A Framework to Procure Nondestructive Testing and Evaluation Services for Highway Bridges

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FOREWORD

Nondestructive testing and evaluation (NDT&E) technologies, when used appropriately, provide objective measurements that can help State highway agencies more effectively assess highway infrastructure asset conditions and maintain them in a state of good repair. Implementing NDT&E to support structural condition assessment typically requires specialized expertise and equipment. As a result, many agencies procure these services from external service providers. However, the absence of a national procurement framework, clearly defined technical expectations, and standard contract language can create challenges in acquiring high-quality testing and analysis services.

This report presents findings on how State highway agencies currently procure NDT&E services. It highlights key elements that may be included in a request for services, explains why those elements are important, and offers practical recommendations for evaluating proposals. In addition, the report provides sample contract language that agencies can adapt to meet their specific needs.

This report is intended as a practical resource for State and local highway agencies and decisionmakers aiming to integrate NDT&E services into their asset management practices.

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<tr><td colspan="5">16. Abstract
Highway agencies often procure nondestructive testing and evaluation (NDT&E) services to assess the condition of highway bridges. Unlike traditional procurement items, NDT&E services typically require specialized resources and expertise, presenting challenges for agencies preparing procurement solicitations. The procurement process can become inefficient when an agency does not leverage current best practices, especially for agencies that lack procurement experience. To enhance procurement efficiency within departments of transportation, this study developed a framework that reveals the current state of practice in NDT&E procurements, as obtained through a literature review, survey, and interviews with agency representatives. The framework provides best practices across agencies. An example of procurement solicitation is presented to streamline future procurement processes. Agencies may remove nonapplicable portions to adapt to their specific procurement needs.</td></tr>
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SI* (MODERN METRIC) CONVERSION FACTORS

APPROXIMATE CONVERSIONS TO SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
in	inches	25.4	millimeters	mm
ft	feet	0.305	meters	m
yd	yards	0.914	meters	m
mi	miles	1.61	kilometers	km
		AREA		
in^2	square inches	645.2	square millimeters	mm^2
ft^2	square feet	0.093	square meters	m^2
yd^2	square yard	0.836	square meters	m^2
ac	acres	0.405	hectares	ha
mi^2	square miles	2.59	square kilometers	km^2
		VOLUME		
fl oz	fluid ounces	29.57	milliliters	mL
gal	gallons	3.785	liters	L
ft^3	cubic feet	0.028	cubic meters	m^3
yd^3	cubic yards	0.765	cubic meters	m^3
	NOTE: volumes greater than 1,000 L shall be shown in m^3			
		MASS		
oz	ounces	28.35	grams	g
lb	pounds	0.454	kilograms	kg
T	short tons (2,000 lb)	0.907	megagrams (or "metric ton")	Mg (or "t")
		TEMPERATURE (exact degrees)		
°F	Fahrenheit	5 (F-32)/9 or (F-32)/1.8	Celsius	°C
		ILLUMINATION		
fc	foot-candles	10.76	lux	lx
fl	foot-Lamberts	3.426	$candela/m^2$	cd/m^2
		FORCE and PRESSURE or STRESS		
lbf	poundforce	4.45	newtons	N
lbf/in^2	poundforce per square inch	6.89	kilopascals	kPa

APPROXIMATE CONVERSIONS FROM SI UNITS

Symbol	When You Know	Multiply By	To Find	Symbol
		LENGTH		
mm	millimeters	0.039	inches	in
m	meters	3.28	feet	ft
m	meters	1.09	yards	yd
km	kilometers	0.621	miles	mi
		AREA		
mm^2	square millimeters	0.0016	square inches	in^2
m^2	square meters	10.764	square feet	ft^2
m^2	square meters	1.195	square yards	yd^2
ha	hectares	2.47	acres	ac
km^2	square kilometers	0.386	square miles	mi^2
		VOLUME		
mL	milliliters	0.034	fluid ounces	fl oz
L	liters	0.264	gallons	gal
m^3	cubic meters	35.314	cubic feet	ft^3
m^3	cubic meters	1.307	cubic yards	yd^3
		MASS		
g	grams	0.035	ounces	oz
kg	kilograms	2.202	pounds	lb
Mg (or "t")	megagrams (or "metric ton")	1.103	short tons (2,000 lb)	T
		TEMPERATURE (exact degrees)		
°C	Celsius	1.8C+32	Fahrenheit	°F
		ILLUMINATION		
lx	lux	0.0929	foot-candles	fc
cd/m^2	candela/m2	0.2919	foot-Lamberts	fl
		FORCE and PRESSURE or STRESS		
N	newtons	2.225	poundforce	lbf
kPa	kilopascals	0.145	poundforce per square inch	lbf/in^2

*SI is the symbol for International System of Units. Appropriate rounding should be made to comply with Section 4 of ASTM E380. (Revised March 2003)

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF ABBREVIATIONS

3D	three dimensional
AASHTO	American Association of State Highway and Transportation Officials
ACI	American Concrete Institute
AE	acoustic emission
A-E	architect engineer
ANSI	American National Standards Institute
ASNT	American Society for Nondestructive Testing
ASR	alkali-silica reactivity
ASTM	ASTM International
AWS	American Welding Society
DoD	Department of Defense
DOT	department of transportation
DOTD	Department of Transportation and Development
EM	engineer manual
ER	electrical resistivity
ET	electromagnetic testing
FHWA	Federal Highway Administration
GPR	ground-penetrating radar
GPS	Global Positioning System
HCP	half-cell potential
IDIQ	Indefinite Delivery/Indefinite Quality
IE	impact echo
IFB	invitation for bids
IR	impulse response
IRT	infrared thermography
ISO	International Organization for Standardization
KTC	Kentucky Transportation Cabinet
LOI	letters of interest
LT	leak testing
MWBPP	Midwest Bridge Preservation Partnership
MFL	magnetic flux leakage
MPT	magnetic particle testing
NCHRP	National Cooperative Highway Research Program
NDE	nondestructive evaluation
NDT	nondestructive testing
NDT&E	nondestructive testing and evaluation
NHI	National Highway Institute
PC	portland cement
PE	professional engineer
PT	penetrant testing
QA	quality assurance
QC	quality control
RFI	request for information
RFP	request for proposal

RFQ	request for qualifications
RT	radiographic testing
SM	structural monitoring
SPRAT	Society of Professional Rope Access Technicians
SOW	scope of work
TO	task order
TSP2	Transportation System Preservation Technical Services Program
UAV	unmanned aerial vehicle
UAS	unmanned aircraft system
USACE	U.S. Army Corps of Engineers
UT	ultrasound testing
VT	visual testing

CHAPTER 1. INTRODUCTION

Highway agencies periodically perform nondestructive testing and evaluation (NDT&E) of inservice highway infrastructure assets. Implementing NDT&E requires specialized resources and expertise; highway agencies often procure NDT&E from service providers. The procurement process can become inefficient when an agency does not leverage current best practices, especially for agencies that lack procurement experience. Research is needed to explore procurement strategies and practices that enhance procurement efficiency within State departments of transportation (DOTs).

A 2025 National Cooperative Highway Research Program (NCHRP) research report, *Practices for Transportation Agency Procurement and Management of Advanced Technologies*, presents a guide with strategies and practices for procuring new and innovative transportation system technologies (Lines et al. 2025). The report highlights the challenges throughout the advanced technology procurement lifecycle, especially the increasing complexity and diversity of technology solutions in DOTs and the growing number of technology providers. The report encourages documenting the current state of practice in procurement and increasing levels of detail in the scope of work (SOW). Due to the lack of specificity on NDT&E, additional research is needed to develop specialized procurement strategies and practices for NDT&E.

This study aimed to develop a framework for owners of transportation infrastructure to procure consistent NDT&E services. Establishing such a framework is important because inconsistent procurement practices can lead to variability in service quality, misalignment of expectations, and challenges in comparing contractor qualifications and deliverables across projects. A standardized approach helps ensure that NDT&E services are procured efficiently, transparently, and in a way that promotes data reliability and cost effectiveness.

To synthesize best practices, this study reviewed existing NDT&E procurement documents collected from various State DOTs and other agencies. The goal was to identify common technical mechanisms and strategies that could inform the development of a standardized procurement framework. Additionally, a survey was conducted to capture methodologies, procedures, and guidelines currently used in NDT&E services procurement.

During the data-collection phase, the research team observed that State DOTs generally procure NDT&E services in one of two ways: as a standalone, primary contract or as part of a broader contract, such as those for routine inspection or design services. This study focused on procurement documents in which NDT&E services were the primary focus.

Initial reviews revealed that many procurement documents included administrative requirements unique to individual States or agencies, such as conflict-of-interest policies, travel regulations, and insurance requirements. Because this study focused on the technical, logistical, and qualification aspects of procurement that could be broadly applicable, these localized administrative and regulatory elements were excluded from the analysis.

Instead, the study focused on several key components common across various solicitations, including the general overview, SOW, personnel qualifications and requirements, evaluation criteria, and general technical requirements not specific to any one State or agency, such as quality assurance (QA) provisions.

For a broader discussion on administrative considerations refer to the NCHRP report (Lines et al. 2025).

CHAPTER 2. REVIEW OF PROCUREMENT DOCUMENTS

To ensure the framework was informed by a diverse set of practices and procurement strategies, the research team reviewed procurement solicitations from a range of transportation agencies across the United States. These agencies included the Arkansas DOT, Louisiana Department of Transportation and Development (DOTD), Iowa DOT, Michigan DOT, Minnesota DOT, Montana DOT, Virginia DOT, and the U.S. Army Corps of Engineers. These agencies were selected to represent a broad geographic distribution, various agency sizes, and different levels of experience with procuring NDT&E services. Their procurement documents offered valuable insights into how different organizations approach the definition of scope, evaluation criteria, and performance expectations. The review provided a well-rounded perspective on commonalities and differences in procurement practices, which helped inform the development of a more universally applicable framework for NDT&E service procurement.

ARKANSAS DOT

Overview

In 2023, the Arkansas DOT released a statewide request for letters of interest (LOIs) that resulted in the award of one project-specific contract to one firm (Arkansas DOT 2023). This project had a negotiated fee and schedule.

Scope

The solicitation included the following SOW:

- Deficiency location and size:
  - Delamination.
  - Spalls.
  - Cracking.
  - Concrete voids.
- Integrity.
- Stiffness (dynamic modulus).
- Rebar cover.
- Corrosion (probability or potential).
- Dimensions (thickness or size of member).

Personnel Requirements

No personnel requirements were included in the initial solicitation. However, staff credentials were included in the evaluation criteria (next section).

Evaluation Criteria

The Arkansas DOT used the following criteria to evaluate the solicitation responses:

- Professional staff—including the number of personnel available, their education, experience, licensure, and registration (if required)—and any partnerships with subconsultants; evaluation points up to 10 points.

- General and professional reputation, including responsiveness to civil rights and equal employment opportunity requirements and opportunities; evaluation points up to 10 points.

- Past work performance with the Arkansas DOT; evaluation points up to 10 points. Past performance or evaluations from other clients were considered when the firm had not worked for the Arkansas DOT previously.

- Experience with projects of a similar nature to those advertised; evaluation points up to 10 points.

No cost information was to be included in the proposal.

Other Requirements

No other requirements, except State-specific requirements, were included.

LOUISIANA DOTD

Overview

The Louisiana DOTD released two statewide Indefinite Delivery/Indefinite Quantity (IDIQ) contracts in 2018 and 2022, respectively (Louisiana DOTD 2018, 2022). Each procurement resulted in two awarded contracts (i.e., four awards in total). The awarded values were $2.5 million each in 2018 and $5 million each in 2022. Both contracts had a period of performance of 5 years. Additional funding could be added to each contract if the original allocation was exhausted through assigned task orders (TOs).

Scope

The 2018 and 2022 solicitations included the following SOW:

- Concrete:
  - Deficiency location and size:
    - Delamination.
    - Spalls.
    - Honeycomb and voids.
  - Integrity.
  - Strength.
  - Stiffness (dynamic modulus).

    - Rebar cover.
    - Dimensions (thickness or size of member).
    - Corrosion (probability or potential).
- Timber:
    - Integrity.
    - Moisture.
- Steel:
    - Deficiency location and size.
    - Corrosion.
    - Cracks.
    - Weld flaws (e.g., porosity, slag, cracking).
- Load rating.
- In-place measurements for the following:
    - Strain.
    - Acceleration.
    - Tilt.
    - Wind speed.
    - Slope stability.

In addition, the 2022 solicitation also included the following:

- Unmanned aerial vehicle (UAV) inspection used to capture and/or process:
    - Three-dimensional (3D) digital twin.
    - Crack detection.

- The consultant had to be able to perform acoustic and electromagnetic testing of the bridge decks with minimal traffic invasiveness and impact.

Personnel Requirements

The 2018 solicitation stated the following requirements:

- At least one principal of the prime consultant had to be a professional engineer (PE), registered in Louisiana.

- At least one principal or another responsible member of the prime consultant had to be a PE, registered in Louisiana, with a minimum of 5 year of experience in nondestructive testing.

- The prime consultant had to also employ on a full-time basis a minimum of two American Society for Nondestructive Testing (ASNT) Level II engineers/technicians with a minimum of 5 years of experience in nondestructive evaluation (NDE) of bridge decks.

- The prime consultant had to also employ on a full-time basis a minimum of one ASNT Level II engineer/technician with a minimum of 2 years of experience in NDE of tunnel liners.

- The prime consultant also was required to employ the following on a full-time basis or through a subconsultant(s):

    - A minimum of one PE, registered in Louisiana, with a minimum of 5 years of experience in bridge load rating.

    - A minimum of one PE, registered in Louisiana, with a minimum of 5 years of experience in charge of geotechnical services.

The 2022 solicitation stated the following requirements:

- At least one principal of the prime consultant had to be a PE registered in Louisiana.

- At least one principal or other responsible member of the prime consultant had to be a PE, registered in Louisiana, with a minimum of 5 years of experience in NDT.

- The prime consultant also was required to employ the following on a full-time basis or through a subconsultant(s):

    - A minimum of four PEs, registered in Louisiana, with a minimum of 5 years of experience in bridge structural design.

    - A minimum of two PEs with a minimum of 5 years of experience in hydraulic engineering.

    - A minimum of two PEs, registered in Louisiana, one with at least 5 years of experience in charge of geotechnical services.

Evaluation Criteria

The 2018 solicitation used the following criteria:

- Consultant's firm experience on similar projects, weighting factor of three.
- Consultant's staff experience on similar projects, weighting factor of four.
- Consultant's firm size as related to the estimated project cost, weighting factor of two.
- Consultant's past performance on similar DOTD projects, weighting factor of six.
- Consultant's current workload with DOTD, weighting factor of three.

The 2022 solicitation included the following:

- Consultant's firm experience on similar projects, weighting factor of three.
- Consultant's staff experience on similar projects, weighting factor of four.
- Consultant's firm size as related to the estimated project cost, weighting factor of three.

- Consultant's past performance on similar DOTD projects, weighting factor of six.
- Consultant's current workload, weighting factor of five.
- Approach and methodology, weighting factor of nine.

No cost information was to be included in the proposals.

Other Requirements

- Quality:
  - The consultant was to develop a QA and quality control (QC) program to provide a mechanism by which all deliverables would be subject to a systematic and consistent review.

  - The consultant had to ensure quality and adhere to established DOTD policies, procedures, standards, and guidelines in the preparation and review of all deliverables.

- Experience:
  - The consultant needed to have a minimum of 10 years of experience performing consulting and testing services of this nature.

  - The consultant needed to have the capability to perform acoustic and electromagnetic testing of bridge decks with minimal traffic invasiveness and impact.

IOWA DOT

Overview

The Iowa DOT released two scopes of service as a Requests for Proposal (RFPs) in 2019 and 2022, respectively (Iowa DOT 2019, 2022). The 2019 procurement document was titled "Non-Destructive Bridge Deck Inspection Acoustic Based Bridge Inspection," and the 2022 document was titled "Non-Destructive Testing (NDT) Bridge Inspection."

Scope

The 2019 solicitation used the following SOW.

Identify delamination in a portland cement (PC) concrete deck with or without a dense PC overlay:

- Only acoustic methods or visual methods coupled with an acoustic system.
- No ground-penetrating radar (GPR) or infrared thermography (IRT) systems.

The 2022 solicitation used the following SOW.

Identify surface visible cracks in PC concrete decks with a minimum of 5 mils or 0.005 inches.

Personnel Requirements

The 2019 and 2022 solicitations used the following personnel requirements:

- The consultant and its subconsultants were required to be prequalified as defined in the *Iowa DOT Policies and Procedures* manual, Policy No. 300.04 (Iowa DOT 2016).

- Both RFPs required identification and qualifications for each professional or technical person to be assigned to the project, as well as the identification of the principal or manager who would serve as the project manager. However, no qualification requirements were identified as part of the procurement.

Evaluation Criteria

The 2019 and 2022 solicitations were selected based on the following evaluation criteria:

- Past experience with similar work, weighting factor of 35 percent.
- Testing methods, weighting factor of 35 percent.
- Experience and expertise, weighting factor of 30 percent.

No cost information was to be included in the proposals.

Other Requirements

No other requirements that were not State specific were included.

MICHIGAN DOT

Overview

The Michigan DOT released one RFP for preliminary engineering design services in 2018 (Michigan DOT 2018). The contract period of performance was anticipated to start on June 1, 2018, and be completed on September 1, 2018.

Scope

The solicitation used the following SOW:

- Concrete delamination: Specified using the impact echo (IE) method with a continuously moving platform.
- Concrete spalling.
- Hot-mix asphalt patches.
- Overlay debonding.

Personnel Requirements

No primary qualification criteria were given except experience using multichannel IE scanning from a continuously moving platform. An engineer was not necessarily needed to perform IE work.

Evaluation Criteria

The procurement was made based on total cost, including a unit price per square foot for the IE scanning, a total price for the traffic control, and a unit price for the mobilization.

Other Requirements

No other requirements that were not State specific were included.

MINNESOTA DOT

Overview

The Minnesota DOT has released multiple RFPs since 2020 (Minnesota DOT 2020a, 2020b). These RFPs were project and bridge specific rather than statewide, but they have all included multiple structures, such as the following:

- Bridge 27831 and associated ramps (Dunwoody bridge complex).
- Concrete box girder posttensioned tendon investigation and remedial repairs.

The Bridge 27831 project was to perform NDE on Bridge 27831 and ramps 27831A–27831D, which collectively carry I–394 over Dunwoody Boulevard in Minneapolis, MN, and to report data that would enable accurate work-type selections for preservation for localized deck repairs, milling and concrete wearing surface placement with underlying deck repairs, hydrodemolition and concrete wearing course placement, and redecking with new epoxy-coated reinforcement.

The project for the concrete box girder was for an in-depth investigation and remedial repairs of the posttensioned tendons of select concrete box girder bridges in the Metro District of Minneapolis. The term of this contract was anticipated to run from early September 2023 to late September 2024.

Scope

The SOW for the Bridge 27831 and associated ramps project was as follows:

- Visual inspection of the underside of the deck.
- Sounding the underside of the deck as identified in the details of the RFP.
    - Contractor would hammer sound the deck underside areas as designated using a handheld chipping hammer.

