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MODEL CLAUSES FOR CIVIL ENGINEERING WORKS

SECTION 125

BRIDGE INSTALLATION BY THRUST BORING

NOTES TO SPECIFIER:

These notes do not form part of the Specification.

General

125.1

The installation of tunnels, bridges, culverts and the like by thrust boring techniques is a relatively new and developing technology. Usage in the UK has been mainly in deep cover systems where structures have been installed through high embankments.

In Europe, usage has included shallow cover systems – this has been prompted by the need to replace level crossings with underline bridges. There appears to have been little use for forming openings through high embankments.

Thrust boring must be carried out by specialist sub-contractors.

Types of thrust boring systems

125.2

Thrust boring systems generally fall into one of the following two categories:

(i) Deep cover systems

This is where a considerable depth of soil or fill material exists between the underside of the track formation and the top surface of the structure being installed.

Except for possible pre-grouting and disturbance at the structure-soil interface, the material over the structure and the track formation is not disturbed, or otherwise supported before or during the installation.

(ii) Shallow cover systems

This is where the track formation will bear directly on, or be close to, the top surface of the structure being installed.

In these cases, prior to the thrust boring work it may be necessary to install a track support system; this is usually fixed directly to the track and is supported by the structure as the structure is thrust under the tracks.

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Careful consideration should be given to which system is most appropriate, particularly when the cover is less than 2.0 metres below formation level. For example, sand and gravel may be best dealt with by a shallow cover system, replacing the material with a deep layer of ballast during the withdrawal of the track support arrangement.

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|---|--------------|---|
| Temporary
Jacking base | 125.3 | Structures installed by thrust boring need a jacking base. This can be located below foundation level and can be abandoned on completion, where it is clear of proposed service positions. Removal of the base is likely to be expensive. |
| Temporary
shield | 125.4 | Structures installed by thrust boring are fitted with a tunnelling shield, the design of which is governed by the type(s) of ground to be passed through. Consideration should be given to the effect of the shield on the final structure, particularly with structures that are skewed to the track when the rail loading applied to one corner of a raked back shield could affect the overall balance of the structure. |
| Preparation prior
to thrust boring | 125.5 | Prior to any thrust boring work, it is imperative that a comprehensive ground investigation is carried out to ascertain the properties of the soils to be encountered. The ground investigation will indicate the feasibility of the proposal, including the minimum depth of cover likely to be acceptable and whether any ground improvement works are necessary. |
| Embankment
settlement and
monitoring | 125.6 | Similar to other tunnelling operations, the movement of the temporary shield generates settlement of the ground due to face loss, displacement of boulders, and overbreak - the temporary tunnelling shield being larger than the structure being thrust. |

The overbreak tends to be greater for thrust boring than for other tunnelling methods and so larger ground movements can be expected. It is, therefore, essential that the Contractor is able to predict, to a reasonable degree of accuracy, the movement expected during the proposed thrust boring operation.

The ground above the line of the thrust bore should be monitored to measure the ground movement, and to determine the extent of any track distortion taking place - in accordance with NR/BS/LI/045. Personnel and equipment should be available to pack the track, as and when necessary, and implement agreed actions for dealing with more severe movements.