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Health and Safety Information

HSI 48

Directional Drilling

Thames Water

Procedure Contents

Introduction

This HSI describes the range of hazards associated with Directional Drilling and any unexpected eventualities arising from failures. It is intended to provide guidance in support of the *Essential Standards 1: Excavations and HSG47: Safe Digging Practices*.

Note – This document must not be used as a design standard and designers must refer to the relevant Health and Safety guidance and Essential Standards.

Hazards arising from Directional Drilling can cause damage to property/ground and result in service strikes as well as presenting risk of injuring colleagues and members of the public.

A large portion of material within the document has been used from "MDA – Unit 18.13c Horizontal Directional Drilling" created by A. Bellis, Asset Development Team.

Definitions

Directional boring and horizontal directional drilling are trenchless technology techniques that enable the laying of utilities without causing a major impact to the surrounding environments or surfaces. The incorporate some aspects of other trenchless techniques of pilot hole micro-tunnelling and reaming. Both techniques work the same way:

Directional Boring

Directional boring is used for small scale projects and pipe diameters. The distance is usually only a few hundred metres.

Horizontal Directional Drilling

Horizontal directional drilling is used for large scale projects and diameters. The distance is usually kilometres.

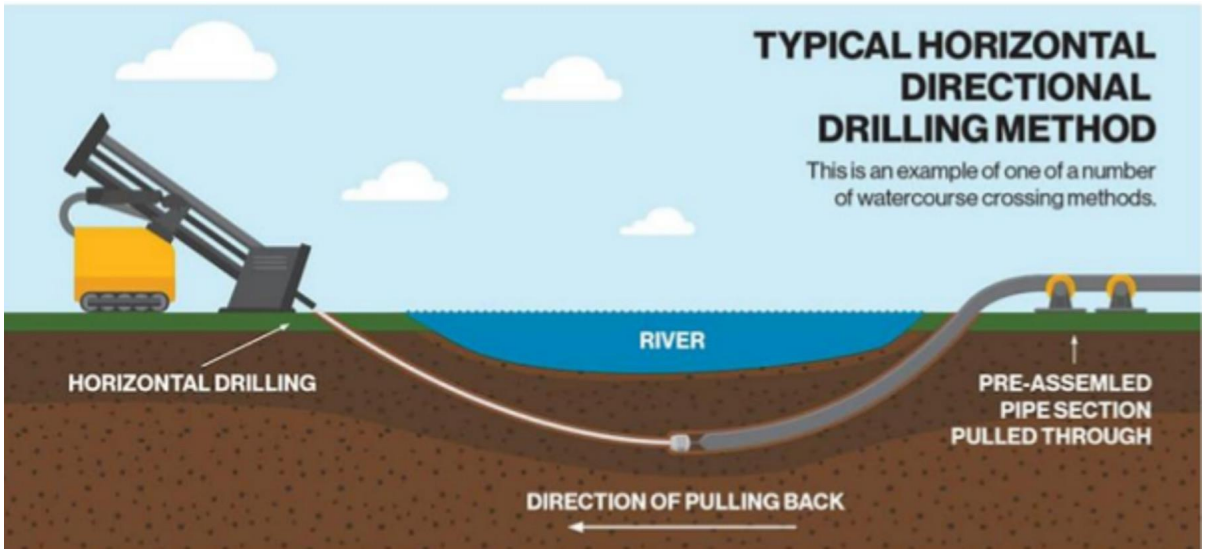
In both cases, the direction is monitored and controlled on the surface by a transmitter in the drilling head.

Applications

Examples where directional drilling can be used, include crossing:

- Major/Heavy traffic roads
- Railways/Sewers crossing railways
- Congested areas
- Waterways and bodies of water – e.g., rivers, canals, lakes etc
- Environmentally sensitive areas – e.g., wetlands
- Areas where other methods (e.g., pipe bursting) are costlier or not possible

Diagram for example purposes only



Considerations

When proposing to use a directional drilling technique, consideration must be given to the specialist, the design, specification, planning and Health and Safety:

Specialist considerations

- The Principal Contractor is to assess the capability of any specialist sub-contractor they are to choose to undertake Directional Drilling. An assessment that they have the capabilities and experience to undertake the required task must in place.

