NORTH DAKOTA DEPARTMENT OF TRANSPORTATION SPECIAL PROVISION VIBRATION MONITORING

PROJECT 8-010(047)934 - PCN 23288



DESCRIPTION

The Work of this Section includes complying with the vibration-monitoring program explained in this Special Provision.

The purpose of the vibration-monitoring program is to protect properties within the vicinity of pile driving from excess vibration during pile driving operations and other construction activities associated with the project. To achieve this, localized monitoring of a several properties nominally within 400 feet of the planned work, and as generally listed below is planned:

- 1. 500 1st Ave NW (residence)
- 2. 502 1st Ave NW (residence)
- 3. 503 1st Ave NW (residence)
- 4. 504 1st Ave NW (residence)
- 5. 505 1st Ave NW (residence)
- 6. 506 1st Ave NW (residence)
- 7. 507 1st Ave NW (residence)
- 8. 508 1st Ave NW (residence)
- 9. 509 1st Ave NW (residence)
- 10. 510 1st Ave NW (residence)
- 11. 512 1st Ave NW (residence)

- 12. 514 1st Ave NW (residence)
- 13. 101 5th St NW (residence)
- 14. 102 5th St NW (residence)
- 15. 104 5th St NW (residence)
- 16. 32 Park Drive (residence)
- 17. 130 Park Drive (residence)
- 18. 132 Park Drive (residence)
- 19. 138 Park Drive (residence)
- 20. 144 Park Drive (residence)
- 21. 150 Park Drive (residence)
- 22. 160 Main Ave W (two storage unit buildings)
- 23. 219 Main Ave W (business)
- 24. 227 Main Ave W (church)
- 25. 239 Main Ave W (business)
- 26. 313 Main Ave W (business)
- 27. 405 Main Ave W (business)
- 28. 413 Main Ave W (business)
- 29. 24 Sheyenne St (business)
- 30. 25 Sheyenne St (business)
- 31. 29 Sheyenne St (business)

The following provisions do not relieve the Contractor of any responsibility for damage caused by Contractor's operations.

CONSTRUCTION REQUIREMENTS

A. Vibration Evaluation Study

A document entitled "West Fargo Main Avenue Slide Repair – Vibration Evaluation Report" (Vibration Evaluation Report) has been prepared for NDDOT by Barr Engineering Co. (Barr) as part of the design phase of the project. The report includes information on landowner concerns about vibration levels, general background information on vibrations from pile

driving, expected vibration levels during pile driving at this site, recommendations on maximum allowable vibration levels for this site, and recommendations on mitigation measures to deal with the expected vibration at the site from pile driving. The Vibration Evaluation Report is available for the Contractor to review, if requested from NDDOT.

B. Pre-Construction Condition Surveys

A pre-construction condition survey will be offered by the Engineer to the landowners for the buildings listed at the beginning of this Special Provision. The pre-construction condition survey will be performed by the Engineer for the buildings whose owners accept the offer to perform the condition survey.

The survey will include documentation of interior sub-grade and above grade accessible walls, ceilings, floors, rooms, and the visible exterior as viewed from the grade level. It will detail (by engineering sketches, video recordings, photographs, and/or notes) the existing visible structural and cosmetic conditions of the property. Results of the survey will be made available to the Contractor.

Crack displacement monitoring gauges may be installed across any significant existing cracks within the buildings to help verify any additional building distress, should it develop. The gauges will be read prior to commencement of vibration-producing activities, during vibration-producing activities, and after vibration-producing activities. Results of crack gauge readings will be made available to the Contractor.

C. Ground Vibration Controls

The following vibration control limits are applicable for all construction work, including but not limited to pile driving and material hauling activities.

The Contractor is advised that the ground vibration control limits defined herein may restrict Contractor's construction practices, and that Contractor should consider these limitations in preparing Contractor's bid.

If the Contractor exceeds 80% of the ground vibration limit given below, for any construction activity, Contractor shall cease that activity and submit to the Engineer in writing within 24 hours, a description of the activity being performed and a proposal for corrective action necessary to ensure that the specified limit is not exceeded for future activities.

If the Contractor exceeds the ground vibration limit for any construction activity, the Engineer will direct that all activities related to those causing vibration be stopped. The Contractor shall submit to the Engineer in writing within 24 hours a description of the activity being performed and a proposal for corrective action necessary to ensure that the specified limit is not exceeded for future activities. To proceed with any further vibration-producing activities, written permission must be obtained from the Engineer.

- 1. **Definitions.** The following definitions apply to the vibration controls:
 - a. <u>Peak particle velocity</u> The peak particle velocity is the maximum rate of change with respect to time of the particle displacement. The velocity amplitudes are in units of inches per second (in/sec).
 - b. <u>Frequency</u> The frequency of the vibration is the number of oscillations (full cycle) that occur in one second. The frequency units are given in Hertz (Hz) where one Hz equals one cycle per second.

2. Ground Vibration Control Limit.

- a. The ground vibration controls are applicable to external locations adjacent to affected buildings or structures.
- b. The maximum single component peak particle velocity resulting from construction activity shall not exceed 0.30 in/sec, measured at the ground surface adjacent to any structure, except as noted in paragraph C.2.c.
- c. The maximum single component peak particle velocity resulting from construction activity shall not exceed 0.50 in/sec, measured at the ground surface adjacent to the two storage unit properties located at 160 Main Ave W.

D. Vibration Monitoring

Vibration monitoring will be performed by the Engineer using seismographs. Approximately eight seismographs will be installed at the ground surface at a variety of offsets from the pile driving, ranging from as close as 50-feet to over 500-feet from the pile driving. Contractor may do additional vibration monitoring, if desired. However, NDDOT seismographs will be used to enforce ground vibration control limit thresholds.

E. Public Relations

Notify Engineer at least 14 days prior to beginning pile driving. Indicate dates pile driving will occur and time of day pile driving will begin and end. Days and times must be in compliance with Working Hours indicated on the Plans. Engineer will notify affected landowners at least 7 days prior to beginning pile driving.

Complaints about vibration will be directed to the Engineer and shared with the Contractor. Depending on the nature and frequency of the complaint(s), the Engineer may direct the Contractor to stop work until the complaint can be resolved.

F. Post-Construction Inspections

The Engineer will perform a post-construction survey to establish any variations in the buildings listed at the beginning of this Special Provision from the pre-construction survey. The post-construction survey will duplicate the pre-construction survey to be used to evaluate if the project construction activities caused damages to the buildings.

G. Damage Correction

Contractor is responsible for correcting any damage to property identified in the postconstruction report or reported by landowner that the Engineer considers attributable to the construction activities of this project.

BASIS OF PAYMENT

Include the costs for complying with all requirements outlined in this provision in the contract unit price bid for Item No. 622-2034 Steel Encased Conc Piling 12IN X .250.

Such payment is full compensation for furnishing all materials, equipment, labor, and incidentals to complete the work as specified.