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23 CFR Part 650

National Tunnel Inspection Standards; Final Rule

**DEPARTMENT OF TRANSPORTATION****Federal Highway Administration****23 CFR Part 650**

[Docket No. FHWA–2008–0038]

RIN 2125–AF24

**National Tunnel Inspection Standards**

**AGENCY:** Federal Highway Administration (FHWA), Department of Transportation (DOT).

**ACTION:** Final rule.

**SUMMARY:** This final rule establishes the National Tunnel Inspection Standards (NTIS) for highway tunnels. The NTIS require tunnel owners to establish a program for the inspection of highway tunnels, to maintain a tunnel inventory, to report the inspection findings to FHWA, and to correct any critical findings found during these inspections.

**DATES:** This final rule is effective August 13, 2015. The incorporation by reference of certain publications listed in the rule is approved by the Director of the Federal Register as of August 13, 2015.

**FOR FURTHER INFORMATION CONTACT:** Mr. Joseph Hartmann, Office of Bridges and Structures, 202–366–4599; or Mr. Robert Black, Office of the Chief Counsel, 202–366–1359, Federal Highway Administration, 1200 New Jersey Ave. SE., Washington, DC 20590. Office hours are from 8 a.m. to 4:30 p.m., eastern time, Monday through Friday, except Federal holidays.

**SUPPLEMENTARY INFORMATION:****Executive Summary***I. Purpose of the Regulatory Action*

The purpose of this final rule is to establish the NTIS for tunnel inspections consistent with the provisions of the Moving Ahead for Progress in the 21st Century Act (MAP–21), which includes requirements for establishing a highway tunnel inspection program, maintaining a tunnel inventory, and reporting to FHWA of inspection results and, in particular, critical findings, which are any structural or safety-related deficiencies that require immediate follow-up inspection or action. The NTIS apply to all structures defined as highway tunnels on all public roads, on and off Federal-aid highways, including tribally and federally owned tunnels.

Routine and thorough inspections of our Nation's tunnels are necessary to maintain safe operation and prevent structural, geotechnical, and functional failures. Data on the condition and operation of our Nation's tunnels is

necessary in order for tunnel owners to make informed investment decisions as part of an asset management program for maintenance and repair of their tunnels. Recognizing that the safety and security of our Nation's tunnels are of paramount importance, Congress declared in MAP–21 that it is in the vital interest of the U.S. to inventory, inspect, and improve the condition of the Nation's highway tunnels. As a result of this declaration and the MAP–21 mandate found in 23 U.S.C. 144, FHWA establishes the NTIS.

*II. Summary of the Major Provisions of the Regulatory Action in Question*

The NTIS require the establishment of a National Tunnel Inventory (NTI); routine inspections of tunnels on all public roads, on and off Federal-aid highways, including tribally and federally owned tunnels; written reports to FHWA of critical findings, as defined in 23 CFR 650.305; training for tunnel inspectors; a national certification program for tunnel inspectors; and the timely correction of any deficiencies.

Section 650.503 establishes the applicability of the NTIS to all highway tunnels on all public roads as authorized by MAP–21.

Section 650.507 describes the organizational responsibilities associated with successful implementation of the NTIS. Tunnel inspection organizations are required to develop and maintain inspection policies and procedures, ensure that inspections are conducted in accordance with the proposed standards, collect and maintain inspection data, and maintain a registry of nationally certified tunnel inspection staff.

Section 650.509 establishes certain minimum qualifications for tunnel inspection personnel. A Program Manager shall be a registered Professional Engineer (P.E.) or have 10 years of tunnel or bridge inspection experience, and be a nationally certified tunnel inspector. The Team Leader shall be a nationally certified tunnel inspector and either be a registered P.E. with 6 months of tunnel or bridge inspection experience, or have 5 years of tunnel or bridge inspection experience or an appropriate combination of education and experience as detailed in the referenced section. This section also describes the requirements for national certification of inspection staff.

Section 650.511 establishes a minimum inspection frequency of 24 months for routine tunnel inspections. An owner is permitted to increase the frequency of inspection based on a risk analysis approach that considers such

factors as tunnel age, traffic characteristics, geotechnical conditions, and known deficiencies. An owner does not need FHWA approval to increase the frequency of inspection. An owner is permitted to decrease the frequency of inspection after a written request that considers tunnel age, time from last major rehabilitation, tunnel complexity, traffic characteristics, geotechnical conditions, functional systems, and known deficiencies has been reviewed and commented on by FHWA.

Section 650.513 requires the establishment of a statewide, Federal agencywide, or tribal governmentwide procedure to ensure that critical findings, as defined in 23 CFR 650.305, are addressed in a timely manner.

Owners are required to notify FHWA within 24 hours of identifying a critical finding and the actions taken to resolve or monitor that finding. This section also discusses inspection procedures for complex tunnels and functional systems, load rating of tunnels, quality assurance, and quality control.

Section 650.515 requires certain inventory data to be collected and reported for all tunnels subject to the NTIS within 120 days of the effective date of this rule. This data will be used to create a national inventory of tunnels that will provide a more accurate assessment of the number and condition of the Nation's tunnels.

*III. Costs and Benefits*

The FHWA anticipates that the benefits associated with this rulemaking will significantly outweigh the costs. The FHWA has only limited data regarding the number of highway tunnels in the Nation and the frequency and cost of their inspection. The FHWA received some data from a 2003 informal survey of tunnel owners.<sup>1</sup> Throughout this rulemaking, FHWA relied on the data received from that survey to develop estimates of the costs and benefits of this final rule. The FHWA expects that there may be some tunnels that could be covered by the expanded scope of this rulemaking that were not included in the survey's limited data set; however, we believe that those tunnels would be only a small fraction of the total cost and that the 2003 survey data provides a sufficient basis for FHWA's analysis.

The FHWA expects that the overall increase in tunnel inspection costs across the Nation will be modest, as the vast majority of tunnel owners already inspect at the 24-month interval required by the NTIS. The FHWA does

<sup>1</sup> See Background section II.D. for more information.

not have any information regarding the cost of fixing critical findings that are uncovered as a result of provisions in this rulemaking. Based on current data, only two tunnel owners, that together own 15 tunnels (bores), would be required to increase their current inspection frequency as a result of this final rule. The FHWA is taking this action because ensuring timely inspections of highway tunnels not only enhances the safe passage of the traveling public, but also protects investments in key infrastructure, as early detection of problems in tunnels will likely increase their longevity and lead to lower repair costs than problems found later. Inspections are vital to preventing tunnel collapses and closures, which often result in millions of dollars in repair and user fee costs.

### Electronic Access and Filing

This document, the 2008 advance notice of proposed rulemaking (ANPRM), the 2010 notice of proposed rulemaking (NPRM), the 2013 supplemental notice of proposed rulemaking (SNPRM), and all comments received may be viewed online through the Federal eRulemaking portal at <http://www.regulations.gov>. The Web site is available 24 hours each day, 365 days each year. An electronic copy of this document may also be downloaded by accessing the Office of the Federal Register's home page at: <https://www.federalregister.gov>.

### Background

#### I. Need for Tunnel Inspection Standards

The majority of road tunnels in the United States were constructed during two distinct periods of highway system expansion. A significant number of these tunnels were constructed in the 1930s and 1940s as part of public works programs associated with recovery from the Great Depression. Another significant number were constructed for the developing Interstate Highway System in the 1950s and 1960s. As a result, most of these structures have exceeded their designed service lives and need to be routinely inspected to ensure continued safe and efficient operation.

The structural, geotechnical, and functional components and systems that make up tunnels deteriorate and corrode due to the harsh environment in which these structures are operated. As a result, routine and thorough inspection of these elements is necessary to collect the data needed to maintain safe tunnel operation and to prevent structural, geotechnical, and functional failures. As our Nation's tunnels continue to age, an

accurate and thorough assessment of each tunnel's condition is critical to avoid a decline in service and maintain a safe, functional, and reliable highway system.

In addition to ensuring safety, it is also necessary to collect data on the condition and operation of our Nation's tunnels for owners to make informed investment decisions as part of a systematic, integrated approach to transportation asset management. Without such an approach, ensuring an accountable and sustainable practice of maintenance, preservation, rehabilitation, or replacement across an inventory of tunnels is a significant challenge. Data-driven asset management provides tunnel owners with a proven framework for long-term accountability and accomplishment.<sup>2</sup> The data collected must be robust enough to support investment decisions within a State and consistent enough to identify national trends in performance and link Federal transportation expenditures to programmatic results.

Timely and reliable tunnel inspection is vital to uncovering safety problems and preventing failures. When corrosion or leakage occurs, electrical or mechanical systems malfunction, or concrete cracking and spalling signs appear, they may be symptomatic of larger problems. The importance of tunnel inspection was demonstrated in the summer of 2007 in the I-70 Hanging Lake tunnel in Colorado when a ceiling and roof inspection uncovered a crack in the roof that compromised the structural integrity of the tunnel. This discovery prompted the closure of the tunnel for several months for needed repairs. The repairs prevented a potential catastrophic tunnel failure and loss of life. That failure could have resulted in a longer period of repairs, injuries, and death.

Unfortunately, loss of life was not avoided in Oregon in 1999. In January of that year, a portion of the lining of the Sunset Tunnel located near Manning (west of Portland) collapsed, killing an Oregon DOT employee. At the time of the collapse, the lining was being inspected after a heavy rain to ensure its safety in response to a report by a concerned traveler. The extent of deterioration in the lining had not been identified and regularly documented in previous inspections of the tunnel, which occurred variably. As a result, the lining had deteriorated to the point that the safety inspection after the rain event

<sup>2</sup> On February 20, 2015 at 80 FR 9231, FHWA issued an NPRM to implement the MAP-21 Asset Management provisions (23 U.S.C. 119(e)). Please see that NPRM for more information on the establishment of State asset management plans.

was sufficient to trigger the collapse. Following the accident, Oregon DOT reviewed their tunnel inspection program and identified a need to define what a tunnel is and establish criteria, procedures, and professional qualifications for tunnel inspection.

Inadequate tunnel inspection was again linked to a loss of life in Massachusetts in 2006. In July of that year, a portion of the suspended ceiling collapsed onto the roadway in the I-90 Central Artery Tunnel in Boston, killing a motorist. It also resulted in closure of this portion of the tunnel for 6 months while repairs were made, causing significant traffic delays and productivity losses. The National Transportation Safety Board (NTSB) stated in its accident investigation report that, "had the Massachusetts Turnpike Authority, at regular intervals between November 2003 and July 2006, inspected the area above the suspended ceilings in the D Street portal tunnels, the anchor creep that led to this accident would likely have been detected, and action could have been taken that would have prevented this accident."<sup>3</sup> Among its recommendations, NTSB suggested that FHWA seek legislative authority to establish a mandatory tunnel inspection program similar to the National Bridge Inspection Standards (NBIS) that would identify critical inspection elements and specify an appropriate inspection frequency. Additionally, the DOT Inspector General (IG), in testimony before Congress in October 2007, highlighted the need for a tunnel inspection and reporting system to ensure the safety of the Nation's tunnels, stating that FHWA "should develop and implement a system to ensure that States inspect and report on tunnel conditions." The IG went on to state that FHWA should establish rigorous inspection standards.<sup>4</sup>

More recently, inspection of ceiling panels in the westbound I-264 Downtown Tunnel in Portsmouth, Virginia, prevented a catastrophic failure. The Virginia DOT routinely performs an in-depth inspection of this tunnel at approximate intervals of 5 to 7 years. During an inspection in 2009,

<sup>3</sup> "Ceiling Collapse in the Interstate 90 Connector Tunnel Boston, Massachusetts July 10, 2006," Highway Accident Report, NTSB/HAR-07/02, July 10, 2006. An electronic format version is available at: <http://www.ntsb.gov/doclib/reports/2007/HAR0702.pdf>.

