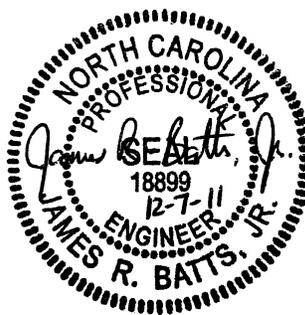


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(SPECIAL)

VIBRATION MONITORING

1.0 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 of the Standard Specifications for Roads and Structures, apply to this provision.

1.2 SUMMARY

- A. Vibration monitoring includes monitoring of all vibration producing activities during the duration of this project. Conduct monitoring before, during, and after any anticipated vibration producing activities. These activities may include but are not limited to: blasting, site excavation, demolition, installation of drilled piers, soil compaction, paving, and construction traffic. Provide and install the necessary equipment specified in this provision to monitor any potential vibrations caused by construction operations. Plan construction operations to remain below the vibration thresholds set by this provision.

1.3 QUALITY ASSURANCE

- A. Employ/retain the services of a qualified vibration specialist with a minimum of 3 years of verifiable experience in the installation of vibration monitoring equipment and performing the required vibration monitoring operations. Contact the Geotechnical Engineering Unit Contract Administrator for a list of consultants approved to perform the work in this provision.

1.4 SUBMITTALS

- A. Submit the following at least 20 days before beginning any construction work:
1. Qualification of vibration monitoring specialist with references.
 2. Technical specifications of vibration monitoring equipment that will be used, with model numbers, serial numbers, and dates of calibration.
 3. Construction schedule with vibration inducing activities clearly marked.
 4. Pre-construction condition assessment

Provide pre-construction condition assessments that include at least the following:

- (a) Summary with pre-construction survey date and time, comments about existing structure condition and name of individual conducting survey;
- (b) Sketches of interior and exterior walls and foundations with existing cracks and written descriptions of cracks including length, width,

type and angle; and

(c) 5-megapixel digital color pictures or video on CD or DVD documenting existing cracks and structure condition.

B. During construction, submit the following:

1. Provide data from vibration monitor to the Engineer at the end of the first day that vibration-inducing activities are conducted.
2. Provide data from vibration monitor to the Engineer at the end of each work week when vibration-inducing activities are conducted.

C. After construction, submit final reports:

1. Provide post-construction condition assessment of adjacent structures with both photographic/video and written documentation and noting any changes from the pre-construction survey and signed by the consultant. Submit to the Engineer three (3) copies of the final report which should include all vibration monitoring records, pre-construction, construction and post construction condition assessments of adjacent structures.

1.5 CONSTRUCTION REQUIREMENTS

- A. Schedule and coordinate construction activities to avoid damage to the existing steam tunnel or other structures within the influence area (100 linear feet to either side of centerline of road) of any construction-induced vibrations including the use of site access routes.
- B. Contractor is responsible for all construction related damage caused by, but not limited to: installation of drilled piers, construction traffic, excavation, and soil compaction. Damage caused by the Contractor's activities must be repaired at no cost to the Department and to the satisfaction of the Engineer.
- C. Vibration monitoring is required during any vibration inducing activity associated with this project.
- D. Note vibration-inducing activities on the construction schedule submitted to the Engineer.

2.0 - PRODUCTS

2.1 VIBRATION MONITORING EQUIPMENT REQUIREMENTS

- A. The equipment used by the vibration specialist shall meet or exceed the following specifications:
1. Capable of monitoring and recording activity in the X, Y, and Z axis simultaneously.
 2. Data output: Peak Particle Velocity verses Frequency for each axis.
 3. Peak particle velocity range: 0 – 10 inches per second
 4. Peak particle velocity resolution: 0.005 inches per second

5. Maximum trigger setting: 0.2 inches per second peak particle velocity
6. Frequency Range 2 to 250 Hz
7. The monitoring equipment must be able to operate in the steam tunnel environment (high temperature, high humidity).

3.0 - EXECUTION

3.1 VIBRATION MONITORING

A. Location:

1. Place the vibration monitoring equipment at accepted locations including in the steam tunnel at the centerline of the bridge.

B. Maximum Allowable Peak Particle Velocity:

1. The maximum allowable peak particle velocity shall be limited based on frequency as shown in the attached graph (Figure 1).

C. Vibration Data Reporting:

1. Submit vibration monitoring to the Engineer per 1.4B.
2. Submit any results that exceed the project threshold to the Engineer the same day as the occurrence.
3. If the project threshold is exceeded, construction activity producing vibration must halt. Provide Engineer with written plan showing measures to reduce vibration. Activity may resume after Engineer's review and approval. Subsequent results to be reported daily.

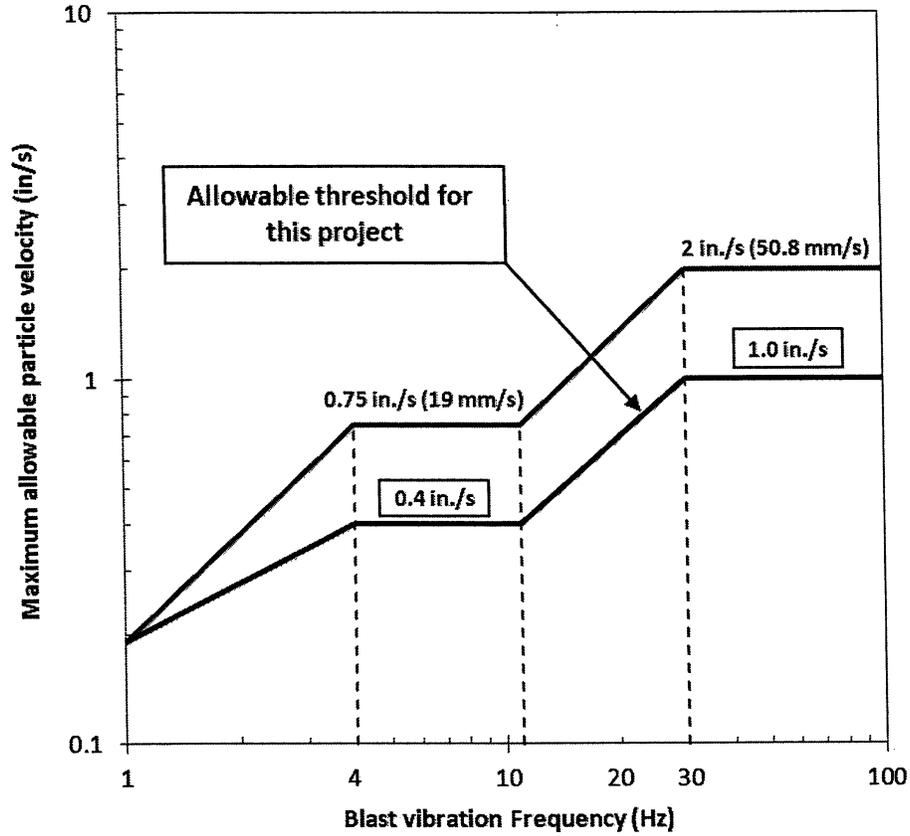


Figure 1 Maximum Allowable Peak Particle Velocity

4.0 – MEASUREMENT AND PAYMENT

Payment will be made by the Lump Sum bid price for “Vibration Monitoring.” Such payment will be full compensation for all work described in this provision including, but not limited to, control of vibration, inspection of the structures, vibration monitoring, and submission of reports.