**USP00420 (07-05-2022)**

### Section 00420 – Vibration Monitoring

Section 00420 is not a Standard Construction Specification. It is included in this Project by unique special provision.

**Description**

**00420.00 Scope** - This work consists of monitoring vibration created by heavy demolition or where shoring installation requires driving slide rail posts or rock chipping or pipe bursting construction methods or as recommended by the Owner, where vibrations travelling through the ground can disturb or undermine surrounding ground and structures.

**00420.01 Definitions**

**Geophysical Consultant** – A specialized consultant with the education and training to design and implement a vibration monitoring program.

**Peak Particle Velocity (PPV)** – A metric used to compare vibration levels in three (3) orthogonal directions, normally reported in units of inches per second (inches/sec) in the U.S. There is a large database of historical measurements that correlate PPV to structural damage.

**Portable Seismographs** – Electronic equipment capable of receiving, recording, and transmitting noise and vibration data. Equipment must be capable of the following:

* Sample at rates from 1,024 to 4,096 S/s per channel.
* Include cellular communications package with “Auto Call Home” feature that instantly communicate to responsible parties if a threshold level of vibration is achieved or exceeded.

**Triaxial Geophone** – A transducer that connects to the portable seismograph and converts ground movements (velocities) in three (3) orthogonal directions to an electronic signal.

**00420.02 Submittals** - Prior to beginning Work, submit for review a Monitoring Plan in accordance with Section 00150.35 that includes, but is not limited to, the following:

1. Proposed methods and equipment meeting the requirements of 00420.41.

***(Designer Note: Include the following applicable bullets when the monitoring will be part of the construction contract. Do not include if the monitoring will be performed by the BES MTL or BES MTL’s subcontractors.)***

1. The Consultant must have a minimum of 3 years of experience monitoring noise and vibration from civil works projects that create vibration by pile driving or blasting. The Consultant shall be retained for the duration of the Contract to analyze data from the submitted plan.
2. Identification of proposed test section location where Contractor plans to begin testing and monitoring.
3. Monitoring equipment and vibration data reporting format.

4) Qualifications of Geophysical Consultant responsible for installing, observing, and recording the vibration and or settlement monitoring equipment.

5) Site-specific recommendations from the project Geotechnical Engineer for reasonable threshold (action) and maximum permissible PPV, not to exceed the values listed in Section 00420.41.

1. Identification of properties where monitoring work may be required on private property.

**Materials**

**00420.10 Materials:**

**Portable Seismographs and Triaxial Geophones** – Consistent with the Contractor’s proposed test section plan, supply portable seismographs, triaxial geophones, and tamper-resistant housings from known vendors such as Instantel, White, or an approved equal.

**Construction**

***(Designer Note: Add the following section .40 only if the monitoring will be performed by MTL or MTL’s subcontractors)***

**00420.40 Monitoring Work** - The Owner may conduct vibration and/or settlement monitoring during construction at the following locations:

* Street Name (Sheet CXX)

Permits of Entry’s (POE), written private property permissions, or Bureau Easement Access Notice, must be in place prior to beginning Work in private property, if applicable.

Provide notice to Owner at least two weeks, but no more than four weeks, prior to start of mobilization of work at the locations noted above to allow for setup of vibration or settlement monitoring equipment and documentation of baseline data by others.

***(Designer Note: Add the following .40 and .41 ONLY if the monitoring will be part of the construction contract. Do not include if the monitoring will be performed by MTL or MTL’s subcontractors.*  Where residential foundation elevations differ more than four (4) feet on opposite sides of the street, include all the structures on both sides of the street nearest to the test section.*)***

**00420.40 Monitoring Work** - During vibration monitoring, the Geophysical Consultant will provide the following:

1. Expert vibration monitoring and analysis.
2. In cooperation with the BES Public Involvement Team, and project Geotechnical Engineer identification of structures, or parts of structures, that could be most impacted by the Contractor’s test section.
3. Immediate notification to designated personnel and reports that plot any exceedance of the limits established above. The data should be presentable in both time and frequency domains, as appropriate.
4. Two (2) to four (4) weeks prior to beginning Work coordinate with Owner’s Representative to establish a preconstruction baseline monitoring.
5. The Contractor will continuously perform monitoring.

If work in the test section exceeds established thresholds for settlement and vibration as defined above and according to section 00420.41, or if work in the test section results in damage claims, the Owner’s Representative shall direct the Contractor to perform additional monitoring work. Contact and coordinate with the Owner’s Representative if the recommended threshold PPVs are exceeded, or additional test sections are required.

Conduct vibration monitoring during construction at the following locations:

* Street Name (Sheet CXX)

**00420.41 Vibration Thresholds** – Limit vibration to nearby structures and utilities per table below. Limit noise according to section 00290.32. Stop work if measured PPVs exceed the values below. Work shall not continue until directed by Owner’s Representative. At the discretion of the Owner’s Representative, submit for approval a revised Vibration Mitigation Plan.

|  |  |
| --- | --- |
| **Structure Type** | **Absolute Maximum Permissible PPV(at location nearest to work)** |
| Utility | One (1) inch/second |
| Structures | 0.5 inch/second |

***(Designer Note: Add the following .80 and .90 only if the monitoring will be part of the construction contract. Do not include if the monitoring will be performed by MTL or MTL’s subcontractors)***

**Measurement**

**00420.80 Measurement** The quantities of Vibration Monitoring work performed under this section will be measured according to Lump Sum.

**Payment**

**00420.90 Payment** - The accepted quantities for work performed will be paid for at the Contract price, per unit of measurement, for the following items:

**Pay Item Unit of Measurement**

1. Vibration Monitoring Lump Sum

For Item (a) includes all materials, equipment, labor, and incidentals necessary to complete the monitoring as specified in the Contract Documents.

No separate or additional payment will be made for project Geotechnical Engineer and / or Geophysical Consultant.

No separate or additional payment will be made for stoppage of work or revised mitigation plans per section 00420.41.