

# Technical Direction

## Geotechnical

GTD 2018 002 | RMS 18.906 – 25 July 2018

### Trenchless Excavation within the Easement of Roads and Maritime Infrastructure

| Summary:  | Audience:   |
|---|---|
| This document provides requirements for the management of risks to Roads and Maritime Services assets affected by trenchless excavations. | <ul style="list-style-type: none"> <li>• Engineers and designers</li> <li>• Development proponents</li> <li>• Contractors</li> <li>• Project managers</li> <li>• Asset managers.</li> </ul> |

### Introduction

Trenchless excavations are used to install underground pipelines and cables carrying utilities such as electricity, water, gas and telecommunications. In recent years, trenchless excavation has been increasingly used near State roads. To ensure safety of road users and functionality of the road networks, it is necessary that the design and construction of such excavations meet the minimum criteria outlined in this technical direction.

This document is for management of the risks on Roads and Maritime assets affected by these trenchless excavations. It sets out the requirements for Roads and Maritime concurrence, including referrals of development applications involving such excavations.

### Approvals:

|                       |   |                        |  |
|-----------------------|---|------------------------|--|
| <b>Owner:</b>         | Samuel Henwood<br>Director Pavements and Geotechnical | <b>Review Date:</b>    | No later than three years after effective date |
| <b>Authorised by:</b> | Chris Harrison<br>Director of Engineering             | <b>Effective Date:</b> | July 2018                                      |

## Scope

This document details the submission and technical requirements for trenchless excavations with diameters up to 1.2 m using techniques such as cased auger boring, laser guided micro-tunnelling, pipe jacking, and horizontal directional drilling. For larger trenchless excavations, proponents shall contact the Roads and Maritime Project Engineer External Works on telephone number: 02 88492114. The document also includes a self-check screening process for review by Roads and Maritime.

The Roads and Maritime review relates to impacts on its assets and does not relieve designers and property developers of their obligations with respect to any other statutory requirements as part of the development.

## Technical requirements

This technical direction contains requirements for the following:

- Design references and design life
- Geotechnical investigations
- Effect on utilities
- Design loads and load combinations
- Groundwater levels
- Ground deformations
- Instrumentation and monitoring
- Thresholds
- Geometrical requirements.

## Design references and design life

The trenchless excavation shall be designed in accordance with this technical direction and the following standards and guidelines. Additional requirements are detailed in each section.

- *AS 1726 Geotechnical Site Investigations*
- *AS 5100 Bridge design*
- *AS 2159 Piling – Design and installation*
- *Specification R44 – Earthworks*
- *AS/NZS 2566.1 Buried flexible pipelines*
- *Australasian Society for Trenchless Technology - Guidelines for Horizontal Directional Drilling, Pipe Bursting, Micro-tunnelling and Pipe Jacking*

The design life of permanent structures within the Roads and Maritime easement shall not be less than 100 years.

## Geotechnical investigations

Geotechnical investigations are to be undertaken in accordance with AS 1726. All investigations shall include boreholes or test pits located at both entry and exit points, and then at intervals of not more than 30 m between them.

The depth of investigations shall reach a minimum of 2 m into the competent material below the invert level of the excavations.

The geotechnical investigation shall provide sufficient information to develop geotechnical models and groundwater conditions for the excavations.

## Effect on utilities

The proponent shall detail the nature and extent of any utilities located within the zone affected by the proposed trenchless excavation.

The proponent shall analyse and report on the effect of the trenchless excavation on these utilities. The design and construction shall take into account the requirements of utility owners and the sensitivity of these utilities to ground movements.

## Design loads and load combinations

Design loads and load combinations shall be in accordance with AS 5100, but with a minimum uniformly distributed live traffic load (UDL) of 20 kPa for the serviceability limit state. This minimum UDL shall be applied on the road which represents the most adverse loading conditions for the excavation.

The design shall take into account construction loads, loads from neighbouring structures and other surcharge loads as required by the relevant design standards. A minimum UDL of 10 kPa at serviceability limit state for loads other than traffic loads shall be considered.

The design shall take into account of any loads and movements emulating from construction or operation of the utilities that could affect the Roads and Maritime assets.

## Groundwater levels

The design groundwater levels shall be documented and shall take into account the short-term, long-term and accidental groundwater levels in the vicinity of the trenchless excavation.