<sup>4</sup> The U.S. Department of Transportation, Office of the Inspector General, "Challenges Facing the U.S. Department of Transportation, Fiscal Year 2008," October 2007, CC-2008-007. An electronic format version is available at: [http://www.oig.dot.gov/sites/dot/files/pdfdocs/Statement\\_DOT\\_Activities101507\\_508version.pdf](http://www.oig.dot.gov/sites/dot/files/pdfdocs/Statement_DOT_Activities101507_508version.pdf).

Virginia DOT personnel found aggressive corrosion of embedded bolts used to support the ceiling panels over the roadway. Upon further evaluation, it was determined that the ceiling panels needed to be removed to ensure the safety of the traveling public. The tunnel was closed for 6 consecutive weekends to perform this maintenance activity. If there had not been a timely inspection, the corrosion would have worsened and there would likely have been a collapse that could have caused death, injuries, or property damage, and complete closure of the tunnel for an extended period of time, resulting in significant productivity losses.

Most recently, on December 2, 2012, the suspended ceiling in Japan's Sasago Tunnel collapsed onto the roadway below and crushed several cars, resulting in the deaths of nine motorists. Early reports in the media citing Japanese officials indicated that the collapse was likely the result of the failure of the anchor bolts connecting the suspended ceiling to the tunnel roof. According to the Central Japan Expressway Company, which is responsible for the operation of the tunnel, those connections had not been thoroughly inspected due to issues with access.<sup>5</sup>

The FHWA estimates that tunnels represent nearly 100 miles—approximately 517,000 linear feet—of Interstates, State routes, and local routes. Tunnels such as the Central Artery Tunnel in Massachusetts, the Lincoln Tunnel in New York, and the Fort McHenry and the Baltimore Harbor Tunnels in Maryland are a vital part of the national transportation infrastructure. These tunnels accommodate huge volumes of daily traffic, contributing to the Nation's mobility. For example, according to the Port Authority of New York and New Jersey, the Lincoln Tunnel carries approximately 120,000 vehicles per day, making it the busiest vehicular tunnel in the world. The Fort McHenry Tunnel handles a daily traffic volume of more than 115,000 vehicles. Any disruption of traffic in these or other highly traveled tunnels would result in a significant loss of productivity and have severe financial impacts on a large region of the country.

On October 29, 2012, flooding caused by Hurricane Sandy led to the closure of many of the vehicular, transit, and rail tunnels in the New York City metropolitan area. Although it is difficult to quantify the total economic

impact of these tunnel closures, Amtrak reported an operational loss of approximately \$60 million due to the closures of four of its tunnels in the region.<sup>6</sup> These closings, although the result of an extreme event and not a structural or functional safety issue, demonstrate the value of the continued operation of tunnels. Because of their importance to local, regional, and national economies and to our national defense, it is imperative that tunnels are properly inspected to ensure the continued safe passage of the traveling public and commercial goods and services.

Of particular concern is the possibility of a fire emergency in one of our Nation's tunnels. Numerous domestic and international incidents demonstrate that tunnel fires often result in a large number of fatalities. In April 1982, seven people lost their lives in the Caldecott tunnel, which carries State Route 24 between Oakland and Orinda, California, when a truck carrying flammable liquid crashed and subsequently collided with other vehicles. In October 2001, 11 people were killed when a fire erupted in the Gotthard tunnel in Switzerland following a head-on collision. In 2000, 162 people were killed when a fire started in the Kaprun train tunnel in Austria. In 1999, 39 people died when a truck caught fire in the Mont Blanc tunnel on the French-Italian border. Tests of 26 tunnels in 13 European countries in 2010 by the European Tunnel Assessment Programme indicated a number of inadequacies related to fire safety, including missing hydrants, no barriers to close the tunnel, inadequate lighting, and insufficient escape route signs.<sup>7</sup> National inspection standards are needed to ensure lights, signs, barriers, and tunnel walls are inspected and fire suppression systems are maintained in safe and operable condition. Such safety features are of critical importance in the event of a fire emergency.

Timely inspections of highway tunnels not only enhance the safe passage of the traveling public, they also contribute to the efficient movement of goods and people and to millions of dollars in fuel savings. For example, the Eisenhower/Johnson Memorial Tunnels, located west of Denver on I-70, facilitate the movement of people and goods from the eastern slope to the western slope of the Rocky Mountains.

The Colorado DOT estimates that the public saves 9.1 miles by traveling through these tunnels instead of over U.S. Highway 6, Loveland Pass. In 2000, approximately 28,000 vehicles traveled through the tunnels per day, which is equal to 10.3 million vehicles per year.<sup>8</sup> Accordingly, FHWA estimates that by traveling through the Eisenhower/Johnson Memorial Tunnels, the public saved approximately 90.7 million miles of travel and millions of dollars in associated fuel costs in 2000. These tunnels help to expedite the transport of goods and people, prevent congestion along alternative routes, and save users money and fuel. If these tunnels were closed due to a collapse or other safety hazard, the economic effects would be considerable.

While the above examples do not constitute a comprehensive list of issues resulting from lack of inspections, they do demonstrate why routine and thorough tunnel inspection is vital to uncovering safety problems and preventing catastrophic failure of key tunnel components.

## II. Research Related to Tunnel Inspections

In addition to the focus Congress has given to tunnel inspection, the NTSB, State DOTs, the IG, FHWA, and others have conducted extensive research related to tunnel design, construction, rehabilitation, and inspection. The following partial list of those activities and projects related to tunnel safety all underscore the need to develop consistent and reliable inspection standards.

A. *Underground Transportation Systems in Europe: Safety, Operations, and Emergency Response.*<sup>9</sup> In 2005, FHWA, the American Association of State Highway and Transportation Officials (AASHTO), and the National Cooperative Highway Research Program (NCHRP), sponsored a study of equipment, systems, and procedures used in the operation and management of tunnels in 9 European countries (Austria, Denmark, France, Germany, Italy, Norway, the Netherlands, Sweden, and Switzerland). One objective of this scan was to identify best practices, specialized technologies, and standards used in monitoring and inspecting the structural elements and operating

<sup>8</sup> See <http://www.coloradodot.info/travel/eisenhower-tunnel/eisenhower-tunnel-interesting-facts.html>.

<sup>9</sup> Federal Highway Administration, "Underground Transportation Systems in Europe: Safety, Operations, and Emergency Response," Office of International Programs, FHWA-PL-06-016, June 2006. An electronic format version is available at: <http://international.fhwa.dot.gov/uts/uts.pdf>.

<sup>5</sup> <http://abcnews.go.com/blogs/headlines/2012/12/japan-orders-immediate-inspections-after-deadly-tunnel-collapse/>.

<sup>6</sup> <http://www.amtrak.com/ccurl/920/456/Amtrak-Requests-.pdf>.

<sup>7</sup> <http://www.independent.co.uk/news/world/europe/new-tunnel-rules-to-be-introduced-after-high-death-toll-7566220.html>.

equipment of roadway tunnels to ensure optimal performance and minimize downtime for maintenance or rehabilitation. As a result of the study, the international team recommended that the United States implement a risk-management approach to tunnel inspection and maintenance. In regard to current practices, the report states that “only limited national guidelines, standards, or specifications are available for tunnel design, construction, safety inspection, traffic and incident management, maintenance, security, and protection against natural or manmade disasters.” The report also notes that only “through knowledge of the systems and the structure gained from intelligent monitoring and analysis of the collected data, the owner can use a risk-based approach to schedule the time and frequency of inspections and establish priorities.”

B. *NCHRP Project 20–07/Task 261, Best Practices for Implementing Quality Control and Quality Assurance for Tunnel Inspection.*<sup>10</sup> In response to NTSB’s preliminary safety recommendations resulting from the I–90 Central Artery Tunnel partial ceiling collapse investigation in Boston, FHWA and AASHTO initiated this NCHRP research project. The objective of the project was to develop guidelines for owners to implement quality control and quality assurance practices for tunnel inspection, operational safety and emergency response systems testing, and inventory procedures to improve the safety of highway tunnels. During the course of the project, the researchers found that tunnel owners in the United States inspect their structures at variable intervals ranging from 1 week to 6 years. The report states that “[s]ince there is currently no consistency in the tunnel inspection techniques used by the various tunnel owners, implementing NTIS and developing a tunnel inspector training program on applying those standards will be vital to ensuring a consistent tunnel inspection program for all tunnels across the nation.”

C. *Best Practices for Roadway Tunnel Design, Construction, Maintenance, Inspection, and Operations.*<sup>11</sup> This

domestic scanning tour was conducted during August and September 2009, and done in partnership with FHWA, AASHTO, and NCHRP to determine if a need existed for national tunnel inspection standards and an NTI. The scan focused on the inventory criteria used by highway tunnel owners; highway tunnel design and construction standards used by State DOTs and other tunnel owners; maintenance and inspection practices; operations, including safety, as related to emergency response capability; and specialized tunnel technologies. The scan team found that the most effective tunnel inspection programs were developed from similar bridge inspection programs. It was determined that tunnel owners often use bridge inspectors to inspect their tunnels because bridges and tunnels are designed and constructed with similar materials and methods, exposed to similar environments, and can be reliably inspected with similar technologies. As a result, the scan team recommended that the development of a tunnel inspection program be as similar as possible to the current bridge inspection program to further capitalize on the success of the standards for bridge inspection established through the NBIS.

D. *2003 Informal FHWA Survey.* In 2003, FHWA conducted an informal survey to collect information about the tunnel inventory, maintenance practices, inspection practices, and tunnel management practices of each State. Of the 45 highway tunnel owners surveyed, 40 responses were received. The survey results suggest that there are approximately 350 highway tunnels (bores) in the Nation and they are currently inspected by their owners at intervals ranging from 1 day to 10 years.<sup>12</sup> The average inspection interval for the 37 responses that included data on this measure was a little over 24 months (2.05 years).

E. *Highway and Rail Transit Tunnel Inspection Manual (HRTTIM).* Recognizing that tunnel owners are not required to inspect tunnels routinely and inspection methods vary among entities that inspect tunnels, FHWA and the Federal Transit Administration developed the HRTTIM for the

inspection of tunnels in 2003. These guidelines, updated in 2005,<sup>13</sup> outline recommended procedures and practices for the inspection, documentation, and priority classification of deficiencies for various elements that comprise a tunnel.

