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**Australasian Society for Trenchless
Technology
Specification for Pipe Bursting**

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1.0 INTRODUCTION

The Australasian Society Trenchless Technology has developed this Specification for assisting industry users in Australia and New Zealand in utilising Pipe Bursting.

General information on current methods of Pipe Bursting as a Trenchless Technology methodology for installing pipe is provided, as well as recommendations on which design requirements to consider before deciding on which method is most appropriate to use for any Works.

This document does not replace any existing relevant manuals or standards. It remains the user's responsibility to ensure that all relevant laws, standards and specifications are adhered to during the course of a Works with use of Pipe Bursting.

Additional Pipe Bursting information can be obtained from the Australasian Society Trenchless Technology website, they are:

- Guideline for (Horizontal Directional Drilling, Pipe Bursting, Microtunnelling and Pipe Jacking).
- Standard for Pipe Bursting.
- 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 attributes (i.e.: diameter, length, depth, geological conditions and so on).

2.0 DEFINITIONS

ASTT - Australasian Society for Trenchless Technology. (www.astt.com.au)

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

CCTV - Closed Circuit Television. The use of video cameras to visually inspect the works. Often used where man entry not feasible/ possible.

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

Contractor - Person or company undertaking the Works required.

Entry Chamber - Also called insertion, thrust, drive or launching pit/shaft.

Exit Chamber - Also called reception pit/shaft.

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

NUCA TAG - National Utility Contractors Association Trenchless Assessment Guide.

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

PB - Pipe Bursting. A trenchless method of replacing pipes. Involves bursting the existing pipe by use of a bursting head while simultaneously installing the new pipe.

Specifications - Specific set of requirements for an item, process, method, material, system or service.

Standard - A document that provides uniform technical criteria, methods and processes. Often establishes an engineering norm.

Work - The project or task to be completed by the Contractor on behalf of the Clients.

3.0 SPECIFICATION FORMAT

From this point on in this specification, the format has deliberately been changed to a format that would typically be used in a Works specific scope of works and or specification. This has been done for the purpose of ease of use by industry users of this specification.

4.0 SUBMITTAL

The Contractor shall submit documentation and tenders in accordance with this specifications SUBMITTAL and GENERAL REQUIREMENTS.

- (i) Documentation detailing the training and relevant experience of the Contractor's personnel shall be submitted to the Client. All Contractor's personnel are required to be fully trained in their respective duties and in the safety of operating any equipment that will be utilised during the course of the Works. Please refer to DRT03 (Training Package for the Drilling Industry)¹ and or BCC03 Civil Construction Industry Training Package² for relevant competency standards and qualifications.

Prior to letting the Contract, the Client should ensure:

- (i) Pipe Bursting is possible i.e. ensure the presence of and proposed proximity to existing services is clearly known and the risks understood.
- (ii) That a comprehensive geotechnical investigation is carried out and available at the time of tender.
- (iii) 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.

5.0 PIPE BURSTING METHODOLOGY

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

- Risks management plan,
- Traffic and public relationship management plan,
- Safety management plan,
- Quality management plan,
- Environmental management plan and noise pollution problems,
- General description of the construction method, sequence of operations and type of trench support,
- Type of existing pipe,
- Manufacturer and type of bursting equipment and related operating system proposed and capability of equipment chosen,
- Existing underground utility services location and proposed special precautions,
- Ground monitoring equipment and methods,
- Type of new pipe (pipe specification) and services reconnection joints used and their relevant specification,
- Calculation of size, depth and location of launching chambers required and hydraulic for bypass pumping,
- Dewatering, flow bypass pumping, field final product testing,
- CCTV inspections frequency (to be agreed with the Client), and/or supply of temporary services (if applicable),
- Location of launching and receiving chambers, trench support and work sites layout,
- Method of temporary spoil storage and disposal,
- Replacement piping type, butt-fusion methods and equipment used,
- Programmed daily work hours and duration for the operation,
- Specialist subcontractors utilised applicable competency training records of personnel.

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

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

5.1 Pipe Bursting Installation of Pipe

The Contractor shall furnish all labours, plant, materials, tools, equipment required to complete the work.

The Contractor shall establish, file and maintained up to date records that demonstrate that the contractor's quality management system is being effectively implemented.

The Contractor shall follow the recommended pipe installation procedure illustrated but is not limited to the following:

Pipe Installation

- (i) Pipes used for PB are specialised. They must be capable of withstanding all forces imposed upon them during the construction phase as well as the final in-place loading conditions. All pipes must be able to withstand a compressive loading greater than the pulling load anticipated on the Work.
- (ii) The driving ends of the pipe and intermediate points shall be protected against damage. The pipe shall be homogenous throughout and shall be free of visible damages.
- (iii) The pipe manufacturer shall be designated at the time of the tender. Any subsequent change of pipe manufacturer must be approved by the Client in writing. The Contractor shall provide a record of experiences and product type information at the time of tendering.
- (iv) The Contractor shall transport, handle and store the pipes and fittings in accordance with the manufacturers' recommendations at all times. Materials that are damaged or lost shall be repaired or replaced by the Contractor at no additional cost to Client.

