

## Dual Head Drilling—Casagrande M9 & C6S

We operate multi-functional Casagrande C6S and M9 'Dual Head' rotary drilling rigs which allow holes to be simultaneously cased to depths of 150m. The dual head facility enables one-pass, steel cased borehole drilling for a range of functions such as; installation of geothermal heating loops, anchors, drilling through unstable ground, filled mineshafts or landfills, installation of monitoring or measurement equipment, injection of gravel, sand or other infilling materials, accurate angle hole drilling and use with specialist grouting techniques. Integral sophisticated cuttings collection systems enable clean drilling to be undertaken in any location. The ability to 'drill-in' casing also enables 'sealing off' drill holes into rock head or through water bearing strata.

The rigs are equipped with two high torque rotary drill heads mounted on slides with upper head being able to move up and down relative to the lower head. The upper head rotates the drill rods while the lower head rotates the casing.

C6S & M9 rigs are track mounted giving a stable drilling platform which is essential to undertake accurate geotechnical drilling work. Track oscillation allows travelling and set up on uneven ground and the multi-angling mast articulation gives additional flexibility in hole positioning with potential reduction in disruption for work in residential, sensitive and protected locations.

'Dual Head' drilling systems offer a number of advantages over traditional drilling methods, including; achievement of drilling tolerances and hole accuracy, ability to drill fully cased holes as a one-pass operation to depths up to 150m, dealing with difficult and unstable drilling conditions (e.g. badly broken ground, sands & gravels & caving holes) and control over the environmental impacts of drilling including flush returns, dust, noise and vibration. Drilling is undertaken with eccentric drilling systems mounted on the down hole hammer in which the drill bit drills a slightly larger hole than the casing, which is drilled in immediately behind the drill bit. Air/water mist flush is normally used to ensure optimum hole cleaning.

Drill holes are fully cased to the base of the hole as the hole is drilled. As the hole is cased concurrently with drilling, only the drilling face is exposed to flushing air/water mist. Furthermore, casing the hole as it is drilled guarantees flush returns to the full depth of the hole, including when drilling through broken ground or after drilling through voids.

Simultaneous casing of holes also ensures no hole degradation or void forming in weak strata, and also ensures that holes cannot collapse or become blocked prior the installation of an injection tube, grout tube or monitoring equipment. The counter rotating rods & casings as well as the air/water mist hole flushing ensure optimum hole cleaning which also ensures a straighter hole.



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The separate drilling and casing heads rotate in opposite directions with the drill string being concentrically situated within the casing allowing both to be advanced simultaneously. This system has a number of advantages including:

- The dual system rigs operated by Forkers have been developed to include sealed cuttings collection systems mounted under the lower drill head to allow the containment and subsequent collection of the flushing medium and drill cuttings as they are returned up the inside of the casing. The cuttings are collected by dust collector if dry, and enclosed skip if wet, enabling analysis of returns.
- The rigidity of the dual drilling/casing string assists accurate drilling.
- Low noise and vibration emission.
- Cased drill hole sizes offered by this system are 114mm, 139mm, 200mm, 250mm & 300mm OD. The one-pass drilling system allows the drill casing to be immediately used for grout injection tube, monitoring, sonar surveying, CCTV survey, or for infilling of voids with granular materials.
- The dual head rigs with the totally sealed cuttings collection system also performs the role of a wellhead blow out preventer by fitting a control valve to the outlet pipe of the cuttings collection system. This enables immediate shut off or controlled release of pressure to be achieved should any trapped air be encountered in the roof of the mine void.

The dual head drilling method has been used successfully on many difficult geotechnical contracts due to its versatility and the drilling parameters to be achieved, i.e. drilling tolerances, hole accuracy and straightness, drilling angles, depth of hole, different hole uses, drilling conditions to be encountered, production requirements, and environmental considerations. Where ground water is encountered, water only penetrates the drill hole at the drilling face thus only minimal quantities of water are removed during drilling.

The independent movement of the drill heads also allows the drill string to be withdrawn into the casing, allowing the casing to be advanced ahead of the drill bit in unstable, broken or void ground. The drill mast kinematics coupled with independently oscillating tracks ensures that all drilling positions and angles can be reached, whatever the terrain or ground conditions.

The importance of drilling accurate fully cased angled holes is extremely important on many contracts due to the sensitive position of boreholes, restrictions placed by buildings, car parks, roads and terrain which can mean the majority of holes are angled.

The dual head system allows special ground conditions and drilling circumstances to be readily dealt with, for example in salt mine investigation and treatment it is necessary to case-off and seal the upper clean groundwater table to prevent migration into the salt strata and erosion of the salt. Drill holes can be advanced with a primary 200mm OD or 250 mm OD casing and eccentric drill system to an agreed level below 'wet rock head'. The drill string is withdrawn and the casing drilled onto the base of the drilled hole to fully seal the hole from groundwater ingress from wet rock head. (The casing can be fully grouted if required). The hole can then be progressed with a smaller 200mm OD or 150mm OD system to the mine cavity and drilled into the floor of the mine if required.

Enclosed wet cuttings collection skips are provided adjacent to the drilling rig which allow settlement of drill returns and reuse of the water flush.