### III. NTIS

Recognizing that the safety and security of our Nation’s tunnels are of paramount importance and pursuant to the legislative mandate in MAP–21, FHWA developed the NTIS. The FHWA modeled the NTIS after the existing NBIS, located at 23 CFR part 650, subpart C. The more than 40-year history of the NBIS has enabled the States to identify and manage deterioration and the emergence of previously unknown problems in their bridge inventory; evaluate those structures properly; and make the repairs needed to mitigate the escalating cost of repairing or replacing older bridges. Similar needs and concerns exist for the owners of aging highway tunnels. The NBIS provided a starting point for designing a national tunnel inspection program. The FHWA has therefore modeled the NTIS after the NBIS, and will make appropriate changes in the NTIS as it gains more experience with tunnel inspections and safety problems. The NTIS will be added under subpart E of 23 CFR part 650—Bridges, Structures, and Hydraulics.

The NTIS require the proper safety inspection and evaluation of all tunnels. The NTIS are needed to ensure that all structural, mechanical, electrical, hydraulic, and ventilation systems and other major elements of our Nation’s tunnels are inspected and tested on a regular basis. The NTIS will also enhance the safety of our Nation’s highway tunnels by making tunnel inspections consistent across the Nation.

The NTIS will create a national inventory of tunnels that will result in a more accurate assessment and provide the public with a more transparent view of the number and condition of the Nation’s tunnels. Tunnel information will be made available to the public in the same way as bridge data contained in the National Bridge Inventory (NBI). The tunnel inventory data will also be available in the annual report to Congress required by MAP–21. The tunnel inventory data will allow FHWA to track and identify any patterns of tunnel deficiencies and facilitate repairs

<sup>10</sup> National Cooperative Highway Research Program, “Best Practices for Implementing Quality Control and Quality Assurance for Tunnel Inspection.” Prepared for the AASHTO Technical Committee for Tunnels (T–20), NCHRP Project 20–07, Task 261 Final Report, October 2009. An electronic format version is available at: [http://onlinepubs.trb.org/onlinepubs/nchrp/docs/NCHRP20-07\(261\)\\_FR.pdf](http://onlinepubs.trb.org/onlinepubs/nchrp/docs/NCHRP20-07(261)_FR.pdf).

<sup>11</sup> National Cooperative Highway Research Program, “Best Practices for Roadway Tunnel Design, Construction, Maintenance, Inspection, and Operations,” Prepared for the AASHTO Technical

Committee for Tunnels (T–20), NCHRP Project 20–68A Scan 09–05 Final Report, April 2011. An electronic format version is available at: [http://onlinepubs.trb.org/onlinepubs/nchrp/docs/NCHRP20-68A\\_09-05.pdf](http://onlinepubs.trb.org/onlinepubs/nchrp/docs/NCHRP20-68A_09-05.pdf).

<sup>12</sup> The definition of a highway tunnel used in the 2003 survey pertained to a single “bore” or constructed shape, but did not pertain to a given tunnel name (*i.e.* a tunnel such as the Holland tunnel in New York actually consists of two tunnels, one in each direction).

<sup>13</sup> The Federal Highway Administration/Federal Transit Administration “Highway and Rail Transit Tunnel Inspection Manual,” 2005 edition, is available in electronic format at: <http://www.fhwa.dot.gov/bridge/tunnel/management/>.

by States to ensure the safety of the public. Tunnel owners will also be able to integrate tunnel inventory data into an asset management program for maintenance and repairs of their tunnels. The data collection requirements in the NTIS are consistent with the performance-based approach to carrying out the Federal-aid highway program established by Congress in MAP-21. These requirements will fulfill the congressional directive to establish a data-driven, risk-based approach for the maintenance, replacement, and rehabilitation of highway tunnels. Such an approach will help to ensure the efficient and effective use of Federal resources.

The NTIS will ensure that tunnels are inspected by qualified personnel by creating a certification program for tunnel inspectors and a comprehensive training course.

#### *IV. Summary of Significant Changes Made in the Final Rule*

The final rule was revised in response to comments received on the SNPRM (78 FR 46118). The following paragraphs summarize the most significant of those changes. Editorial or slight changes in language for consistency are not addressed in this section.

In § 650.505, a definition for *end-of-course assessment* was added. This definition was needed to clarify the qualification requirements for Program Managers and Team Leaders in § 650.509.

Section 650.507 was retitled *Tunnel Inspection Organization Responsibilities*. Since the provisions of this section deal primarily with the responsibilities of a tunnel inspection organization rather than the structure and mechanisms of that organization, the title was amended to better reflect the content.

Language was added to § 650.507(e)(2) to explicitly state that the Tunnel Inspection Organization is responsible for managing critical findings. The MAP-21 assigns this responsibility and the language in this section was added to emphasize that requirement (23 U.S.C. 144(h)(2)(D) and 144(h)(3)(B)).

Section 650.507(e)(4) was added to respond to comments received on § 650.509 *Qualifications of Personnel*. This new paragraph was added to ensure that adequately qualified personnel inspect complex tunnels or tunnels with distinctive features or functions.

In § 650.509, the qualifications for Program Manager and Team Leader have been significantly altered in response to comments received on the

SNPRM. The majority of the commenters requested relief from the requirement that Program Managers and Team Leaders must have a P.E. license in addition to experience and training requirements. With only minor differences, the general qualifications for Program Managers and Team Leaders now closely mirror those for the same positions under the NBIS. Under the final rule, a P.E. license is only required for Team Leaders if an FHWA-approved process determines that the qualification is necessary to adequately and appropriately inspect a tunnel that is complex or has distinctive features or functions. The FHWA eliminated the training and national certification requirements for inspectors other than Program Managers and Team Leaders. Instead, the appropriate training for those inspectors is left to the discretion of the responsible States, Federal agencies, and tribal governments.

In § 650.511, the format of the *Inspection Date* was altered in response to comments. Some owners believe that the four-digit year should be captured in the NTI records. The FHWA concurs and the required format is now MM/DD/YYYY.

In § 650.513, in response to several comments, the requirement to conduct a load rating within 1 month of the completion of an inspection was extended to 3 months, and the requirement to post a tunnel within 48 hours of the determination of need was extended to 30 days. If an inspection determined that deterioration had significantly changed the capacity of an element, it is expected that a load rating would be conducted earlier than 3 months in order to ensure the safety of the tunnel. Likewise, if an inspection determined that the posting load was significantly below the legal load as to be a safety issue, it is expected that posting would occur earlier than 30 days. These are examples of critical findings that are required to be addressed under this rule.

A number of non-substantive changes were made to the regulatory text for clarity and formatting purposes.

#### **Regulatory History**

The FHWA issued an ANPRM on November 18, 2008, (73 FR 68365) to solicit public comments regarding 14 categories of information related to tunnel inspections to help FHWA develop the NTIS. The FHWA reviewed and analyzed the comments received in response to the ANPRM and published an NPRM on July 22, 2010 (75 FR 42643). In the NPRM, FHWA proposed establishing the NTIS based in part on the comments received in response to

the ANPRM. The FHWA published an SNPRM on July 30, 2013, (78 FR 46118) in order to update NTIS for the comments received on the NPRM and incorporate the requirements mandated in MAP-21. The FHWA received comments on the SNPRM from 26 commenters, including: 16 State DOTs (Alabama, Alaska, California, Florida, Michigan, Missouri, New York, North Carolina, Ohio, Oregon, Pennsylvania, South Dakota, Tennessee, Texas, Virginia, and Washington); 1 engineering consulting firm (Architecture, Engineering, Consulting, Operations, and Maintenance Technology Corporation (AECOM)); 4 organizations (AASHTO, American Council of Engineering Companies (ACEC), National Society of Professional Engineers (NSPE), and Professional Engineers in California Government (PECG)); 2 local authorities (the Maryland Transportation Authority (MdTA) and Metropolitan Transportation Authority Bridges and Tunnels of New York City (MTABT)); 2 private citizens (William Wright and John Williams); and 1 anonymous commenter. This final rule addresses the comments received on the SNPRM and establishes the NTIS.

#### **Section-by-Section Analysis**

##### *650.501 Purpose*

The California DOT commented that a regulation focused on in-service inspection will not prevent another occurrence of the Massachusetts “Big Dig” failure.

The FHWA Response: With regard to the “Big Dig” failure, the NTSB investigation found that “had the Massachusetts Turnpike Authority, at regular intervals between November 2003 and July 2006, inspected the area above the suspended ceilings in the D Street portal tunnels, the anchor creep that led to this accident would likely have been detected, and action could have been taken that would have prevented this accident.”<sup>14</sup> The FHWA concurs with NTSB that timely tunnel routine (in-service) inspections are key to preventing tunnel failures such as the Big Dig failure.

The Missouri DOT commented that although it seems logical to make the NTIS similar to the NBIS, tunnels are unique structures and should be treated differently from bridges.

The FHWA Response: The FHWA did use the NBIS as a starting point in developing the NTIS. The NBIS have proven successful in ensuring the safety

<sup>14</sup> NTSB, Ceiling Collapse in the Interstate 90 Connector Tunnel 103 (2007), <http://www.nts.gov/doclib/reports/2007/HAR0702.pdf>.

of the Nation's bridges for several decades. However, FHWA recognizes the difference between tunnels and bridges and portions of the NTIS depart from the companion provisions of the NBIS where necessary.

#### 650.503 Applicability

The Alaska Department of Transportation and Public Facilities commented that owners should decide whether a structure will be defined as a tunnel, culvert, or bridge.

The FHWA Response: Where a structure could be defined as either a bridge or a tunnel, as in the case of a "tunnel" that is used to support a roadway, this regulation gives the structure's owner the discretion to determine how it will be classified (tunnel, culvert, or bridge). Under such a scenario the structure may be classified as either a tunnel or a bridge, but not both. Structures classified as bridges would be subject to the NBIS, while those structures classified as tunnels would be subject to the NTIS. Bridge-length culverts are classified as bridges and are also subject to the NBIS. When a structure functions solely as a tunnel, FHWA expects that it will be defined as a tunnel.

#### 650.505 Definitions

*American Association of State Highway and Transportation Officials (AASHTO) Manual for Bridge Evaluation.* The FHWA changed this definition so that it's consistent with the incorporation by reference section. This change allows the FHWA to require the current version of the document to be utilized.

*Complex tunnel.* The AASHTO and the Ohio, Pennsylvania, and New York DOTs commented that the definition of "complex tunnel" is too vague and that a clearer definition is needed. They suggest adding additional features like geometrics, structural criteria, and/or inclusion of functional systems to better define a "complex tunnel." The Missouri DOT suggested that there is no need to define "complex tunnel" since all tunnels are complex by their nature and will require an individual approach for inspection. The Oregon DOT suggested that the definition include tunnels with multiple traffic levels, multiple traffic directions, on/off ramps, and ventilation systems that have automated controls or fire suppression systems.