Drawing and Calculations

- (i) All drawings and calculations used during the construction shall return to the client with marks up to serve as "As-Built" record. Marks up shall include the following but not limited to the new pipe alignment, access chamber, pipe joints, and lateral service connections.

5.2 Settlement and Surface Heave Monitoring

- (i) The Contractor shall undertake all the necessary care and precautions to protect existing structures, utilities and services in planning and execution of the Works. Any damage to adjacent properties that are not part of this work shall be repaired and restored to its original condition at the Contractor's expenses.
- (ii) The Contractor shall be responsible for the identification and protection of services where these are crossed by construction activities.
- (iii) The Client's shall be notified immediately of all services encountered during the progress of the Works. The services shall be marked on the "As-Built" drawings by the Contractor.

- (iv) Where crossing of roadways and railways are involved, the Contractor shall be required to record and report any ground settlement to the satisfaction of the controlling agencies.
- (v) Where utilities and pipelines are involved, 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 any surface disruption. The Contractor shall propose immediate action for review and approval by the Client to remedy the problem.

5.3 Performance Requirements

- (i) The Contractor shall provide certification by the PB equipment manufacturer of the energy, condition, and operational characteristics of all equipment to be used for installing the specified pipe.
- (ii) Dewatering shall not be permitted for PB. If required, it may be permitted for construction of launching and utilities cross over access chambers.
- (iii) The Contractor shall ensure that the pipe is assembled on site using a butt-fusion method to provide a leak proof joint. Threaded or solvent cement joints and connections are not permitted. The Contractor shall ensure that fusing is accomplished by personnel certified as a fusion technician to the satisfaction of the client.
- (iv) The Contractor shall in accordance with the manufacturer specification ensure that a butt-fused joint is constructed in true alignment with a result an uniform roll-back beads. The joint shall be allowed adequate cooling time before removal of pressure. All identified defective areas of the pipe shall be cut out and the joint fused in accordance with the procedures stated by the manufacturer and replaced at no additional cost to the Client.
- (v) The Contractor shall ensure that the terminal sections of pipe that are joined are connected with Central Plastics electrofusion couplings or connectors with tensile strength equivalent to that of the pipe being joined.
- (vi) The Contractor shall ensure that the system is monitored by the operator at all times. All functions of the system shall be monitored and related to the operator. The minimum information the Contractor must make available to the operator shall include, but not be limited to, rate of advance length of conduit installed, thrust or pull force, deviation from line and grade, role, and valve positions.
- (vii) The Contractor shall ensure that all utilities crossing within 600mm of the existing bursting pipe have soil excavated and removed to relieve pressure caused by heaving during the bursting operation.
- (viii) The Contractor shall ensure that the equipment has the capability of limiting the bursting force applied to the pipe so as not to exceed the manufactures recommended tension loads for the pipe.

5.4 Launching and Receiving Chambers

The Contractor shall take the 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) Chambers shall be of the minimum possible size commensurate with safe working practices and located at the maintenance holes. The Contractor shall select the size and provide the details of all chambers.
- (ii) Every face of any excavation that exceeds a depth of 1.5 m shall be supported or contained by shoring unless the face is cut back to a safe.
- (iii) The shoring of the excavation shall be braced as the excavation progresses and where a mechanical digger is used, the shoring shall be kept as close as practicable to the excavator.
- (iv) All necessary measures must be taken to ensure that excavations are left in a safe condition, including the erection of suitable hard barricades, warning signs and hazard lights.
- (v) The earthworks shall be set out in accordance with the design drawings.
- (vi) 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.
- (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.

5.5 Grade and Alignment Tolerances

- (i) Tolerances in the gradient and alignment of the final lining shall comply with the Client's specifications.
- (ii) The Contractor shall record the exact position of the bursting head to ensure that heave or settlement along the alignment is within specified tolerances. The Contractor shall make immediate corrections to alignment before allowable tolerances are exceeded if a misalignment is recorded.
- (iii) Pipe installed outside tolerances and subsequently abandoned shall first be fully grouted and indicated on "As-Built" drawings as an abandoned pipe.

