



**Australasian Society for Trenchless
Technology Sample
Specification for Horizontal Directional
Drilling sample**

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1.0 INTRODUCTION

The Australasian Society Trenchless Technology has developed this Specification to assist industry users in Australia and New Zealand in utilising Horizontal Directional Drilling.

This document does not replace any existing relevant manuals or standards. It remains the users responsibility to ensure that all relevant laws, standards and specifications are adhered to during the course of a Works with use of Horizontal Directional Drilling.

Additional horizontal directional drilling information can be obtained from the Australasian Society Trenchless Technology website (www.astt.com.au), they are:

- Guideline for (Horizontal Directional Drilling, Pipe Bursting, Microtunnelling and Pipe Jacking).
- Standard for Horizontal Directional Drilling.
- National Utility Contractors Association Trenchless Assessment Guide, a web-based tool that can be used for identifying trenchless construction methods suitable for a particular set of project parameters (i.e.: diameter, length, depth, geological conditions and so on).

[a1]NUCATAG

2.0 DEFINITIONS

A number of abbreviations and technical terms have been used in this specification:

ASTT - Australasian Society for Trenchless Technology.

Client - Person or company requiring the Works to be undertaken.

CCTV - Closed Circuit Television - The use of video cameras to visually inspect the installation. Often used where manual entry is not feasible or possible.

Contingency Plan - A plan for backup procedures, emergency response, and post-disaster recovery.

Contractor - Person or company undertaking the Works required.

Guideline - General information about an item, process, method, material, system or service. GDR, GBR

HDD - Horizontal Directional Drilling. A steerable trenchless method of installing underground pipes, along a prescribed path by using a surface launched drilling rig.

HDPE - High Density Polyethylene.

NUCA TAG - National Utility Contractors Association Trenchless Assessment Guide.

Operator - Suitably trained or qualified person who operates machinery, an instrument, or other equipment.

Specification - A document that specifies, in a complete, verifiable manner, the requirements, design, behaviour, or other characteristics of a system, component, product, result, or service and, often, the procedures for determining whether these provisions have been satisfied.

Standard - A document that provides uniform technical criteria, methods and processes to establish a norm.

Works - The project or task to be completed by the Contractor on behalf of the Client.

3.0 SPECIFICATION FORMAT

The format of this specification is one that would typically be used in a TT project specific scope of works and specification. This has been done for the purpose of ease of use by TT industry users.

4.0 SUBMITTAL

The Contractor shall submit documentation and tenders in accordance with this specification's SUBMITTAL and GENERAL REQUIREMENTS.

- (i) Documentation detailing the training and relevant experience of the Contractor's personnel shall be submitted to the Client for review which includes all personnel that would undertake the work. All Contractor's personnel are required to be fully trained in their respective duties and the safe operation of any equipment that will be utilised during the course of the Works. Please refer to DRT03 Training Package for the Drilling Industry¹ and BCC03 Civil Construction Industry Training Package² for relevant competency standards and qualifications.

Prior to letting the Contract, the Client should ensure:

- (ii) Horizontal Directional Drilling is possible i.e. ensure the presence of and proposed proximity to existing services is clearly known and the risks understood.
- (iii) That a comprehensive geotechnical investigation is carried out and available at the time of tender.
- (iv) Liaison with relevant authorities e.g. railways, road authorities and local residents is completed and a system of liaison during the construction works is developed and detailed in the tender documents. Define any third party requirements, which will impact the works e.g. extent of ground settlement monitoring if required during the works.

¹ Australian Drilling Industry Training Committee www.aditc.com.au.

