COFFS HARBOUR CITY COUNCIL

DEVELOPMENT SPECIFICATION
DESIGN

1392 Trenchless conduit installation

Version 1 ***01 January 2009***

1392 TRENCHLESS CONDUIT INSTALLATION

1 SCOPE AND GENERAL

1.1 SCOPE

This worksection covers the installation of any type of drainage or service conduit where it is a requirement of the Contract that trenchless techniques are to be used. Trenchless techniques minimise interference with existing features, facilities or traffic. These techniques may be by either jacking, ramming, bursting, thrust or auger boring, micro-tunnelling, directional drilling or other suitable technique as appropriate for the particular installation.

The work to be executed under this worksection consists of supply of the conduit, installation and all necessary ancillary work, whether such work is temporary or permanent, as shown on the Drawings.

This worksection should be read in conjunction with 1351 *Stormwater drainage (Construction)*, 1352 *Pipe drainage*, 1353 *Precast box culverts*, and 1354 *Drainage structures* 1391 *Service conduits*, as appropriate.

1.2 QUALITY

Requirements for quality control and testing, including maximum lot sizes and minimum test frequencies, are given in 0161 *Quality (Construction)*.

1.3 REFERENCED DOCUMENTS

The following documents referred to in this worksection shall be deemed as the latest edition of the Australian Standards, including amendments and supplements.

Worksections

0161 *Quality (Construction)*

0179 *General requirements (Construction)*

0310 *Minor concrete works*

1151 *Road openings and restoration*

1351 *Stormwater drainage (Construction)*

1352 *Pipe drainage*

1353 *Precast box culverts*

1354 *Drainage structures*

1391 *Service conduits*

Standards

AS/NZS 3725 Loads on buried concrete pipes

AS/NZS 4058 Precast concrete pipes (pressure and non-pressure)

Other publishcations

Concrete Pipe Association of Australia (CPAA)

Concrete pipe jacking, Technical brief

International Society for Trenchless Technology (ISTT)

(Represented in Australia by the Australasia Society for Trenchless Technology)

Glossary of trenchless terms

1.4 TERMINOLOGY

Some of the trenchless techniques available are described below in accordance with the ISTT Glossary of trenchless terms:

- Jacking: A system of directly installing pipes behind a shield machine by hydraulic jacking from a drive shaft such that the pipes form a continuous string in the ground.
- Ramming: A non-steerable system of forming a bore by driving a steel casing, usually open-ended, using a percussive hammer from a drive pit.

- The soil may be removed from an open-ended casing by augering, jetting or compressed air. In appropriate ground conditions a closed casing may be used.
- Bursting: A technique for breaking the existing pipe by brittle fracture, using force from within, applied mechanically, the remains being forced into the surrounding ground.
- At the same time a new pipe, of the same or larger diameter, is drawn in behind the bursting tool.
- The pipe bursting device may be based on a pneumatic impact moling tool to exert diverted forward thrust to the radial bursting effect required, or by a hydraulic device inserted into the the pipe and expanded to exert direct radial force.
- Thrust boring: A method of forming a pilot bore by driving a closed pipe or head from a thrust pit into the soil which is displaced.
- Some small diameter models have steering capability achieved by a slanted pilot-head face and electronic monitoring, generally in conjunction with a locator.
- Back reaming may be used to enlarge the pilot bore.
- Auger boring: A technique for forming a bore from a drive pit to a reception pit, by means of a rotating cutting head.
- Spoil is removed back to the drive shaft by helically wound auger flights rotating in a steel casing.
- The equipment may have limited steering capability.
- Micro-tunnelling Steerable remote control pipe jacking to install pipes of internal diameter less than that permissible for man-entry.
- Directional drilling: A steerable system for the installation of pipes, conduits and cables in a shallow arc using a surface launched drilling rig.
- Traditionally the term applies to large scale crossings in which a fluid filled pilot bore is drilled without rotating the drill string, and this is then enlarged by a washover pipe and back reamer to the size required for the product pipe.
- The required deviation during pilot boring is provided by the positioning of a bent sub.
- Tracking of the drill string is achieved by the use of a downhole survey tool.

