

Piling and Shoring – GN117SS

Supplementary Specification

April 2017

This Supplementary Specification describes the maximum allowable vibration level requirements for construction work near bridges, trunk and local sewers, and transmission and distribution watermains, heritage or structurally sensitive buildings, hereby defined as structures.

Piles shall be installed at a minimum horizontal distance of one metre clear of existing structures. The Contractor is required to demonstrate that the method of installation will not pose a concern or risk of damage to the existing structures.

For piling operations near structures that are in soil other than loose sand and silt, or sensitive clays that may have the tendency to experience liquefaction or reduced bearing capacity or shear strengths when disturbed, the maximum allowable vibration levels (ambient vibrations plus vibrations caused by piling) at the structure, expressed as a peak particle velocity (PPV) shall be:

If structure type is . . .	Then maximum allowable vibration levels is . . .
Old¹ sewer / watermain	10 mm /s
Modern sewer / watermain	25 mm /s
Old¹ bridge—old construction methods or materials	10 mm /s
Modern bridge—steel or reinforced concrete	25 mm /s
Heritage building or structurally sensitive buildings	10 mm /s

¹ Old, as defined here, is related to both the age and condition of the structures. Old pipes and bridges are the structures that were constructed with old methods and materials, such as lined tunnel, brick, and clay, cast iron for pipes; and brick and wood for bridges. The old structures also refer to the structures that have high failure rates due to accelerated ageing process.

All piling activities shall cease when the ambient vibrations at the structure are above the maximum allowable vibration levels. The method of construction shall be revised accordingly such that the vibration levels do not exceed the maximum allowable limits.

For soils that are prone to settlement, the Contractor shall evaluate the geotechnical conditions of the site, analyse the effect of vibrations on the soil surrounding the structure, and determine

the soil-specific maximum allowable vibration levels at no extra cost to the City. The Contractor shall summarize their findings in a report and submit it to the Contract Administrator for review and approval before the Contractor proceeds further in construction. The soil-specific maximum allowable vibration levels determined by the Contractor shall prevent settlement around the driven pile or below the structure.

The Contractor shall monitor vibrations at the structure using a pre-set vibrograph alarm supplied by the proponent during piling. A compliance report, with the vibration data attached to it, shall be submitted every 7 Days to the Inspector. If the maximum allowable vibration levels are exceeded during construction, the piling operations shall be suspended and alternative construction procedures shall be engaged at no extra cost to the City.

The Contractor shall hire a noise and vibration consultant to conduct pre-construction and post construction condition surveys of the nearby structures when the Contract Administrator deems it necessary. The Contractor shall provide reports to the Contract Administrator within 15 Working Days of completion of surveys.

Pre-construction condition surveys shall consist of the following activities:

1. record the results of the surveys in written format with supporting documentation;
2. record the time and date of survey, location of the structure and the name and title of the surveyor;
3. provide high-quality coloured photographs for proof of evidence purposes in the survey report;
4. supplement high quality coloured photographs with video records of the condition of the structure;
5. identify, describe and take coloured photographs of all differential settlements, visible cracks and other apparent visible structural or cosmetic damages and defects and evaluate the potential hazards of the damages and defects; and
6. avoid subjective descriptions as much as possible and record damages, cracks, settlements and defects quantitatively by measuring actual dimensions.

Depending on the age, material type and state of repair of the existing buried municipal infrastructure, CCTV inspection according to TS 409 may be required by the Contractor at the discretion of the Contract Administrator for watermains, sewers and related appurtenances.

Pre-construction conditions survey shall always be followed by the post construction condition survey. In the post-construction condition surveys, the data and information collected from the pre-construction condition survey shall be used for comparison with the post construction

conditions survey data, and all new damages, cracks and defects caused by the construction activity shall be identified, recorded and photographed.

The use of tie-back anchors for shoring works shall be designed to provide a minimum clearance of one metre at the point of crossing of the trunk watermain or sewer in stable ground conditions, and under no circumstance, shall the end of the tie-back terminate closer than one metre from the outside face of the trunk watermain/sewer or encasement. The one metre clearance shall account for the extent of the primary grout bulb at the bond (fixed) length of the tie-back. When required, soils information and calculations shall be submitted to confirm the stability of the installation.