- The contractor could, as an alternative, use a commercially available delamination detection tool with a spoked wheel, after successful blind verification of equivalent delamination (within 10 percent) area findings in a 200-square-foot demonstration area.

- Coring and chloride analysis.
- NDE methods:
  - GPR and top cover survey:
    - The GPR would consist of an array of noncontacting antennas and be capable of high-speed bridge deck inspections for delamination and deteriorated concrete, measurement of rebar depth, and overlay thickness.

    - The GPR inspection would be conducted in compliance with the American Association of State Highway and Transportation Officials (AASHTO) TP 36 *Standard Test Method for Evaluating Asphalt-Covered Bridge Decks Using Pulsed Radar* (AASHTO 1993), ASTM International (ASTM) D6087-97/03 (ASTM 2022a) *Standard Test Method for Evaluating Asphalt-Covered Bridge Decks Using Ground Penetrating Radar*, and Strategic Highway Research Program, Project C-101, Task B for research for detection of deterioration in asphalt-covered concrete decks (Algongi, Clemena, and Cady 1993).

    - The GPR would be a digital, touchscreen-controlled system with noncontacting horn antennas, synchronized for simultaneous operation.

    - Each antenna would transmit a 1.0 ns monocycle signal at a 5 MHz pulse repetition frequency.

    - Each antenna would operate with a range scan of 15 ns and a range scan of 100 scans per second minimum.

    - The radar equipment would employ an autolock capability to automatically lock and stabilize the surface reflection against antenna bounce.

    - The radar equipment would employ a digital subtraction technique to improve signal quality by digital removal of internal system noise, known as "clutter."

    - A data-acquisition system would consist of equipment for collecting radar data at a minimum rate of 80 kHz for each antenna.

    - The data-acquisition system would be capable of acquiring every radar range scan from all antennas simultaneously without loss of data to ensure maximum longitudinal deck coverage.

    - A distance measurement system consisting of an appropriate distance measurement instrument with an accuracy of ± 100 mm per kilometer (± 6.5 inches per mile) and a resolution of 25 mm (1 inch) would be used to register GPR data relative to traveled distance. The GPR would be capable of acquiring Global Positioning System (GPS) information.

- The bridge decks had to be cleaned of soil, aggregate, or other particulate debris, and must be in surface-dry condition.

- The radar inspection would be performed in a series of longitudinal passes along the length of the bridge deck using an array of air-coupled GPR antennas.

- The antenna array would be positioned at a consistent distance in front of the inspection vehicle and at a fixed spacing between antennas to ensure registration of radar passes achieved full lane coverage.

- Longitudinal radar passes would be made in a continuous manner along the length of the deck and accurately spaced in the transverse direction. Enough passes would be made to cover the width of the bridge deck.

- The survey would be performed in all traffic lanes in the direction of traffic, and at no time would the GPR vehicle be permitted to straddle lanes during data collection.

- Each vehicle pass would simultaneously collect antenna passes. Enough passes would be made to cover the width of the bridge deck.

- Distance would be maintained using a vehicle-mounted, precision distance-measuring instrument and GPS.

- The GPR inspection would be conducted at highway speeds (45+ mph) or at the posted speed, whichever was lower. The data collection speed would minimize interference with traffic and eliminate the need for maintenance and protection of traffic.

- The following information would be reported: Date and time of scan, weather type at time of scan, date of last rain event before scan, average deck reading (change in amplitude) at top mat of reinforcement (decibels), maximum deck reading (change in amplitude) at top mat of reinforcement (decibels), threshold used to determine deteriorated or contaminated concrete (decibels), plan view of GPR results showing range of deteriorated or contaminated concrete values, and average depth of rebar (top mat). Analyzed all radar data to determine the topmost reinforcement depth and presented graphically in a color topographical plan view and in numerical format. Top reinforcement: Presented areas of delamination at the top rebar graphically in plan-view mappings. Bottom reinforcement: Analyzed and presented bridge deck GPR data for delamination at the bottom rebar graphically in plan-view mappings; determined quantities and percentage of deck at or above the threshold value, excluding areas within 1 ft–6 inches of expansion joints consisting of steel extrusions and neoprene seals.

- IRT:
  - Followed ASTM D4788 *Standard Test Method for Detecting Delamination in Bridge Decks Using Infrared Thermography* for inspection (ASTM 2022b).

        - Reported an estimated percentage for the number of defects.
        - Recorded the date and time of the scan.
        - Recorded the weather and temperature (°F) during the scan.
        - Reported IRT results in different levels as specified in the RFP.
    - High-resolution video:
        - Located deck features and areas of visible deterioration, such as cracking, spalling, and patching.
        - Used a camera equipped with a distance measurement instrument for accurate location referencing.
    - Unmanned aircraft systems (UAS):
        - Drone had to first be approved by the State's project manager.
        - Drone operator had to be certified by the Federal Aviation Administration.
    - Chaining or mobile deck acoustic response.
    - Other methods as proposed by the contractor.

The SOW for the concrete box girder project was to use posttensioned tendons within concrete box girder bridges:

- Grout voids (location and volume).
- Strand corrosion.

Personnel Requirements

The personnel requirements for the Bridge 27831 and associated ramps project were as follows:

- Team leader qualifications:
    - Had to be a registered PE in Minnesota.
    - Had to successfully complete a Federal Highway Administration (FHWA)-approved comprehensive bridge inspection training course.
- Assistant team leader qualifications—Successful completion of one of the following National Highway Institute (NHI) courses (NHI n.d.):
    - Introduction to Safety Inspection of In-Service Bridges (FHWA-NHI-130101).
    - Engineering Concepts for Bridge Inspectors (FHWA-NHI-130054).
    - Safety Inspection of In-Service Bridges (FHWA-NHI-130055).

The State could review the qualifications of assistant bridge inspectors who do not meet the requirements. Review and approval were based on the following criteria:

- Relevant bridge inspection experience, including understanding and knowledge of defects and deficiencies of the type that might be encountered during this project.
- Knowledge and understanding of complex bridge design issues.
- Understanding and experience with inspection data-collection requirements.
- Demonstrated ability through a similar type of formal certification program.
- PE license in any State.

All field personnel assigned to the project had to be physically capable of performing the tasks associated with their positions. Team leaders and assistant bridge inspectors had to be able to work at heights, on ladders, scaffolding, aerial lifts, or under bridge inspection equipment. They had to be able to climb, work in confined spaces, and work under adverse weather conditions as required.

The personnel requirements for the concrete box girder project were as follows. The RFP stated that responders clearly demonstrated how cited personnel experience was relevant and similar in scope and complexity to this project and listed years of experience related specifically to the individual tasks. At a minimum, responders had to provide detailed statements of relevant project experience for the following positions:

- Project manager.
- Task leads.
- Bridge inspectors.
- NDE lead.
- QA manager.
- Support staff (e.g., anyone performing 25 percent or more of any task).

Evaluation Criteria

For the Bridge 27831 and associated ramps project, the proposals were rated on a 100-point scale to create the final evaluation recommendation. The factors and weighting on which proposals were judged were broken down as follows:

- Project understanding: 10 percent.
- Responder experience and qualifications (company and key personnel): 35 percent.
- Work plan—project approach: 15 percent.
- Deliverables: 10 percent.
- Cost detail: 30 percent.

Proposals were evaluated on a "best value" basis, with 70 percent qualifications and 30 percent cost considerations. The review committee did not open the cost proposals until after the qualification points had been awarded.

For the concrete box girder project, the proposals were rated on a 100-point scale to create the final evaluation recommendation. The factors and weighting on which proposals were judged were broken down as follows:

- Project understanding, work plan, and schedule: 30 percent.
- Key personnel experience and qualifications: 35 percent.
- Quality management plan: 5 percent.
- Cost detail: 30 percent.

Proposals were evaluated on a "best value" basis, with 70 percent qualifications and 30 percent cost considerations. The review committee did not open the cost proposals until after the qualification points had been awarded.

Other Requirements

A project QA and QC plan had to be submitted to the State for review and approval before any work could be performed on the contract. The plan had to include the following:

- A detailed description of the coordination protocol and methods for directing the activities of any staff and subconsultants and keeping the State informed about field activities.

- Spot verification procedures for each inspection method. Spot verification would be performed on at least 0.25 percent of the deck area surveyed and had to be performed by chaining or hammer sounding for unsound concrete.

- A description of the field staff oversight policy for confirming inspection quality and reporting.

- Verification and maintenance of staff licenses and certifications.

- Coordination of any aerial-based surveys and obtaining the necessary permits.

- Procedures for reviewing and correcting deficient reports.

MONTANA DOT

Overview

The Montana DOT released RFPs for consulting services in 2021 and 2023, one for each year (Montana DOT 2021, 2023). The 2021 procurement resulted in two awarded contracts. The 2021 contract value was $0.4 million for up to 2 years starting from the award date (a 2-year base term with a 1-year optional extension). The 2023 contract value was approximately $0.3 million for a 2-year base term with a possible 1-year extension.

Scope

The 2021 solicitation used the following SOW:

- Detailed and proven QC procedures for field work, including equipment calibration certifications and records, were required.
- Concise and organized data reports were required for each bridge evaluated.
- QC procedures were required for office work, reports, and data entry.
- On-call availability for time-sensitive assignments requiring accelerated schedules were required. It was anticipated that some assignments might require data collection and final report submittal within 30 days of the notice to proceed.
- Services to obtain the desired data could include, but were not limited to, the following:
    - Bridge deck chaining or other acoustic-sounding methods to accurately map deck delamination. This work would include documentation of deck delamination on a grid overlain on the plan view of the bridge deck.
    - Bridge deck concrete coring and testing for compressive strength and chloride content.
    - GPR, pachometer, other methods, or a combination of methods to evaluate deck condition and accurately determine steel reinforcing concrete cover to ± 1/4 inch or less.
    - Aerial IRT to assess delamination and overall deck condition.
    - Traffic control had to meet the requirements of the *Manual on Uniform Traffic Control Devices* (FHWA n.d.a).
    - Data entry into AASHTOWare® Bridge Management™ software (AASHTO n.d.).

The 2023 solicitation used the following SOW:

- The consultant would provide a QC plan to the Montana DOT contract manager 45 days before performing inspections.

- The consultant would complete QC processes and submit all data entry, including the upload of the inspection report.

- The consultant would provide the necessary personnel, tools, and expertise to complete accurate and consistent NDT bridge inspections on inservice pin-and-hanger assemblies and other steel members as required.

- The consultant would ensure accurate and consistent defect identification results through the following:

    - Properly calibrated testing equipment.
    - Inspection processes that were proven and well-documented.

- NDT inspections required the submission and approval of a bridge-specific NDT inspection procedure to the Montana DOT contract manager.

Personnel Requirements

The 2021 solicitation set the following personnel requirements:

- ASNT Level II certified inspectors were required to oversee the work.

- All personnel had to also be trained and certified, where appropriate, for the services and equipment required to perform the services.

- Personnel also had to be capable of handling the physical requirements needed to access and perform the work.

The 2023 solicitation set the following personnel requirements:

- The consultant had to provide a PE, licensed in Montana, to provide oversight and assurance of inspection quality.

- The consultant had to designate one member of the inspection team as the bridge inspection team leader. The bridge inspection team leader had to meet one of the qualifications stated in chapter 2 and appendix 2G of the Montana DOT *Bridge Inspection and Rating Manual* (Montana DOT 2018).

- NDT personnel had to be qualified in accordance with ASNT recommended practice SNT-TC-1A (ASNT 2024) as prescribed by the 2020 edition of AASHTO/American Welding Society (AWS) D1.5 (AASHTO/AWS 2020). The bridge inspection team leader was required to meet the standards of American National Standards Institute (ANSI)/ASNT CP-189-2020 (ASNT 2020) for a minimum of Level II certification.

Evaluation Criteria

For the 2021 solicitation, if multiple consultants were selected and multiple-term contracts were awarded, task or work orders (term assignments) would be awarded through an additional selection procedure. This procedure would select specific personnel in accordance with the following weighted factors:

- Qualifications for specific task assignments (70 points possible). Using the proposals submitted in response to the RFP and work performed with Montana DOT since the submittal of the proposal, Montana DOT would evaluate all personnel from all firms holding term contracts on their qualifications, knowledge, skills, and abilities required for the individual task assignment.

- Current workload (10 points possible). Using the availability stated in the proposals submitted in response to the RFP and the volume of work assigned by Montana DOT since the submittal of the proposal, Montana DOT would evaluate the availability of each firm holding a term contract.

- Cost component (20 points possible):
  - The calculation would be based on labor costs plus lodging.

  - The proposal with the lowest overall cost received the maximum allotted points. All other proposals received a percentage of the points available based on their cost, related to the lowest overall cost. For example, consultant A's cost was $4,000. Consultant B's cost was $5,000. Consultant A would receive 20 points. Consultant B would receive 16 points.

For the 2023 solicitation, proposals were evaluated in accordance with the following factors:

- Team qualifications (100 points possible).
- Approach to task assignments (50 points possible).
- Record of past performance (30 points possible).

Following the review, evaluation, and rating of all proposals, the results were presented to the Consultant Selection Board at Montana DOT headquarters. The board could consider any proposal scoring within 2 percent of another proposal as equally qualified and take into account its knowledge of the firm's workload, past performance, and familiarity with the specific work to be performed in selecting the most-qualified consultant(s).

If multiple consultants were selected and multiple term contracts awarded, task or work orders (term assignments) would be awarded through an additional qualifications-based selection procedure. This procedure would select a firm in accordance with the following weighted factors based on qualifications for a specific task assignment (60 points possible):

- An evaluation of the consultant's qualifications as related to the specific knowledge, skills, and abilities required for the individual task assignment, including familiarity with the region in which the task assignment was located (50 points possible).

- The firm's current workload and amount of recent work with the Montana DOT, in relation to this type of work (10 points possible).

Other Requirements

No other requirements that were not State specific were included.

VIRGINIA DOT

Overview

The Virginia DOT has released multiple RFPs since 2018, including the following:

- *Statewide Survey and Monitoring Deformation of Structures* (Virginia DOT 2018).
- *Statewide Survey and Monitoring Deformation of Structures* (Virginia DOT 2023a).
- *Statewide On-Call Bridge Testing & Evaluation* (Virginia DOT 2023b).

Scope

The SOW for the 2018 Statewide Survey and Monitoring Deformation of Structures (bridges, buildings, tunnels, islands, utilities, walls, etc.) was as follows:

- Deflection, settlements, or displacements:
    - Observe and record the impacts of deformations and deflections on the structures and report to the department.
    - Monitor changes in the baseline record to identify and provide early warnings of potential adverse impacts to the department.
- Vibration: Calibrate and validate geotechnical models for predicting soil behavior for ground improvement, thereby reducing the impact on existing structures.
- Strain.
- Crack.
- Tilt.

The 2023 Statewide Survey and Monitoring Deformation of Structures added the use of photogrammetry, creation of point cloud data, and analysis and observation of the information by resampling the same data at set intervals.

For the 2023 statewide on-call bridge testing and evaluation, the SOW included the following for concrete:

- Sounding and marking deck concrete would consist of sounding concrete decks to determine locations of delamination in accordance with ASTM D4580-12 (ASTM 2018),

marking delaminated areas in rectilinear patterns using spray paint or keel as directed by the contract administrator, and providing a report in accordance with section D of this RFP. The report would include a plan view(s) of the bridge showing the delamination. The total quantity of delamination would be shown in a spreadsheet sorted by span and lane.

- Sounding and marking substructure and superstructure concrete would consist of sounding concrete substructure and superstructure elements with a hammer to determine locations of delamination in accordance with ASTM D4580-12 (ASTM 2018), marking delaminated areas in rectilinear patterns using spray paint or keel as directed by the contract administrator, and providing a report in accordance with section D of this RFP. The report would include an elevation view(s) of the bridge component showing the delamination. The total quantity of delamination would be shown in a spreadsheet.

- Chloride ion profile sampling and testing would consist of obtaining and providing chloride ion concentrations at 1/2-inch depth increments centered at 1/2, 1 1/2, 2 1/2, and 4 inches below a concrete surface in accordance with AASHTO T 260-97, Procedure A, (Determination of Acid-Soluble Chloride Ion Content) (AASHTO 2016). The unit price would include all field sampling, subsampling of concrete powder, preparation of the sample, concentration testing, and reporting for four depths in a single profile. Patching the resulting hole would be in accordance with the 2020 Virginia DOT *Road and Bridge Specifications,* section 512 (Virginia DOT 2020), or most recent edition, with a patching material from Virginia DOT's approved product list (Virginia DOT n.d.a) and providing a report in accordance with section D of this RFP.

  The report would include a table, along with a plan view of the concrete surface, showing the locations of the tests and correlating the test results with the test locations and the method of concrete powder extraction (coring and crushing versus powder sampling by hammer-drill).

- Reinforcement cover depth would consist of using magnetometers to determine the depth of cover and locations of steel reinforcement in concrete deck, substructure, and superstructure elements in accordance with BS 1881-204:1988 (British Standards Institution 1988). Recommendations on the use of electromagnetic cover meters (British Standards) and providing a report in accordance with section D of this RFP would also be included.

  The report would include a map of cover depths on a plan view and a detailed spreadsheet showing the location and depths of the reinforcing steel.

- Half-cell electrical potential tests would consist of performing half-cell potential (HCP) tests from the surface of a concrete element, recorded to the nearest 0.01 V, in accordance with ASTM C876-15 (ASTM 2022c) and providing a report in accordance with Section D:
    - The test procedure on a bridge deck was summarized in the following steps:
        - Lay out a 5-by-5-ft grid on the deck. Tests were to be conducted on a rectilinear 5-by-5-ft grid.
        - Locate the top reinforcing bar using a rebar locator (GPR or pachometer) at several points along the bridge deck. Separate tap points were required for each reinforced concrete segment and span separated by a joint/discontinuity of reinforcement.
        - Patch all tap locations with acceptable concrete materials from the Virginia DOT Approved Products List (Virginia DOT n.d.a) once testing is complete.
    - The report would include a topographic map of the deck, representative of the potential readings.
- Corridor study: A corridor study would include a minimum of 100,000 ft^2 for each mobilization. All work would be performed as a mobile operation, moving continuously, as defined in the latest edition of the *Virginia Work Area Protection Manual* (Virginia DOT n.d.b). The work would include a rapid-scanning, air-coupled GPR; automated acoustic sounding; high-resolution imaging; and a report of the information noted in each of the following sections and detailed in section D of this RFP for each structure:
    - Rapid-scanning, air-coupled GPR would consist of performing GPR scans in accordance with ASTM D6087-08(2015)e1 using a host vehicle capable of collecting data from the deck surface (ASTM 2022a).
    - The bridge deck would be cleaned before GPR testing if soil, aggregate, or other particulate debris was present.
    - The bridge deck would be tested in a dry surface condition.
    - The host vehicle would be equipped with a multichannel array of air-coupled (noncontacting) horn antennas with center frequencies of at least 1.0 GHz minimum, with 1.5–3.0 GHz preferred, or the system might employ step-frequency radar that covered at least this range.
    - Multiple passes would be used as needed to test the entire deck surface and obtain any overlap that may be needed based on the equipment and analysis used.

- Edges of the scan area would be no more than 1 ft from the face of the curb or parapet. The testing equipment would be integrated and synchronized with a distance-measuring instrument system or GPS.