² Construction Industry Training Board www.constructionskills.com.au

5.0 HORIZONTAL DIRECTIONAL DRILLING METHODOLOGY

Prior to commencing any work, the Contractor shall submit a clear and detailed plan for the execution of the trenchless pipe installation to the Client, which shall include but is not limited to the following:

- Safety management plan,
- Risks Management plan,
- Environmental management plan and plans for the allocation of noise pollution,
- Quality management plan,
- Traffic and public relationship management plan
- Manufacturer and type of HDD equipment and related operating system proposed and capability of equipment chosen,
- Bore drilling, reaming and pull back plan,
- Bore tracking and related equipment use,
- Existing underground utility services location and proposed special precautions,
- Ground monitoring equipment and methods, for example heaving, fluid loss or frac-out,^[a2]
- Type of existing pipe and services reconnection joints used and their relevant specification,
- Calculation of size and depth of exit pit required,
- Hydraulic calculation for bypass pumping (if applicable),
- CCTV inspection frequency, and or supply of temporary services for waterline services (if applicable),
- Type of slurry or drilling fluid used, fluid mixing design plan, and mud handling system specification,
- Location of exit pits, trench support and work sites layout,
- Method of temporary spoil storage and disposal,
- New pipe product details connection methods and equipment used,
- Programmed daily work hours and duration for the operation,
- Details of specialist subcontractors including applicable competency training records of personnel.

5.1 Horizontal Directional Drilling and Installation of Pipe

The Contractor shall furnish all labour, plant, materials, tools, equipment required to complete the works.

The Contractor shall have a quality management system and work in accordance with the quality management plan.

The Contractor shall follow the recommended drilling and pipe installation procedures details below:

(a) Drilling and Pipe Installation

- (i) The Contractor shall not attempt to drill, ream and install new pipe without verifying the capacity of the HDD machine.
- (ii) A drilling fluid design plan, including recycled fluid handling system shall be established and agreed with the Client prior to commencing the Works. This plan shall be revised, when warranted, throughout the project to ensure the drilling fluid is performing as per specification.
- (iii) The Contractor's drilling execution plan shall identify the equipment to be retained onsite to check drilling fluid properties. Alternations to the drilling fluid mix shall be made, when warranted, to stay within the specification of the drilling fluid plan.
- (iv) In the event that the drilling equipment becomes stuck, the Contractor shall immediately cease operations to allow any ground induced hydro-lock to subside. Then if on re-commencement of the operations the pipe remains stuck the Contractor shall immediately notify the Client. The Contractor, in consultation with the Client, will discuss the appropriate equipment recovery plan (e.g. open cut) to be implemented to allow the work to continue.
- (v) In the event of a boring fluid fracture or return loss occurring during pilot hole boring operations, the Contractor shall ensure that the contingency plan for frac-out or fluid loss is implemented. The Client and the Contractor will discuss additional options, and implement as required.
- (vi) In the event that the pilot bore deviates from the planned bore path, the Contractor shall notify the Client. The Contractor may be required to pull back and redrill from the location along the bore path where the deviation occurred, if deemed necessary by the Client. (refer to 4.6(iii))
- (vii) Upon successful completion of the pilot hole, the Contractor shall ream the bore hole using the appropriate tools. The bore diameter shall be a minimum of 25% greater than outside diameter of pipe.
- (viii) The Contractor shall pull the pipe through the borehole during the last step of reaming with the new pipe attached to the back of a swivel connector. Once pull back operations have commenced, the operation must continue without interruption until the pipe is completely pulled through the reamed hole. This is to prevent the slurry hardening in the borehole. During the pull back operation the Contractor will not apply more than the maximum safe pipe pull force as specified by the pipe manufacturer.
- (ix) The new pipe shall be homogenous throughout and shall be free of visible cracks, holes and other faults.
- (x) The pipe manufacturer shall be designated at the time of the tender. The Client, must approve in writing, any subsequent change of pipe manufacturer. The Contractor shall provide a record of product specific experience and product information at the time of tendering.

