer air

turned off. The diverter is raised to expose the flat on the top of the starter tube, which can then be secured in the table with the drill tube wrench. The rotation head can then be unscrewed and travelled to the top of the mast.

### **Adding Casing.**

It is important to use a length of casing that matches the length of the drill pipe. Many casings are of random length, and care should be taken when adding casings not to cover the top wrench flat of the drill pipe. It is desirable to measure each casing and record the length so that occasionally a casing can be cut to offset these discrepancies

Drill tubes need to be inserted into the casings whilst in the horizontal position preferably on the ground; this can be done manually or with a draw cable. To lift the assembly into the drill mast, it is recommended that a proper double hook and chain be attached to the winch. The drill tube/casing assembly is then raised into the mast, the upper drill tube thread aligned into the saver sub and the two screwed together.

The winch with the casing still engaged then can be lowered until the hook sits on the drill table leaving the drill tube hanging from the rotation head.

The winch rope can now be slackened and a sling attached. The casing can now be lifted enough to allow the hook to be disengaged from the casing. At this point the drill tube is to be engaged and tightened on to the tube held by the wrench below. The casing is then lowered onto the previously drilled casing, clamped into position Tack weld in three places. The casing should then be welded around the joint using an electrode approx 3/32" diameter at 85Amps. In cold weather it is recommended that the components to be welded should be preheated.

The sling can now be removed from the casing.

### **Continuing to Drill.**

Locate the Diverter into the lower position by raising the control handle. Ensure the diverter is located on the top of the casing.

Drilling can now recommence by slowly rotating with the hammer air supply on, and water or foam injection engaged. As the driver bit closes into the DTH hammer, it will start to drill. With the addition of each casing only enough downthrust should be applied to make the DTH hammer run smoothly. Again it is important that the operator monitors the discharge pipe to verify a good flow of debris.

Drilling can continue in this manner until the top of casing is level with the drill table, when the whole process starts over again.

### **Retrieving the driver bit.**

When the casing is drilled to the desired depth, the driver/bit can be disengaged from the casing crown by reverse rotation. It helps the disengagement process if the driver bit is thoroughly flushed with air, water, and foam if available. This can be done with the DTH hammer in the lifted position to allow the hammer to go into the by-pass mode which allows more flushing air and fluids to pass. The driver should then be rotated in reverse approximately 1/8 of a turn and then lifted. If the driver is disengaged, the drill tubes will rise leaving the casing in the hole. If the driver bit does not disengage on the first attempt, rotate it back and forth into and out of the locked position with the rotation motor. After

the driver/bit is disengaged pull all the drill tubes out of the casing in the conventional manner, with the hammer air on and slowly rotating in the drilling direction.

**Drilling below the Casing.**

Drilling below the casing with the same diameter as the casing, the specially designed GeoRocFor “Square Bit” is required. This drill bit has two opposing flats, which allow it to pass through the flats on the casing crown. The driver should be exchanged for the square bit then the hammer bit and drill tubes lowered into the drill hole in the conventional manner. The operator should be aware of the casing depth so that when the square bit is approaching the casing crown, the hammer air supply can be turned off. The square bit should be rotated slowly in the drilling direction as it approaches the crown, this will help the flats line up on the bit and crown. When the flats are aligned the drill tubes will drop approximately 6”, after which drilling can commence.

**Relocating the Driver Bit.**

Should it be found necessary to advance the casing further after the driver bit is disengaged, it can be re-engaged by lowering into the casing whilst inducing the flushing fluids and rotating the driver/bit slowly in the direction of drilling. When the driver contacts the crown, continue to turn slowly with the hammer air off, until the drill tube is seen to drop. The operator can ascertain if the driver/bit is engaged in the crown by lifting the drill string, if the drill string lifts without the casing then the driver/bit is not engaged. If resistance to lifting is felt then the driver and crown are engaged.