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MODEL CLAUSES FOR CIVIL ENGINEERING WORKS

SECTION 124

TEMPORARY WORKS TUNNELS CONSTRUCTED USING A SHIELD

NOTES TO SPECIFIER:

These notes do not form part of the Specification.

General

124.1

This Section of the Model Clauses has been drafted to specify requirements for tunnels to be constructed using a shield with excavation using hand tools. Other methods of forming a tunnel such as timbered heading, thrust boring or pipe jacking are not covered although some of the Clauses may be applicable.

The requirements of this Section are considered suitable for tunnels up to 4 metres internal diameter and where ground conditions are reasonably consistent. For larger diameter tunnels, or for work in difficult ground conditions such as soft silts or running sands, the requirements may need to be enhanced. Conversely, where ground conditions are considered good, it may be appropriate to relax some of the requirements.

Temporary tunnels under the Permanent Way are normally associated with portal bridges constructed alongside the railway and slid into place on previously prepared foundations and slide paths. The use of temporary tunnels enables the foundations (either piles and pile caps or strip footings) and slide path to be constructed with minimum interference to the track above.

The tunnels are normally considered to be Temporary Works although the lower part of the tunnel will probably remain following installation of the bridge.

There are two ways of installing temporary tunnels of this nature:

- (i) mining through the embankment using a shield, with segmental concrete lining to the tunnel. In this method it is only the shield which moves under the railway,*
- (ii) by jacking through the embankment a tunnel made of rectangular or circular precast concrete units. In this method the entire tunnel moves under the railway.*

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For both methods a temporary speed restriction, and Track Monitoring Procedure to NR/CIV/LI/045 is required whilst there are construction works under the tracks. There is little to choose between the two methods with regard to disruption of the Railway. However, the jacking method can take up more room with its thrust pit and jacking equipment, and this may extend the slide path or delay the portal construction. It also tends to be more expensive. As a consequence the mining method tends to be more commonly used.

Preparation before tunnel construction

124.2

Prior to any tunnelling work it is imperative that a comprehensive ground investigation is carried out to ascertain the properties of the soils to be encountered. This 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.

If a non-cohesive soil, such as loose sand, gravel, or embankment fill, is present it will normally be necessary to carry out a grouting operation to strengthen the soil. This will be required to stabilise the face being mined and to minimise settlement of the track.

It is often possible to achieve the desired result using a cementitious grout, injected from alongside the railway in a fan arrangement.

However if very fine grained materials are present, chemical grouting may be necessary, which is likely to be an expensive operation.

Depending on the tunnel depth relative to the local ground levels, a drive pit will generally be required on one side of the railway and a reception pit where the tunnel emerges on the opposite side. These are frequently formed by sheet piling with suitable strutting and walings. Careful attention needs to be paid to the support of the entrance and exit walls as a large portion will need to be cut away to enable the tunnel to pass through.

Tunnel equipment

124.3

To keep costs to acceptable limits, the Contractor is likely to use standard tunnelling equipment. Segmental lining will usually be either cast iron or precast concrete. The tunnel lining should be able to withstand embankment loading and railway loads in accordance with GC/RT5112 and GC/RC5510, and NR/SP/CIV/007.

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