1.5 PERFORMANCE

The conduit and all aspects of the work shall meet the performance requirements detailed in this worksection.

1.6 METHODOLOGY

Submission
The Contractor shall submit a clear and detailed methodology for the execution of the trenchless conduit installation. This detailed methodology shall be included in the Contractor's tender submission as a method statement.

Method statement
The Method Statement shall adequately address the following items as a minimum requirement:

- General description of method and sequence of operation.
- Specialist subcontractors to be utilised.
- Conduit type and specification, including compliance with relevant Australian Standard.
- Jointing type and specification.
- Grout type, if required, methodology and equipment for grout injection.
- Mechanical description of any motorised pumping, jacking, horizontal boring, directional drilling or mining equipment intended for use.
- Existing underground utility services:
  . Treatment at conflict locations.
  . Protection of services in zone of influence.
- Survey equipment and methods.
- Direction of installation of conduit.
- Size, depth and position of temporary access pits required.
- Location of temporary spoil site if required and nature of haulage equipment.

- Programmed daily working hours and duration for the operation.
- Strategy for dealing with noise pollution problems.
- Traffic management.
- Dewatering.

General requirements and design guidelines for jacking precast concrete and other rigid pipes are given in the CPAA publications, Pipe jacking—Design guidelines and concrete pipe jacking—Technical Bulletin.

Location of services

The 'Dial Before You Dig' Service, telephone 1100, shall be contacted to obtain locations of water, sewer, stormwater, gas, electricity and telephone services, during the preparation of the Method Statement.

Services verification

The Utility Authorities' contact names listed in 0179 *General requirements (Construction)* shall also be contacted to verify the location of services, during the preparation of the Method Statement.

2 CONSTRUCTION

2.1 CONDUIT

Concrete pipe strength

For precast concrete pipes, the strength of the conduit shall be verified by the Contractor as adequate for the purpose utilising the methodology set out in AS 3725 with reference to AS 4058, for cracking load test parameters, and the Contractor's own determination of appropriate soil parameters.

The ultimate load for the conduit is to exceed cracking load by a factor of safety of 50%.

Other pipe strengths

The Contractor shall provide similar and equivalent verification if the conduit does not comprise precast reinforced concrete pipe.

Load testing

The conduit shall not be installed until the Contractor has produced documentary evidence to the Superintendent that appropriate load testing as required by Australian Standards and this worksection has been carried out and the representative specimens have satisfied the appropriate requirements.

This action constitutes a HOLD POINT.

The Superintendent's approval of the documentary evidence is required prior to the release of the hold point.

2.2 INSTALLATION

The installation shall provide for the following performance requirements:

- The installation of the conduit by open trenching shall not be permitted over the length designated for trenchless techniques.
- Where appropriate, voiding around the conduit shall be eliminated by grouting prior to completion of works, with material and methodology of grouting described in the Method Statement.
- The line and grade of the conduit shall comply with the Drawings within the tolerances indicated on the Drawings or stated in **Tolerances** when not explicitly shown on the Drawings.
- After installation all joints shall be flush to the internal conduit walls and watertight.
- After installation of the conduit laid by trenchless techniques and prior to any grouting procedures, bulkhead walls shall be established at locations shown on the Drawings. Such bulkheads shall comply with **Bulkheads**.
- The installation of the conduit shall not affect any adjacent building foundations and shall provide for consistent support prior to, during and after installation.
- The installation of the conduit shall not endanger the stability or health of the root systems of trees to be retained as designated by the Superintendent in conjunction with Council's Tree Preservation Officer.

2.3 TOLERANCES

The conduit shall be installed in accordance with the horizontal and vertical alignment as shown on the Drawings subject to the following definition of tolerances:

- The position of both the inlet and outlet of the conduit shall be determined by a registered Surveyor and shall comply with the Drawings for horizontal position to a tolerance of ±30 mm.
- Vertical tolerance at the inlet/outlet of the conduit where installation commences shall be ±10 mm.
- The average grade of the conduit shall comply with the grade as shown on the Drawings ±0.05%.
- The conduit alignment at all joints will be true with a tolerance of ±5 mm deflection in any direction at 1.5 m from the joint.