- The test data would be analyzed for the distribution of clear concrete cover over the top mat of deck-reinforcing steel.

- The report would include a plan view(s) of the bridge showing apparent cover depths over the top mat of reinforcing steel, rectilinear locations of suspected delaminations, and a color topographic map of the collected data. Cover depths, delaminations, and data would be reported as independent topographic plans and layers. Top mat cover depth readings would also be tabulated in x-y-z format and reported in a spreadsheet, sorted by span and lane. The total quantity of delamination would be shown in a spreadsheet sorted by span and lane.

- Thresholds of the center frequency used for the evaluation would be documented for each deck.

- Automated acoustic sounding would consist of an array of excitation sources, acoustic sensors, and a data-acquisition device. The excitation sources and acoustic sensors would be spaced transversely at a maximum of 12 inches. The system would be capable of producing a map of a concrete bridge deck showing areas of delaminated concrete:

  - IE and proprietary automated acoustic systems would be allowed.

  - Edges of the sounded area would be no more than 1 ft from the face of the curb or parapet. The testing equipment would be integrated and synchronized with a distance-measuring instrument system or GPS.

  - Multiple passes would be used as needed to test the entire deck surface and obtain any necessary overlap based on the equipment and analysis used.

  - The report would include a plan view(s) of the bridge showing apparent delaminations in a rectilinear format and a color topographic map of the data collected. Delaminations and the data collected would be reported as independent topographic plans and layers. The total quantity of delamination would be shown in a spreadsheet sorted by span and lane.

  - High-resolution imaging would take high-resolution, digital images of the deck surface and be capable of displaying cracks of one-sixteenth of an inch or larger. The system would be capable of taking the images at night, and any light source would be positioned to avoid pointing at vehicular traffic:

    - Edges of the photographed area would be no more than 1 ft from the face of the curb or parapet. The testing equipment would be integrated and synchronized with a distance-measuring instrument system or GPS.

- Multiple passes would be used as needed to test the entire deck surface and obtain any necessary overlap based on the equipment and analysis used.

- The report would include a plan view(s) of the bridge linking the image location with its approximate location on the bridge deck.

Personnel Requirements

The following requirements were included in the 2018 Statewide Survey and Monitoring Deformation of Structures:

- The instrumentation manager would be a qualified person with at least 5 years of continuous documented experience in instrumentation and monitoring of the work mentioned in the SOW.

- All work would be performed under the direct supervision of a PE or land surveyor licensed in the Commonwealth of Virginia.

- All surveying work would be performed by or under the direct supervision of a surveyor who is licensed in Virginia as a land surveyor. All photogrammetry work would be performed by or under the direct supervision of a licensed survey photogrammetrist or a licensed land surveyor experienced in this field.

The following requirements were included in the 2023 statewide survey and monitoring deformation of structures:

- The instrumentation manager would be a qualified person with at least 5 years of continuous documented experience in instrumentation and monitoring of the work mentioned in the SOW.

- All work would be performed under the direct supervision of a PE or land surveyor licensed in the Commonwealth of Virginia.

- All surveying work would be performed by or under the direct supervision of a surveyor who is licensed in Virginia as a land surveyor. All photogrammetry work would be performed by or under the direct supervision of a licensed survey photogrammetrist or a licensed land surveyor experienced in this field.

- The candidates for engineer project manager and technical project manager should have significant experience in structural health monitoring. (This stipulation was added to the 2018 requirements).

For the 2023 Statewide On-Call Bridge Testing and Evaluation RFP, all personnel conducting evaluations and testing would be qualified to perform the work and would have received all prerequisite and statutorily required training and certifications required to perform the work. The certifications for personnel would be submitted to the contract administrator before beginning the work.

Virginia DOT also provided statewide requirements for personnel in the "Professional Services Class Groupings & Working Titles" section (Virginia DOT n.d.c).

Evaluation Criteria

The 2018 Statewide Survey and Monitoring Deformation of Structures used the following evaluation criteria:

- Firm or team experience with similar types of services (scale from 1–10 with a weight factor of 30 percent).
- Personnel's experience with similar types of services (scale from 1–10 with a weight factor of 35 percent).
- Qualifications of the project manager (scale from 1–10 with a weight factor of 10 percent).
- Organizational capability (scale from 1–10 with a weight factor of 15 percent).
- Present workload with department (scale from 0–10 with a weight factor of 10 percent).

The 2023 Statewide Survey and Monitoring Deformation of Structures used the following evaluation criteria:

- Firm or team experience with similar types of services (scale from 0–10 with weight factor of 25 percent).
- Personnel's experience with similar types of services (scale from 0–10 with weight factor of 40 percent).
- Qualifications of the project manager (scale from 0–10 with weight factor of 5 percent).
- Organizational capability (scale from 0–10 with weight factor of 20 percent).
- Present workload with department (scale from 0–10 with a weight factor of 10 percent).

For the 2023 Statewide On-Call Bridge Testing and Evaluation, the project would be awarded to the lowest qualified bidder.

Other Requirements

The following were also required for the 2018 and 2023 Statewide Survey and Monitoring Deformation of Structures proposals:

- Data collected on all instruments (raw data and final data) would be available for Virginia DOT via the Internet at all times.
- This work was to be accomplished using computerized design and drafting systems compatible with Virginia DOT's automated design and drafting systems.

For the 2023 Statewide On-Call Bridge Testing and Evaluation, no other requirements were specified in addition to State-specific items.

U.S. ARMY CORPS OF ENGINEERS

Overview

In 2022, the U.S. Army Corps of Engineers (USACE) released one indefinite delivery contract, also known as a single-award TO contract. The 2022 procurement was titled "Architect-Engineer (A-E) Structural and Mechanical Instrumentation, Monitoring and Analysis Services" and resulted in one awarded contract (USACE 2022). The 2022 contract value was $7 million for up to 5 years starting from the award date (a 3-year base term with two 1-year options).

Scope

Structural and mechanical instrumentation, monitoring and analysis services were primarily required for various Walla Walla District civil works projects. Projects would be primarily located within the States of Washington, Oregon, and Idaho; however, work could be assigned at other Northwestern Division USACE Districts (Seattle, WA; Portland, OR; Kansas City, MO; and Omaha, NE) that requested assistance. The work to be performed under this contract would consist of, but not be limited to, furnishing all necessary labor, materials, supplies, and equipment required for professional A-E services as defined in the contract and as specified by individual TOs. The scope of professional services would require experience and technical knowledge to include, but not be limited to, the following:

- Install instrumentation on structural gates, such as spillway, tainter, miter, lift, stoplogs, bulkheads, supporting frame members, and mechanical equipment, such as shafts, gear boxes, and bull gears. Instruments would be either temporarily or permanently installed. Typical readings to gather include stress, strain, torque, displacements, pressures, positions, rotations, and acceleration.

- Perform monitoring of structural and mechanical instruments. This monitoring required periodic reading of instrumentation data stored in dataloggers.

- Conduct analysis of the test results. The team conducting the analysis had to include at least one registered PE.

- Employ individuals to install instruments on structures or mechanical equipment that require climbing inspections who are Society of Professional Rope Access Technicians (SPRAT) Level I qualified. A SPRAT Level III individual had to be present for these types of operations, and the engineer manual (EM) 385-1-1, *USACE Safety Manual*, has to be followed at all times (USACE 2014).

- Receive and process data through automated data acquisition from more than 50 sensors simultaneously. Gathered datasets needed to be compatible with and presented in Microsoft Excel.

Personnel Requirements

The 2022 solicitation stated that the following requirements needed to be met at the time the proposal was submitted:

- The team conducting the analysis had to include at least one registered PE.

- Individuals installing instruments on structures or mechanical equipment that require climbing inspections would be SPRAT Level I qualified. A SPRAT Level III individual had to be present for these types of operations, and EM 385-1-1, *USACE Safety Manual*, had to be followed at all times (USACE 2014).

Evaluation Criteria

The primary evaluation criteria were as follows:

- Specialized experience and technical competence: The selected firm had to meet these criteria for the type of work discussed in the project information for the preceding 8 years.

- Professional qualifications: The selected firm had to have the professional qualifications necessary for satisfactory performance of required services and relevant experience in the structural and mechanical disciplines for instrumentation, monitoring, and analysis listed in the project information. The evaluation would consider A-E structural and mechanical instrumentation, monitoring, and analysis.

- Past performance: Past performance on contracts with government agencies and private industry in terms of cost control, quality of work, and compliance with performance schedules would be considered. Evaluations would be pulled from the U.S. Department of Defense (DoD) Past Performance Information Retrieval System based on the Data Universal Numbering System number for the prime and any subcontractors (U.S. DoD n.d.).

- Capacity to accomplish the work: The firm had to demonstrate its capacity to accomplish at least two $100,000 individual TOs simultaneously. Additionally, the firm had to demonstrate its capacity for rapid response actions for mobilization and short suspense dates for task completion.

- Demonstrated knowledge of civil works projects: The selected firm had to demonstrate knowledge of civil works projects similar to those of the Columbia, Lower Snake, and Clearwater Rivers.

The second evaluation criteria (used as tie-breakers for technically equal rated firms; therefore, firms should not have commingled submission of data related to those criteria with the primary criteria) were as follows:

- The extent of participation of small and disadvantaged businesses measured as a percentage of the total estimated effort. Firms were to indicate the estimated percentage involvement of each small business and small disadvantaged business firm on the team.

  Walla Walla District's overall small business goals for 2022 were 48.68 percent small business firms, 11.88 percent small disadvantaged business firms, 2.23 percent service-disabled veteran-owned small business firms, and 4.67 percent historically underutilized business zone small business firms.

- Geographic proximity to the primary assignment area of the States of Washington, Oregon, and Idaho.

- The volume of DoD contract awards in the last 12 mo, with the objective of effecting a fair distribution of DoD A-E contracts among qualified firms.

Other Requirements

The contractor was required to provide automated data acquisition to receive and process data from more than 50 sensors simultaneously. Gathered datasets needed to be compatible with and presented in Microsoft Excel.

CHAPTER 3. REVIEW OF RECENTLY PERFORMED SURVEYS

AASHTO TSP2 2022 MIDWEST BRIDGE PRESERVATION PARTNERSHIP

The AASHTO Transportation System Preservation Technical Services Program (TSP2) "2022 Midwest Bridge Preservation Partnership (MWBPP) NDE Experience Query" resulted in 15 responses from participating agencies.[1] The results informed the development of a panel discussion held at the 2022 MWBPP meeting in Lexington, KY, focusing on the application and challenges of implementing NDT&E in bridge preservation practices.

The survey findings revealed that all respondents (15 out of 15) considered using NDT&E for bridge deck evaluation, and two-thirds of respondents (10 out of 15) reported using NDT&E for steel inspection of fracture-critical structures. The survey also indicated that 4 out of 15 agencies reported that NDT&E for detecting deck delamination helps them better maintain and preserve their bridge assets more effectively.

Nearly all the respondents (14 out of 15) relied on contractors to perform NDT&E work, while approximately half (7 out of 15) also leveraged in-house expertise.

Slightly less than half of the respondents (6 out of 15) indicated their procurements focused more on the qualifications of the proposers, while only a few (2 out of 15) prioritized cost as the primary evaluation criterion. Another six respondents considered a balanced approach, weighing both qualifications and cost in their selection criteria.

KENTUCKY TRANSPORTATION CABINET 2016 NATIONAL BRIDGE NDE SURVEY

In 2016, the Kentucky Transportation Cabinet (KTC) conducted a national survey of State DOTs focused on the use of NDE for inspecting steel bridges. The survey aimed to understand State DOTs' practices and use of NDE for bridge inspections and examine how NDE findings are incorporated into the decisionmaking process. KTC received responses from 31 DOTs, although the number of responses to individual questions varied. The full results are documented in the report by Hopwood et al. (2016).

The following summary highlights key findings relevant to this study.

Penetrant testing (PT) and magnetic particle testing (MPT) were the most used NDE methods for routine steel bridge inspections. Ultrasonic testing (UT) was also widely reported, particularly for inspecting bridge pins. Most DOTs referenced the AASHTO/AWS D1.5 standard for steel weld inspections (AASHTO/AWS 2020) and ASTM standards for PT (ASTM 2021a), MPT (ASTM 2021b), and radiographic testing (RT) (ASTM 2024). ASNT certification was commonly required as a qualification for NDE personnel.

[1]Survey results shared by Shane Boone of the MWBPP Working Group through email on February 29, 2024.

Approximately 75 percent of respondents indicated that their DOTs used a combination of contract and in-house personnel to perform NDE services, while only 25 percent relied exclusively on in-house staff.

About 30 percent of responding DOTs reported using NDE as part of a structural monitoring program, with acoustic emission (AE) being the most used method for this purpose.

All responding agencies indicated that NDE results were used to inform followup actions, such as maintenance or repairs. While most DOTs expressed general satisfaction with the level of training and information available for NDE, a clear need was identified for uniform national standards and specifications, particularly related to the procurement of NDE services and the collection and analysis of NDE data.

CHAPTER 4. FHWA NDE SURVEY AND RESULTS

OVERVIEW

A review of recent surveys revealed that most focused primarily on the owner's perspective regarding the use of NDT&E technologies. However, there was limited information on why certain procurements were made or how those procurements were specified and evaluated.

To address this gap, the FHWA NDE Program developed a targeted survey consisting of up to 20 questions (the exact number varied depending on responses). The survey was distributed to the AASHTO TSP2 bridge preservation partnerships. The survey received 15 valid responses with information specifically related to NDT&E procurements.

SURVEY ANALYSIS

Survey Questionnaire

For the full questionnaire and survey results, please see appendix A.

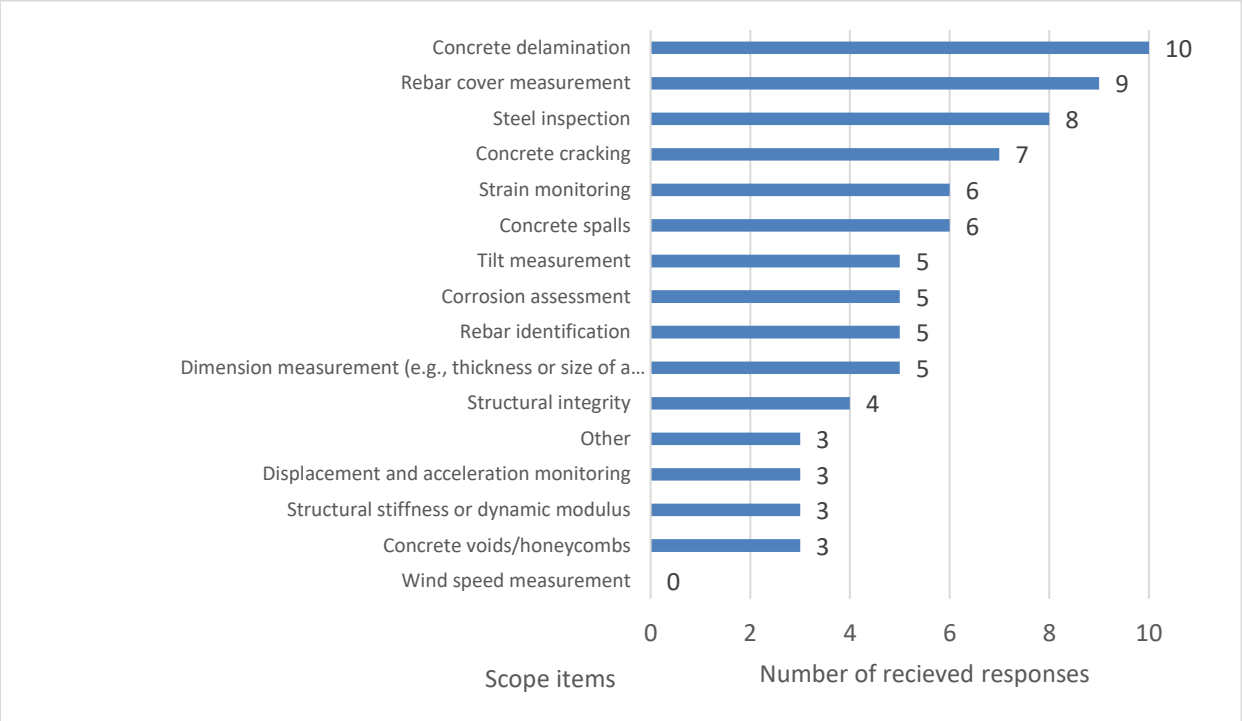
Participating Agencies

The analyzed responses were from the following agencies:

- Whatcom County Public Works, Washington.
- Virginia DOT.
- Wisconsin DOT.
- Arkansas DOT.
- City of Grand Junction, CO.
- Colorado DOT.
- North Carolina DOT.
- Hennepin County, MN.
- Indiana DOT.
- West Virginia DOT.
- Nevada DOT.
- KTC.
- Iowa DOT.
- Florida DOT.

Scope

Figure 1 summarizes the statistics for the scope items of the NDT&E procurement.



Source: FHWA.

Figure 1. Bar graph. Statistics for the scope of procurement.

The three responses for the "other" category were as follows:

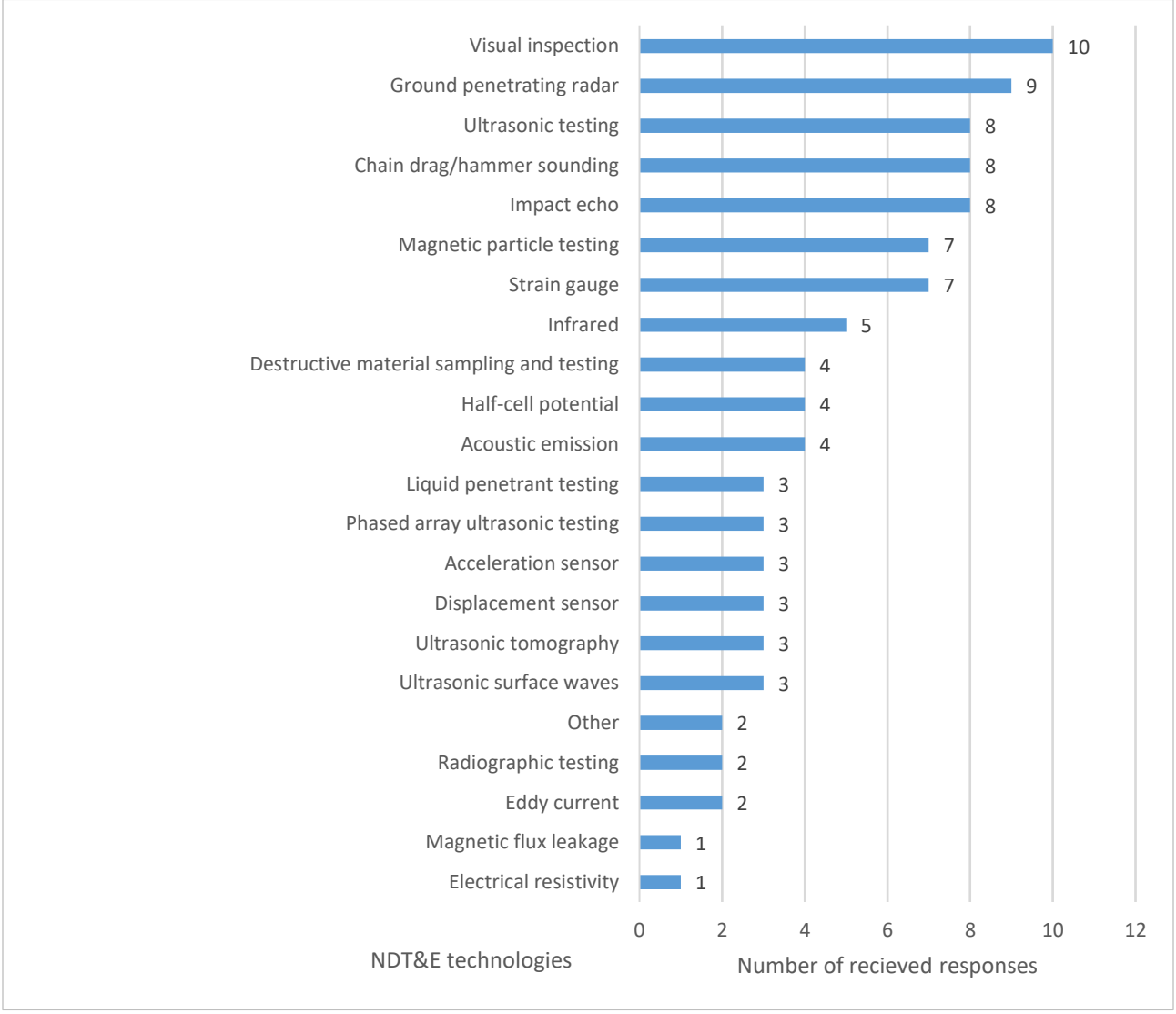
1. Engineering services for the unchecked, ongoing monitoring.
2. Scour monitoring.
3. Weld inclusions.