## Ground deformations

Roads and Maritime will determine permissible deformations on a case-by-case basis, depending on the sensitivity of the Roads and Maritime assets. For preliminary design purpose, a total ground surface settlement limited to 15 mm may be considered. The differential settlement shall not be greater than 6 mm over any 2 m length. The calculated settlement contours due to the trenchless excavation, conforming to these requirements, shall be presented in graphical form.

The permissible movements shall be confirmed with Roads and Maritime before the final design.

## Instrumentation and monitoring

Where Roads and Maritime infrastructure assets could be affected by the excavation and construction, instrumentation and monitoring shall be implemented. The monitoring requirement will be varied to suit the different needs of the assets. In general, sufficient survey points to enable accurate measurement of ground deformation are required. The monitoring over carriageways needs to consider the following:

- Survey markers at the edges of the shoulder points, edges of the pavements, each line marking (or centreline for two lane roads), and otherwise at 3 m intervals along the pipe centreline.
- A baseline survey shall be performed before starting any trenchless excavation. Subsequent surveys need to be performed on a daily basis until the zone of active excavation has passed and no further movement is detected.
- A copy of all baseline measurements shall be forwarded to Roads and Maritime Services before starting any site works.

Where negligible ground movement is anticipated, monitoring may be carried out by walkover survey, subject to agreement with Roads and Maritime Services.

## Thresholds

The following trigger threshold criteria are to be adopted, where required, and shown on the drawings:

- **Alert:** If the deformations are less than 80% of the agreed values then the excavation could continue.
- **Action:** If the deformations are greater than 80% but less than 100% of the agreed values then the Roads and Maritime representative shall be notified within 24 hours and the monitoring data be reviewed. The frequency of monitoring should be increased. A comprehensive risk management or contingency action plan is required, and this is to be implemented by the proponent with prior agreement from Roads and Maritime.
- **Alarm:** If the deformations are greater than the agreed values, the Roads and Maritime representative shall be advised within four hours and the excavation works shall be suspended until an appropriate mitigation action is implemented by the Proponent. All actions shall obtain prior agreement from Roads and Maritime.

The action plan shall include likely incidents such as needs to clear blockage during excavation or recovery of damaged drill head. In all circumstances the recovery action must protect the integrity of the Roads and Maritime assets, safety of road users and avoid disruption to traffic.

## Geometrical requirements

The cover to the trenchless excavation, and the locations of the pits and trenches, will need to be agreed with Roads and Maritime. In general, the design shall be a minimum depth of 1.5 m from the road surface level to the obvert level of the excavation.

Alignment of the excavation shall be such that all existing structures including bridges, power poles etc shall be kept at least 2 m clear horizontally from a line extending at 45° from the horizontal from any points of the excavation.

## Screening process for review

Figure 1 shows a screening process for review by Roads and Maritime.

Reviews are determined by the following factors:

- depth of ground cover
- diameter of trenchless excavation
- quality of excavation materials.

Excavations that could affect assets such as bridges, retaining walls or other major infrastructures will require Roads and Maritime reviews, and their acceptance will be assessed on a case-by-case basis.