5.6 Obstructions and Loss of Ground

After satisfactory completion of the installing the new pipe and removal of all equipments and excavated materials for the PB operations, the Contractor shall conduct the inspection outlined as follows:

- (i) If a stoppage in the forward progress of the Works is encountered, the cause of the stoppage shall be determined by the Contractor. When the cause has been identified, the installation method shall be modified to the satisfaction of the client to best suit the actual conditions encountered. Should the stoppage be shown to have resulted as a direct result of the Contractor's incorrect or faulty equipment, materials or method, then all remedial costs will be at the Contractor's expense.
- (ii) Should appreciable voids in the of ground occur during the PB operation, the voids shall be backfilled promptly to the extent practicable with soil cement consisting of a slightly moistened mixture comprising one part cement to five parts granular material. Where the soil is not suitable for this purpose, the Contractor shall import suitable materials.
- (iii) Any concrete encasements shall be excavated and broken out prior to the bursting operation to allow the steady and free passage of the pipe bursting process. All in-line valves and fitting shall be removed prior to the bursting operation.

5.7 Pipe Testing, Disinfection and Inspection

After satisfactory completion of the installing the new pipe and removal of all equipments and excavated materials for the HDD operations, the Contractor shall conduct the inspection outlined as follows:

- (i) Air testing of individual pipe joints using low-pressure air methods (in compliance with ASTM C828) shall be used to complete the test requirements.
- (ii) Hydrostatic testing and CCTV inspection for pipe shall be used to complete the necessary test requirements.
- (iii) Further testing may be required to ensure the pipeline is leak proof, based on manufacturer provided material panel properties.
- (iv) All test sheets of inspection equipment shall be provided to the Client as part of the "As-Built" documentation.

5.8 Closing of Chambers

- (i) After the satisfactory completing all testing and all equipment and excavated materials for the PB operations have been removed, the Contractor shall prepare the bottom of all pits to the same specification as required for the pipe foundation. The Contractor shall remove all loose and disturbed materials below

pipe grade to the undisturbed earth level and shall recompact the materials to as close to the original condition as possible.

5.9 Quality Control and Assurance

- (i) The Contractor shall submit a description of the method and frequency of survey control that will be utilised (e.g. daily bursting log).
- (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 Scope of Works, throughout the duration of the contract.
- (iii) The Client reserves the right to reasonable access to the Contractor's facilities and Quality Assurance records for the purposes of Quality Assurance Audit and inspection throughout the contract period.
- (iv) The Contractor's Quality Management System shall be subject to formal audits as required by the Client.
- (v) The Contractor's Quality Management System 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 appropriate local environmental requirements.
- (ii) Prior to commencing any earthworks or excavation operations, the Contractor is obtain an "Excavation Permit" from the Client and to 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 all approvals require from external agencies e.g. local councils, State Road Authorities, and other affecting controlling agencies. The Contractor shall take all 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 local Regulator.

6.2 Geotechnical Baseline Report

- (i) It is the Contractor responsibility to ensure that the geotechnical assessment of the grounds provided by the client is sufficient to complete the work.

6.3 Traffic and Public Relationship Management Plan

- (i) The Contractor shall undertake works in accordance with requirements of an approved Traffic Management Plan, (per 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. 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 cleared identify in the Traffic Management Plan.
- (iii) The Traffic Management Plan shall clearly identify what traffic control devices shall be implemented for the work. All traffic control devices shall be kept clean to ensure visibility and reflectivity is maximised for both day and night traffic.
- (iv) Any by-pass roads, detours and other temporary works as proposed should be clearly identify in the Traffic Management Plan. Details of the proposed temporary works shall be provided to the Client for approval prior to the start of these works.
- (v) Pursuant to these requirements, a traffic management diagram shall be provided to parties nominated by the Client for distribution and display on all safety notice boards. This diagram shall be updated to display the current conditions at all times.
- (vi) Traffic management plans implemented on site shall be inspected daily or at greater frequency as required to ensure they are maintained in accordance with the plans. A register of traffic management plans shall be maintained to reflect inspections and maintenance undertaken.
- (vii) The Contractor shall provide a public relationship management plan.

6.4 Safe Work Practices

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

6.5 By-pass Pumping

- (i) The Contractor shall outline temporary services plans for the duration of this project. Each plan, and details of how it shall affect the Client, and the Works, shall be submitted to the Client for his approval.

- (ii) The Contractor shall outline all hydraulic calculations of by-pass flow pumping during the project. The Contractor will also submit pumps specifications, the number of stand-by, duty and operating procedures to the Client for approval.

7.0 CONTINGENCY PLANNING

The contractor should prepare a contingency plan specific to the site of operation.

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

- (i) General procedures
- (ii) Labour issues
- (iii) Equipment needs and spares
- (iv) Time considerations
- (v) Clean up and monitoring methods
- (vi) Client and regulatory contact
- (vii) Disposal plans
- (viii) Public Relations

8.0 MEASUREMENT AND PAYMENTS

- (i) Payment shall be based on the Contract Schedule and paid in accordance with the contracted terms and conditions.
- (ii) All work necessary to complete the Works, including but not limited to shafts, manholes, dewatering, connections, and similar items are considered subsidiary to the bid items. Payment will be made based on the bid items complete and in place.

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