The FHWA response: The FHWA believes the modified version of the AASHTO T-20 definition is adequate to capture the structures targeted by this regulation without overcomplicating the determination of what is or is not a

tunnel.<sup>15</sup> The current definition clearly states that a structure shall be inspected and reported only once under either the NBIS or the NTIS, but not both. The FHWA believes that including categories for tunnels, or additional detailed language on functional systems or type of construction, would narrow what is intended to be a fairly broad definition. Also, the definition for complex tunnel addresses advanced or unique structural elements or functional systems.

*Critical findings.* The Texas DOT suggested that FHWA define "critical findings" for tunnels in order to ensure national consistency. Ohio DOT suggested considering a condition coding of '2' or less as the definition of a "critical finding."

The FHWA response: The FHWA believes it is not possible to create an all-inclusive list of issues that could exist in tunnels and that adding additional language would limit the definition of a "critical finding." Tunnels will be inspected using an element-level methodology included in the Tunnel Operations, Maintenance, Inspection and Evaluation (TOMIE) Manual and, as a result, will not generate condition codes.

*End-of-course assessment.* As outlined in the below discussion, FHWA has significantly altered the qualification requirements for Program Managers and Team Leaders in response to comments. As a result, it became necessary to include a definition for "end-of-course assessment" as this phrase is now used in the determination of the qualifications for a Program Manager and Team Leader. The term "end-of-course assessment" means a comprehensive examination given to students after the completion of a training course.

*Inspection Date.* Washington State DOT questioned whether the official Inspection Date is the first day or last day of the inspection if the inspection lasts for more than 1 day. Oregon DOT and AASHTO noted that some States record the Inspection Date as the date the inspection was completed.

The FHWA response: Irrespective of the duration of the inspection, the "Inspection Date" is the date, established by the Program Manager, on which the inspection begins.

*Load rating.* The Ohio DOT suggested that under the definition for "load rating," "there are non-vehicular loads the tunnel should account for *i.e.* rock

impact, suspended systems." The AASHTO expressed concern that the definition does not include the evaluation of "tunnel ceiling hangers or conduit attachments for dead load of the ceiling itself and for live load produced by trucks pushing air thru the tunnels that creates a compression force on the hangers."

The FHWA response: The current definition of "load rating" in 23 CFR 650.305 is "the determination of the live load carrying capacity of a bridge using bridge plans and supplemented by information gathered from a field inspection." The current definition in the AASHTO Manual for Bridge Evaluation is "the determination of the live-load carrying capacity of an existing bridge." As the proposed definition is consistent with 23 CFR 650.305 and the AASHTO Manual, FHWA declines the changes suggested by AASHTO and Ohio DOT. In addition, the commenters' suggested changes would effectively incorporate structural evaluation, which is separate from load rating. Structural evaluation can be required by the owner at any time and should occur automatically if damage or deterioration with the potential to affect performance is detected through an inspection.

*Routine permit load.* Ohio DOT suggested that the definition for "routine permit load" should also include "geometrics taking into consideration the limited size, curvature, and traffic control associated with permitted vehicles through tunnels."

The FHWA response: The FHWA believes the definition in this rule is consistent with the definition used in the NBIS and is commonly accepted and understood within the bridge and tunnel community. Routine permit loads need to be defined for the purposes of this rule because they are used to conduct load ratings. While factors like geometrics and traffic control are important considerations for evaluating safe passage of vehicles in tunnels, for the purposes of defining routine permit load, they are unnecessary.

*Tunnel.* California and Ohio DOTs suggested that the definition of "tunnel" include such physical parameters as linear length, length to width, forced ventilation to limit carbon monoxide buildup, fire suppression systems, structures bored or mined through undisturbed material, emergency egress, and depth of cover. They suggested that the definition needs to be explicit to ensure public entities are able to consistently distinguish the difference between a tunnel, bridge, and culvert. The South Dakota DOT questioned

<sup>15</sup> "AASHTO T-20" refers to the American Association of State Highway and Transportation Officials Highway Subcommittee on Bridges and Structures, Technical Committee T-20 Tunnels.

whether FHWA intends for the tunnel inventory to include “short/small hard rock unlined tunnels that have no man made structural components.”

Tennessee DOT suggested that the definition ensures a structure is exempt from the tunnel inspection program only if it is being inspected under the NBIS as a full bridge record, as opposed to only an underpass record. They also suggested that FHWA include a minimum length in the definition. Tennessee DOT explained that “the length should be selected such that it is large enough to exclude normal underpass structures but will include any structure that is long enough to require the special attributes (lighting, ventilation, etc.) of true tunnels.” They recommended a length of 50 meters. Florida DOT interpreted the proposed definition of “tunnel” to say that if a tunnel is inspected and inventoried as part of their bridge inspection program, then they don’t have to include that tunnel in a tunnel inspection program.

The FHWA response: The FHWA believes the modified version of the AASHTO T-20 definition is adequate to capture the structures targeted with this proposed regulation without overly complicating the determination of what constitutes a tunnel. Consistent with the majority of the comments received on the ANPRM and the NPRM, this definition does not include a minimum length. The FHWA believes that including categories for tunnels, or additional detailed language on functional systems or type of construction, would narrow what is intended to be a broad definition. Also, the definition for “complex tunnel” addresses advanced or unique structural elements or functional systems. Finally, if a State DOT classifies a structure as a tunnel, it will need to be inspected and inventoried under NTIS. If a structure serves a dual purpose and is already being inspected and inventoried under NBIS, it will be the State DOT’s decision to reclassify the structure as a tunnel.

Washington State DOT noted that the “tunnel” definition “does not make reference to load carrying element. In fact it states “bridges” are covered separately under the NBI.” The Washington State DOT suggested that FHWA modify the definition to clarify what the load rating requirements are referring to, and whether the load ratings for traffic carrying elements will be reported under NTIS or NBIS.

The FHWA Response: Within the NTIS regulations, the definition of load rating includes the phrase “the determination of the vehicular live load carrying capacity within or above the

tunnel.” As the commenter notes, these structures do not include bridges or culverts. Therefore these elements will be reported to the NTI.

*Tunnel inspection experience.* The Washington State DOT noted that “tunnel inspection experience” should include experience in similar fields such as bridge inspection. The Ohio DOT suggested that the definition for tunnel inspection experience is too restrictive and will encourage entities to code potential tunnels as bridges.

The FHWA response: The FHWA added language in the SNPRM to clarify the criteria to be used in evaluating years of experience under § 650.509(a), including: The relevance of the individual’s actual experience, exposure to problems or deficiencies common in the types of tunnels inspected by the individual, complexity of tunnels inspected relative to the individual’s skills and knowledge, and the individual’s understanding of data collection needs and requirements. Under the NTIS, tunnel inspection experience is only one of the requirements used to evaluate the eligibility of a Program Manager or Team Leader.

Oregon DOT and AASHTO noted that owner agencies have very few tunnels in comparison to bridges, making it unlikely that tunnel inspection will be a full time job in most agencies. They raised their concern that, as proposed, the experience requirement would cause inspection outsourcing. To address this, they suggested modifying the definition of “tunnel inspection experience” to make participation in a single tunnel inspection per calendar year sufficient.

*The FHWA response:* The FHWA believes that flexibility is built into the regulation in that it only requires the individual to actively participate in the performance of tunnel inspections in accordance with the NTIS, in either a field inspection, supervisory, or management role. It is expected that the Program Manager use his or her judgment in the evaluation of whether a Team Leader has reasonable experience in any given year to satisfy that year’s experience criteria.

*Tunnel-specific inspection procedures.* Virginia DOT commented that “written documentation should not be required for damage or special inspections.” Oregon DOT and AASHTO expressed concern that if this requirement is not limited, FHWA could impose requirements for maintenance, drainage, operational, damage, or special inspections that would greatly restrict an owner’s ability to manage and operate their tunnels.

*The FHWA response:* The FHWA agrees that it would be difficult to write specific procedures for any damage incident that could occur in a tunnel or special inspection that would be necessary for tunnel components. However, general guidance should be included in each structure inspection procedure to address how the inspectors should inspect and document a damage or special inspection of deficient tunnel components.

#### 650.507 Tunnel Inspection Organization Responsibilities

The PECC commented that they “firmly believe that the inspection process is inherently governmental” and that the regulation should “clearly state that a State is required to use their own professional staff to perform tunnel inspection functions unless the State lacks its own current or obtainable professional staff with the qualifications and capacity to perform the inspections.”

*The FHWA Response:* The final rule includes the qualification requirements for personnel who will manage, plan, and conduct tunnel inspections. The FHWA is not in a position to determine the most efficient and effective way for an owner to identify the personnel needed to meet those qualifications. Therefore, owners will need to make individual decisions based on the best use of their program resources.

Michigan DOT questioned whether this final rule would apply to privately or locally owned tunnels and, if so, whether the State program manager be responsible for inventory and inspection according to NTIS.

*The FHWA Response:* The MAP-21 legislation mandates that the NTIS apply to all highway tunnels. Therefore, if a privately or locally owned tunnel not owned by a Federal agency or tribal government services a public roadway, then it is subject to this final rule and the State DOT is ultimately responsible for the inspection and inventory of that tunnel.

Ohio DOT noted that State law does not give the Ohio DOT the authority to inspect, or cause to be inspected, locally owned tunnels. The AASHTO and Oregon DOT commented that some State laws do not allow the State DOT to conduct these inspections unless there is an executed agreement with the local owner.

*The FHWA Response:* This requirement is similar to the long standing requirement for the inspection of bridges under the NBIS. Under 23 U.S.C. 302, a State DOT is required to have adequate powers to fulfill its duties. If the current legal or regulatory

authority does not exist within a State to carry out this responsibility, the State DOT should seek that authority through the appropriate legislative process.

New York State DOT commented that many large tunnels are locally owned and suggested that FHWA deal directly with those owners instead of with the State highway agencies. New York State DOT also commented that requiring a State that owns a small number of small tunnels to establish a Tunnel Inspection Organization is a “waste of resources, ineffective, and unnecessary.” Ohio and Missouri DOTs also commented that States with a small number of tunnels should not be required to have a Program Manager or establish a Tunnel Inspection Organization, respectively.

*The FHWA Response:* Under 23 U.S.C. 302, FHWA’s primary relationship in a State is with the State DOT. The State DOT maintains the primary relationship with the local owners within its borders. As such, the State DOT is in the best position to manage the inspection and inventory of locally owned tunnels. For States that have a small number of tunnels and cannot easily incorporate a tunnel inspection organization into their bridge inspection organization, it might be more effective for the State DOT to contract out many of the elements of a Tunnel Inspection Organization to another party. Although the delegation of some functions is permitted under this final rule, the State DOT retains all of the responsibilities detailed in the regulation.

Florida, Missouri, Texas, Michigan, New York State, and Virginia DOTs and AECOM questioned whether it was realistic, feasible, or necessary for a State DOT to maintain a registry of nationally certified tunnel inspectors. Several suggested that FHWA or another nationally recognized organization assume the responsibility. Virginia DOT also commented that the registry should include an inspector’s current organizational information.

