**Instructions for Using this Special Provision**

1. This Special Provision is applicable to and intended to be used with SCDOT GDM v2.0. Further, the use of this Special Provision presupposes that Level 2 has been agreed to by the various Project Team members as required in the GDM v2.0.
2. Modify this Special Provision to meet the requirements of the project for which this Special Provision is being used.
3. Fill in all blanks with correct project information.
4. Use Section C, Paragraph 1 only if a Pre-Construction Condition Assessment will be performed as directed by the RCE. Use Section C, Paragraph 2 only if Paragraph 1 has been used and the RCE has not decided whether a Post-Construction Condition Assessment will be performed or not. If no Condition Assessment is performed remove this Section.
5. Only use Section D if Crack Monitors will be installed. If no Crack Monitors are being installed remove this Section.
6. In Section E, Subsection 1 GEOR to indicate whether impact or vibratory hammer is anticipated being used.
7. Submit a draft copy of this Special Provision with the Final Bridge Geotechnical Report.

# SECTION 107: MONITORING OF CONSTR.-RELATED EARTHBORNE VIBRATIONS:

* 1. **DESCRIPTION**

1. This specification is provided to the Contractor for use in selecting equipment and processes to accomplish the various work items within the specified vibration limits and for information on vibration monitoring to be provided by the Department. The Department will choose a firm from the On-Call Structure and Foundation and Testing and Engineering contract to perform the vibration monitoring services for the project. The Department and their selected Vibration Monitoring Consultant (Consultant) will determine the specific vibration monitoring requirements for the project. The information, herein, is intended to provide the Contractor general information relative to the vibration monitoring requirements for this project.
2. The project construction will generate vibrations that will travel through the earth, which will subsequently be received or “sensed” by nearby structures and inhabitants. Specific procedures that will generate earthborne vibrations during bridge and roadway construction include, but are not limited to, general foundation construction, shoring walls, and vibratory earth compaction. To mitigate the risk of vibration-related damage to nearby structures, this Special Provision outlines the instrumentation program consisting of structure condition assessment(s) and vibration monitoring during construction.
3. This specification is based, in part, on AASHTO R 8-96 (2004) *Standard Recommended Practice for Evaluation of Transportation-Related Earthborne Vibrations*. As discussed in AASHTO R 8-96 (2004), humans respond to a much broader range of vibration frequencies and intensities than structures. Intrusive vibration levels can annoy humans at much lower intensities than levels considered critical for structures. Thus, occupants of adjacent properties may perceive that the construction-induced vibrations may present risk to their structures. The recommended safe vibration limits are intended to mitigate the risk of structure damage, and more specifically, reduce the development of “threshold cracks” or cosmetic cracking. Such cracks may appear at lower vibration levels than the level at which architectural or minor structural damage would be expected to occur.
   1. **DEFINITIONS**
      1. Level 1 Vibration Monitoring:

SCDOT has elected to not monitor the site; therefore, no Earth-borne Vibration Monitoring is required. SCDOT assumes all risk for any potential damage.

* + 1. Level 2 Vibration Monitoring:

Earth-borne Vibration Monitoring is required. Earth-borne Vibration Monitoring will be performed by the Department. The RCE or his/her designated representative will coordinate with the Contractor for site access, the schedule of vibration inducing activities and the placement of the required equipment. The Contractor is required to provide at least 48 hours’ notice prior to commencing any vibration inducing activity to the RCE. Any damage caused by vibrations in excess of permitted levels will be the responsibility of the Contractor.

1. **PRE-CONSTRUCTION & POST CONSTRUCTION CONDITION ASSESSMENT**
2. A pre-construction condition assessment has been performed, the assessment included structures within \_\_\_\_\_ feet of any vibration inducing construction activity. The assessment included video and/or photographic documentation of structure exteriors and interiors, and installation of crack monitors on cracks that might propagate due to construction vibrations.
3. Once the Department considers the project to be significantly complete, the Department will determine if a post-construction condition assessment is necessary to verify that no additional damage has been caused by the construction. The post-construction condition assessment will consist of the same activities as the pre-construction condition assessment.
4. **CRACK MONITORING DURING CONSTRUCTION**
5. During construction, the Consultant shall perform periodic readings, at a frequency and duration determined by the Department, of the crack monitors that were installed during the pre-construction condition assessment. If the crack readings suggest that vibrations from the project site are contributing to crack width, then the Consultant shall immediately notify the RCE and review those activities that are generating the earthborne vibrations. The RCE may stop construction and require the Contractor to submit a detailed plan for repair, perform the repair at no cost to the Department and develop and submit for review a revised construction plan to address the vibration problems and minimize further damage and complaints.
6. **VIBRATION MONITORING DURING CONSTRUCTION**
7. General – Structures at the site are within approximately \_\_\_\_\_ feet of potential \_\_\_\_\_\_\_\_\_\_ (place type of equipment here).
8. Procedure – Vibration monitoring shall be performed at no less than \_\_\_\_\_\_ locations at varying distances from the vibration generating activity within the project limits. The locations will be selected by the Consultant, with input from the Department, based on the location of the construction activities and their relative position to nearby structures. The Contractor shall provide at least two (2) weeks notice to the Department prior to requesting vibration monitoring services. Prior to construction, the Consultant shall submit a plan of the monitoring locations to the Department for acceptance. The locations of the vibration monitors may be adjusted during construction, as needed, to avoid conflict with other construction activities. Prior to foundation or embankment construction, the vibration monitors shall be established at the site so that background vibrations may be determined. The sensitivity range of the seismograph shall be selected so that the recording is initiated below the maximum allowable particle velocity and extends above the highest expected intensity. If a seismograph measures a particle velocity greater than the allowable criteria, the Consultant shall be capable of determining the specific source of the vibration activity.
9. Project Vibration Criteria – The maximum allowable Peak Particle Velocity (PPV) along the site, is \_\_\_\_\_\_ in/sec. These threshold values shall be applied at the receptor location and not adjacent to the vibration generating activity. If the data from the monitors indicate that vibrations are exceeding the threshold values, then the Consultant performing the monitoring services will inform the RCE and the RCE will immediately notify the Contractor to halt construction activities. The RCE may not allow construction to continue until the Contractor has developed a revised construction plan to lower the vibration producing activity to below the threshold PPV. No time or money will be provided to the Contractor for any and all losses incurred by the Contractor from the RCE halting construction due to exceeding the threshold PPV. In addition, no time or money will be provided for the Contractor altering their construction techniques to reduce vibrations below the allowable thresholds.
10. No Method of Measurement or Basis of Payment is required for this Special Provision.