The top three scope items for NDT&E procurement were as follows:

1. Concrete delamination (10 out of 15).
2. Concrete cover measurement (9 out of 15).
3. Steel inspection (8 out of 15).

NDT&E Methods and Technologies

Figure 2 summarizes the statistics for the NDT&E methods and technologies used for the procurement.



Source: FHWA.

Figure 2. Bar graph. Statistics for the targeted NDT&E and structural monitoring (SM) methods and technologies.

The two responses for the "other" category were as follows:

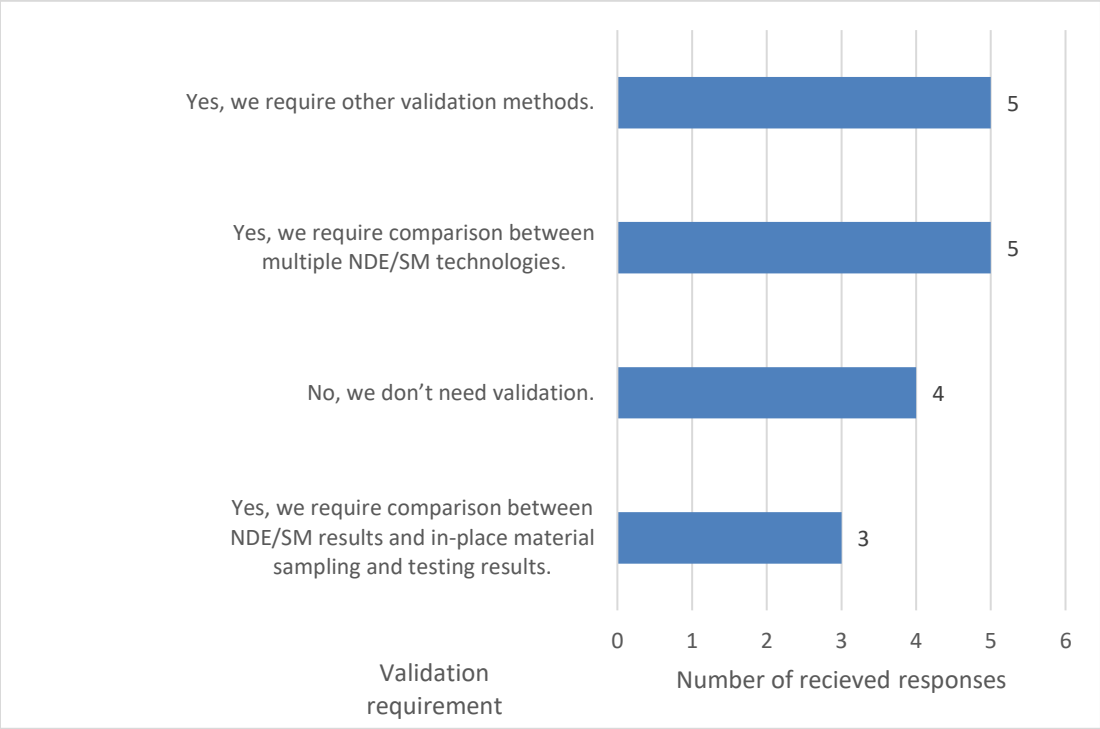
1. Petrographic analysis to investigate alkali-silica reactivity (ASR) potential within concrete.
2. Salt, automated mobile sounding, high-resolution photography.

The top three NDE methods and technologies were as follows:

1. Visual inspection (10 out of 15).
2. GPR (9 out of 15).
3. UT (8 out of 15).

Validation Requirements

Figure 3 summarizes the statistics for the validation requirements of the NDT&E results.



Source: FHWA.

Figure 3. Bar graph. Statistics for the validation requirements.

The five responses for the "other validation methods" category were as follows:

1. All results are subject to quality review by the department.
2. It depends. We have required in-situ verification by a different technician for some UT.
3. Technician qualification testing using FHWA flaw plates.
4. May use comparison to other testing.
5. Something we will consider in future.

Most agencies require some sort of results validation (11 out of 15), either a comparison across different NDE and SM technologies (5 out of 15), a comparison against in-place material sampling and testing (3 out of 15), or other methods (5 out of 15).

Procurement Requirements

The survey reported five responses that specified procurement requirements for NDT&E services or equipment:

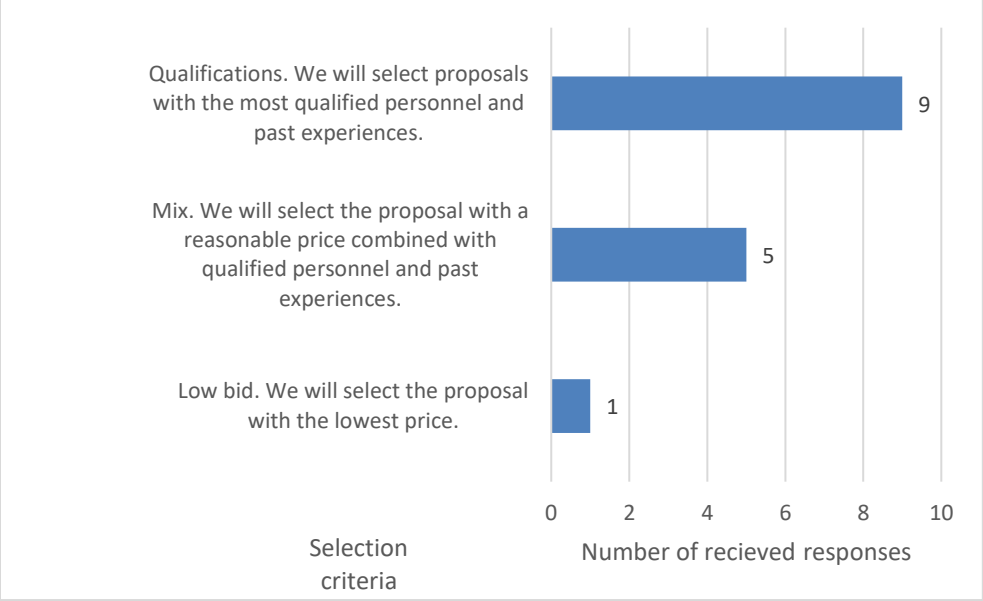
1. There is a contract with specifications for each pay item.
2. Depends on each project requirements.
3. Information on the time and weather at testing.
4. UT, MPT, PT, RT. We procure for steel inspection at the plant and posttensioning operations at the plant*, along with UT of pin bridges.
5. Dependent on work. Have specified methods for concrete testing.

*This response is likely for fabrication inspection.

Most agencies (10 out of 15) do not add specific requirements to their NDT&E procurements.

Selection Criteria

Figure 4 summarizes the statistics for the NDT&E procurement selection criteria.



Source: FHWA.

Figure 4. Bar graph. Statistics for the selection criteria.

Most agencies (9 out of 15) prefer to select vendors with the most qualified personnel and past experience.

A moderate number of agencies (5 out of 15) balance the selection with price. The five responses for the mixing factors were as follows:

1. It depends. Case-by-case basis. Generally, if it is not the low bid, it is closer to 20 percent price, 40 percent qualifications, and 40 percent past experience.

2. Unknown weights, categories were responsiveness of the submittal to the RFP, understanding of the project and objectives, experience and demonstrated capability, strategy and implementation plan, references, and fees.

3. Each project is different. If it is a common, simple NDE, it is more favored to the low bid. If it is more technical, then personnel and past experience are weighted more.

4. Not sure if we have used specific weights and percentages. We make sure the firm has adequate qualifications and experience, and we negotiate the time and fee, as appropriate.

5. It's not exactly the way you describe for us. We have both nonprofessional services contracts (low bid) and separate professional services contracts, which are awarded based on qualifications.

Few agencies (1 out of 15) decide the selection only based on the lowest price.

The survey received 12 valid responses for specific requirements:

1. Past experience, qualifications.

2. Very few minimum qualification requirements, but vendors lacking acceptable qualifications have been rejected. Most qualifications use general language. Vendor must use a qualified bridge inspector in the State of Wisconsin.

3. Similar projects and ASNT Certification for NDT.

4. We did not have specific qualification requirements, other than three references from similar projects.

5. Particular certification levels in the techniques to be used.

6. Required previous experience with deep steel girder NDE and SM services.

7. Consultants with extensive experience in testing required, consultants with DOT work experience.

8. AASHTO/AWS D1.5 (AASHTO/AWS 2020).

9. ANSI, State ANSI standards.

10. Level II or Level III in accordance with ASNT SNT-TC-1A (ASNT 2024) or ANSI/ASNT CP-189 (ASNT 2020).

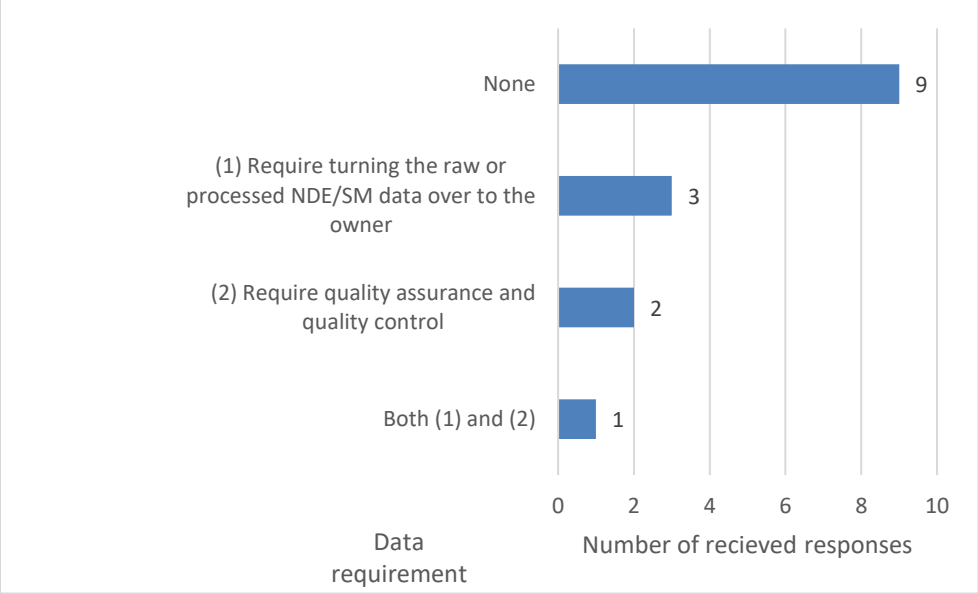
11. Experience with the test method, similar experience, experience of project manager and team.

12. Past experience based on resume.

The survey results show that most agencies specify requirements for the qualifications and past experience of vendors. Enforcing testing standards in place is common for steel inspection, but less so for concrete inspection.

Data Requirement in Procurement

Figure 5 summarizes the statistics for the data submittal and QA and QC requirements.



Source: FHWA.

Figure 5. Bar graph. Statistics for data requirements in procurement.

Most agencies (9 out of 15) do not specify any data requirements in their procurement contracts. A few agencies either require turning the raw or processed NDE data over to the owner (3 out of 15) or require QA and QC (2 out of 15). Very few agencies require both (1 out of 15).

Regarding the data format, the survey only received three responses:

1. Spreadsheet.
2. Microsoft OneDrive®.
3. Report.

Other Requirements

The survey received two responses for additional qualifications or requirements:

1. We have required performance testing for UT of butt welds.
2. ANSI Level III for oversight and ANSI Level II for inspections.

SURVEY SUMMARY

The survey results revealed common scopes that motivated agency procurements. For NDT&E, the most reported scopes were concrete delamination, rebar cover measurement, and steel inspection. For SM, the most reported scopes were monitoring of strain and tilt.

The survey also indicated that the most reported NDT&E methods were visual inspection, along with GPR and UT. GPR is a common NDT&E method for concrete inspection, including rebar mapping and rebar cover measurement, and UT is used for multiple steel inspections, including testing of pins and hangers, welded connections, thickness, and other steel properties. The survey revealed that, as a simpler and less sophisticated NDT&E method compared to others, chain drag and hammer sounding was the fourth most popular NDT&E method.

Most State DOTs and agencies (11 out of 15) required validation of the NDT&E services, either by comparison across different NDT&E technologies, comparison against in-place material sampling and testing, or via other methods.

Most State DOTs and agencies (10 out of 15) did not set specific requirements for NDT&E methods or equipment, but instead identified structure and material degradation they wished to be detected (e.g., delamination). Often, the requirements varied from project to project.

Qualifications and past experience were the primary factors that most State DOTs and agencies (9 out of 15) considered for procurement selection. Few State DOTs and agencies (1 out of 15) chose low bids for NDT&E services. Some State DOTs and agencies (5 out of 15) also considered mixing factors to balance costs and qualifications to provide the best value to the agency. However, there were no consistent weighting factors across State DOTs or agencies.

Commonly required personnel certifications included registered PE for the primary team leader and ASNT Level II or III for technicians. State DOTs and agencies normally enforce testing standards are in place during procurement, such as AASHTO, American Concrete Institute (ACI), ASTM, and ASNT.

Very few State DOTs and agencies (2 out of 15) specified QA and QC on NDT&E data collection, and 3 out of 15 required contractors to turn over the raw or processed NDE and SM data. The primary deliverable of the procurement was still in the form of reports.

CHAPTER 5. IN-DEPTH INTERVIEWS

DISCUSSION

The review of the procurement document, existing survey, and FHWA NDE survey indicated the following:

- Most State DOTs and agencies (10 out of 15) did not specify requirements on the NDT&E methods and equipment in the NDE procurement. Information is needed to understand if State DOTs and agencies have prior knowledge regarding the relationship between the scope and NDT&E methods and technologies or if their preference is to identify the typical degradation types of interest to them and let NDT&E service providers choose suitable methods to detect and measure those types of degradation.

- Qualifications and past experience were the primary factors for procurement selection. Information is needed to understand how State DOTs and agencies assess qualifications and past experience.

- Personnel qualification required a registered PE for the primary team leader and ASNT Level II or III for engineers or technicians. However, the current ASNT certification primarily focuses on steel inspection:

    - Information is needed to understand how State DOTs and agencies specify personnel requirements for this type of inspection.

    - Information is needed to understand why a PE license is required for NDT&E, while most of the work does not require an engineering stamp for submittal.

- State DOTs and agencies would enforce having testing standards in place for the procurement:

    - Information is needed to understand if State DOTs and agencies prefer to set the requirement of relevant testing standards by themselves or to have the testing standards followed during work provided by the NDT&E service providers.

    - Inputs and suggestions are needed about whether the information provided by FHWA InfoTechnology™ (FHWA n.d.b) is sufficient if State DOTs and agencies prefer to set the requirement of relevant testing standards.

- Very few State DOTs and agencies (2 out of 15) specified QA and QC on NDT&E data collection, and 3 out of 15 required contractors to turn over the raw or processed NDT&E data:

    - Information is needed about whether State DOTs and agencies see value in promoting data requirements in procurements.

    - Inputs and suggestions are needed about how to set data requirements in procurement.

IN-DEPTH INTERVIEW QUESTIONS

The discussions suggested that the following questions be addressed through interviews with State agencies. The estimated time was approximately 15–30 min per interview:

- How does your agency set the scope of procurement for NDT&E services? Do you specify a particular NDT&E technology within a SOW, or do you prefer to have the proposers present their options and methods to detect or measure the degradation mechanisms that you have identified and plan to resolve?

- How does your agency set relevant testing standards in the procurement? Do you specify a particular testing standard for the SOW to be procured, or do you prefer to have the proposers present their options?

- How does your agency assess the qualifications and past experience of a service provider? Do you feel the criteria you have used in the past are adequate, if you have set some criteria in the past? Have you observed any challenges or difficulties in assessing the qualifications and past experience of a service provider?

- How does your agency set personnel requirements (e.g., ASNT Level II or III) for NDT&E procurements? If you have not set any personnel requirements in the past, what challenges have you observed that were likely related to the personnel requirements? Do you feel that including additional personnel requirements is feasible to address these challenges?

- Does your agency see value in adding additional requirements for NDT&E data? For example, raw data should be provided in an accessible format to the agency.

IN-DEPTH AGENCY INTERVIEWS

The research team conducted in-depth interviews with the following nine agencies:

- Arkansas DOT.
- Indiana DOT.
- Iowa DOT.
- Louisiana DOTD.
- Minnesota DOT.
- Texas DOT.
- Utah DOT.
- Virginia DOT.
- Wisconsin DOT.

Appendix B contains the full results from the in-depth interviews.

INTERVIEW SUMMARY

The in-depth interviews provided additional information regarding how State DOTs set the scope for procurement, reinforce relevant testing standards, evaluate vendor qualifications, and value the raw data submissions.

The scope and structure of NDT&E procurement are often shaped by the State DOT's level of experience. When a DOT has prior experience with a particular testing method or technology and confidence in its effectiveness, it typically specifies that method directly in the procurement documents. This choice ensures consistency with past practices and leverages proven solutions. Conversely, when a DOT lacks familiarity or has limited in-house expertise, it tends to rely more on vendor input and recommendations to identify the most appropriate testing approach. In many cases, a discussion occurs between the agency and the vendor. To further support informed decisionmaking, DOTs also refer to published literature and FHWA's InfoTechnology (FHWA n.d.b) platform for guidance on selecting suitable technologies. For the testing standards, the interviewed State DOTs normally reinforce available testing standards in place, mostly ASTM standards. However, State DOTs are aware that not all NDT&E methods have a testing standard. Such a gap in testing standards presents a challenge, as different vendors may provide different results for the same testing method.