*The FHWA Response:* FHWA believes it is important for each State DOT to maintain a State-specific registry of certified inspectors who perform or have performed inspections on their tunnels. There are a number of reasons that each State should maintain this registry. The registry can be used to communicate with inspectors who work in that State to announce such things as anticipated work, training requirements, and training opportunities. State-specific requirements for inspectors can be incorporated and data quality is more easily maintained at the State level. Also, information affecting the good standing of any inspector would be

local. With regard to the registry containing an inspector’s organizational information, FHWA intended the requirement for the registry to contain an inspector’s contact and organizational information.

Washington DOT questioned whether the requirement that the nationally certified tunnel inspector registry include a method to positively identify each inspector means that the registry should include photo identification.

*The FHWA Response:* FHWA did not intend to imply that a photograph was required for positive identification of an inspector. The FHWA also does not intend to dictate what method is used by a State DOT in fulfilling this requirement. However, a unique numbering system that positively ties an individual to a certification record would satisfy this requirement.

New York State DOT commented that clarification was needed regarding the collection of information that may affect the good standing of an inspector. They note that maintaining this information may also subject the State DOT to unnecessary legal exposure.

*The FHWA Response:* It is the intent of FHWA to ensure that all inspectors meet the requirements of national certification and that they have not previously demonstrated behavior that could call into question whether the inspector could be trusted to adequately perform all assigned inspection activities. The level of detail needed in the information collected to challenge or negate an inspector’s good standing is left to the judgment of the State DOT.

The AASHTO and Oregon DOT commented that some States may have specific requirements for tunnel inspectors that are more restrictive or robust than national standards, and it would be an unnecessary burden to maintain two separate lists of inspectors—one for those meeting State requirements and one for those meeting national requirements.

*The FHWA Response:* It is not the intent of FHWA to require States to maintain a Federal-specific registry of certified tunnel inspectors. As long as the registry used by the State DOT fulfills the requirements of this regulation, it may also be used to maintain State specific information about each inspector.

#### 650.509 Qualifications of Personnel

California, Texas, South Dakota, Michigan, Missouri, and Pennsylvania DOTs commented that requiring the Program Manager to have 10 years of tunnel inspection experience, be a P.E., and be a nationally certified tunnel inspector is excessive and cautioned

that many States do not have staff that meet these requirements. Texas DOT recommended requiring 5 years of tunnel inspection experience in combination with a P.E. license. The MdTA supported the requirement that a Program Manager have a P.E. license. Florida DOT also supported the requirement for Program Managers to have a P.E. license but thought 10 years of inspection experience was excessive and preferred a requirement for 1 or 2 years of inspection experience. Ohio, Alaska, and New York State DOTs and AASHTO requested that consideration be given to add an experience component to allow non-P.E.s. to perform the Program Manager role, similar to the NBIS. Another consideration offered by South Dakota DOT was that qualification requirements for a Program Manager be risk-based, depending on the complexity of an owner’s tunnels. The MTABT commented that in addition to the P.E. license, 10 years of tunnel or bridge inspection experience, and comprehensive training, the Program Manager should have extensive experience in tunnel design and tunnel construction.

*The FHWA Response:* The FHWA has reconsidered the requirement that a Program Manager be a P.E. Recognizing the success that the NBIS has had using Program Managers qualified by experience in lieu of a P.E., the qualifications for a Program Manager in NTIS are now similar to those in the NBIS. A Program Manager shall, at a minimum, be a registered Professional Engineer or have 10 years of tunnel or bridge inspection experience, be a nationally certified tunnel inspector, and be able to determine the minimum qualifications for a Team Leader.

Alabama, Alaska, California, Missouri, New York State, North Carolina, and Pennsylvania DOTs and AASHTO commented that the proposed P.E. requirement for Team Leaders, in addition to tunnel inspection experience and inspector certification, is too restrictive and that the requirements for Team Leaders should mirror those of the NBIS. The MdTA agreed that the Team Leader should be required to have a P.E. Several States commented that the P.E. requirement would preclude in-house inspectors who have gained knowledge and experience from performing tunnel inspections or are seasoned bridge inspectors from filling these positions.

*The FHWA Response:* The FHWA has reconsidered the P.E. license requirement proposed for Team Leaders. Recognizing the success that the NBIS has had using Team Leaders qualified

by experience in lieu of a P.E. license, the qualifications for a Team Leader in NTIS are now similar to those in NBIS. However, FHWA added an additional requirement that requires a Program Manager to determine when a Team Leader who is leading the inspection of a complex tunnel or a tunnel with distinctive features or functions must have a P.E. license.

Washington State DOT commented that the proposed rule should require a minimal level of prior inspection experience to become a lead inspector.

*The FHWA Response:* The FHWA agrees that Team Leaders should have prior inspection experience and has added the requirement to the final rule. Team Leaders are now required to have either a P.E. license and at least 6 months of inspection experience, 5 years of inspection experience, or a combination of education, certification with 2 years of inspection experience.

The MdTA commented that any mechanical or electrical engineers supporting a tunnel inspection should only need their P.E. license and any discipline-specific certifications, and should not be required to be nationally certified tunnel inspectors. The MdTA commented further that the discipline-specific staff supporting an inspection should just know how to perform their job (InterNational Electrical Testing Association testing for example) and should not be required to be familiar with tunnel inspection in general. Similarly, Missouri DOT noted that inspectors of functional systems should not be required to be nationally certified tunnel inspectors.

*The FHWA Response:* The FHWA agrees with the comments and has limited the requirement for national certification as a tunnel inspector to the Program Manager and Team Leader.

Washington State DOT questioned whether a Team Leader for unlined tunnels will need a P.E. license in the field of geotechnical engineering.

*The FHWA Response:* The FHWA does not believe it necessary to identify the discipline of a P.E. license since license holders are ethically bound to practice engineering only in their area of expertise. However, under the provisions of the final rule, the Program Manager will determine whether a Team Leader must have a P.E. license and any additional requirement of that license in accordance with the FHWA-approved process developed by the Tunnel Inspection Organization. The definition for Professional Engineer in section 650.505 of the rule emphasizes that a P.E. is limited to practicing within their area of expertise. Further, FHWA believes it is the responsibility of the

Team Leader to assemble a team of inspectors with appropriate expertise and experience to inspect the various elements, components, and systems that comprise the tunnel.

The ACEC expressed support for requiring both Program Managers and Team Leaders to have a P.E. license.

*The FHWA Response:* The FHWA has reconsidered the requirement that a Program Manager and a Team Leader must be a P.E. Recognizing the success that the NBIS has had using Program Managers and Team Leaders qualified by experience in lieu of a P.E., the qualifications for a Program Manager and a Team Leader in NTIS are now similar to those in the NBIS. However, FHWA added an additional requirement that requires a Program Manager to determine when a Team Leader who is leading the inspection of a complex tunnel or a tunnel with distinctive features or functions must have a P.E. license.

Missouri, Oregon, and Washington State DOTs and NSPE suggested that the requirement that the Program Manager be a nationally certified tunnel inspector is excessive.

*The FHWA response:* The FHWA believes that due to the difference in the complexity of the structures that are being inspected under the NTIS, and the need for a general understanding of the functional systems included in the design of these structures, this requirement is appropriate for Program Managers.

Washington State DOT and MTABT stated that the experience listed in § 650.509(a)(1) is not clear or relevant.

*The FHWA response:* The FHWA believes that §§ 650.509(a)(1), (2), and (3) are all measures that may be used in evaluating the Program Manager's 10 years of experience requirement. Section 650.509(a)(1) addresses an individual's field experience in leading an inspection team (bridge or tunnel). This is just one skill set that a Program Manager should possess to understand the challenges associated with the tunnel inspection program.

Oregon DOT and AASHTO suggested that any tunnel inspection experience gained in a given year should be counted as credit for that year.

*The FHWA response:* The relevance of an individual's actual experience, including the extent to which the individual's experience on at least one tunnel inspection per calendar year has enabled the individual to develop the skills needed to properly lead a tunnel safety inspection, will be determined by the Program Manager.

The AASHTO commented that § 650.509(a)(1) will increase its

members' costs because some States will lack qualified inspectors and may be forced to hire consultants to do inspections. The AASHTO further indicated that States "would like to have the ability to perform interim inspections of special focus areas with bridge inspectors that have taken the tunnel inspector training."

*The FHWA response:* The FHWA believes that the minimum criteria established in § 650.509(a) are necessary to ensure that tunnel inspectors are qualified to inspect tunnels.

California DOT questioned why experienced bridge inspectors who have not completed the certification training are not qualified to inspect tunnels under the direction of a Team Leader. North Carolina and Oregon DOTs and AASHTO suggested that the Program Manager should be able to establish State-specific qualifications for inspectors of functional systems.

*The FHWA Response:* The FHWA has reconsidered the requirement that all tunnel inspectors need to be nationally certified. Under the final rule, only the Program Manager and Team Leaders are required to be nationally certified tunnel inspectors. However, FHWA believes it is the responsibility of the Team Leader to assemble a team of inspectors with appropriate expertise and experience to inspect the various elements, components, and systems that comprise the tunnel.

Pennsylvania DOT and AECOM suggested that FHWA consider addressing qualifications for inspectors of functional systems. Pennsylvania DOT suggested more flexibility in those qualifications. South Dakota DOT suggested that inspectors of unlined tunnels should have a geotechnical background.

*The FHWA Response:* The FHWA believes it is the responsibility of the Team Leader to assemble a team of inspectors with appropriate expertise and experience to inspect the various elements, components, and systems that comprise the tunnel.

California DOT noted that the development of the specialized training and procedures by FHWA to improve inspections would benefit States, but is concerned about deadlines because no training program currently is in place.

*The FHWA Response:* The FHWA agrees that training for tunnel inspection is a critical part of the NTIS program, and we are actively working with National Highway Institute (NHI) to complete the development of this training. It is the intent of FHWA that the required training will be available shortly after the final rule is published,

which should provide sufficient time for all deadlines to be met.

California DOT noted that there is no current national certification program.

The FHWA Response: The FHWA added the requirements for nationally certified tunnel inspectors in the SNPRM as a result of the requirements of MAP-21. The FHWA is developing training and expects that the training required to become a nationally certified tunnel inspector will be available soon after the effective date of this final rule.

Oregon DOT commented that States should be able to establish inspector qualifications and maintain their own certification lists.

*The FHWA Response:* Because of the variability and complexity of the structures that are being inspected under the NTIS, FHWA believes that minimum national standards for inspectors will bring national consistency to tunnel inspections, evaluations, and data collection/submission. However, State DOTs may require additional qualifications for tunnel inspectors in their State. Any State maintained certification list or registry of inspectors that meet the minimum requirements of this final rule can serve as the State's registry of nationally certified tunnel inspectors.

The MTABT commented that "the development and initiation of National Tunnel Inspector certification programs should be administered by individual States, similar to the Bridge Inspector certification and in advance of the effective date of this rule."

