

Protection of Sewage and Drainage Tunnels

Sewage Tunnel Protection Areas

The Sewage Tunnels (Statutory Easements) Ordinance (ST(SE)O) provides inter alia for the creation of statutory easements and other rights over land in connection with sewage tunnels. Under section 4 of the ST(SE)O, the Secretary for the Environment may cause to be published in the Gazette plans showing the route of sewage tunnels and the land situated on the route over which easements and rights may be created. Such plans are deposited in the Land Registry and also available for inspection in the Drainage Services Department (DSD).

2. Proposals for building works on land situated on and in the vicinity of a route of such sewage tunnel are subject to section 17A of the Buildings Ordinance (BO). This empowers the Building Authority to refuse approval of, or impose conditions on, proposals found to be incompatible with sewage tunnel works gazetted under section 4 of the ST(SE)O.

3. Area Number 5 of the scheduled areas in Schedule 5 to the BO shows the sewage tunnel protection areas. Plans numbered KCE/S/G/765B, KCE/S/G/766B, KCE/S/G/767B, KCE/S/G/768B, KCE/S/G/769B, KCE/S/G/770B, KCE/S/G/771B and 90806/STPA/1000 to 1004, dated 16 May 2012, signed by the Secretary for Development are relevant. Such plans are deposited in the Land Registry and also available in BD's website (<http://www.bd.gov.hk/english/ScheduledAreas.html>).

4. All ground investigations in Area Number 5 of the scheduled areas are building works as defined under section 2 of the BO and are subject to the control under Part II of the Ordinance.

5. Sewage tunnels are constructed at great depths so as to minimise adverse effect on building development on the land above: a minimum cover of 30 m of bedrock will normally be allowed. In the interest of public safety, however, it is still necessary for relevant technical requirements to be met to avoid incompatibility between any building works (especially foundation works) and sewage tunnel works. For this purpose, the DSD has prepared the technical notes at Appendix.

6. Plans submitted to the BD for proposed building works within 100 meters from the centreline of the gazetted route of sewage tunnels or for ground investigation works within Area Number 5 of the scheduled areas will be circulated to the DSD and the Geotechnical Engineering Office (GEO) under the centralised processing system for building plans.

7. The ST(SE)O also contains provisions for compensation. Relevant enquiries are handled by the Director of Lands.

Protection of Other Drainage and Sewage Tunnels

8. There are other existing drainage and sewage tunnels of the DSD, namely Hong Kong West Drainage Tunnel, Kai Tak Transfer Scheme Drainage Tunnel, Lai Chi Kok Drainage Tunnel, Tsuen Wan Drainage Tunnel, North West New Territories Sewage Tunnel, Tolo Harbour Effluent Tunnel and Tseung Kwan O Sewage Tunnel, and their associated structures (the DSD Tunnels), which are also important facilities to maintain the stormwater drainage and wastewater services in Hong Kong.

9. The DSD Tunnels should be protected against damage from proposed building works (especially excavation and foundation works) in their vicinity. Authorized Persons, Registered Structural Engineers and Registered Geotechnical Engineers are required to observe the technical guidelines specified in DSD Practice Note No. 2/2017 which may be viewed and downloaded from DSD's website (http://www.dsd.gov.hk/EN/Files/Technical_Manual/dsd_TechCirculars_n_PracticeNotes/Practice_Notes_2-2017.pdf). This practice note also provides plans showing the indicative boundaries of the tunnel protection zones (TPZs) of the DSD Tunnels.

10. Plans submitted to the BD for proposed building works within boundaries of the TPZs will be circulated to the DSD and the GEO under the centralised processing system.

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**Technical Notes for Guidance in Assessing
the Effects of Civil Engineering Works/Building Developments
on Sewage Tunnels Works**

These technical notes apply to building works on lands situated on or adjacent to the alignment of sewage tunnels.

General

2. "Sewage tunnel" means an underground tunnel and associated underground structures for the transfer of sewage. A shaft connecting to a sewage tunnel is part of the sewage tunnel. For the application of these guidelines, the extent of sewage tunnels is defined by the route and minimum depth as shown on the gazetted sewage tunnel plan. The extent of a shaft is the external diameter in soil and the internal diameter plus 5 metres in rock. The Director of Drainage Services should be consulted if there is any query concerning the route and extent of sewage tunnels.

3. Shafts of sewage tunnels are located within the Drainage Services Department sites. Tunnels constructed or to be constructed between these shafts are generally deep with at least 30 metres of rock cover except for both ends of the tunnel section between Ap Lei Chau Preliminary Treatment Works and Aberdeen Preliminary Treatment Works which are under soil or shallow rock cover. Most of the construction works on ground surface will not have any significant effect on sewage tunnels and no restrictions on these works will be necessary.

