While noise, dust and other inconveniences are inevitable during construction, LTA will work closely with the contractor to keep them to a minimum.

The underground retaining wall is installed before excavation commences. The retaining wall can be a concrete diaphragm wall, a concrete bored pile wall or a steel sheet pile wall; depending on the site condition, soil type and the excavation depth.

01. Installation of Retaining Wall

02. Excavation & Installation of Steel Strut

03. Excavation & Installation of Steel Strut

04. Construction of Underground Structure

05. Construction of Underground Structure

06. Backfilling & Reinstatement

The underground retaining wall is installed before excavation commences. The retaining wall can be a concrete diaphragm wall, a concrete bored pile wall or a steel sheet pile wall; depending on the site condition, soil type and the excavation depth.
CONSTRUCTION OF CONTIGUOUS BORED PILE WALL

This pictorial guide illustrates the construction sequence of a Contiguous Bored Pile (CBP) wall. This type of retaining wall was used for the construction of several deep excavation works on road and rail projects.

**Safety Measures**

The Land Transport Authority (LTA) accords top priority to safety. Professional Engineers (PE) and Qualified Persons (QP) are engaged to carry out stringent checks on the temporary structures to ensure that they are installed correctly and safely before the excavation can proceed from one level to the next level. In addition, our engineers monitor the various stress and strain gauges installed on the temporary structures on a regular basis so as to be sure that the stresses fall within acceptable limits set by the design engineers. Likewise, instruments are extensively installed in the vicinity of the construction site to monitor vibrations, ground movements etc. This is so that the engineers are always in the know of the impact of the construction on the surrounding buildings and structures, thereby ensuring that they are safe.

**Inconveniences**

Noise and vibrations are generated when the casing is driven in and extracted from the ground by the vibro-hammer. Noise is also generated during the augering process. We will therefore try our best to schedule the work such that it creates minimal disruption to the public.

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### Step 01. Position of Bored Pile

Wooden pegs are used to mark out the center position of each bored pile. The gap between two bored piles is typically between 100 to 200 millimeters.

### Step 02. Installation of Casing

The vibro-hammer drives a casing into the ground, leaving about 1 metre length of the casing protruding from the ground.

### Step 03. Augering of Borehole

The auger, a drilling tool, cuts and removes the soil within the casing to form a borehole. The soil surrounding the borehole is supported by the casing. If the casing is not long enough to reach the required depth in the ground, bentonite slurry is used to support the soil below the casing.

### Step 04. Installation of Steel Cage

The crane lifts up the steel cage and places it within the borehole.

### Step 05. Concreting of Borehole

Concrete is poured into the borehole to form the bored pile.

### Step 06. Extraction of Casing

The vibro-hammer extracts the casing from the ground.

### Step 07. Repetition of Process

Steps 2 - 6 are repeated till the entire length of the contiguous bored pile wall construction is completed.