Design considerations

- Prior to committing to a directional drill, it should be documented why and what other methods were considered.
- The pipe tension load capacity must be considered and correct for the application – a thicker pipe may be needed if it cannot cope with the pulling stress.
- The correct SDR and size of the replacement pipe – the assessment must be based on operating pressure and capacity.
- Launch and receiving pits must be clearly marked on surveys and drawings. Any changes to location of either pit must be signed off by the appropriate design team and management.
- Depending on the task, authorisation and permission may be required for the drill, for example directional drilling under railways/fuel pipes/high risk. Ensure the appropriate authorities, external parties and third parties have been engaged and written confirmation has been received.

Specification considerations

- The specification must incorporate the maximum pull force on the pipe which must be obtained from the pipe suppliers. Note all pipes must confirm with Thames Water Asset Standards and be procured from an approved supplier.

Planning considerations

- The route must be clear and free from obstacles and shallow arc(s).
- Geotechnical investigations and surveys must be undertaken to identify ground conditions. Poor or difficult ground (e.g., gravels, cobbles and sand) can create an unstable pipe route.
- Contingency planning must be relevant to the task, such as breeching, break out of drilling

fluid, leaks etc.
- Spill plan – Fluid leaking or entering ground is a foreseeable risk. A suitable and sufficient mitigation plan must be in place.
- Proximity to other utilities and services must be considered to ensure minimal risk of service strikes and undermining.
- Recording of all services, stat plans, surveys must be kept and decision making appropriately recorded.
- Permits must be provided and issued for all activities that break ground as per Essential Standard 1: Excavations.
- All fluids used to keep the bore holes open, such as bentonite/MX powder, must be suitable to the task/activity and consideration given to any environmental impact.
- If crossing any live services, an emergency rescue plan must be developed and briefed to all teams.

Health and safety considerations

- The area must have safe access and the site setup must be suitable and sufficient.
- Intermediate excavations may be required at pinch points.
- Pipe restraint must be in place before being released or cut from the coil trailer.
- Reliable communications must be in place between pipe entry location, rig operator and guidance operator.
- The route of the guidance operator must be considered to ensure they do not come into harm during the monitoring process.
- Excavation of launch and receiving pits must be undertaken appropriately and in accordance with Essential Standard 1: Excavations.
- Drilling fluids collection must be considered as part of the demobilisation plan. Suitable access and egress to the pits must be in place.

Requirements for Directional Drilling Activities

Drilling Equipment and Rig

The drilling rig must be appropriate to the size of the drill. Operatives and the drill operator must be able to clearly understand the working pressure and functionalities of all equipment.

Guidance Location Equipment

The location and guidance of the drilling head is an important part of the process because it is usually not visible from the ground surface. If not monitored, holes would be drilled in the wrong place and the ground would be liable to subside into the cavity created.

There is three difference guidance location equipment available for locating the bore head

- Walk-over locating system
- Wire-line locating system
- Gyro-based location system

All three have their own merits, and a particular system should be chosen based on the site requirements, soil conditions, boring depth, obstacles and interference, speed, accuracy and ease of operation. This assessment must be recorded within the design.

Measuring Points

Measuring points of depth must be provided based on geographical data, coordinates, and datum points. Geographical variation must be considered as part of the design and all information should be shared with all parties.

Calibration of measuring equipment

Any location equipment used in the directional drill must be certificated and within calibration.

Crossing Points

Guidance location equipment must not be solely relied on. Where the directional drill activity is to cross services of any type, all services must be considered as critical and visibly verified. Where this is not possible, for example in the middle of a road or waterway, the depth of the directional drill must be visibly verified at the start of the exclusion zone and the finish.

Bends or Curves

Bends or curves within the drill plan must be given additional attention to ensure there is no deviation.

Training and Competence

All personnel making up the directional drill team must be suitably and sufficiently trained and competent to undertake the task.

Supervision

When directional drills are undertaken by a specialist sub-contractor. The activity must always have adequate supervision during the entirety activity.

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