Virginia DOT, Wisconsin DOT, and Louisiana DOTD have statewide standard guidelines or policies in place to evaluate vendor qualifications. Other interviewed State DOTs may face challenges in assessing vendor qualifications. The PE requirement is often a statewide requirement for procuring engineering services. Evidence of a PE can show that a vendor understands the practices and standards in a State.

Most interviewed State DOTs do not request raw data submissions due to a lack of sufficient human resources to analyze the raw data. Instead, State DOTs typically request processed data and are aware of the risk in data quality if the data are solely based on the vendor's data analysis. To mitigate the risk, some State DOTs may contract the task of data analysis to an independent vendor. Some State DOTs may also request sample raw data and intermediate data analysis steps as part of the final report for QC.

CHAPTER 6. A FRAMEWORK FOR NDT&E PROCUREMENT

This study aimed to develop a framework to reflect common mechanisms used in the current practice of State DOTs and agencies for procuring NDT&E services. The review of an array of existing procurement documents indicated that each procurement solicitation often contained requirements for local laws and practices that were specific to a State DOT or agency. These requirements included, but were not limited to, conflict of interest, State travel policies, insurance, or other State-specific items. Because these local requirements were likely independent of the technical objective and scope of the solicitation, this framework purposefully excluded these State-specific mandates.

Based on the review of existing surveys, the results of the FHWA NDE program survey, and the results of in-depth interviews, this study identified the following non-State-specific requirements to be considered in procurements of NDT&E services:

- Procurement method.
- General process and timeline.
- SOW and deliverables.
- Data ownership, format, storage, analysis, and reporting.
- Testing standards and best practices.
- Vendor qualifications:
  - Relevant experience.
  - Minimum personnel requirements.
- Evaluation criteria.
- Quality management.
- Budget estimation method.

PROCUREMENT METHOD

Generally, the procurement method varies across agencies. Available methods may include RFPs, requests for qualifications (RFQs), invitations for bids (IFBs), and requests for information (RFIs). Agencies should choose the best-suited method(s) based on their experience and needs.

An RFP is a document that outlines the procurement process, serves as the foundation for final proposals, and may ultimately become part of the contract (National Archives and Records Administration 2002). An IFB is similar to an RFP; however, it typically results in the selection of the bidder offering the lowest price (Federal Transit Administration 2023). An RFQ is issued by the owner during phase I of a two-phase selection process. An RFQ provides enough detail about the project to help potential offerors decide whether to participate and serves as the basis for evaluating qualifications to identify the most highly qualified candidates (National Archives and Records Administration 2002). Similar to an RFQ, an RFI is primarily used to gather information about potentially qualified contractors.

GENERAL PROCESS AND TIMELINE

The procurement process generally begins with an RFP, IFB, RFQ, or RFI. Service providers prepare and submit their proposals by the posted due date, in accordance with the agency's standard procurement practices. Agencies should review and evaluate all proposals, followed by an announcement of award and contracting. Based on feedback from agencies and stakeholders consulted during this project, the entire procurement process typically takes between 3 and 6 mo, depending on the complexity and internal approval procedures.

SOW

The SOW should typically require vendors to provide measurements, including locations and quantifications, of physical properties or structural distresses or identify cause(s) of structural distresses. Typical examples of measurable physical properties or structural distresses to be included in a SOW are as follows:

- Concrete delamination.
- Concrete cracking.
- Concrete spalls.
- Concrete voids and honeycombs.
- Concrete strength.
- Rebar cover measurement.
- Rebar corrosion assessment.
- Steel corrosion.
- Steel cracking.
- Steel section loss.
- Structural dimension measurement.
- Structural stiffness and dynamic modulus measurement.

To address the requested SOW, the procurement can be performance-based, prescriptive, or a mix of both, which have been commonly exercised by State DOTs.

Performance-based procurement could solicit vendors to propose their recommended methodology or technology for the requested SOW. This option is suitable when an agency has limited experience with the SOW.

Alternatively, when an agency has good experience with a set of NDT&E technologies, the agency can exercise the prescriptive procurement, which specifically requests one or more testing methods or technologies that may include the following:

- Acoustic methods (e.g., IE, impulse response (IR), and ultrasonic tomography).
- Electromagnetic methods (e.g., GPR, IRT, and magnetic flux leakage (MFL)).
- Electrochemical methods (e.g., HCP, electrical resistivity (ER), and galvanic pulse).

- Visual methods (e.g., high-resolution imaging, photogrammetry, and 3D-modeling).

- Structural monitoring methods (e.g., strain, acceleration, vibration, or tilt measurements), if necessary.

The prescriptive procurement highly depends on an agency's expertise and experience, which may vary across agencies. The research team recommends using FHWA InfoTechnology as a tool for technology screening and selection (FHWA n.d.b). Agencies may also conduct literature reviews as a method for technology searches.

The technology selection could be made per TO, and agencies can discuss the technology selection with vendors as part of the process for developing scope items. Other options could include procuring services to include a specific technology (e.g., GPR to identify rebar cover) or a set of technologies to be excluded if TOs are not preferred.

Templates for drafting a SOW and gathering project requirements are available in the appendixes of the NCHRP report (Lines et al. 2025).

DELIVERABLES

Deliverables can vary based on the SOW. Depending on their expertise and experience, agencies may either specify the exact deliverables required to meet their needs or allow service providers to propose appropriate deliverables based on the defined SOW. At a minimum, deliverables should include the following:

- Executive summary of procedures and equipment used (including calibration methods and dates), tasks completed, names and qualifications of personnel who performed the testing, dates of testing and environmental conditions during testing, and condition assessment findings.

- Modifications or deviations from standard test methods.

- Condition assessment description and narrative.

- Summary chart of total quantities with units (e.g., square foot or linear foot) by defect per span and structure totals.

- Simplistic plan views of the element tested to scale using contour maps (or similar) to identify the locations and severity of deterioration or indications, distributions of rebar cover, or other items tested.

- Representative photographs.

- Conclusions and recommendations, if reasonably obtained from the measurements and subsequent analysis performed.

Agencies should consider requiring all deliverables, including data, in electronic formats that are easy to access, for example, without the need for special proprietary software to view, edit, and comment.

VENDOR QUALIFICATION

Agencies should evaluate a vendor's nontechnical and technical qualifications for the procurement. This recommendation is to ensure safety and timely, competent, and high-quality execution of work.

For nontechnical qualifications, agencies should evaluate a vendor's capacity to complete the requested SOW on time (e.g., team members, equipment, and schedule). The vendor should also explicitly explain in the proposal how its past relevant experience and task management demonstrate its ability to complete the requested SOW. During the in-depth interviews, agency representatives reported experience as an important factor in vendor evaluation. A reported evaluation criterion of experience for bridge inspection could be the square footage of deck areas that have been scanned using the requested testing methods. The number of years with relevant testing experience could also be included as a measurement for evaluating the experience qualification of a vendor or key personnel.

For technical qualifications, agencies should evaluate the qualifications of a vendor's key technical personnel for the requested SOW. Agencies should consider accredited certification programs for personnel qualification. Commonly reported certification programs include ASNT NDT Level II and III certifications. The ASNT NDT Level II certification examines a technician's qualification for conducting MPT, PT, RT, UT, and visual testing (VT). The ASNT NDT Level III certification is for examining AE, electromagnetic testing (ET), IR, leak testing (LT), MFL, MPT, PT, RT, UT, and VT. The ASNT certifications are mostly designed for steel inspection, and the certification may also apply to GPR and IR inspection of concrete. For other concrete inspection and testing outside of GPR and IR, alternative personnel qualification may consider a manufacturer's training certificates (e.g., IE); validated in-house standard operating procedures; in-house training programs; NHI training certifications; or other QA methods, such as independent validation or verification studies, as described previously. The research team is aware that ACI is in the process of developing certification programs for concrete NDE. The research team is also aware that New York State DOT has its own certification program for UT, which requires the examinee, holding an ASNT Level III for UT, to pass the exam administered by New York State DOT.

Agencies may require a PE for the primary engineer or team manager of a vendor. Normally, states require a licensed PE for procuring engineering services. Evidence of PE certification may help prove a vendor's qualification in understanding the practices and standards in a State, as reported by agency representatives during the in-depth interview. Architectural and engineering related services are professional services of an architectural or engineering nature, as defined by State law. Requirements to perform engineering work are based on licensing and procurement laws of the State.

QUALITY MANAGEMENT

Agencies should incorporate a comprehensive quality management approach, including QA and QC, as part of the procurement process to ensure data validation, repeatability, and reliability. As noted by agency representatives during the in-depth interview, evaluating a vendor's quality management practices is a critical component of the procurement process. Agencies may require service providers to submit a quality management plan that outlines the overall framework for maintaining quality, including specific QA procedures (e.g., adherence to standards, personnel training, and process validation) and QC procedures (e.g., review a subset of NDT&E data and verification testing).

To promote transparency and reduce bias, agencies may require independent third-party validation of vendor results. In addition, where feasible, agencies may procure a demonstration project at a small scale, such as testing on a single bridge deck, to assess the effectiveness of the vendor's QA and QC measures before full deployment.

DATA OWNERSHIP, FORMAT, STORAGE, ANALYSIS, AND REPORTING

Agencies should claim ownership of any data collected through the procurement to ensure long-term availability, support QA, and build institutional knowledge. Data ownership empowers agencies to independently validate vendor results, enhance transparency, and promote vendor accountability. To support data usability, agencies should require that all data be delivered in nonproprietary file formats (e.g., CSV, DICONDE, JSON), which ensures interoperability and long-term use without relying on vendor-specific software.

Given that many agencies may lack the internal resources to store, manage, or analyze large volumes of NDT&E data, they can require vendors to submit a representative data sample and documentation of intermediate analysis steps as part of the final report. These analyses should follow recognized standards (e.g., ASTM, ASNT, AASHTO, ACI, AWS, International Organization for Standardization (ISO)) or include a clear justification when alternative methodologies are used. This requirement allows vendors to demonstrate their proficiency and build confidence in the validity and reliability of their results.

To further mitigate the risk of biased or inaccurate analysis, agencies are encouraged to take several steps. They should request evidence of past performance from vendors, demonstrating that their results are consistent and well-correlated with ground-truth validation. In addition, agencies may choose to procure independent validation services, such as core sampling or chain-drag testing, to independently verify the vendor's findings. Another strategy is to include teaming requirements in the procurement, promoting collaboration between multiple vendors, where one may be responsible for data analysis and another for providing independent verification.

As part of the project deliverables, agencies should require vendors to submit raw data, processed data, and accompanying metadata. The metadata should include, at a minimum, the date and time of data collection, the name of the individual who collected the data, the location, the testing equipment used, weather conditions, and any other relevant contextual information necessary to understand and interpret the data.

Additionally, vendors should be required to store all collected data for a minimum of 3 years following the final submission and ensure it is readily accessible to the agency on request. While storage fees may apply, agencies should weigh these costs against the critical value of maintaining data accessibility for future use, validation, and infrastructure monitoring.

TESTING STANDARDS AND BEST PRACTICES

Agencies should outline, where possible, the testing standards such as ASTM, ASNT, AASHTO, ACI, AWS, and ISO standards, as well as data-collection protocols, including the FHWA Long-Term Bridge Performance protocol that vendors should follow (Hooks and Weidner 2016). Using standards and protocols increases the reliability and repeatability of the analysis. In cases where no testing standards or protocols are available, vendors should enclose their best practices and policies for the requested SOW.

Appendix C provides a list of testing standards for typical NDT&E.

EVALUATION CRITERIA

Evaluation criteria provide a clear, consistent, and objective framework for selecting qualified vendors. The criteria also allow agencies to identify vendors who are most capable of meeting project requirements and reducing the risk of poor performance, delays, or cost overruns. The evaluation of a proposal may vary across agencies' needs and expectations. Generally, the evaluation should consider the following items, with a weighting factor applied to each according to the agency's preference:

- The firm's experience on similar projects, preferably projects performed in the agency's region.
- Proposed testing methods and quality management plan.
- Staff qualifications and experience with the proposed testing methods.
- Equipment ownership.
- Testing schedule, including the need for lane closures.
- Current workload.
- The firm's location.
- Cost. The literature review, survey, and in-depth interviews with agency representatives have shown that cost is typically a minor factor in evaluation criteria.

Templates for scoring RFPs, proposal evaluation, and cost evaluation are available in the appendixes of the NCHRP report (Lines et al. 2025).

BUDGET ESTIMATION METHOD

Agencies should estimate the budget for TOs based on historical data from similar projects and market research, when available. Typically, labor and indirect rates are negotiated at the master contract level, while detailed estimates for scope, schedule, and budget are developed individually for each TO.

To help ensure that testing durations are met as planned, agencies may consider including liquidated damages provisions in the contract. This provision can serve as an effective mechanism to reinforce schedule adherence and reduce the risk of delays.

CHAPTER 7. AN EXAMPLE SOLICITATION FOR NDT&E

This chapter provides sample language and information that may be used to develop a solicitation for procuring NDT&E services. Agencies should remove nonapplicable portions and modify the example language to fit their legal requirements and needs for specific procurements.

INTRODUCTION

The objective of this solicitation is to identify a qualified firm or a team of firms to provide consulting and/or testing services to evaluate and monitor transportation structures within the agency's jurisdiction. These structures may be composed of concrete, steel, timber, or other structural materials and can vary in geometry, size, and structural condition. The selected consultant (referred to as the Consultant throughout this document) will perform services covered by an Indefinite Delivery/Indefinite Quantity (IDIQ) contract or similar mechanism. Depending on the agency's in-house capabilities, the agency may request testing, data analysis, or both.

Each task order (TO) issued under the contract will define the specific scope of work (SOW), schedule, and compensation applicable to that TO. The Consultant shall perform the work in accordance with the requirements outlined in this advertisement and the resulting contract, including any TOs issued under it. Unless otherwise specified in an individual TO, all deliverables shall be provided in the format described in the following sections.

SCOPE OF SERVICES

The Consultant should demonstrate its capability to provide nondestructive testing and evaluation (NDT&E) services to test for the following items:

- Concrete:
  - Deficiency location and size:
    - Delamination.
    - Spalls.
    - Honeycomb and voids.
    - Cracking.
  - Strength.
  - Stiffness or dynamic modulus.
  - Rebar cover.
  - Dimensions (thickness or size of member).
  - Corrosion (probability or potential).
- Timber:
  - Integrity.
  - Moisture.
- Steel:
  - Deficiency location and size:
    - Corrosion.
    - Cracks.

- Weld flaws (porosity, slag, lack of fusion, cracking, etc.).

The Consultant shall propose appropriate technologies to be used for the requested testing services. Proposed technologies should minimize the need for traffic control. If traffic control is required, it shall be the Consultant's responsibility to provide and implement it in accordance with the latest edition of the *Manual on Uniform Traffic Control Devices*. Lane closures shall be limited to what is absolutely necessary and should be scheduled during off-peak hours to minimize disruption to traffic flow. The Consultant must also provide all necessary equipment to complete the requested testing services.

DELIVERABLES

At a minimum, deliverables should include the following:

- Executive summary of procedures and equipment used (including calibration methods and dates), tasks completed, names and qualifications of personnel who performed the testing, dates of testing and environmental conditions during testing, and findings.
- Modifications or deviations from standard test methods.
- Condition assessment description and narrative.
- Summary chart of total quantities (e.g., square feet by defect per span) and structure totals.
- Simplistic plan views of the element tested to scale, using contour maps (or similar), identifying the locations and severity of deteriorations or indications, distributions of rebar cover, or other items tested.
- Representative photographs.
- Conclusions and recommendations that were obtained by rigorous reviews of the measurements and subsequent analysis performed.

QUALIFICATIONS

In the proposal, the Consultant shall demonstrate its capability to complete the requested SOW in a timely manner, providing evidence from its management of equipment, logistics, workload, etc. This evidence should come in the form of project examples completed for this agency or similar work performed for other agencies.

The Consultant shall enclose contact information to reference its past work experience with the agency. If short-listed, reference letters will be requested. The reference letters shall address the number of units (e.g., square footages of deck areas) that have been scanned using the requested testing methods.

The Consultant shall demonstrate that its key personnel meet the following criteria:

- At least one project manager or team leader who will directly work on the contract shall be a registered PE in the agency's locale. No PE license may be required for Federal agencies.

- At least one project manager or team leader who will directly work on the contract shall have a minimum of 10 years of experience in responsible charge of NDT&E.

The Consultant shall include documentation of any certifications or training programs relevant to the testing methods and technologies proposed. For steel inspections, American Society for Nondestructive Testing Level II certification or equivalent is required.

QUALITY MANAGEMENT

In the proposal, the Consultant should demonstrate its capability to perform repeatable NDT&E testing and provide reliable results for those services. This information should include examples of previous validation and verification by independent parties, as well as suggested methodologies for validation and verification of results by a third party. The Consultant shall include a summary of its quality assurance, quality control (QC), and safety plan for the requested work.

DATA OWNERSHIP, FORMAT, STORAGE, AND ANALYSIS

The agency has unlimited rights to all documents, materials, and data produced under this TO All documents, data, and materials, including the source code of any software or analysis tools produced under this TO, shall be agency owned and the property of the agency, with all rights and privileges of ownership and copyright belonging exclusively to the agency. These documents, data, and materials may not be used or sold by the Contractor without written permission from the agency. All materials supplied to the agency shall be the sole property of the agency and may not be used for any other purpose. This right does not abrogate any other agency rights. Copyrighted materials shall not be used unless permission is obtained and unlimited and irrevocable rights are provided to the agency.

The Consultant is required to submit a data management plan detailing the procedures for data submissions and storage. The data submissions should include all raw, metadata (organization and description of the collected data), and processed data files. The metadata includes, but is not limited to, the date and time of data collection, name of the person collecting the data, location, testing equipment used, weather conditions, and any relevant information that may have affected the collected data. All data submissions should be in electronic formats that are easy to access, for example, without the need for special proprietary software to view, edit, and comment. Examples of accessible and nonproprietary data file formats include CSV, DICONDE, and JSON. Unless stated otherwise, the Consultant is required to store all data submissions for at least 3 years from the date of final data submission.

The Consultant is required to enclose a data analysis plan that clearly indicates the approach that will be used and assumptions that will be made throughout the data analysis. In the project report, the Consultant is required to include examples and intermediate steps to demonstrate how the data analysis plan has been executed.

TESTING STANDARDS

The Consultant shall perform work according to applicable ASTM International (ASTM), American Association of State and Highway Transportation Officials (AASHTO), American Concrete Institute, American Welding Society (AWS), and the International Organization for Standardization standards and data-collection protocols for the requested testing services.