- (xi) The Contractor shall transport, handle and store the pipes and fittings in accordance with the manufacturer's recommendations at all times. Materials that are damaged or lost shall be repaired or replaced by the Contractor at no additional cost to the Client.
 - (xii) Due to the heat generated during the pull-back process due to friction and high tension stresses, prior to sealing the annulus space (space between outer pipe installed and the conduits inside), restoring the exit pit, and backfilling the entry pit, the installed pipe shall be allowed to cool and relax for the manufacturer's recommended amount of time, but not less than four hours. Sufficient excess length of new pipe shall be allowed to protrude into the access chamber to allow for cooling and relaxation and the consequential axial contraction that will take place.
 - (xiii) Connections of the pipe ends shall be achieved by means of Central Plastics Electro Fusion couplings if PE pipe were used or other methods approved by the Client. The electro-fusion couplings shall be slipped over the pipe ends at the entry and fused in place. Installation of electro fusion couplings shall be done in accordance with the manufacturer's recommended procedures.
 - (xiv) Prior to backfilling the entry and exit pits, the Contractor shall ensure that new pipe has been properly connected and installed. Suitable material, approved by the Client, shall be used directly under the new pipe as support, in order to avoid sagging after backfill and compaction.
- (b) Drawing and Calculations
- (i) All construction drawings and design calculations used during the construction shall return to the client marked up and revised to status. The mark-ups shall include pipe final alignment, entry and exit pit, pipe connection joints and any lateral service connections.

5.2 Settlement and Surface Heave Monitoring and Collapse of Bore Hole

- (i) The Contractor shall take all care and necessary precautions to protect existing structures, utilities and services in planning and execution of the Works. All potential affected work area shall be visually inspected to assess and document condition prior to any work being conducted. Any damage to adjacent properties caused by or part of this work shall be repaired and restored to its original condition at the Contractor's expense.
- (ii) The Contractor shall be responsible for the identification and protection of services where these are crossed by construction activities.
- (iv) Where crossing of roadways and railways are involved, the Contractor shall be required to measure, record and report any ground settlement to the satisfaction of the respective controlling agencies.
- (v) Where crossing any utilities and pipelines during the HDD process, minimum of the Contractor shall monitor ground settlement or heave directly above and 3m before and after the utility or pipeline intersection.

- (vi) The Contractor shall cease operations when monitoring points indicate surface disruption. That falls between the agreed specifications. The Contractor shall propose in action plan for review and approval by the Client to remedy the problem.

5.3 Performance Requirements

- (i) The Contractor shall provide consumption proof of certification by the HDD equipment manufacturers of the power, condition, and operational characteristics of all equipment to be used.
- (ii) Screwed or solvent cement joints connecting section of the new pipe shall not be permitted under any circumstances.
- (iii) The Contractor shall join all HDPE piping using the butt-fusion method. The jointing shall be carried out in accordance with the manufacturers recommendations and specifications. The joints shall be leak-free, straight and true and have uniform roll-back beads within limits specified by the manufacturer.
- (iv) The newly fused joints shall be held under pressure whilst being cooled. The cooling time shall be as specified by the manufacturer. Should the pre-inspection of the pipe material reveal defects, the defective section shall be cut out of the pipe. The pipe shall then be jointed as described above. Similarly, should a joint be found to be defective, the joint shall be cut out and a new joint made. All such residual work shall be at these cost of the contractor.
- (v) The Contractor shall ensure that the terminal sections of new pipe are joined to existing pipes with Central Plastics Electrofusion Couplings, or other approved connectors with tensile strength equivalent to that of the existing pipe. Written client approved of other connectors shall be in place before connection takes place.
- (vi) The Contractor shall ensure that the operator monitors the HDD system at all times. The minimum information available to the operator shall include thrust force, pull force, rotational speed, depth, temperature and fluid pressure.
- (vii) The Contractor shall include in his drilling plan the process managing the drilling operation for all utility crossing identified to be within 600mm of the proposed pipe alignment.
- (viii) The Contractor is to ensure that the HDD equipment has the capability of limiting the thrust and pulling force applied to the new pipe to ensure that the manufactures recommended tension loads for the pipe are not exceeded.

