



**SPECIAL PROVISIONS
FOR
VIBRATION MONITORING TO PROTECT HISTORIC STRUCTURES**

**Des Moines County
STBG-SWAP-0977(671)--SG-29**

**Effective Date
August 19, 2025**

THE STANDARD SPECIFICATIONS, SERIES 2023, ARE AMENDED BY THE FOLLOWING MODIFICATIONS AND ADDITIONS. THESE ARE SPECIAL PROVISIONS AND THEY SHALL PREVAIL OVER THOSE PUBLISHED IN THE STANDARD SPECIFICATIONS.

235004a.01 DESCRIPTION.

A. This specification identifies the Contractor's responsibilities for protecting the properties listed below. Contractor shall develop a work plan which minimizes the potential for possible vibration damage due to construction and demolition activities near the identified structures. Contractor will also be asked to monitor vibrations and crack behavior at the identified structures to protect them from any vibration induced damage.

B. The following properties shall be protected per the requirements in this specification.

| Address | Resource Name | Property Owner (Subject to Change) | National Register Status (SHPO #) |
|--|--|---|--|
| Varies | Downtown Commercial District | Varies | Eligible (29-0003685) |
| 300-304 Washington St | Elks Building | Varies | (29-03671) |
| 322 N. 4 th St | Langerbeck Building | David & Dawn Hazel | (29-000146) |
| 106-110 Washington St | Drake Hardware Company | Jennison Industries Inc | (29-01657) |
| 313 Washington St | Unterkircher House | BurlingtonTrade Winds LLC | (29-01661) |
| Varies | Heritage Hill Historic District | Varies | Eligible (29-0000005) |
| Washington St & Snake Alley | Snake Alley Historic District | Varies | Eligible (29-000002) |
| 321 N 5 th St | First Presbyterian Church | First Presbyterian Church | (29-00209) |
| 600 Washington St | First Baptist Church | Steve R. Browner | (29-01666) |
| 401 N 5 th St | Masonic Temple | Masonic Temple Assn | (29-00210) |
| 516 Washington St | Fordney House | PS Irrevocable Trust | (29-01664) |
| 600 Washington St | Pappas House | Steve R. Browner | (29-01666) |

| Address | Resource Name | Property Owner (Subject to Change) | National Register Status (SHPO #) |
|---|---------------------------|---------------------------------------|--------------------------------------|
| Varies 8th Street Intersection / West of Snake Alley | Limestone Retaining Walls | Varies | N/A |

235004a.02 PRECONSTRUCTION SURVEY.

- A. No information is available concerning condition of these properties.
- B. Perform a pre-construction condition survey at the above listed addresses (see table), and provide a copy of survey report(s) to the Engineer no later than 30 calendar days prior to starting work. Contractor shall have a Professional Engineer licensed in the State of Iowa and experienced in evaluating structural vulnerabilities and vibration monitoring perform the survey.
- C. Firms listed below have completed this type of vibration monitoring previously:
 - Exponent, Inc., 185 Hansen Ct., Suite 100, Wood Dale, IL 60191
 - Klienfelder East, Inc., 3730 South 149th Street, Suite 107, Omaha, NE 68144
 - Wiss, Janney, Elstner Associates, Inc., 330 Pfingsten Road, Northbrook, IL 60062
 - Terracon Consultants, Inc., 600 SW 7th Street, Suite M, Des Moines, IA 50309
 - Braun Intertec Corp., 5915 4th Street SW, Suite 100, Cedar Rapids, IA 52404
- D. Document all aspects of the structural condition through observations, actual measurements, plan sketches, photographs, and other data the preparer deems appropriate. Submit survey report to the Engineer electronically.
- E. Perform a pre-construction condition survey including photos and plan sketches indicating existing vulnerabilities, an evaluation of risk from construction vibration, and recommendation of maximum safe peak particle velocity (PPV) threshold. Determine construction methods required to protect properties listed above based on the pre-construction survey and the safe vibration threshold.
- F. Contractor shall arrange with property owners the rights-of-entry to their property in order to engage in condition surveys, vibration monitoring, and crack monitoring.

235004a.03 MONITORING PLAN.

- A. Provide Engineer a monitoring plan no later than 30 calendar days prior to commencing work. The plan will be reviewed by the Engineer and comments will be returned within 20 calendar days. Contractor will then have 10 calendar days to revise the work plan and resubmit a final plan to the Engineer prior to commencing work.
- B. Monitoring plan shall describe the following:
 - Construction methods and equipment chosen to achieve low project vibration levels.
 - Alternative construction methods and equipment that will be used if PPV threshold is reached or exceeded.
 - Detailed description of vibration and structural integrity monitoring systems and, if necessary, catalog cuts of monitoring equipment that will be used; how monitoring equipment will be calibrated and re-calibrated, if necessary, during life of the project; description and schematics, if necessary, of how independent components will function as a system.
 - Identification of the individual along with their contact information, designated to oversee vibration and crack monitoring system(s); and daily recording activities required in this specification. A brief description of qualifications or resume of the individual is also required.
 - How monitoring equipment will be deployed to continuously record vibration events, including crack monitoring during construction activity. Depending on monitoring equipment deployed

and method chosen for networking, it is possible there will need to be both electrical and telecommunications connections available at multiple remote locations. Monitoring plan shall address how utility service will be provided to monitoring equipment, protection of monitoring equipment from potential vandalism and elements, and monitoring of overall system's day-to-day operation. Monitoring plan shall describe in detail the method and means used to identify and monitor existing cracks and document new cracks. For significant cracks or cracks that appear to have a high potential to migrate, it is recommended that crack monitoring gauges be utilized.