4. The main risks of damage to sewage tunnels arise from either site formation or foundation works or tunnel/cavern works constructed immediately adjacent to shaft sites or from boreholes, wells, shafts, tunnels, grouting or other deep works constructed close to sewage tunnels. There is also a risk from ground investigation works for a project requiring deep boreholes to be drilled into the rock.

5. For the purposes of these notes the term "rock" is defined as Grades I, II and III according to Table 4 - Classification of Rock Material Decomposition Grades - in Geoguide 3 (Guide to rock and soil descriptions) published by the Geotechnical Engineering Office. The term "soil" is defined as Grades IV, V and VI, also defined in Geoguide 3, reclamation materials, and marine and alluvial deposits.

6. Leakage of sewage and the migration of gas from sewage tunnels poses health and safety risks. These risks must be evaluated when considering any proposed works near sewage tunnels, especially in respect of any dewatering works where there is the potential for the migration of hazardous substances in the groundwater.

7. All proposals for new building works within 100 metres from the centreline of the gazetted route of sewage tunnels shall be subject to special scrutiny by Government. Each proposal shall be treated on its individual technical merits and subject to the requirements of the following technical guidelines.

Site Formation or Foundation Works or Tunnel/Cavern Works

8. Where site formation, foundation works or excavation for basements, shafts, tunnels, cavern and such like are proposed above or adjacent to sewage tunnels, the effects of such works shall be within the following limits :

- (a) The vertical or horizontal pressure on any sewage tunnel structure in soil due to the above operations (including filling and dewatering) and due to change of loads transmitted from foundations (including loads arising during construction) shall not be varied by more than 20kPa or by 5% of the total overburden pressure for structures at depths greater than 20m. For sewage tunnel structures in rock, where it is not possible to assess the change in ground pressure due to the above operations, the hydrostatic pressure shall not be increased or decreased by more than 50kPa;
- (b) Differential movement resulting from the works shall not produce a calculated final diametric distortion exceeding 0.1% of the shaft or sewage tunnel internal diameter and the calculated total movement in any plane shall not exceed 20mm;
- (c) The peak particle velocities at any sewage tunnel structures resulting from blasting (where permitted) or from driving or withdrawing of piles or any operation which can induce prolonged vibration shall not exceed 25mm/sec for blasting and 15mm/sec for other operations;
- (d) No holes or excavations shall be sunk or excavated within a distance of 3m from any point of any sewage tunnel structure without prior approval by the Building Authority for the works and the method to be employed;
- (e) No pile, foundation, well, soil nail, horizontal drain, or rock bolt/dowel shall be driven or constructed within a distance of 3m in any plane of any point of any sewage tunnel structure; and
- (f) Any part of a ground anchor shall be more than 3m from any part of any sewage tunnel structure.

9. Proposals for monitoring the effects on sewage tunnels shall be submitted to the Building Authority before works commence and subsequent data together with interpretation shall be submitted to the Building Authority for the duration of the works. Where the proposed works or any part of the proposed works shall come within a distance of **10m** from any point of any sewage tunnel structure, the submission shall also include detailed method statements on the method to be employed for constructing the proposed works and for monitoring the alignment/depth of the proposed works.

Ground Investigation Works

10. Where ground investigations are proposed within Area No. 5 of the scheduled areas in Schedule 5, it is necessary for the following to be submitted to the Building Authority :

- (a) details of the exploration and locations of the proposed exploration holes, field testing or instrumentations relative to sewage tunnels;
- (b) proposed depth of holes, field testing or instrumentation;
- (c) a method statement for sinking holes, conducting field testing or installing instrumentation; and
- (d) a method statement for monitoring and checking the alignment and depth of holes when the minimum distance from a hole to any point of a sewage tunnel is less than 10m in any plan.

11. Any proposal will also be judged against the following technical guidelines :

- (a) The vertical and horizontal pressure on any sewage tunnel structure in soil due to site investigation works including field testing such as plate load test, pressuremeter test, packer test or any operation should not be increased or decreased by more than 20kPa or by 5% of the total overburden pressure for structures at depths greater than 20m. For structures in rock, where it is not possible to assess the change in ground pressure due to the above operations, the hydrostatic pressure shall not be increased or decreased by 50kPa;
- (b) The peak particle velocities at any sewage tunnel structure resulting from :
 - (i) artificial shocks generated either by the detonation of explosives or a mechanical blow at ground surface or at depth within a hole should not exceed 25mm/sec; and
 - (ii) percussion drilling, hammer drilling or any operation which can induce prolonged vibration, should not exceed 15mm/sec; and
- (c) No holes should be sunk or excavated within a distance of 3m from any point of any sewage tunnel.

Dewatering Works and Wells

12. Assessment shall be made regarding the leakage of sewage and the migration of gas in respect of all dewatering and well proposals within 100 metres of sewage tunnels. Monitoring proposals shall be submitted to the Building Authority with an agreed programme for the duration of the dewatering or extraction.