*The FHWA Response:* The FHWA has approved alternate bridge inspection training courses used to meet the NBIS comprehensive training requirements; however, most States use the FHWA-developed training. Similarly, under the NTIS, FHWA will permit States to use FHWA-approved training in order for inspectors to meet the qualifications for national certification. Also, FHWA agrees that States should maintain a registry of nationally certified tunnel inspectors that work in their State.

Washington State DOT asked whether the training to be a "nationally certified tunnel inspector" will be "specific to each discipline (structural, mechanical, electrical)."

*The FHWA Response:* The FHWA intends for the proposed tunnel inspection training course to be comprehensive in nature. This training course will cover the content of the TOMIE Manual and the Specifications for the NTI. The FHWA believes that adequate guidance is provided in these manuals to inspect and code the conditions of tunnel elements.

Florida DOT asked how long a State Highway Agency will have after a new Program Manager is designated for this individual to take the required comprehensive course.

*The FHWA Response:* The FHWA is currently developing a comprehensive tunnel inspection training course. We believe that it will be available for all owners to ensure that all programmatic requirements can be met and the initial inspections completed within 24 months from the effective date of this final rule. The FHWA expects future Program Managers to meet the requirements of NTIS before they are designated as the Program Manager.

California DOT questioned why refresher training for tunnels must be FHWA-approved and why refresher training is required every 48 months for tunnel inspectors. California DOT noted that there is no similar refresher training requirement in NBIS and suggested that NTIS be consistent. Similarly, New York State DOT suggests removing 48-month refresher training requirement to be consistent with NBIS for bridge inspections. Virginia DOT requested that the refresher training requirement interval be no less than 60 months. California DOT also asked how various disciplines (structural, mechanical, and electrical) will recertify.

*The FHWA Response:* The final rule has been revised to extend the interval for required refresher training to 60 months. Also, only Program Managers and Team Leaders are required to attend refresher training. The purpose of refresher training is to improve the quality of tunnel inspections, introduce new techniques, and maintain the consistency of the tunnel inspection program once every 60 months. The required refresher training will be comprehensive and will cover all disciplines. The FHWA currently requires its approval for bridge inspection training and bridge inspection refresher training.

The ACEC expressed support for the requirement that inspectors complete a comprehensive training course and periodic "refresher" courses in order to be certified, as provided in § 650.509(e).

*The FHWA Response:* The FHWA acknowledges the comment.

#### 650.511 Inspection Interval

Alaska DOT commented that the initial inspection requirement for existing tunnels should be extended to 3 years from the effective date of this final rule if the existing tunnels are not currently inspected at a shorter interval. The AECOM commented that it will be a challenge for tunnel owners to meet the requirements of NTIS in 24 months

and suggested that FHWA consider a phased approach.

*The FHWA Response:* The FHWA appreciates the challenge that implementation of this final rule will pose for tunnel owners. However, the 24-month requirement for both the initial and routine inspections was supported by comments on the NPRM received from State DOTs, AASHTO, and others. In addition, tunnels are constructed with similar materials and methods and face similar deterioration mechanisms as bridges, and the 24-month inspection interval required for bridges under NBIS has proven very successful. As a result of the significant support for this interval of inspection and the success of past practice in the bridge industry, FHWA elects to keep the initial inspection requirement at 24 months.

Alaska DOT also commented that the requirement for an initial inspection should be waived if an existing tunnel is already regularly inspected and that FHWA should permit the Program Manager to waive the requirement for a routine inspection when a tunnel is regularly inspected in a more rigorous manner.

*The FHWA Response:* The FHWA will not waive the requirement for an initial inspection. The initial inspection is intended to provide the baseline of inventory and condition information needed to fulfill the requirements of NTIS. However, if a tunnel is already regularly inspected and the State DOT can document that the latest inspection was conducted in accordance with the minimum requirements of NTIS, FHWA will accept the inventory and condition data from that inspection as the initial inspection. This information will establish the Inspection Date for the tunnel and then compel the next routine inspection at the appropriate interval.

The FHWA will not waive the requirement for a routine inspection of a tunnel that is regularly and rigorously inspected. However, if a tunnel is being regularly inspected in a more rigorous manner than required by NTIS, FHWA will recognize those inspections as meeting the definition of a routine inspection.

With regard to the requirement for initial inspection, Ohio DOT commented that 12 months is too short of a time period to enact such a comprehensive program that includes a new manual, training, possible contracts, and staffing components.

*The FHWA Response:* The time period proposed in the SNPRM and included in this final rule for conducting the initial inspection is 24 months from the effective date of the final rule.

Ohio DOT commented that the criteria used to support an extended routine inspection interval should be established before issuing the regulation to eliminate inconsistencies between FHWA Division Offices. Ohio DOT also commented that in addition to the factors listed in the SNPRM, the criteria should include access for emergency vehicles, traffic evacuation, and response to emergencies. Oregon and Virginia DOTs and AASHTO suggested removing the list of risk factors.

*The FHWA Response:* The FHWA has not attempted to produce an all-inclusive list of the criteria that need to be considered in order to justify an extended routine inspection interval. A general list of factors to be assessed is included in the final rule, but FHWA believes it is the responsibility of the State DOT to produce an appropriate evaluation that considers the risk associated with the particular circumstances of a tunnel in justifying an extended routine inspection interval. The FHWA has provided these general criteria to establish a minimum baseline and create consistency.

Washington State DOT commented that requiring an initial inspection for new tunnels before opening to traffic is “overly restrictive and does not match [the] direction [of] the NBIS.” Washington State DOT suggested requiring the inventory inspection within 90 days of a tunnel opening and the functional system inspection prior to the opening of the tunnel.

*The FHWA Response:* The FHWA believes that the thoroughness and efficiency of an initial tunnel inspection is increased when it is conducted prior to opening. In this scenario, FHWA thinks it likely that the initial inspection to fulfill the requirements of NTIS will be conducted concurrent with the final construction inspection. Because tunnels, unlike most bridges, typically contain many elements that are suspended or otherwise fixed over the travel lanes, FHWA wants the initial inspection of new tunnels to be conducted prior to opening the tunnel to ensure the safety of the traveling public.

Texas DOT suggested that the routine Inspection Date be reported in a month, day, and year (MM/DD/YYYY) format and that the whole 4-digit year be used.

*The FHWA Response:* The FHWA agrees with the suggestion and has revised the final rule to require the routine Inspection Date in a month, day, and year format with a 4-digit year.

The MTABT suggested an interval of 10 years between “comprehensive inspections (in-depth inspections) for all structural and functional systems.”

The MTABT also commented that “[r]outine [i]nspection intervals and intensity also be variable based on continuous routine maintenance and a full time presence of maintenance, operations, and engineering staff on-site.” Alaska, Michigan, and Texas DOTs suggested that routine inspection intervals should be determined by States, by their Program Managers and Team Leaders, using a risk-based method. The Texas and Michigan DOTs suggested that routine inspection intervals should be determined by States using a risk-based method. The Alaska and Oregon DOTs commented that the frequency and type of inspection should be established by the owner and not regulated by Federal agencies.

*The FHWA Response:* The FHWA believes that the similarities between bridge and tunnel construction materials and associated deterioration mechanisms, design methodologies, and inspection technologies and protocols, along with the long-standing success of the 24-month inspection interval under NBIS and the current inspection activities of many tunnel owners, support the establishment of a 24-month routine inspection interval under NTIS. The FHWA also believes that there is flexibility in the final rule to accommodate both extended routine inspection intervals after consideration of appropriate factors and more rigorous inspection procedures based on the needs of a particular tunnel.

Washington State DOT stated that they currently inspect some tunnels on a 48-month interval and asked whether they will have to inspect them on a 24-month interval or provide FHWA a written request justifying the extended routine inspection interval as a result of the final rule.

*The FHWA Response:* For tunnels currently inspected on a 48-month interval, the tunnel owner will be required to either reduce the inspection interval to 24-months, or receive approval from FHWA for the extended inspection interval. The FHWA’s approval will be based on submission of a written justification that considers the appropriate criteria provided in the final rule.

Washington State DOT commented that tunnel lining type should affect inspection interval and recommended that unlined tunnels and some types of lined tunnels should not be permitted for consideration of the extended inspection interval.

*The FHWA Response:* The FHWA expects that all appropriate risk factors need to be assessed when justifying an extended routine inspection interval.

The tunnel owner is the best judge of the comprehensive list of criteria to be reviewed for a particular tunnel. The type and condition of the tunnel lining, although not explicitly stated in the regulation, should be considered as part of the assessment. The general criteria listed in the final rule include tunnel complexity, geotechnical conditions, and known deficiencies which should prompt a consideration of the type and condition of the tunnel lining.

Texas DOT suggested that there should be no maximum tolerance for early inspections.

*The FHWA Response:* Under the final rule, tunnel owners are allowed to begin an inspection 2 months before or after the Inspection Date to maintain that date in NTI. Inspections started prior to the 2-month tolerance given to the Inspection Date would require the Program Manager to modify the routine Inspection Date for a tunnel in order to maintain the regular 24-month interval. The FHWA believes that the need to modify this date should be minimized in order to avoid confusion in the data and history of inspection. However, the flexibility does exist for the Program Manager to modify the date if it is in the best interest of the tunnel owner, or traveling public to have a routine inspection started prior to the 2-month tolerance.

#### 650.513 Inspection Procedures

California DOT commented that the manual incorporated by reference is still a draft.

*The FHWA Response:* The FHWA released the TOMIE Manual as a draft because we were seeking comment on the contents from State DOTs and others. The FHWA will issue a final version of the TOMIE Manual with this final rule.

Ohio DOT asked whether element-level inspections will be required or if NBIS condition rating inspections will be permitted.

*The FHWA Response:* The TOMIE Manual and the Specifications for the NTI, both incorporated by reference in this final rule, require element-level inspections and include condition state language.

Virginia DOT suggested that it is not necessary to have the Team Leader at the tunnel at all times during inspection, especially for components in which the Team Leader is not necessarily involved, as long as reporting procedures are in place for priority/critical findings.

*The FHWA Response:* The FHWA believes that while the Team Leader may not be able to add considerable technical expertise during a functional

system inspection, there are many quality control checks on data, documentation, safety, procedural checks, etc., that would be expected of the Team Leader while an inspection is being performed.

The MTABT suggested adding a requirement to the tunnel inspection manual for periodic settlement and sounding surveys for subaqueous tunnels. They further suggested that this testing would be valuable because any significant change in the amount of cover over a tunnel may change the stresses imposed on the tunnel linings. The MTABT also commented that the scope of inspections could be variable, excluding, for example, systems under rehabilitation, newly in-service, or recently tested.

*The FHWA Response:* The FHWA believes it is the responsibility of the Team Leader to assemble a team of inspectors with appropriate expertise and experience to inspect the various elements, components, and systems that comprise the tunnel. The FHWA also believes that the scope of inspections will vary over time, based on the needs of a particular tunnel, and that the Team Leader, working with the Program Manager, will identify those needs and the appropriate level of inspection rigor.