When applicable, the Consultant shall demonstrate that its practices comply with the following testing standards or protocols, or the most recent updates to these standards or protocols:

- ASTM D4580. *Standard Practice for Measuring Delaminations in Concrete Bridge Decks by Sounding* (ASTM 2018).
- ASTM C1383. *Standard Test Method for Measuring the P-Wave Speed and the Thickness of Concrete Plates Using the Impact-Echo Method* (ASTM 2022d).
- ASTM C597. *Standard Test Method for Ultrasonic Pulse Velocity Through Concrete* (ASTM 2023a).
- ASTM D6432. *Standard Guide for Using the Surface Ground Penetrating Radar Method for Subsurface Investigation* (ASTM 2019).
- ASTM D6087. *Standard Test Method for Evaluating Asphalt-Covered Concrete Bridge Decks Using Ground Penetrating Radar* (ASTM 2022a).
- AASHTO R 37. *Standard Practice for Application of Ground Penetrating Radar (GPR) to Highways* (AASHTO 2022).
- AASHTO PP 98. *Standard Practice for Asphalt Surface Dielectric Profiling System Using Ground Penetrating Radar* (AASHTO 2023).
- ASTM C1740. *Standard Practice for Evaluating the Condition of Concrete Plates Using the Impulse-Response Method* (ASTM 2024a).
- ASTM C1876. *Standard Test Method for Bulk Electrical Resistivity or Bulk Conductivity of Concrete* (ASTM 2023b).
- ASTM C876. *Standard Test Method for Corrosion Potentials of Uncoated Reinforcing Steel in Concrete* (ASTM 2022c).
- ASTM D4788. *Standard Test Method for Detecting Delaminations in Bridge Decks Using Infrared Thermography* (ASTM 2022b).

- ASTM E709. *Standard Guide for Magnetic Particle Testing* (ASTM 2021b).
- ASTM E1417. *Standard Practice for Liquid Penetrant Testing* (ASTM 2021a).
- ASTM E1742. *Standard Practice for Radiographic Examination* (ASTM 2024b).
- AASHTO/AWS D1.5/D1.5M. *Bridge Welding Code* (AASHTO/AWS 2020).
- ASTM E164. *Standard Practice for Contact Ultrasonic Testing of Weldments* (ASTM 2024c).
- ASTM A435/A435M. *Standard Specification for Straight-Beam Ultrasonic Examination of Steel Plates* (ASTM 2023c).
- ASTM E2700. *Standard Practice for Contact Ultrasonic Testing of Welds Using Phased Array* (ASTM 2020)*s*.
- FHWA-HRT-16-007. *Long-Term Bridge Performance Program Protocols, Version 1* (Hooks and Weidner 2016).

In cases where no testing standards are available, the Consultant shall propose, in sufficient detail to allow the agency to evaluate its approach, its detailed procedures and test parameters for execution and QC of specific tests to achieve the stated objective.

EVALUATION CRITERIA

The following items may be identified in a solicitation evaluation section:

- The firm's experience on similar projects, with a preference for projects performed at the agency's locale.
- Proposed testing methods and quality management plans.
- Staff qualifications and experience with the proposed testing methods.
- Project schedule (duration and the need for lane closures).
- Equipment and logistics.
- Current workload.
- Location of the firm.
- Cost.

APPENDIX A. FHWA NDE PROGRAM SURVEY AND RESULTS

Survey title: Procurement of NDE or SM service.
Received 28 responses. Average time to complete: 11 min and 5 s.

Question 1: Your Name.
Received 28 responses.

Question 2: Your position title.
Received 28 responses.

Question 3: Contact phone number.
Received 24 responses.

Question 4: Email address.
Received 28 responses.

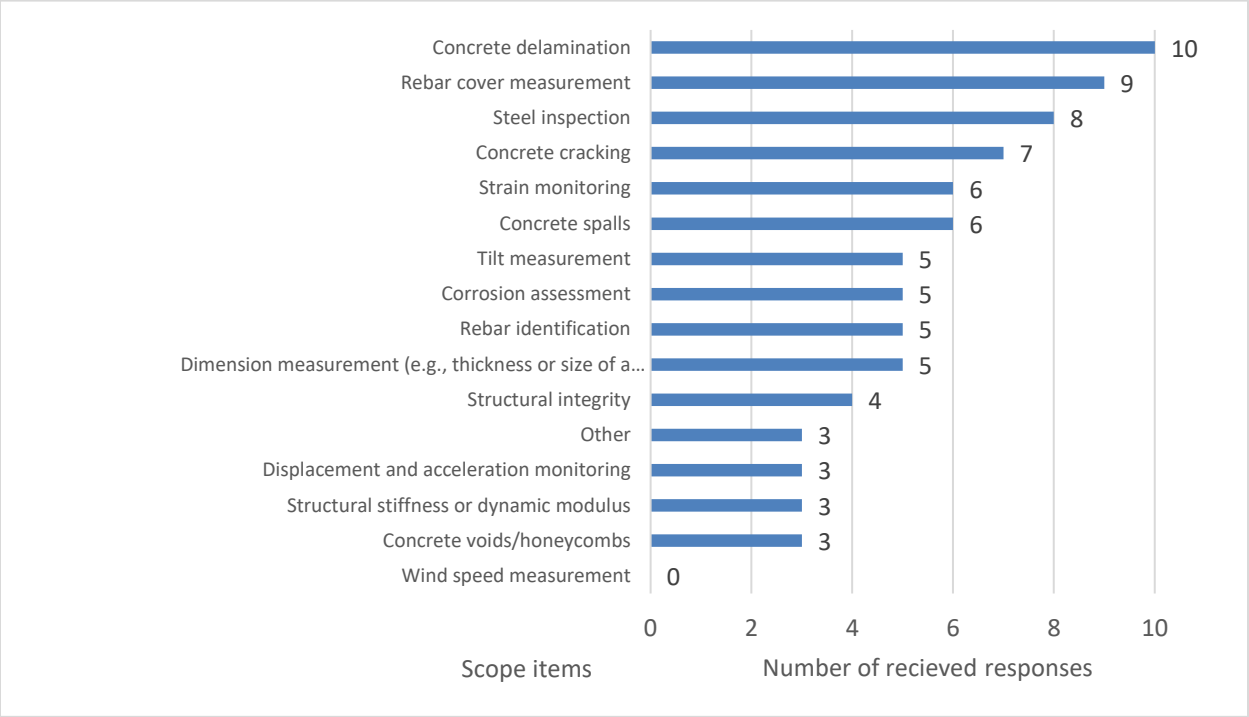
Question 5: Are you interested in participating in a future in-depth interview that would be a followup to this survey? This potential interview would focus on gaining additional detailed information from you with regard to your agency's practice of procuring NDE and SM services and/or equipment.

Yes: 17.
No. 11.

Question 6: Has your agency released solicitations and/or awards where the services to be procured are primarily NDT&E and/or SM related? That means the procurement is not a subcontract under other contractual mechanisms, such as routine inspection, fracture critical inspection, or design.

Yes: 15.
No: 13.

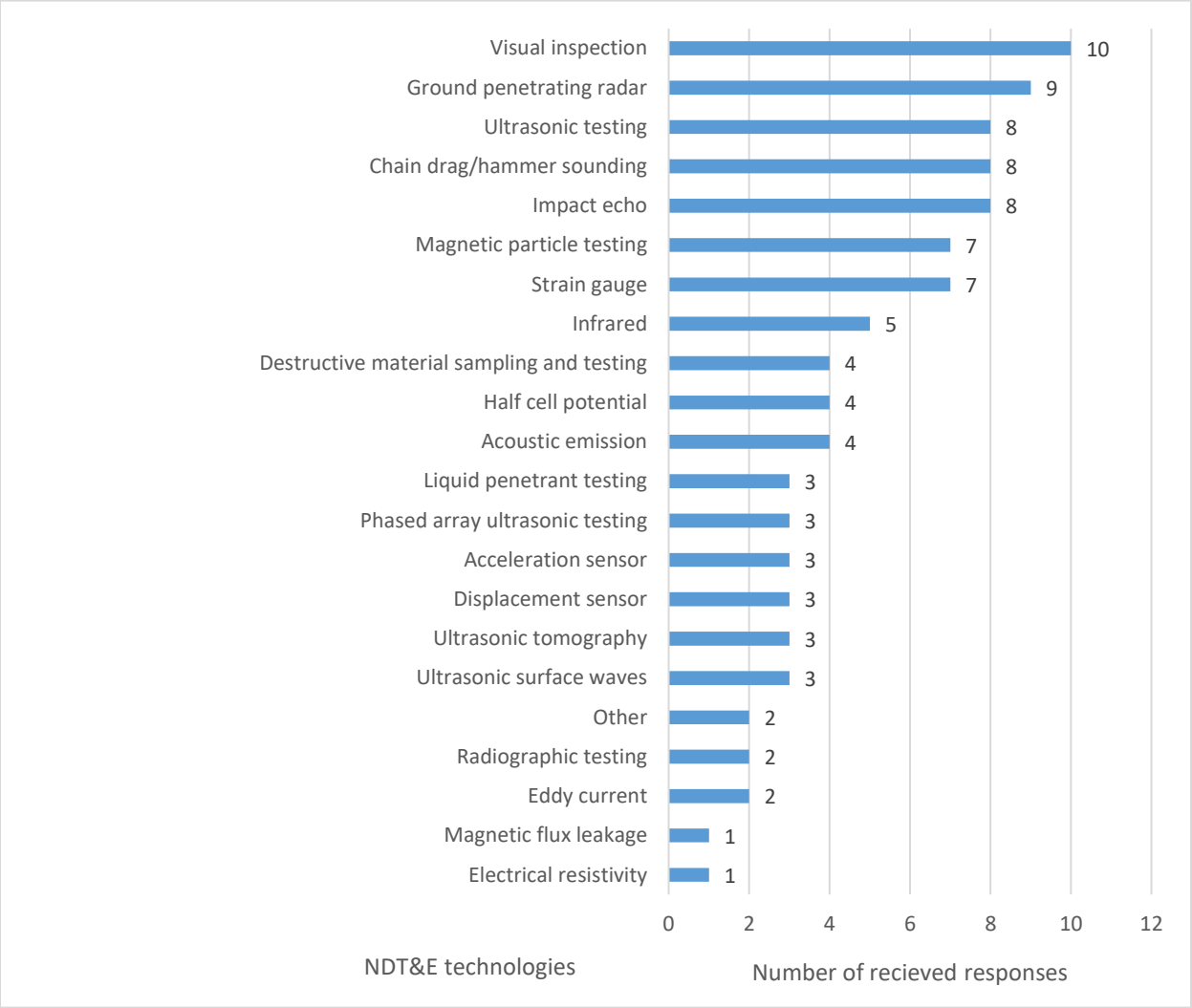
Question 7: What was the scope of your procurement? Multiple choices are available. Please select all that apply. (Figure 6 shows the survey responses.)



Source: FHWA.

Figure 6. Bar graph. Responses about procured scope items received in survey.

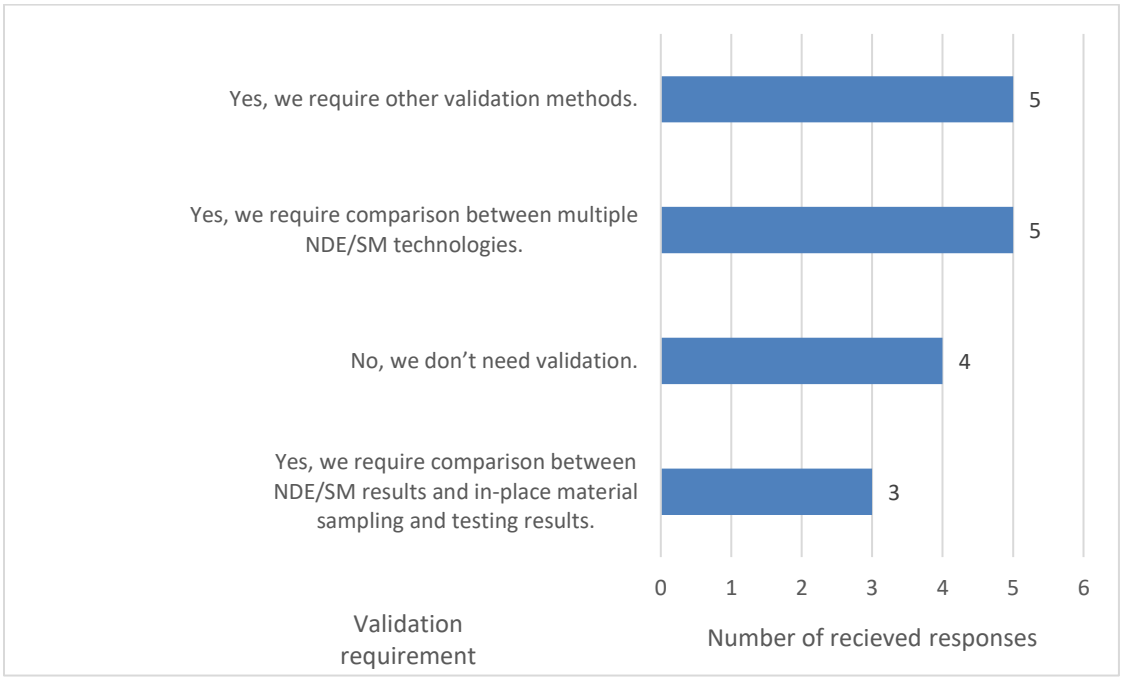
Question 8: What were the NDT&E methods/technologies used for the procurement? Multiple choices are available. Please select all that apply. (Figure 7 shows the survey responses.)



Source: FHWA.

Figure 7. Bar graph. Responses about procured NDT&E technologies received in the survey.

Question 9: Do you require validation of the NDT&E results in the procurement? (Figure 8 shows the survey responses.)



Source: FHWA.

Figure 8. Bar graph. Responses about validation requirements received in the survey.

Question 10: Do you include a specific requirement for the NDT&E services or equipment in the procurement?

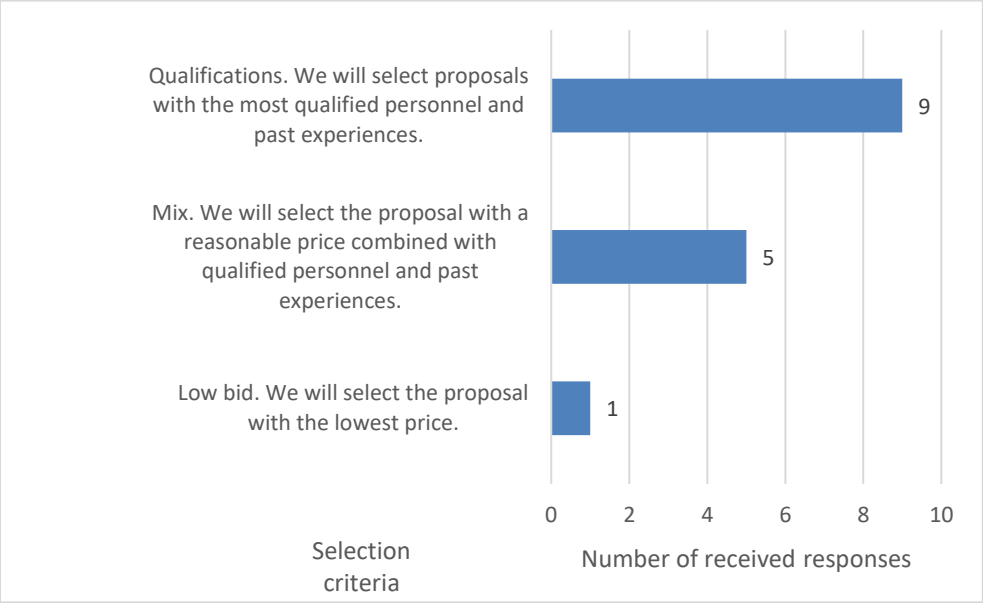
No: 10.
Yes: 5.

Question 11: Please indicate what specific requirement your State includes for the NDT&E equipment in the procurement.

Five responses were received:

1. There is a contract with specifications for each pay item.
2. Depends on each project's requirements.
3. Information on the time and weather at testing.
4. UT, MPT, PT, RT. We procure for steel inspection at the plant and posttensioning operations at the plant, along with UT of pin bridges.
5. Dependent on work. Have specified methods for concrete testing.

Question 12: What are the selection criteria for the procurements in your State? (Figure 9 shows the survey responses.)



Source: FHWA.

Figure 9. Bar graph. Response about selection criteria received in the survey.

Question 13: What were the mix weights for selecting the proposal? For example, 30 percent price, 35 percent personnel qualifications, and 35 percent past experience.

Five responses were received:

1. It depends. Case-by-case basis. Generally, if it is not the low bid, it is closer to 20 percent price, 40 percent qualifications, and 40 percent past experience.

2. Unknown weight, categories were responsiveness of the submittal to the RFP, understanding of the project and objectives, experience and demonstrated capability, strategy and implementation plan, references, and fees.

3. Each project is different. If it is a common, simple NDE, it is more favored to the low bid. If it is more technical, then personnel and past experience are weighted more.

4. Not sure if we have used specific weights and percentages. We make sure the firm has adequate qualifications and experience, and we negotiate time and fee, as appropriate.

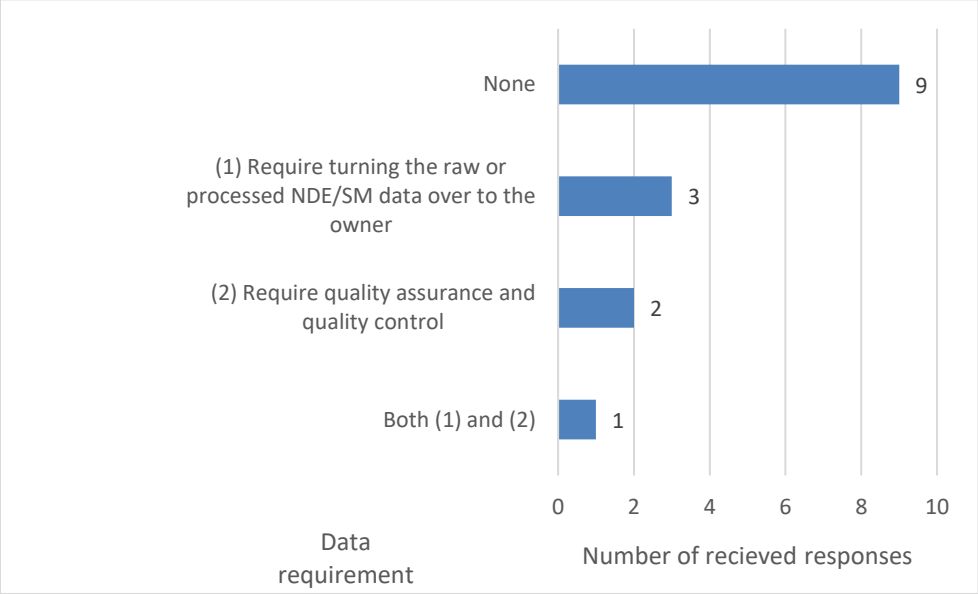
5. It's not exactly the way you describe for us. We have both nonprofessional services contracts (low bid) and separate professional services contracts, which are awarded based on qualifications.

Question 14: What were your qualification requirements, including personal and past experience? Please list any related specifications, standards, and guidelines you included in your past procurements.