5.4 Entry, Exit and Access Pits

The Contractor shall take all necessary action to ensure the safety of the work and shall ensure compliance with the pre-approved Safety Management Plan requirements at all times.

The sizes of all excavations shall conform with the following requirements:

- (i) All pits shall be of the minimum possible size commensurate with safe working practices. The Contractor shall select the size and provide for client approval the details of all pits.
- (ii) Every face of any excavation that exceeds a depth of 1.5 m shall be supported or contained by appropriately designed shoring.
- (iii) The shoring of the excavation shall be braced in accordance with the appropriate trench safety standards as the excavation progresses.
- (iv) All necessary measures must be taken to ensure that excavations are left after each operating hours in a safe condition at the end of each work day. This should include the erection of suitable hard barricades, warning signs and hazard lights.
- (v) The Contractor shall inspect the site, and verify all existing levels, survey control points and set out points shown on the Drawings, before commencing the earthworks.
- (vi) The earthworks shall be set out in accordance with the design drawings.
- (vii) All excavations shall be made to the depth and extent as shown on the Drawings with proper allowance for fill, additional cover (where required) and formwork. The excavations shall be kept free and clear of loose materials, water and rubbish. Should excavation to the nominated depth reveal unstable or unsuitable ground, the Contractor shall immediately notify the Client and take steps to make safe. This work will be undertaken at additional cost to the client if the ground conditions are found to be different from the initial ground conditions investigation.

5.5 Gradient and Alignment Tolerances

- (i) Tolerances in the gradient and alignment of the final installation shall comply with the Client's specifications.
- (ii) The contractor shall measure and record the exact position of the drilling head along the route by using a tracker to ensure that heave or settlement along the alignment is within specified tolerances. The Contractor shall make immediate corrections to the alignment before allowable tolerances are exceeded if a potential misalignment is recorded.

5.6 Obstructions and Loss of Ground

- (i) If a work stoppage is encountered, the cause of the stoppage shall be determined by the contractor. Should the stoppage be a result of the

Contractor's equipment, materials or method, all remedial costs will be for the Contractor's account. If the cause is found to be an obstruction, the installation methods shall be modified to the satisfaction of the Client to best suit the actual conditions encountered.

5.7 Pipe Testing, Disinfection and Inspection

After satisfactory completion of the installation of the new pipe and removal of all equipment and excavated material, the Contractor shall conduct inspection and testing as follows:

- (i) All appropriate pipe joint testing methods shall be applied. The joints shall be in compliance with ASTM C828, ASTM C1103, ASTM C969, BS 5911.
- (ii) Hydrostatic pressure testing and CCTV inspection for the entire pipeline.
- (iii) Further testing may be required to ensure the pipeline is leak proof, based on manufacturer provided material properties. If sewer pipeline is installed, the testing shall be as recommended in the following testing standards (EN160, EPA).
- (iv) All test records shall be provided to the Client as part of the "As-Built" documentation.

5.8 Closing of Pits

After satisfactory completion of all testing, removal of all equipment and excavated materials, the Contractor shall prepare the bottom of all pits to the same specification as required by the rest of the pipelines. The Contractor shall remove all loose and disturbed materials below pipe grade to the undisturbed earth level and shall recompact the materials to the agreed specification.

5.9 Quality Control and Assurance

- (i) The Contractor shall submit an Inspection and Testing Plan (ITP) and Manufacturers Data Report (MDR) for approval.
- (ii) The Contractor shall maintain a record of "As-Built" drawings and other data in accordance with the General Conditions of Contract, this Specification and the approved Scope of Works.
- (iii) The Client reserves the right to reasonable access to the Contractor's facilities and Quality Assurance records for the purposes of a Quality Assurance Audit and inspection throughout the contract period.
- (v) The Contractor's Quality Management Plan shall define the method for performing its own internal audits.