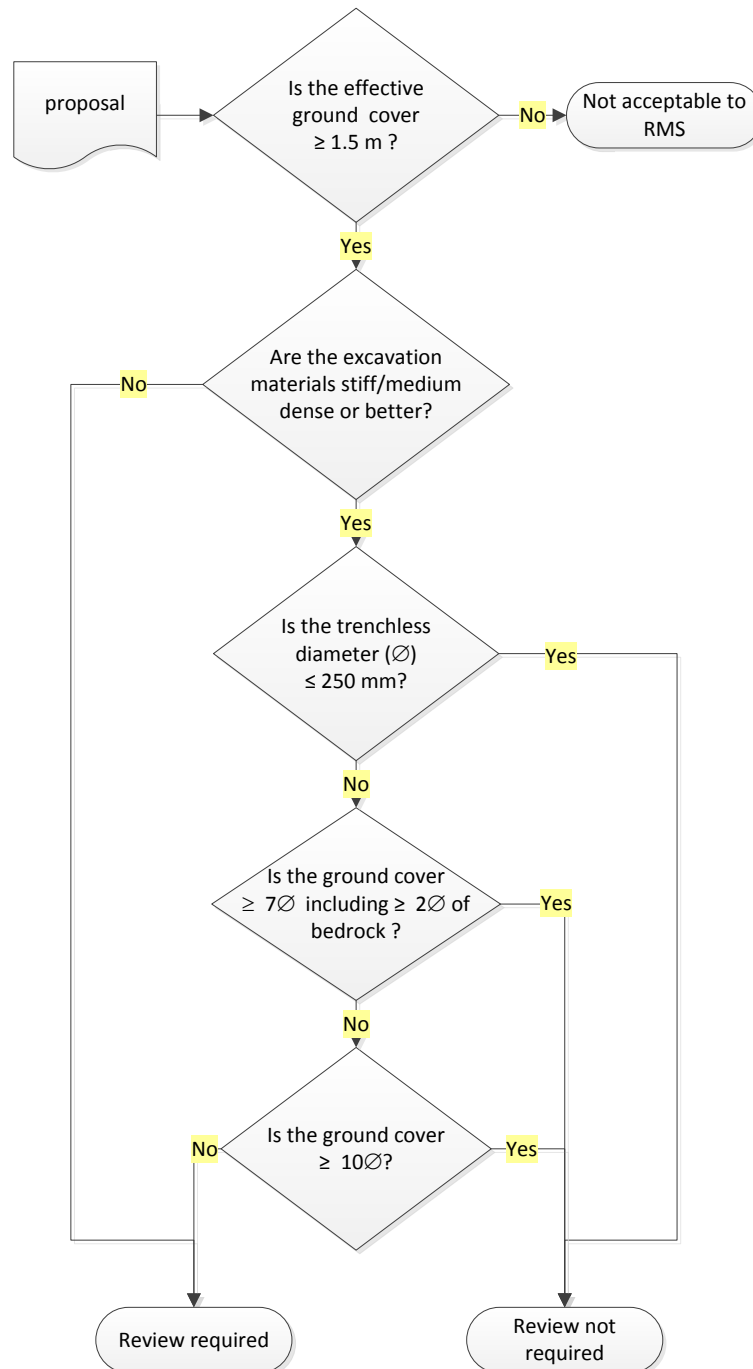


Figure 1: Screening process for review

## Submission requirements

Proponents seeking concurrence from Roads and Maritime Services shall include the following contents in their submission documents, where review is needed:

- **Geotechnical investigation report:** The geotechnical report for the proposed under-road crossing shall assess the geotechnical conditions and the materials through which the trenchless excavation is to be used. As a minimum, the report shall include, the following:
  - Objectives of the investigation
  - Site description
  - Results of field and laboratory tests
  - Findings of the investigation
  - Geotechnical interpretation.
- **Trenchless excavation method:** A review of the viable trenchless techniques shall be carried out with an assessment on appropriateness of the method chosen for the site. The selected trenchless technique shall be described thoroughly including its limitations and provisions needed.
- **Ground deformation assessment:** Appropriate geotechnical and hydrogeological models shall be developed, and assessments of ground movements and their effects on Roads and Maritime assets shall be documented. The assessment is to include the cumulative effects of ground movements from successive stages of the project, including installation, operation and maintenance of the development.
- **Specifications:** Relevant Specifications of the trenchless excavation technique and its system components such as drilling fluid or slurry, grouts, additives, bore lining, pipe materials shall be included.
- **Drawings:** The drawings shall show the alignment of the proposed trenchless excavation, entry and exit shafts in conjunction with the affected Roads and Maritime assets. These assets could include state roads, tunnels, bridges, embankments, retaining walls, slope structures, noise walls, traffic signal facilities, subsoil drainage system and the like. Appropriate longitudinal and cross sections are to be shown for all critical locations. Not limited to the following, the drawing shall also document:
  - The construction sequences
  - Tolerance of the excavation and control measures during installation.
- **Instrumentation and monitoring plan:** where required instrumentation and monitoring plan shall be including in the drawings. The plan shall include the instrumentation layout, the monitoring frequency, trigger levels and actions to be taken by the responsible parties. The monitoring results shall be made available to Roads and Maritime within 24 hours.
- **Condition Survey:** condition surveys are required when there is a risk of damage to the RMS sensitive assets. The survey shall cover all the Roads and Maritime assets within the influence zone of the excavation.

## Construction

Construction shall be carried out in accordance with the DA approved drawings, and specifications accepted by the Roads and Maritime. Any amendments to the design shall be re-submitted for Roads and Maritime concurrence before implementation.

## Post-construction

Upon completion of construction an electronic copy of the work-as-executed (WAE) drawings of the development shall be submitted to Roads and Maritime for record purposes.



[rms.nsw.gov.au](http://rms.nsw.gov.au)



13 22 13



Customer feedback  
Roads and Maritime  
Locked Bag 928  
North Sydney NSW 2059

**July 2018**  
RMS 18.906

---