- Details for establishing and deploying an alarm system to announce immediate shut down of site activities if a vibration event occurs exceeding PPV threshold established for properties listed above. Alarm system shall include a phone modem which will dial cell phones of Engineer and Contractor's site personnel in the event of an exceedance.
- Method for coordinating with the Engineer whereby the Contractor's retained licensed engineer will conduct a post-alarm survey in the event of a PPV threshold alarm occurrence.
- Establish a protocol for identification of activity or construction equipment that caused the PPV threshold to be exceeded.
- Description of the process which will be used to verify that the monitoring equipment will function as planned before starting work and the process which will be used to verify (daily) the monitoring equipment remains in calibrated working order.
- Detail a protocol including responsible parties to be notified if an exceedance occurs. This includes, but is not limited to, construction superintendent and Department's lead inspector.
- Daily activity log of vibration activity and crack monitors to ensure identification of cause of vibration event. Depending on equipment deployed, crack monitors could be monitored remotely or by visual inspection. Daily inspection log for the duration of the construction project shall be maintained either in written or electronic form.
- Daily testing and logging of entire geophone/seismograph/communications network (start of day test). If equipment fails daily test, correct deficiency before proceeding with planned activities for that day or temporarily suspend work until equipment is repaired or replaced. Daily logs shall be available to the Engineer for review and a summary of daily logging shall be provided in the post-condition survey.

235004a.04 PRE-CONSTRUCTION SITE PREPARATION.

At the properties designated in Article 235004a.01:

A. Crack Monitoring.

1. In accordance with project's monitoring plan, mark existing cracks in such a way that future observations would clearly indicate whether cracks remained unchanged, opened, closed, or propagated. Monitor and log racks and crack monitoring devices daily and immediately notify Engineer of observed change. It is recommended, but not required, to have and record metrological data within close proximity to the project. Cracks that can be documented during the project to respond to changes in meteorological conditions will not require additional explanation in the final report.
2. Following is a list of companies that supply crack monitoring equipment; however other equipment of equal reliability and quality will be acceptable.
 - Tell-Tale Crack Monitors, RST Instruments Ltd.; 800.665.5599; www.rstinstruments.com
 - Crack Monitoring Equipment, Geotest Instrument Corp.; 866.430.7645; www.crackgauge.com
 - Avongard Crack Monitor, Avongard Products USA; 800.244.7241; www.avongard.com

B. Vibration Monitoring.

In accordance with project's monitoring plan, monitoring equipment shall be initially installed and maintained during project in accordance with manufacturer's recommendations, calibration

standards, and specifications. No site work can begin until monitoring equipment is deployed and verified to be operating in accordance with factory recommendations and specifications.

C. Proof of Installation.

Demonstrate that installed equipment continuously and accurately measures vibrations, electronically logs vibration history (date/time stamp), and provides a communication notice system that notifies site personnel should PPV threshold be exceeded. Monitoring equipment shall remain in-place and in operation throughout the project.

235004a.05 VIBRATION LIMITS.

After a thorough conditions evaluation, propose in the pre-construction survey a PPV level for the monitored structure. PPV level proposed shall be determined by a qualified expert in the field of vibration monitoring. If Engineer agrees the level proposed will reasonably protect the structure, that PPV level will be added to the contract by mutual benefit change order for the specific property. In no case shall PPV level exceed 0.2 inches/second [ips] as measured at or near the monitored structure. To ensure PPV level is not exceeded, an alarmed monitoring system shall be implemented to signal any vibration event that equals or exceeds a threshold of 80% of the PPV level.

235004a.06 DEMOLITION/CONSTRUCTION.

- A.** Periodically check to ensure the monitoring system(s) are continuously operating within manufacturer's specifications during project.
- B.** Immediately cease work if alarm at the structure indicates PPV threshold is reached or exceeded causing a vibration event. In the event of an exceedance notify Engineer immediately. Conduct a post-alarm survey. The shutdown shall remain in effect until, to the Engineer's satisfaction, the cause of the exceedance has been identified; potential for another exceedance has been addressed by replacing faulty monitoring equipment; work process has been modified; or a recommended change to the equipment being used has been provided. Work shall not resume until approved by the Engineer.

235004a.07 POST-CONSTRUCTION SURVEY.

Perform a post-construction survey and analysis at designated adjacent structure to determine if structural changes are the result of construction activity. Provide Engineer a copy of post construction survey reports, daily log summaries for vibration and crack monitors, and analysis documents comparing pre and post structural condition prior to contract acceptance.

235004a.08 METHOD OF MEASUREMENT.

The item Vibration Monitoring will be measured as a lump sum unit of work.

235004a.09 BASIS OF PAYMENT.

Vibration Monitoring will be paid for at the contract lump sum price. This price shall be full payment for pre-construction surveys; furnishing, installing, monitoring, and removing crack monitoring gauges; preparing and providing a report documenting crack monitoring during this project; furnishing, installing, monitoring, and removing vibration monitoring equipment; preparing and providing a report documenting vibration data collected during this project; notification of vibration events; post-construction surveys; reports; and labor, equipment and materials necessary to complete work as described. There will be no compensation for delays as the result of exceeding PPV threshold or delays from faulty or damaged monitoring equipment. There will be no compensation for adjustment of construction activities or equipment to reduce the vibration levels to less than the maximum PPV, should an exceedance occur.