6.0 GENERAL REQUIREMENTS

6.1 Environmental Impact Assessment

- (i) The Contractor shall undertake all Works in accordance with the relevant environmental requirements.
- (ii) Prior to commencing any earthworks or excavation operations, the Contractor is obtain an "Excavation Permit" from the Client. The contractor will identify the location of underground installations (i.e. gas, sewer, water, fuel, electrical and communications cabling) in the area. If required, the Contractor shall obtain any or all approvals required from external agencies e.g. local councils, State Road Authorities. The Contractor shall take all reasonable measures necessary to ensure that all such installations are protected from damage or displacement during the course of the work.
- (iii) The Contractor shall obtain a "Gain Access approval", and be responsible for clearing any construction spillage, waste and debris from the appropriate local Regulator.

6.2 Geotechnical Data Report

- (i) The contractor shall ensure that the geotechnical data report (GDR) provided is sufficient to complete the work. Additional geotechnical investigation maybe requested by the contractor if it is deemed that the GDR provided is insufficient detailed to complete the work without undue risk to the project.

6.3 Traffic and Public Relationship Management Plan

- (i) The Contractor shall undertake works in accordance with in accordance with an approved Traffic Management Plan (TMP). The TMP shall be in accordance with the provisions of AS 1742 - Manual of Uniform Traffic Control Devices and any additional requirements of the local and state authority.
- (ii) The Contractor shall ensure that access is maintained for public and construction traffic. Public traffic shall be isolated from construction traffic wherever practicable. In areas where access for public traffic cannot be separated from construction traffic, appropriate traffic measures shall be clearly identified in the Traffic Management Plan.
- (iii) The Traffic Management Plan shall clearly identify what traffic control equipment shall be implemented for the duration of the works. All traffic control equipment shall be kept in good order to ensure visibility and reflectivity is maximised for both day and night traffic.
- (iv) Any by-pass roads, detours and other temporary works proposed shall be clearly identified in the Traffic Management Plan. Details of the proposed temporary works shall be provided to the Client and other relevant traffic authorities for approval prior to the start of the Works.

- (v) Pursuant to these requirements, traffic management notices shall be provided to parties nominated by the Client for distribution and displayed on all safety notice boards. These notices shall be updated to display the current conditions at all times.
- (vi) Traffic management actions implemented on site shall be inspected at least daily or at such greater frequency as required to ensure they are in accordance with the plans. The contractor shall complete and maintain a register of traffic management actions to reflect inspections and maintenance undertaken.
- (vii) The Contractor shall provide for Client approval, a Public relationship management Plan in accordance with the relevant Australian Standards.

6.4 Safe Work Practices

- (i) Daily safety meetings (toolbox meetings) shall be conducted before the commencement of daily works and a written record of attendance (and safety topic) shall be submitted to the Client's Representative.
- (ii) The Contractor shall undertake the works in accordance with safety requirements as laid down by local, state and federal regulations. Safety measures shall include, but not be limited to, personal protective equipment, operating of machinery within job site, storage and transportation of materials and equipment.

6.5 By-pass Pumping

- (i) The Contractor shall provide, for Client approval details of any temporary services required for the duration of this project.
- (ii) The Contractor shall provide, for approval by the Client, all hydraulic calculations of by-pass flow pumping during the project. The Contractor will also submit for client approval, pump specifications, the proposed number of duty and stand-by pumps, and the proposed operating procedures.

7.0 CONTINGENCY PLANNING

The Contractor shall prepare a drilling contingency plan specific to the site of operation.

The plan should address, but not be limited to, the following:

- (ii) General procedures and labour issues for the duration of the project
- (iii) Equipment requirements and the basis of duty and standby
- (iv) Boring fluid fracture (borehole) and general spillage
- (v) Time considerations

- (vi) Clean up, environmental and surface monitoring methods
- (vii) Contract details for the client and any local regulatory bodies that may be affected by the project
- (viii) Waste disposal plans
- (ix) General Public Relations requirements

8.0 MEASUREMENT AND PAYMENTS

- (i) Payment shall be based on the Contract Schedule and paid in accordance with the contracted terms and conditions.

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