Ohio DOT suggested that the requirement to prepare and document tunnel-specific inspection procedures for each tunnel is "overkill." They recommended that FHWA limit this requirement to only complex tunnels or clarify that the requirement will not result in unnecessary inspection manuals.

*The FHWA Response:* The FHWA expects that less detailed procedures will be developed for less complex tunnels.

Pennsylvania DOT requested clearer guidance on data and inventory reporting requirements for functional (non-structural) systems and inspection procedures.

*The FHWA Response:* The FHWA has developed the content of the TOMIE Manual and the Specifications for the National Tunnel Inventory to provide adequate guidance to inspect and code the conditions of these functional systems.

South Dakota DOT recommended different tunnel classifications with corresponding requirements based on risk and complexity.

*The FHWA Response:* The FHWA recognizes that there are differing types of tunnel construction. The FHWA believes it is the Program Manager's responsibility to establish a team of suitable inspectors to properly inspect a

tunnel based on the risks associated with that tunnel.

The AASHTO suggested that written inspection procedures should be required only for the structural portion of the routine and in-depth inspections, but not for damage or special inspections.

*The FHWA Response:* The FHWA acknowledges that it would be difficult to write specific procedures for every damage incident that could occur in a tunnel or special inspection that would be necessary for tunnel components. General guidance should be included in each structure inspection procedure to address how the inspectors would inspect and document a damage or special inspection of deficient tunnel components.

Missouri DOT suggested that the NTIS regulations are too specific and complicated. They recommended that States write a tunnel-specific manual to cover all the components within a tunnel, qualifications needed for inspectors, inspection frequency for all components, load ratings, etc. They suggested that the contents of this manual would ultimately need to be agreed upon by FHWA and the State.

*The FHWA Response:* The FHWA modeled the complexity and level of detail of the NTIS after the NBIS. Under NTIS, States are free to develop tunnel-specific procedures and manuals as long as they comply with the program requirements of the regulation. The FHWA believes that as long as any tunnel-specific procedures meet the requirements of NTIS, they will ensure national consistency in tunnel inspection practices.

Alabama, Oregon, and Pennsylvania DOTs and AASHTO suggested that flexibility is needed to allow maintenance and operations personnel meeting the NTIS qualifications to either participate in, or have oversight of, the tunnel inspection process.

*The FHWA Response:* The FHWA believes that it is necessary to have independent inspectors performing inspections of all aspects of the tunnel to ensure that an unbiased examination is conducted. This minimizes the possibility of a compromised review.

California DOT asked why FHWA allows only 1 month between the Inspection Date and when the load rating is required and whether FHWA will allow assigned load ratings for tunnels.

*The FHWA Response:* In response to comments, FHWA has extended the requirement for a load rating to 3 months after the completion of an inspection. Assigned load ratings will be permitted for the live load carrying

elements in tunnels as long as the criteria supporting an assigned load rating detailed in the 2nd Edition of the AASHTO Manual for Bridge Evaluation (incorporated by reference in section 650.517) are satisfied. An assigned load rating would typically be made by the load rating engineer of the entity responsible for load rating a tunnel. However, a Program Manager, Team Leader, or other qualified engineer could also make the assigned rating as long as they met the requirements of the 2nd Edition of the AASHTO Manual for Bridge Evaluation as indicated previously.

Washington State DOT questioned whether there was a need to load rate tunnel elements that do not carry live load. Washington State DOT also requested that the elements of a tunnel that do carry live load be defined.

*The FHWA Response:* The proposed definition for load rating in this rule is consistent with 23 CFR 650.305 and the AASHTO Manual for Bridge Evaluation. The intent is that only elements of a tunnel that carry live load will require a load rating. The FHWA believes it would be difficult to prepare an exhaustive list of the elements that carry live load in tunnels due to the complexity and variety that exists in tunnel construction. The Program Manager working with the Team Leader should identify live load carrying elements of each tunnel and document those in the tunnel records.

Missouri, Texas, Virginia, and Washington State DOTs commented that the proposed 48-hour timeframe to take action and post a structure is too short. These States indicated that sign fabrication and erection will take longer than 48 hours and recommended making the posting requirement consistent with NBIS, or following State policy or law. Missouri DOT recommended a more realistic expectation of 30 days.

*The FHWA Response:* In response to the comments, FHWA has reconsidered the posting timeframe requirement and has revised the NTIS regulations to require posting within 30 days.

New York State, Ohio, Oregon, Texas, and Virginia DOTs and AASHTO suggested that it is unreasonable to require that a load rating evaluation be conducted as soon as practical, but not later than 1 month after the completion of the inspection. The New York State and Texas DOTs recommended a 3-month or 90-day requirement.

*The FHWA Response:* In response to the comments, FHWA has reconsidered the 1-month requirement and has revised the final rule to include a 3-

month requirement to load rate a tunnel after the completion of an inspection.

Ohio DOT noted that "some tunnels do not carry vehicles (above), but deterioration could still lower the load carrying capacity to the point of failure." Ohio DOT suggested eliminating the load-rating requirement or rewording it to "consider dead load or falling rock onto liners etc."

*The FHWA Response:* The FHWA expects that only elements of a tunnel that carry live load will be load rated. The deterioration described by Ohio DOT should be documented appropriately and, if necessary, a structural evaluation conducted to ensure the tunnel can remain safely open.

In § 650.513(h), Virginia DOT recommended changing, "must also include diagrams . . ." to ". . . will also include diagrams," since all the information may not be required for all tunnels.

*The FHWA Response:* The FHWA agrees with the comment and has revised the language in the final rule to clarify that the tunnel data listed in § 650.513(h) is not required for every tunnel.

Virginia DOT recommends modifying the documentation requirement in § 650.513(h) by deleting part of the last sentence, "as well as the national . . . for the inspection," and adding, "In each inspection report, names of the Team Leader and inspectors and functional area inspected shall be identified."

*The FHWA Response:* The FHWA will only require the identification in the NTI of the Team Leader or Team Leaders responsible, in whole or in part, for a tunnel inspection. Others that were a part of, or support, an investigation will be identified in the inspection documentation.

Oregon DOT and AASHTO recommended that electronic files be made equal to "written documentation" in the requirements for inspection documentation.

*The FHWA Response:* The FHWA agrees with the comment and has revised the language in the final rule.

Ohio DOT asked if FHWA will take the lead in quality assurance, as it did in the 23 Metrics for NBIS.

*The FHWA Response:* The FHWA intends to develop an oversight process, similar to the 23 Metrics for NBIS, to monitor a State DOT's compliance with NTIS.

California, Florida, Michigan, New York State, and Texas DOTs commented that the proposed requirement to notify FHWA of a critical finding within 24 hours of its discovery is too restrictive,

and that regular updates on the resolution of critical findings and the annual summary reporting of the resolution of critical findings are excessive.

*The FHWA Response:* Due to the critical nature of these conditions, FHWA does not believe that these requirements are excessive. The intent of these requirements is to create a reporting mechanism to FHWA of the most extreme and critical structural, component, system deteriorations, or failures that could be a threat to the traveling public's safety. Further, this portion of the final rule seeks to ensure that severe conditions are addressed in a timely and appropriate manner through oversight and partnership with FHWA, which was specifically required in MAP-21. The regulation does not require a formal report or a developed resolution, but simply notification of the local FHWA Division Office. The FHWA believes this can easily be accomplished through a telephone conversation or an email message.

California DOT expressed concern that providing FHWA tunnel data on demand will create chaos by asking owners to answer questions on multiple sets of ever-changing data.

*The FHWA Response:* The FHWA expects that requests for data will be similar to those currently being made in support of the National Bridge Inspection Program. However, circumstances may arise when interim data sets will be needed to address an unforeseen challenge or situation.

Ohio DOT asked if FHWA will supply standard reporting formats.

*The FHWA Response:* The FHWA-approved reporting formats are included in the NTIS docket and available on the FHWA Web site at <http://www.fhwa.dot.gov/bridge/inspection/tunnel/>.

Oregon DOT commented that the use of a system similar to the NBIS metrics to provide oversight will not adequately target the needs of a tunnel inspection program and "instead have the unintended consequence of overly burdening owners into tasks not directly related to safety and effective management into time consuming data reporting."

*The FHWA Response:* The FHWA disagrees with the comment from Oregon DOT. Across the Nation, the NBIS' 23 Metrics process has helped focus owners and FHWA on gaps in compliance and issues that could potentially develop into safety concerns. The common understanding of the issues developed by assessment of the 23 Metrics will continue to strengthen the partnership between State DOTs and FHWA in addressing those challenges.

Washington State DOT commented that the final rule should include the AASHTO Manual for Bridge Evaluation as an incorporated reference.

*The FHWA Response:* The AASHTO Manual for Bridge Evaluation has been added to § 650.517 and is now incorporated by reference for subpart E.

Michigan and Oregon DOTs and AASHTO suggested FHWA use a number system similar to the current NBIS number (0–9) to identify critical findings.

*The FHWA Response:* The NBIS does not include a number system to identify critical findings. The FHWA has used the NBIS definition of critical findings at all stages of this rulemaking. The definition is broad enough to appropriately define critical findings without overlooking unforeseen circumstances that may arise to a similar level of urgency.

California DOT notes that the proposed tunnel inspection program will not address accidents that result in fires.

*The FHWA Response:* The FHWA believes that the tunnel inspection program will aid in recovery from these accidents by ensuring that functional systems are regularly inspected and evaluated to help minimize the impact on the traveling public during a fire event in a tunnel.

#### 650.515 Inventory

California and Texas DOTs expressed concern about the requirement to provide FHWA preliminary inventory data within 120 days of the effective date of the rule. California DOT believes that the time period to provide data on the tunnel inventory is not sufficient to identify all tunnels owned by local agencies. Texas DOT believes the timeframe will not allow them to adequately train inspectors to collect the data.

*The FHWA Response:* The FHWA understands the concern with completing the preliminary tunnel inventory within 120 days of the effective date of this rule as required in § 650.515(a). The NPRM included a proposed requirement of 30 days for submitting preliminary inventory data. That proposal generated 3 comments, one in support of the 30 days, one suggesting 90 days, and one suggesting it was an unrealistic requirement. All other commenters to the NPRM were silent on this proposed requirement. As a result, FHWA extended the proposed timeframe to 120 days in the SNPRM. This new 120 timeframe generated comments from California DOT and Texas DOT, with all other commenters silent on the requirement. While FHWA

understands California DOT's concern, FHWA believes it is a reasonable timeframe based on the limited number of tunnels expected to be reported for each jurisdiction. Also, with regard to the comment from Texas DOT, FHWA expects the data reported to be compiled from existing records and will not require tunnel inspectors to be deployed to collect data.

Florida DOT requested that FHWA provide the appropriate format for inventory data submission. Washington State DOT and AASHTO asked where the required inventory and condition data is defined.