2.4 PERMANENT AND TEMPORARY PITS

Excavation

Any permanent and/or temporary pits established for purposes of installation shall be constructed in accordance with 1351 *Stormwater drainage (Construction)*.

Temporary pits

Backfilling of temporary pits shall comply with the backfilling and compaction requirements of 1351 *Stormwater drainage (Construction)*.

The surface of temporary pits, after backfilling, shall be restored to pre-construction condition as in accordance with 1151 *Road openings and restoration*.

Permanent pit construction

Permanent pits or access chambers, located at the pits used for trenchless conduit installations, shall be constructed to the details as shown on the Drawings and in accordance with the appropriate Specification following demobilisation of the trenchless conduit installation equipment.

Backfill and compaction around permanent pits or access chambers shall be in accordance with 1351 *Stormwater drainage (Construction)*.

2.5 BULKHEADS

Grout loss

Bulkheads shall be constructed in accordance with the Drawings or as nominated in the Method Statement submitted.

They shall be built in reinforced concrete as detailed in the Drawings, and fabricated to bond to the conduit so as to exclude direct grout pressure loss at the conduit/soil interface.

Installation sequence

Bulkheads shall be constructed, and any grouting undertaken, prior to construction of adjacent conduits installed under conventional trench techniques so as to prevent undermining of the previously installed trenchless conduit.

2.6 CONCRETE WORK

For all concrete work, the Contractor shall comply with 0310 *Minor concrete work* in relation to the supply and placement of normal class concrete and steel reinforcement, formwork, tolerances, construction joints, curing and protection.

Measurement and payment

2.7 MEASUREMENT

Payment shall be made for all activities associated with completing the work detailed in this worksection on a schedule of rates basis, in accordance with the Pay Items 1392.1 to 1392.5.

A lump sum price for any of these items, except item (a), shall not be accepted.

If any item, for which a quantity of work listed in the Schedule of Rates, has not been priced by the Contractor, it shall be understood that due allowance has been made in other items for the cost of the activity which has not been priced.

Excavation for permanent pits or access chambers is measured and paid in accordance with 1351 *Stormwater drainage (Construction)*.

Excavation and backfilling for temporary pits, including additional excavation and backfill at permanent pits sites, is measured and paid in this worksection and not 1351 *Stormwater drainage (Construction)*.

Restoration for temporary pits is measured and paid in accordance with this worksection and not 1151 *Road openings and restoration*.

Construction of, and backfilling for, permanent pits or access chambers is measured and paid in accordance with the appropriate conjunctive Specifications.

Bulkheads are measured and paid in accordance with this worksection and not 0310 *Minor concrete work*.

2.8 PAY ITEMS

1392.1 Mobilisation, establishment and demobilisation

The unit of measurement shall be an item.

The sum shall include all activities involved in the mobilisation, establishment and demobilisation of the trenchless conduit installation equipment and facilities.

The sum shall be all inclusive.

1392.2 Trenchless installation of conduit

The unit of measurement shall be the plan linear metre measured in the plane including access pits along the centreline of each particular type, class and size of conduit installed by trenchless techniques.

The schedule rate shall include:

- Survey and setting out.
- Supply of conduit.
- Installation.
- Jointing.
- Lining.
- Grouting.
- Excavation, removal and disposal.
- Temporary pits, excavation, backfill and restoration.

1392.3 Bulkheads

The unit of measurement shall be ‘each’ bulkhead completed.

The rate shall include all activities and materials required to complete the bulkhead structures as shown on the Drawings.

1392.4 Excavation for temporary pits

The unit of measurement shall be the cubic metre measured as bank volume of excavation.

The schedule rate shall be an average rate to cover all types of material encountered during excavation. Separate rates shall not be included for earth and rock.

The plan area for payment shall be the area calculated from the outside dimensions of the pit as shown on the Drawings. The depth shall be determined from the actual site measurement of the distance from the surface at the time of excavation to the base of the pit.

1392.5 Backfill for temporary pits

The unit of measurement shall be the cubic metre of compacted material.

The schedule of rate shall include backfill and compaction in layers as specified and restoration of surface to pre-construction condition.