

An MND Statutory Board

Specific Conditions of Permit for Projects Involving Bored Tunnelling Works

10. Specific Conditions of Permit for Projects Involving Bored Tunnelling Works (for both geotechnical building works and non-geotechnical building works (based on the Control Framework for Bored Tunnelling Works in Circular dated 15 September 2017)

Supervision of Key Performance Indicators

- (a) The Supervising QP and Builder shall continuously monitor and review the key tunnelling operational parameters including face pressure and excavation volume so as to maintain a safe and stable tunnelling face at all times.

Tunnelling within control zone

- (b) When tunnelling within control zone, for high- and very high-risk categories, the Builder and Supervising QP shall adopt appropriate geophysical survey to detect potential void at the cutterhead location for each tunnel ring. The Supervising QP shall submit to the Commissioner of Building Control on a daily basis his certification of structural integrity of existing building(s) within the control zone and assessment of any safety concern arising in the course of the tunnelling works.

Over-excavation control measures

- (c) The Supervision QP and Builder shall comply with Annex 4 of the Control Framework for Bored Tunnelling Works in Circular dated 15 September 2017.

Flushing of TBM

- (d) Flushing of TBM refers to a slurry operational technique in slurry TBMs whereby circulation of slurry into the excavation chamber is done with no TBM advancement or very slow advance of TBM as compared to normal TBM operation. One such example whereby flushing is carried out is to remove obstructions or blockages at excavation chamber. For tunnelling in medium-risk, high-risk and very high-risk categories, no flushing of TBM is allowed. If flushing is detected, Builder is required to carry out probe and grout from ground surface to detect and grout up identified void. For tunnelling in low-risk category, the Builder shall obtain written consent from the Supervising QP before flushing of TBM can be carried out.

Cutter Head Intervention

- (e) The Supervising QP shall complete and comply with the requirements stated in tunnel control measures (TUNNEL_Annex C-1 and TUNNEL_Annex C-2) at all planned and unplanned Cutter Head Intervention (CHI) locations.
- (f) For all CHIs, the Design QP is to carry out stability analysis of the tunnel face considering the stand-up time of the soil or rock to ensure that the tunnel face remains stable during CHI and specify the allowable stand-up time for each CHI in the approved plan. During CHIs, the Design QP shall review daily the face inspection form made by the Supervision QP or RE(tunnel) to verify the ground condition at the tunnel face to be in accordance with the design.
In accordance with regulation 10A(3)(a)(iv) of the Building Control Regulations 2003, the Builder shall carry out CHIs under compressed air pressure of not less than 1.5 bars or a higher pressure as specified by Design QP for all planned and unplanned CHIs except for CHI under low overburden pressure with depth less than 15 m or when assessed and approved by Supervision QP under any one of the 3 conditions:
 - i) in full face rock with face pressure stepped down gradually;
 - ii) within ground improvement block with face pressure stepped down gradually; or

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- iii) within defined conditions listed below for CHI in OA(A) or OA(B) with face pressure stepped down gradually
 - a. CHI is located outside zone of close proximity to buildings, one tunnel diameter (1D) outside live traffic/ pedestrian zone;
 - b. At least 1D of OA(A) or OA(B) soil cover above tunnel crown and thickness of soil cover to be verified by borehole;
 - c. Adequate face stability supported by stand-up time calculation using permeability values obtained from field permeability test; and
 - d. Total duration of CHI under compressed air pressure of less than 1.5 bars shall not be more than 72 hours. Thereafter, compressed air pressure of 1.5 bars or higher to be adopted.

Supervising QP and Builder shall notify the Commissioner of Building Control in writing immediately of any unsuccessful or abandoned CHI or any cutterhead intervention carried out below 1.5 bars except for tunnelling under low overburden pressure with depth less than 15 m or if any of the conditions under items i) to iii) specified above are present.

Tunnelling or CHI under low overburden pressure with depth less than 15 m shall be treated with special care. The Design QP is required to specify special countermeasures to mitigate the risk associated with low overburden pressure.

- (g) Where there is an unplanned stoppage for a CHI, the Supervising QP and Builder shall notify the Commissioner of Building Control in writing immediately. Further to this, the Supervising QP and Builder must comply with the requirements set out in paragraphs (e) and (f) above.

Emergency preparedness plan

- (h) For tunnelling carried out in close proximity to existing buildings, the Developer, Builder and Supervising QP must take all reasonable steps and exercise due diligence to put in place an emergency preparedness plan to decant occupants of existing buildings in close proximity to the Project site undermined by tunnelling works.

Incident reporting

- (i) The Supervising QP and Builder shall suspend TBM excavation and advancement and notify the Commissioner of Building Control in writing immediately when there is any excessive movement (i.e. immediate settlement exceeding 150 mm), sinkhole or blowout.