The following 13 responses were received:

1. Past experience, qualifications.
2. Very few minimum qualification requirements, but vendors lacking acceptable qualifications have been rejected. Most qualifications use general language. Vendor must use a qualified bridge inspector in the State of Wisconsin.
3. Similar projects and ASNT certification for NDT.
4. We did not have specific qualification requirements, other than three references from similar projects.
5. You'll have to reach out for that information, too much to copy and paste here.
6. Particular certification levels in the techniques to be used.
7. Required previous experience with deep steel girder NDE and SM services.
8. Consultants with extensive experience in testing required, consultants with DOT work experience.
9. AASHTO/AWS D1.5 (AASHTO/AWS 2020).
10. ANSI, State ANSI standards.
11. Level II or Level III in accordance with ASNT SNT-TC-1A (ASNT 2024) or ANSI/ASNT CP-189 (ASNT 2020).
12. Experience with test method, similar experience, experience of project manager and team.
13. Past experience based on resume.

Question 15: In your past solicitations, has your agency specified any requirements on (1) turning the raw or processed NDE and/or SM data over to the owner, and (2) data quality assurance and quality control (QA/QC)? (Figure 10 shows the survey responses.)



Source: FHWA.

Figure 10. Bar graph. Response about data requirements received in the survey.

Question 16: Please indicate what data format you have requested.

Three responses were received:

1. Excel.
2. Transmitted by Microsoft OneDrive®.
3. Currently only reports.

Question 17: Please indicate any specifications, standards, or guidelines you have utilized to develop the data QA/QC.

Two responses were received:

1. Current standards that are in place.
2. Varies for particular disciplines or techniques.

Question 18: Please indicate (1) what data format you have requested, and please provide (2) any specifications, standards, or guidelines you have utilized to develop the data QA/QC.

One response was received, and that was that it varies.

Question 19: In addition to personnel and past experience, data format, and data QA/QC, do you have any other qualification requirements that you have included in your past procurements?

No: 13.
Yes: 2.

Question 20. Please indicate the additional requirements you have included.

Two responses were received:

1. We have required performance testing for ultrasonic testing of butt welds.
2. ANSI Level III for oversight and ANSI Level II for inspections.

APPENDIX B. IN-DEPTH INTERVIEW RESULTS

ARKANSAS DOT

- How does your agency set the scope of procurement? Do you specify a particular NDT&E technology for a SOW, or do you prefer to have the proposers present their options and methods to detect or measure the degradation mechanisms that you have identified and plan to resolve?
    - Arkansas DOT currently specifies contracts based on specific needs.
    - Arkansas DOT asks the service providers to provide testing options and methods to address the requested scopes of work.
- How does your agency set relevant testing standards in the procurement? Do you specify a particular testing standard for the SOW to be procured, or do you prefer to have the proposers present their options?
    - Arkansas DOT exercises both options.
- How does your agency assess the qualifications and past experience of a service provider? Do you feel the criteria you have used in the past are adequate, if you have set some criteria in the past? Have you observed any challenges or difficulties in assessing the qualifications and past experience of a service provider?
    - Arkansas DOT lists evaluation criteria in the RFP. The evaluation criteria vary from project to project.
    - Arkansas DOT has limited experience evaluating the effectiveness of the way it assesses qualifications.
    - Arkansas DOT saw challenges that DOT engineers may not have sufficient knowledge in NDE to help them identify the best candidate.
- How does your agency set personnel requirements (e.g., ASNT Level II or III) for NDT&E procurements? If you have not set any personnel requirements in the past, what challenges have you observed that were likely related to the personnel requirements? Do you feel adding additional personnel requirements is feasible to address these challenges?
    - Arkansas DOT normally specifies a registered PE for the primary engineer. Requiring a PE is a State requirement for procuring engineering services.
- Does your agency see value in adding additional requirements for NDT&E data? For example, raw data should be provided in an accessible format to the agency.
    - Arkansas DOT prefers to have raw data as part of the project deliverables, making sure everything is in place for future needs (e.g., data review).

INDIANA DOT

- How does your agency set the scope of procurement? Do you specify a particular NDT&E technology for a SOW, or do you prefer to have the proposers present their options and methods to detect or measure the degradation mechanisms that you have identified and plan to resolve?

    - Indiana DOT specifies NDE technologies for procurement in view of Indiana DOT's institutional experience in NDE. The top three common NDE technologies used by Indiana DOT are IE, infrared, and GPR.

- How does your agency set relevant testing standards in the procurement? Do you specify a particular testing standard for the SOW to be procured, or do you prefer to have the proposers present their options?

    - Indiana DOT enforces testing standards where applicable. Indiana DOT will also specify a testing guide in the RFP or project document. For example, to avoid the influence of temperature on sensor performance, Indiana DOT normally does not perform NDE in the winter (January and February).

- How does your agency assess the qualifications and past experience of a service provider? Do you feel the criteria you have used in the past are adequate, if you have set some criteria in the past? Have you observed any challenges or difficulties in assessing the qualifications and past experience of a service provider?

    - Indiana DOT evaluates the experience of vendors in the requested NDE technologies. Indiana DOT will review the profile and past projects of a proposer for the requested NDE technologies. Only a few companies provide NDE services, and Indiana DOT is already familiar with the providers.

    - Indiana DOT would prefer a local company with the capabilities of performing the desired work rather than out-of-state providers.

- How does your agency set personnel requirements (e.g., ASNT Level II or III) for NDT&E procurements? If you have not set any personnel requirements in the past, what challenges have you observed that were likely related to the personnel requirements? Do you feel adding additional personnel requirements is feasible to address these challenges?

    - Indiana DOT has a strong interest in national certifications for NDE technicians.

    - Indiana DOT may use equipment manufacturer-sponsored certificates/training for personnel qualification purposes due to the lack of national certificates in concrete inspections.

    - Due to the lack of testing standards and national certificates, Indiana DOT faces challenges in varied NDE results by different vendors for the same testing subject/structure.

- Does your agency see value in adding additional requirements for NDT&E data? For example, raw data should be provided in an accessible format to the agency.

    - Indiana DOT does not ask for raw data because Indiana DOT does not have sufficient human resources to digest the data and does not have the data infrastructure to store the data.

    - Indiana DOT has an interest in standardized data format and NDE data interpretation methods that can reduce the variation in NDE results. Indiana DOT is willing to add data requirements in future NDE procurements.

IOWA DOT

- How does your agency set the scope of procurement? Do you specify a particular NDT&E technology for a SOW, or do you prefer to have the proposers present their options and methods to detect or measure the degradation mechanisms that you have identified and plan to resolve?

    - Most of the time, Iowa DOT specifies the technology to be used for testing based on the agency's NDE experience. If not, Iowa DOT will discuss options with vendors and conduct small testing projects to evaluate the testing options.

- How does your agency set relevant testing standards in the procurement? Do you specify a particular testing standard for the SOW to be procured, or do you prefer to have the proposers present their options?

    - Iowa DOT enforces ASTM and AASHTO testing standards where applicable.

    - However, Iowa DOT is aware that not all NDE methods have testing standards. Iowa DOT will ask for details about the testing procedure to be performed by the vendor.

- How does your agency assess the qualifications and past experience of a service provider? Do you feel the criteria you have used in the past are adequate, if you have set some criteria in the past? Have you observed any challenges or difficulties in assessing the qualifications and past experience of a service provider?

    - Iowa DOT gives more weight to the NDE experience of the team member and the interpretation of NDE results of a service provider.

    - Iowa DOT sees the value in past work experience with DOT projects for a vendor.

- How does your agency set personnel requirements (e.g., ASNT Level II or III) for NDT&E procurements? If you have not set any personnel requirements in the past, what challenges have you observed that were likely related to the personnel requirements? Do you feel adding additional personnel requirements is feasible to address these challenges?

    - It depends on the testing methods. For steel inspections, Iowa DOT will use ASNT certifications. However, for concrete deck evaluation, there is no certification available.

    - Iowa DOT requires a PE stamp on inspection reports if the NDE inspection falls under a bridge inspection project. However, if the NDE project is a specific testing project, Iowa DOT does not require a PE stamp.

- Does your agency see value in adding additional requirements for NDT&E data? For example, raw data should be provided in an accessible format to the agency.

    - Iowa DOT does not require submissions of raw data. Iowa DOT has a difficult time deriving value out of the raw data because of data storage and accessibility restrictions with proprietary software. Iowa DOT will ask for raw data if the value is present.

    - Iowa DOT has specific requirements for the final project report regarding the testing results. Iowa DOT requires vendors to submit plots of NDE results overlayed on structure designs.

    - Depending on the reputation and work experience of a vendor, Iowa DOT requires intermediate results of data analysis to ensure the quality of NDE results.

LOUISIANA DOTD

- How does your agency set the scope of procurement? Do you specify a particular NDT&E technology for a SOW, or do you prefer to have the proposers present their options and methods to detect or measure the degradation mechanisms that you have identified and plan to resolve?

    - Louisiana DOTD normally requests proposals for a long-term IDIQ contract in which Louisiana DOTD lists potential scopes of work (based on inventory) and all interested testing methods.

    - Louisiana DOTD leaves it up to the vendors to provide solutions and testing methods to address the requested scopes of work.

- How does your agency set relevant testing standards in the procurement? Do you specify a particular testing standard for the SOW to be procured, or do you prefer to have the proposers present their options?

    - Louisiana DOTD has no particular requirement for the testing standards. Louisiana DOTD leaves it up to the vendors to provide the testing standards that are being used.

- How does your agency assess the qualifications and past experience of a service provider? Do you feel the criteria you have used in the past are adequate, if you have set some criteria in the past? Have you observed any challenges or difficulties in assessing the qualifications and past experience of a service provider?

    - Louisiana DOTD has statewide evaluation criteria for contract evaluation. The vendors may ask questions during the question-and-answer session.

    - Louisiana DOTD had good experience using the criteria to find good contractors.

    - NDT&E are specialized projects that require more knowledge than general bridge inspection. The challenge in assessing the qualification can be the knowledge required to understand to what extent the work being proposed by the contractors can meet the contract needs. Writing the proposal in an easy-to-understand way can facilitate the review process.

- How does your agency set personnel requirements (e.g., ASNT Level II or III) for NDT&E procurements? If you have not set any personnel requirements in the past, what challenges have you observed that were likely related to the personnel requirements? Do you feel adding additional personnel requirements is feasible to address these challenges?

    - Louisiana DOTD normally specifies a registered PE for the primary engineer. Although the work does not require a PE stamp on the final deliverable, the liability of the work can be an issue.

    - Louisiana DOTD also reviews the personnel requirements based on specific projects. For example, mechanical and electrical engineers, in addition to civil engineers, are preferred to have on the contractor's team to inspect a movable bridge.

- Does your agency see value in adding additional requirements for NDT&E data? For example, raw data should be provided in an accessible format to the agency.

    - Raw data is available when the Louisiana DOTD asks for it. Not sure if this language has been put in writing in the contract.

    - Louisiana DOTD prefers the processed data and is aware that data quality may be an issue if processed data is provided directly from the contractors. To mitigate the issue, Louisiana DOTD normally rotates different vendors on the same task work, serving as a validation process over time.

MINNESOTA DOT

- How does your agency set the scope of procurement? Do you specify a particular NDT&E technology for a SOW, or do you prefer to have the proposers present their options and methods to detect or measure the degradation mechanisms that you have identified and plan to resolve?
    - Minnesota DOT normally specifies the SOW for procurement along with a list of interested NDT&E technologies.
    - Minnesota DOT does not restrict one technology for a specific SOW; instead, Minnesota DOT tends to overlap multiple technologies for QC purposes and validations.
    - Minnesota DOT allows proposers to present options that are not listed in the RFP; however, the proposed new options should undergo a QC program.
- How does your agency set relevant testing standards in the procurement? Do you specify a particular testing standard for the SOW to be procured, or do you prefer to have the proposers present their options?
    - Minnesota DOT enforces ASTM standards in place if available. Not all testing methods have ASTM standards.
- How does your agency assess the qualifications and past experience of a service provider? Do you feel the criteria you have used in the past are adequate, if you have set some criteria in the past? Have you observed any challenges or difficulties in assessing the qualifications and past experience of a service provider?
    - Minnesota DOT faces a challenge in assessing the qualifications and past experience of service providers.
    - Minnesota DOT does not have a consistent evaluation system that systematically evaluates the qualifications and past experience of service providers.
    - Minnesota DOT is interested in QC programs that can help evaluate the qualifications and past experience of service providers.
    - Minnesota DOT saw a challenge when a service provider did not present details of past relevant projects in the proposal. A service provider should explain what has been done in past projects and how that experience would help the provider complete the requested work in a timely manner.

- How does your agency set personnel requirements (e.g., ASNT Level II or III) for NDT&E procurements? If you have not set any personnel requirements in the past, what challenges have you observed that were likely related to the personnel requirements? Do you feel adding additional personnel requirements is feasible to address these challenges?

    - Minnesota DOT does not specify personnel requirements specifically for NDE. Instead, Minnesota DOT enforces personnel requirements for general bridge inspections. For example, the primary engineer shall have a registered PE in the State of Minnesota.

    - Minnesota DOT is interested in national certifications to help set personnel requirements for QC of contractors.

- Does your agency see value in adding additional requirements for NDT&E data? For example, raw data should be provided in an accessible format to the agency.

    - Minnesota DOT requests that contractors provide a fusion of all processed data in one place, which can help Minnesota DOT engineers understand the cause of deterioration by comparing the NDE results against bridge design and construction parameters. However, the data can be huge, and the large data size can result in difficulties in data storage and review.

    - Minnesota DOT prefers processed data to raw data. Minnesota DOT cannot afford the human resources to analyze the raw data. Minnesota DOT is interested in tools that can help it process the raw data for QC purposes.

TEXAS DOT

- How does your agency set the scope of procurement? Do you specify a particular NDT&E technology for a SOW, or do you prefer to have the proposers present their options and methods to detect or measure the degradation mechanisms that you have identified and plan to resolve?

    - Normally, NDE projects are under general bridge inspection/evaluation projects. Texas DOT does not specify NDT&E technologies in the general contract requirements.

    - However, for specific work authorizations, Texas DOT requires specific NDT&E technology for a SOW (e.g., GPR for rebar cover measurement) if Texas DOT has experience and expertise. In cases where Texas DOT is unsure about technology selection, Texas DOT will run a literature review to find suggestions. Texas DOT will also discuss with vendors and consider other DOTs' research findings. Texas DOT uses FHWA InfoTechnology (FHWA n.d.b) for technology selection.

- How does your agency set relevant testing standards in the procurement? Do you specify a particular testing standard for the SOW to be procured, or do you prefer to have the proposers present their options?
    - Texas DOT enforces ASTM and AASHTO testing standards where applicable.
    - However, Texas DOT also faces challenges because not all NDE methods have testing standards.
- How does your agency assess the qualifications and past experience of a service provider? Do you feel the criteria you have used in the past are adequate, if you have set some criteria in the past? Have you observed any challenges or difficulties in assessing the qualifications and past experience of a service provider?
    - Texas DOT requires the minimum number of years of NDE experience for a service provider.
    - Texas DOT faces challenges because of the lack of NDE testing standards, which means different vendors may provide different NDE results. The required qualifications and past experience may not completely mitigate the variation.
- How does your agency set personnel requirements (e.g., ASNT Level II or III) for NDT&E procurements? If you have not set any personnel requirements in the past, what challenges have you observed that were likely related to the personnel requirements? Do you feel adding additional personnel requirements is feasible to address these challenges?
    - Texas DOT will require ASNT Level II certificates for steel inspection projects.
    - Texas DOT generally requires PE seals on the NDE report. However, not all project reports are subject to PE stamps.
- Does your agency see value in adding additional requirements for NDT&E data? For example, raw data should be provided in an accessible format to the agency.
    - Texas DOT generally does not ask for raw data because of insufficient human resources to digest the data.
    - Texas DOT may ask for sample raw data. However, Texas DOT faces challenges in the data format, which may not be accessible without proprietary software. As a result, Texas DOT requires the project report to include sample raw data (e.g., data representing defect versus intact conditions) and intermediate steps of data analysis toward the final contour map in the appendix.

UTAH DOT

- How does your agency set the scope of procurement? Do you specify a particular NDT&E technology for a SOW, or do you prefer to have the proposers present their options and methods to detect or measure the degradation mechanisms that you have identified and plan to resolve?

    - Mixed.

    - Utah DOT may ask vendors to provide their options and methods. At the same time, Utah DOT asks vendors to provide a literature review on the NDE methods and the testing subject.

    - For cases where Utah DOT has experience and validations, Utah DOT may ask for specific technology for the SOW.

- How does your agency set relevant testing standards in the procurement? Do you specify a particular testing standard for the SOW to be procured, or do you prefer to have the proposers present their options?

    - Utah DOT enforces testing standards where applicable and suggestions from the literature review.

- How does your agency assess the qualifications and past experience of a service provider? Do you feel the criteria you have used in the past are adequate, if you have set some criteria in the past? Have you observed any challenges or difficulties in assessing the qualifications and past experience of a service provider?

    - Utah DOT does not assess the qualifications because NDE projects are normally under a master project. The personnel qualifications for NDE projects would be required by the general contractor of the master project.

    - Utah DOT faces challenges when the NDE methods are implemented differently across vendors, which may generate different NDE results.

    - Utah DOT is interested in certification programs that can generate consistent NDE results.

- How does your agency set personnel requirements (e.g., ASNT Level II or III) for NDT&E procurements? If you have not set any personnel requirements in the past, what challenges have you observed that were likely related to the personnel requirements? Do you feel adding additional personnel requirements is feasible to address these challenges?

    - Utah DOT does not assess the qualifications because NDE projects are normally under a master project. The personnel qualifications for NDE projects would be required by the general contractor of the master project.

    - Utah DOT tried ASNT models for certifications. However, Utah DOT found it difficult to verify the vendors' experience based on their ASNT certificates.

    - Utah DOT is interested in certificate programs that can validate a vendor's experience.

- Does your agency see value in adding additional requirements for NDT&E data? For example, raw data should be provided in an accessible format to the agency.

    - Utah DOT asks for processed data. Utah DOT does not have sufficient human resources to process the raw data.

    - Utah DOT is interested in data specifications/recommendations/standards that fuse or overlay different NDE results on top of high-resolution images of the structure being tested.

VIRGINIA DOT

- How does your agency set the scope of procurement? Do you specify a particular NDT&E technology for a SOW, or do you prefer to have the proposers present their options and methods to detect or measure the degradation mechanisms that you have identified and plan to resolve?

    - It depends, and it is not a one-time decision.

    - If we do not know the best suited methods for a specific project, we will ask the consultants/contractors to provide their options and methods for the SOW we want to address (distress, cracks, etc.).

    - If we know the best suited methods for a specific project, we can add them to the RFP. However, if the consultants/contractors have different suggestions, we will discuss the best suited solutions together.

    - Virginia DOT now issues a master contract that includes *all* possible NDT&E methods. Under the master contract, Virginia DOT issues TOs that pick the best suited methods for assigned work.

- How does your agency set relevant testing standards in the procurement? Do you specify a particular testing standard for the SOW to be procured, or do you prefer to have the proposers present their options?
    - If any ASTM standards are available, Virginia DOT will add them to the RFP.
    - Virginia DOT also uses Virginia DOT guidelines, which are publicly available. For example, chapter 32 of *Preservation, Maintenance, Repair, Widening and Rehabilitation* (Virginia DOT 2025).
- How does your agency assess the qualifications and past experience of a service provider? Do you feel the criteria you have used in the past are adequate, if you have set some criteria in the past? Have you observed any challenges or difficulties in assessing the qualifications and past experience of a service provider?
    - Virginia DOT assesses a service provider based on the following:
        - Education.
        - Past experience in general.
        - Past experience in designated testing method.
        - Past experience in designated testing structures.
        - Team capacity (number of team members, equipment, etc.) that enables the service provider to complete the work on time.
    - Virginia DOT assesses past experience based on the following:
        - Number of years in engineering.
        - Past relevant projects and what has been produced from the projects.
    - Virginia DOT saw a challenge when a service provider did not present details of past relevant projects in the proposal. A service provider should explain what has been done in past projects and how that experience would help the provider complete the requested work in a timely manner.
    - Virginia DOT had a template for proposal writing, but still had challenges.

