MARYLAND DEPARTMENT OF TRANSPORTATION STATE HIGHWAY ADMINISTRATION	Office of Structures ***Guidelines and Procedures Memorandum***	INSPECTION Number: OOS-GPM-SI-115 Date: 08-06-2026
	In-Depth Inspections	Approval: Maurizio Agostino

Definition

In-depth inspections are generally used to supplement visual inspections and the more common inspection techniques to evaluate elements that have known or suspected deficiencies and to monitor the performance of elements under service conditions. The primary type of in-depth inspection used by SHA consists of Non-Destructive Evaluation (NDE). This GPM focuses on NDE applications and techniques, while additional less common in-depth inspection types may be pursued on an as-needed basis.

An NDE permits the inspection of the element without impairing its usefulness. There are numerous NDE techniques. The appropriate technique to be employed is dependent upon a number of factors including the construction material, the quality of information or data required, inspection access and equipment costs. Some of the more commonly used techniques include hammer soundings, pachometer, dye penetrants, magnetic particle, ultrasonics, X-rays, radiography, ground penetrating radar, impact echo, acoustic emissions, taut cable vibration, strain gauges, instrumentation and load testing.

Qualifications

Non-Destructive Evaluation techniques require expertise in using the equipment and interpreting the results and conducted in accordance with the appropriate requirements of the American Society for Testing and Materials (ASTM) specifications. Therefore, most Non-Destructive Evaluation techniques are to be performed by specially trained and experienced personnel.

The personnel engaged to perform a Non-Destructive Evaluation must possess and can produce upon request documentation showing that they have completed training and obtained experience to a level appropriate for the type of technique being performed. The required qualifications should be reviewed with the Office of Materials Technology.

Frequency

Routine NDE is performed on those bridge elements described in the following different NDE programs at a minimum72 month interval and coded in the appropriate category of SIA Item 92. More frequent inspection or additional element NDE may be necessary as determined by the Division Chief, SIRE – Structures Remedial Design or the LA Program Manager.

NDE Programs

Ultrasonic Testing Program of Steel Pin Assemblies

A routine Ultrasonic Testing Program of Steel Pin Assemblies is established to determine cracks, remaining thickness (loss of section), internal defects and other discontinuities. Steel pin assemblies which could result in the failure of a primary load carrying member are included in the program.

The testing program includes all bridges that contain pin and hanger assemblies, fixed hinge pins, expansion link pins, tie-bar pins, tie-bar bearing pins, arch pins, truss connection pins, truss connection bearing pins, rhomboid connection pins, rhomboid connection bearing pins, Mabey panel connection pins, pier/girder pins and steel column/shoe bearing pins

Ultrasonic Testing Program of Steel Anchor Rod/Bolt Assemblies

A routine Ultrasonic Testing Program of Steel Anchor Rod Assemblies is established to determine cracks, remaining thickness (loss of section), internal defects and other discontinuities. Steel anchor rod/bolt assemblies which could result in the failure of a bridge railing and impact the safety of the traveling public are included in the program.

The testing program includes all bridges that contain anchor rod/bolt assemblies which are used as the primary attachment of the barrier in lieu of reinforcing steel cast into the bridge deck and generally used for reconstructed barriers for existing bridge decks. The barriers may be precast or cast-in-place concrete along parapets or medians. There may be numerous anchor rod/bolt assemblies present at a bridge requiring testing which may necessitate a risk based sampling percentage to be developed with possible confirmation by random destructive evaluations.

Taut Cable Vibration Measurement Program of Post-Tensioning Bar Assemblies

A routine Taut Cable Vibration Measurement (TCVM) Program of Post-Tensioning Bar Assemblies is established to determine tension forces in the post-tensioning bars. The TCVM method is based on the relationship between tension force and vibration frequency of the bar. A rubber mallet is used to excite the high strength, large diameter post tensioning bar to vibrate between its anchorages. The method employs multiple accelerometers attached to the bars, specialized Wi-Fi data collection instrumentation, software and the fundamental mathematical correlation between vibration frequency and tension to be able to compute the in-situ tension forces. The testing program includes all bridges that contain post-tensioning bars that were retrofitted onto pier caps or onto the steel plate girders at the top of rhomboid trusses directly over the piers.

Documentation

The evaluation report shall be submitted within 60 days of the completion of the test and shall include as a minimum the following sections:

1. Title Page - This sheet shall identify the bridge, the type of Non-Destructive Evaluation performed, the date of testing and the responsible individuals/organizations. This sheet shall be signed by the technician/engineer who performed the field testing and interpreted the results. If the Non-Destructive Evaluation is performed by a consultant, then the report shall be signed/sealed by a Professional Engineer.

2. Description - Provide a brief description and location of the assemblies tested, referencing attached sketches and/or As-Builts for coordinates. Describe fully the testing equipment used (manufacturer, model, power requirements, operational settings, etc.). Note access equipment and maintenance of traffic requirements, testing sequence/scheme, site conditions and any special procedures utilized.

3. Observations and Test Results - Provide a narrative discussion of the observations and test results. Provide a comparison to prior inspection's report. Summarize significant observations and test results in a table.

4. Sketches - Provide sketches as necessary to identify test locations, detail condition accurately, develop repair plans or for future comparisons. All significant defects or discontinuities shall be clearly located and dimensioned.

5. Photographs – Provide representative pictures of typical testing equipment / assembly set-up.

6. Recommendations – Provide any recommended repairs, analyses, additional non-destructive or destructive evaluations, inspection frequency changes, special inspection procedures, monitoring schemes, etc.