- How does your agency set personnel requirements (e.g., ASNT Level II or III) for NDT&E procurements? If you have not set any personnel requirements in the past, what challenges have you observed that were likely related to the personnel requirements? Do you feel adding additional personnel requirements is feasible to address these challenges?
    - Virginia DOT sets personnel qualifications.
    - Virginia DOT has a spreadsheet that contains a list of professional titles and corresponding qualification requirements. No additional requirements beyond the spreadsheet (Virginia DOT n.d.c).
    - Virginia DOT tends to set higher qualifications, normally longer years of experience, to ensure the quality of the project.
- Does your agency see value in adding additional requirements for NDT&E data? For example, raw data should be provided in an accessible format to the agency.
    - Virginia DOT will add a term such as "data shall be available if Virginia DOT asks for" in the proposal.
    - Virginia DOT prefers to have processed data instead of raw data because processed data provides the information Virginia DOT needs (e.g., strain alert). Processing raw data requires a lot of time that Virginia DOT may not afford. Virginia DOT may consult technical issues with the Virginia Transportation Research Council.
    - Virginia DOT agrees that having processed data directly from consultants/contractors runs the risk of data quality issues.

WISCONSIN DOT

- How does your agency set the scope of procurement? Do you specify a particular NDT&E technology for a SOW, or do you prefer to have the proposers present their options and methods to detect or measure the degradation mechanisms that you have identified and plan to resolve?
    - Mixed.
    - Wisconsin DOT requires specific NDE methods for standard bridge scans. The standard bridge scan policy is publicly available in appendix A of the *Structure Inspection Manual* (Wisconsin DOT 2025).
    - For other projects, Wisconsin DOT may ask the service providers to provide testing options and methods to address the requested scopes of work.

- How does your agency set relevant testing standards in the procurement? Do you specify a particular testing standard for the SOW to be procured, or do you prefer to have the proposers present their options?
    - Wisconsin DOT enforces ASTM and AASHTO testing standards where applicable.
    - However, Wisconsin DOT also faces challenges because not all NDE methods have testing standards.
- How does your agency assess the qualifications and past experience of a service provider? Do you feel the criteria you have used in the past are adequate, if you have set some criteria in the past? Have you observed any challenges or difficulties in assessing the qualifications and past experience of a service provider?
    - Wisconsin DOT lists the minimum qualifications in the solicitation.
    - Wisconsin DOT prefers to evaluate the contractors' qualifications with a small work order to test a bridge where Wisconsin DOT has confidence about the testing results. The small work order serves as a means of QC for the contractors.
- How does your agency set personnel requirements (e.g., ASNT Level II or III) for NDT&E procurements? If you have not set any personnel requirements in the past, what challenges have you observed that were likely related to the personnel requirements? Do you feel adding additional personnel requirements is feasible to address these challenges?
    - Most ASNT certifications are about steel inspections. Wisconsin DOT has a strong interest in national certifications for concrete inspections.
    - Wisconsin DOT normally sets PE as the personnel requirement. The PE requirement is not intended to ensure the contractors' NDE knowledge but to ensure the contractors understand the Wisconsin DOT standards and practices.
- Does your agency see value in adding additional requirements for NDT&E data? For example, raw data should be provided in an accessible format to the agency.
    - Wisconsin DOT asks for all raw data and processed data. The raw data can be used as a means of QC by being sent to an independent contractor for data analysis.
    - Wisconsin DOT adds relevant language in the solicitation. However, Wisconsin DOT does not specify the data format.

APPENDIX C. A LIST OF APPLICABLE TESTING STANDARDS AND PERSONNEL CERTIFICATIONS

TESTING STANDARDS

Sounding: ASTM D4580. *Standard Practice for Measuring Delaminations in Concrete Bridge Decks by Sounding* (ASTM 2018).

IE: ASTM C1383. *Standard Test Method for Measuring the P-Wave Speed and the Thickness of Concrete Plates Using the Impact-Echo Method* (ASTM 2022d).

Ultrasonic surface waves: ASTM C597. *Standard Test Method for Ultrasonic Pulse Velocity Through Concrete* (ASTM 2023a).

GPR:

- ASTM D6432. *Standard Guide for Using the Surface Ground Penetrating Radar Method for Subsurface Investigation* (ASTM 2019).
- ASTM D6087. *Standard Test Method for Evaluating Asphalt-Covered Concrete Bridge Decks Using Ground Penetrating Radar* (ASTM 2022a).
- AASHTO R 37. *Standard Practice for Application of Ground Penetrating Radar (GPR) to Highways* (AASHTO 2022).
- AASHTO PP 98. *Standard Practice for Asphalt Surface Dielectric Profiling System Using Ground Penetrating Radar* (AASHTO 2023).

IR: ASTM C1740. *Standard Practice for Evaluating the Condition of Concrete Plates Using the Impulse-Response Method* (ASTM 2024a).

ER: ASTM C1876. *Standard Test Method for Bulk Electrical Resistivity or Bulk Conductivity of Concrete* (ASTM 2023b).

HCP: ASTM C876. *Standard Test Method for Corrosion Potentials of Uncoated Reinforcing Steel in Concrete* (ASTM 2022c).

IRT: ASTM D4788. *Standard Test Method for Detecting Delaminations in Bridge Decks Using Infrared Thermography* (ASTM 2022b).

MPT: ASTM E709. *Standard Guide for Magnetic Particle Testing* (ASTM 2021b).

PT: ASTM E1417. *Standard Practice for Liquid Penetrant Testing* (ASTM 2021a).

RT:

- ASTM E1742. *Standard Practice for Radiographic Examination* (ASTM 2024b).
- AASHTO/AWS D1.5/D1.5M. *Bridge Welding Code* (AASHTO/AWS 2020).

UT:

- ASTM E164. *Standard Practice for Contact Ultrasonic Testing of Weldments* (ASTM 2024c).
- ASTM A435/A435M. *Standard Specification for Straight-Beam Ultrasonic Examination of Steel Plates* (ASTM 2023c).
- AASHTO/AWS D1.5/D1.5M. *Bridge Welding Code* (AASHTO/AWS 2020).

Phased array ultrasound testing:

- ASTM E2700. *Standard Practice for Contact Ultrasonic Testing of Welds Using Phased Arrays* (ASTM 2020).
- AASHTO/AWS D1.5/D1.5M. *Bridge Welding Code* (AASHTO/AWS 2020).

PERSONNEL CERTIFICATION

ASNT Level II certification (ASNT 2024):

- MPT.
- PT.
- RT.
- UT.
- VT.

ASNT Level III certification (ASNT 2024):

- NDT basic.
- AE.
- ET.
- IR.
- LT.
- MFL.
- MPT.
- PT.
- RT.
- UT.
- VT.

NHI (NHI n.d.):

- Bridge Inspection Techniques for Nonredundant Steel Tension Members (FHWA-NHI-130078).
- Nondestructive Evaluation Fundamentals for Bridge Inspection (FHWA-NHI-130111).
- NDE for Timber and Other Material Bridge Elements (FHWA-NHI-130112C).
- NDE for Concrete Bridge Elements (FHWA-NHI-130112A).
- NDE for Steel Bridge Elements (FHWA-NHI-130112B).
- Introduction to Safety Inspection of In-Service Bridges (FHWA-NHI-130101).
- Engineering Concepts for Bridge Inspectors (FHWA-NHI-130054).
- Safety Inspection of In-Service Bridges (FHWA-NHI-130055).

ACI (ACI n.d.): Concrete strength.

New York State DOT (New York State DOT n.d.): UT.

REFERENCES

AASHTO. 1993. *Standard Test Method for Evaluating Asphalt-Covered Bridge Decks Using Pulsed Radar.* AASHTO TP 36. Washington, DC: American Association of State Highway and Transportation Officials.

AASHTO. 2016. *Standard Method of Test for Sampling and Testing for Chloride Ion in Concrete and Concrete Raw Materials*. AASHTO T 260. Washington, DC: American Association of State Highway and Transportation Officials.

AASHTO/AWS. 2020. *Bridge Welding Code*. AASHTO/AWS D1.5/D1.5M. Washington, DC: American Association of State Highway and Transportation Officials.

AASHTO. 2022. *Standard Practice for Application of Ground Penetrating Radar (GPR) to Highways*. AASHTO R 37. Washington, DC: American Association of State Highway and Transportation Officials.

AASHTO. 2023. *Standard Practice for Asphalt Surface Dielectric Profiling System Using Ground Penetrating Radar*. AASHTO PP 98. Washington, DC: American Association of State Highway and Transportation Officials.

AASHTO. n.d.. *AASHTOWare Bridge Management* (software). https://www.aashtoware.org/products/bridge/bridge-management/, last accessed July 14, 2025.

ACI. n.d.. "Certification Programs" (web page). https://www.concrete.org/certification/certificationprograms.aspx?m=details&pgm=Laboratory%20Concrete%20Testing&cert=Concrete%20Strength%20Testing%20Technician, last accessed July 11, 2025.

Algongi, A. J., G. C. Clemena, and P. D. Cady. 1993. *Condition Evaluation of Concrete Bridges Relative to Reinforcement Corrosion*, Volume 3: *Method For Evaluating the Condition of Asphalt-Covered Decks*. SHRP-S-325. Washington, DC: National Academy of Sciences.

Arkansas DOT. 2023. *Request For Letters of Interest Nondestructive Testing (NDT) Of Concrete Bridge Decks*. Little Rock, AR: Arkansas Department of Transportation.

ASNT. 2020. *ASNT Standard for Qualification and Certification of Nondestructive Testing Personnel*. ASNI/ASNT CP-189. Columbus, OH: American Society for Nondestructive Testing.

ASNT. 2024. *Recommended Practice No. SNT-TC-1A: Personnel Qualification and Certification in Nondestructive Testing*. Columbus, OH: American Society for Nondestructive Testing.

ASTM. 2018. *Standard Practice for Measuring Delaminations in Concrete Bridge Decks by Sounding*. ASTM D4580. West Conshohocken, PA: ASTM International.

ASTM. 2019. *Standard Guide for Using the Surface Ground Penetrating Radar Method for Subsurface Investigation*. ASTM D6432. West Conshohocken, PA: ASTM International.

ASTM. 2020. *Standard Practice for Contact Ultrasonic Testing of Welds Using Phased Arrays*. ASTM E2700. West Conshohocken, PA: ASTM International.

ASTM. 2021a. *Standard Practice for Liquid Penetrant Testing*. ASTM E1417. West Conshohocken, PA: ASTM International.

ASTM. 2021b. *Standard Guide for Magnetic Particle Testing*. ASTM E709. West Conshohocken, PA: ASTM International.

ASTM. 2022a. *Standard Test Method for Evaluating Asphalt-Covered Concrete Bridge Decks Using Ground Penetrating Radar*. ASTM D6087. West Conshohocken, PA: ASTM International.

ASTM. 2022b. *Standard Test Method for Detecting Delaminations in Bridge Decks Using Infrared Thermography*. ASTM D4788. West Conshohocken, PA: ASTM International.

ASTM. 2022c. *Standard Test Method for Corrosion Potentials of Uncoated Reinforcing Steel in Concrete*. ASTM C876. West Conshohocken, PA: ASTM International.

ASTM. 2022d. *Standard Test Method for Measuring the P-Wave Speed and the Thickness of Concrete Plates Using the Impact-Echo Method*. ASTM C1383. West Conshohocken, PA: ASTM International.

ASTM. 2023a. *Standard Test Method for Ultrasonic Pulse Velocity Through Concrete*. ASTM C597. West Conshohocken, PA: ASTM International.

ASTM. 2023b. *Standard Test Method for Bulk Electrical Resistivity or Bulk Conductivity of Concrete*. ASTM C1876. West Conshohocken, PA: ASTM International.

ASTM. 2023c. *Standard Specification for Straight-Beam Ultrasonic Examination of Steel Plates*. ASTM A435/A435M. West Conshohocken, PA: ASTM International.

ASTM. 2024a. *Standard Practice for Evaluating the Condition of Concrete Plates Using the Impulse-Response Method*. ASTM C1740. West Conshohocken, PA: ASTM International.

ASTM. 2024b. *Standard Practice for Radiographic Examination*. ASTM E1742. West Conshohocken, PA: ASTM International.

ASTM. 2024c. *Standard Practice for Contact Ultrasonic Testing of Weldments*. ASTM E164. West Conshohocken, PA: ASTM International.

British Standards Institution. 1988. *Testing of Concrete*. BS 1881: Part 204. London, England: British Standards Institution.

FHWA. n.d.a. *Manual on Uniform Traffic Control Devices for Streets and Highways*. 11th edition. Washington, DC: Federal Highway Administration. https://mutcd.fhwa.dot.gov/, last accessed July 14, 2025.

FHWA. n.d.b. "FHWA InfoTechnology™" (web page). https://infotechnology.fhwa.dot.gov/, last accessed July 9, 2025.

Federal Transit Administration. 2023. "BPPM Methods of Solicitation and Selection" (web page). https://www.transit.dot.gov/funding/procurement/bppm-methods-solicitation-and-selection, last accessed July 11, 2025.

Hooks and Weidner. 2016. *Long-Term Bridge Performance (LTBP) Program Protocols, Version 1*. Report No. FHWA-HRT-16-007. McLean, VA: Federal Highway Administration.

Hopwood, T. I., C. Goff, J. Fairchild, and S. Palle. 2016. *Nondestructive Evaluation of Steel Bridges: Methods and Applications*. Report No. KTC-16-26/SPR14-485-1F. Lexington, KY: University of Kentucky Transportation Center. https://doi.org/10.13023/KTC.RR.2016.26, last accessed July 14, 2025.

Iowa DOT. 2019. *Non-Destructive Testing (NDT) Acoustic Based Bridge Inspection Request for Proposal*. Ames, IA: Iowa Department of Transportation.

Iowa DOT. 2022. *Non-Destructive Bridge Deck Inspection Request for Proposal*. Ames, IA: Iowa Department of Transportation.

Iowa DOT. 2016. *Iowa DOT Policies and Procedures.* Policy No. 300.04. Ames, IA: Iowa Department of Transportation.

Lines, B., J. Smithwick, K. Sullivan, K. Hurtado, J. Savicky, J. Sawyer, K. A. Turner, and K. Baxter. 2025. *Practices for Transportation Agency Procurement and Management of Advanced Technologies*. NCHRP Report 1145. Washington, DC: National Academies Press.

Louisiana DOTD. 2018. *IDIQ Contracts for Non-Destructive Evaluation of Structures Statewide*. Baton Rouge, LA: Louisiana Department of Transportation and Development.

Louisiana DOTD. 2022. *IDIQ Contracts for Non-Destructive Evaluation of Structures Statewide*. Baton Rouge, LA: Louisiana Department of Transportation and Development.

Michigan DOT. 2018. *Evaluation of Bridge Decks using Multichannel Impact-Echo Scanning from a Continuously Moving Platform*. Lansing, MI: Michigan Department of Transportation.

Minnesota DOT. 2020a. *Bridge 27831 Deck Inspection Request for Proposal*. Saint Paul, MN: Minnesota Department of Transportation.

Minnesota DOT. 2020b. *Contract No. 1045260 Deck Inspection Scope of Services*. Saint Paul, MN: Minnesota Department of Transportation.

Montana DOT. 2018. *Bridge Inspection and Rating Manual*. Helena, MT: Montana Department of Transportation.

Montana DOT. 2021. *Performing Nondestructive Testing and Evaluation Methods on Concrete Bridge Decks*. Helena, MT: Montana Department of Transportation.

Montana DOT. 2023. *Performing Nondestructive Testing and Evaluation Methods on Concrete Bridge Decks*. Helena, MT: Montana Department of Transportation.

National Archives and Records Administration. 2002. "Highways." *Code of Federal Regulations*, Title 23 Part 636. https://www.ecfr.gov/current/title-23/chapter-I/subchapter-G/part-636?toc=1, last accessed July 11, 2025.

New York State DOT. n.d.. "NYSDOT Field Welder and Ultrasonic Testing (UT) Technician Certification Programs" (web page). https://www.dot.ny.gov/divisions/engineering/structures/engineering/approved-field-welder-list, last accessed July 11, 2025.

NHI. n.d.. "National Highway Institute" (web page). https://www.nhi.fhwa.dot.gov/home.aspx, last accessed July 11, 2025.

USACE. 2014. *Safety and Health Requirements Manual*. EM385-1-1. Washington, DC: U.S. Army Corps of Engineers.

USACE. 2022. *Architect-Engineer (A-E) Structural and Mechanical Instrumentation, Monitoring and Analysis services*. Washington, DC: U.S. Army Corps of Engineers.

U.S. DoD. n.d.. *Past Performance Information Retrieval System*. https://www.dodig.mil/Reports/Audits-and-Evaluations/Article/1117190/contractor-past-performance-information/, last accessed July 14, 2025.

Virginia DOT. 2018. *Statewide Survey and Monitoring Deformation of Structures*. Richmond, VA: Virginia Department of Transportation.

Virginia DOT. 2020. *Road and Bridge Specifications*. Richmond, VA: Virginia Department of Transportation.

Virginia DOT. 2023a. *Statewide Survey and Monitoring Deformation of Structures*. Richmond, VA: Virginia Department of Transportation.

Virginia DOT. 2023b. *Statewide On-Call Bridge Testing & Evaluation*. Richmond, VA: Virginia Department of Transportation.

Virginia DOT. 2025. *Preservation, Maintenance, Repair, Widening and Rehabilitation*. Richmond, VA: Virginia Deapartment of Transportation. https://www.vdot.virginia.gov/media/vdotvirginiagov/doing-business/technical-guidance-and-support/technical-guidance-documents/structure-and-bridge/manuals-of-structure-and-bridge-acc/part2/Chapter32.pdf, last accessed July 14, 2025.

Virginia DOT. n.d.a. “Approved Products” (web page). https://www.vdot.virginia.gov/doing-business/technical-guidance-and-support/materials/, last accessed July 11, 2025.

Virginia DOT. n.d.b. “Work Area Protection Manual (VWAPM) and Pocket Guide” (web page). https://www.vdot.virginia.gov/doing-business/technical-guidance-and-support/technical-guidance-documents/work-area-protection-manual-and-pocket-guide/, last accessed July 11, 2025.

Virginia DOT. n.d.c. *Professional Services Class Groupings & Working Titles*. https://www.vdot.virginia.gov/media/vdotvirginiagov/doing-business/business-opportunities/consultants/Class-Grouping-with-Working-Titles-07102024_acc.xlsx, last accessed July 11, 2025.

Wisconsin DOT. 2025. *Structure Inspection Manual.* Madison, WI: Wisconsin Department of Transportation.

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