*The FHWA Response:* The Specifications for the NTI is the document that is intended to supplement the NTIS and provide the specifications for coding data to be submitted to the NTI. The TOMIE Manual is the document that provides guidance to tunnel owners on operations, maintenance, inspection and evaluation practices. Drafts of both of these documents were made available with the SNPRM for review and comment. Both documents have been incorporated by reference in § 650.517.

Washington State DOT expressed concern that the established time lines for reporting data should be consistent with the NBIS to reduce confusion.

*The FHWA Response:* Where appropriate, FHWA established the timing of reporting activities under NTIS in a manner that will prevent confusion between NBIS and NTIS program requirements.

The MdTA noted that tunnels are very complex and do not fit the mold of a bridge inspection program because their conditions are constantly changing. The MdTA commented further that the information collected for the NTI should be kept to a very high level.

*The FHWA Response:* The FHWA believes that the data defined in the Specifications for the National Tunnel Inventory and the TOMIE Manual is at a level appropriate for adequate national oversight and decisionmaking.

Pennsylvania DOT and AASHTO suggested that an extended compliance deadline of at least 3 years should be considered.

*The FHWA Response:* The FHWA agrees that establishing a system for collecting and reporting tunnel inspection and inventory data will be a challenge for tunnel owners who have not instituted an inspection program on their own. In recognition of this, FHWA has extended the initial inspection requirement to 24 months from the effective date of this final rule. The FHWA believes that, based on responses to the 2003 survey and comments

received throughout the NTIS rulemaking process, 24 months is a reasonable timeframe.

#### *650.517 Incorporation by Reference*

The MTABT commented that the TOMIE Manual and the Specifications for the National Tunnel Inventory should be finalized after several cycles of technical reviews and field inspections are completed.

*The FHWA Response:* The FHWA believes it is necessary to have finalized versions of the TOMIE Manual and the Specifications for the National Tunnel Inventory in place with the final rule so that all tunnel owners will have the best knowledge of the national program requirements prior to the establishment of their State programs. The FHWA intends to make appropriate changes to these documents and the NTIS as we gather more experience with tunnel inspections and safety issues.

William White commented that there is not a national standard for exit signs. He suggested that a requirement that exit doors be green in color and that the use of "the running figure" exit sign be included in the final rule.

*The FHWA Response:* Use of the running figure exit sign and exit door identification are addressed in the TOMIE Manual, which is incorporated by reference in this final rule.

South Dakota DOT asked whether there will be further information added to the TOMIE Manual or another reference to better cover the inspection requirements for small/short hard rock tunnels.

*The FHWA Response:* The FHWA believes the TOMIE Manual provides adequate guidance to inspect small/short hard rock tunnels. Owners of these types of tunnels will be required to develop tunnel-specific inspection procedures that adequately address safety concerns in addition to the guidance given in the TOMIE Manual.

The ACEC expressed support for replacing the HRTTIM and its 0-9 ratings classification with the TOMIE Manual.

*The FHWA Response:* The FHWA agrees with the comment and believes that the element level inspection procedure and condition state rating system of the TOMIE Manual will better serve the purposes of ensuring safety and adequate asset management.

The Washington DOT suggested incorporating the AASHTO *Movable Bridge Inspection, Evaluation and Maintenance Manual* by reference for functional system inspection criteria and protocol.

*The FHWA Response:* The FHWA declines the suggestion to include the

AASHTO *Movable Bridge Inspection, Evaluation and Maintenance Manual* as an incorporated reference. The FHWA believes the TOMIE Manual will sufficiently provide the guidance needed for the inspection of functional systems. However, in the absence of guidance elsewhere from FHWA, FHWA does encourage owners to use the AASHTO manual when it can provide valuable advice to the development of inspection criteria and protocols.

#### *650.519 Additional Materials*

The FHWA removed § 650.519 which recommended additional materials that States should consult when establishing their tunnel inspection programs. The FHWA feels that this material would be more appropriate for inclusion in a supplementary guidance document to accompany this final rule.

#### **General Comments on the Regulation**

California DOT commented that many of the requirements of this proposed rule exceed those listed in the NBIS. California DOT also noted that FHWA used the term "data" as an impetus for performing tunnel inspections to maintain safe operations and to prevent structural, geotechnical, and functional system failures. Finally, California DOT questioned whether a management system to collect data is needed for owners to make informed investment decisions when the NTIS will cover less than 60 structures in California.

*The FHWA Response:* Some of the provisions of the final rule exceed similar provisions in the current NBIS. In some instances this is due to the complexity of tunnels compared to bridges. In other instances, the differences result from FHWA's years of experience in implementing the NBIS. The collection of inspection data through a comprehensive and consistent methodology has ensured the successful operation of bridges under NBIS. The NTIS looks to duplicate that success. Finally, although FHWA believes it is prudent to manage every public investment as effectively as possible, the regulation does not require any State to have a management system in place for the inspection data, only that it collect and maintain that data and submit it to FHWA regularly or as requested.

Tennessee DOT suggested that tunnel inspections are needed to ensure the safety of the motoring public and recommended an allowance of their Federal-aid safety funds be used to implement this NTIS program. An anonymous commenter also suggested that a dedicated source of funding be made available to the States to cover the

cost of inspection of their tunnel inventory.

*The FHWA Response:* Under MAP-21, the inspection of tunnels on the NHS and the training of tunnel inspectors are eligible activities under the National Highway Performance Program. (23 U.S.C. 119(d)(2)(D) and (E)). In addition, the inspection of tunnels, regardless of the highway system or functional classification they are on, and the training of tunnel inspectors are eligible activities under the Surface Transportation Program. (23 U.S.C. 133(b)(4)).

The MdTA and Pennsylvania DOT expressed concern with security if the data collected by FHWA is made publicly available.

*The FHWA Response:* The FHWA agrees with the comment that the security of our Nation's tunnels is of the utmost importance. However, FHWA believes that the data being gathered for the NTI will be general enough as not to pose any security concern.

John Williams recommended that the final rule include a requirement that all immersed tube tunnels must have a Fixed Fire Fighting System (FFFS).

*The FHWA Response:* The FFFS is generally considered a best practice and although FHWA promotes it for new construction and rehabilitation if the existing structure can accommodate the demands of the technology, including design criteria as part of this regulation is not pragmatic. Design criteria generally advance as systems mature and new technologies are developed. Mandating criteria in regulation could impede maturation and discourage development of improved techniques.

Pennsylvania DOT requested FHWA flexibility in the implementation of NTIS.

*The FHWA Response:* The NTIS was first proposed in 2008. The FHWA has encouraged owners to continue to follow the progress of the rulemaking and prepare for implementation. However, FHWA understands the challenges that the implementation of NTIS poses for many tunnel owners. The FHWA is committed to working with its partners in the State DOTs to bring them into compliance with the regulation in a reasonable and appropriate manner.

#### **Incorporation by Reference**

In § 650.517, FHWA incorporates by reference a number of items. First, FHWA incorporates the "Tunnel Operations, Maintenance, Inspection and Evaluation (TOMIE) Manual," 2015 edition, U.S. Department of Transportation, FHWA-HIF-15-005. The TOMIE Manual provides guidance

to tunnel owners on operations, maintenance, inspection and evaluation practices. The TOMIE Manual is available at no charge on the FHWA Web site at: <http://www.fhwa.dot.gov/bridge/tunnel/>. Incorporation by reference of the TOMIE Manual is approved for §§ 650.505, 650.511(a), 650.513(a), and 650.513(h).

The FHWA also incorporates by reference the "Specifications for National Tunnel Inventory," 2015 edition, U.S. Department of Transportation, FHWA-HIF-15-006. The Specifications for the NTI supplements the NTIS and provides the specifications for coding data to be submitted to the National Tunnel Inventory. The Specifications is available at no charge on the FHWA Web site at: <http://www.fhwa.dot.gov/bridge/inspection/tunnel/>. Incorporation by reference of the Specifications is approved for §§ 650.515(a) and 650.515(b).

Lastly, FHWA incorporates Sections 6 and 8 of the American Association of State Highway and Transportation Officials "Manual of Bridge Evaluation", with 2011, 2013, 2014 and 2015 interim revisions. The Manual was developed to assist bridge owners by establishing inspection procedures and evaluation practices that meet the National Bridge Inspection Standards. The manual is divided into eight Sections, with each Section representing a distinct phase of an overall bridge inspection and evaluation program. The Manual is available for purchase from the American Association of State Highway and Transportation Officials, Suite 249, 444 N. Capitol Street NW., Washington, DC 20001. It may also be ordered via the AASHTO bookstore located at the following Web site:

<https://bookstore.transportation.org>. The FHWA believes that the entities affected by this regulation, namely tunnel owners, already own a copy of this AASHTO Manual. Incorporation by reference of the Manual is approved for §§ 650.505 and 650.513(a).

A copy of all of the incorporated documents outlined above will be on file and available for inspection at the National Archives and Records Administration. These documents will also be available for viewing at the Department of Transportation Library.

#### **Executive Order 12866 (Regulatory Planning and Review), Executive Order 13563 (Improving Regulation and Regulatory Review), and DOT Regulatory Policies and Procedures**

The FHWA has determined that this final rule constitutes a significant regulatory action within the meaning of

Executive Order 12866 and DOT regulatory policies and procedures. This action complies with Executive Orders 12866 and 13563 to improve regulation. This action is considered significant because of widespread public interest in the safety of highway tunnels. It is not economically significant within the meaning of Executive Order 12866.

Having received relatively few comments from the ANPRM regarding costs and being mindful of the potential cost implications of the proposed rule, FHWA renewed its request for information regarding estimated or actual costs associated with tunnel inspections, particularly the typical inspection costs per linear foot of tunnel. In addition, FHWA requested comments regarding the anticipated increased costs the proposed NTIS would impose on tunnel owners. Only Washington State DOT commented on the cost of tunnel inspections in response to the NPRM. Washington State DOT stated that the budget for the recently completed mechanical and electrical inspection of the MLK Lid and Mount Baker Ridge Tunnel was \$409,500 for the consultants alone. Washington State DOT was negotiating a scope of work and cost estimate for similar inspections of the Mercer Island Tunnel and the Convention Center. While FHWA appreciates such information, it is unclear what the scope of the work and inspection for this particular tunnel would be. Without further information on the length of the tunnel, the complexity of the design, and the number and type of functional systems, it is difficult to determine if the numbers provided by Washington State DOT fall within the anticipated cost range outlined below.

In the SNPRM, FHWA again requested comments on the potential costs and benefits of the proposed NTIS. The comments received and our responses are summarized below.

California DOT commented that there is no basis to conclude that the effects of the final rule on tunnel inspection cost are expected to be modest. They note that each State will have to invest significant resources to establish a tunnel inspection program. California DOT commented further that NTIS is duplicative of NBIS and will require additional program costs, including inspection software development and training, creation and support of a database for tunnels, a quality control and quality assurance program, compliance reviews, reporting, and corrective plans for tunnels.

*The FHWA Response:* The FHWA's basis for its cost-effectiveness statement is that a large majority of the tunnel

owners that responded to our 2003 survey reported that they are already inspecting tunnels at the 24-month interval required by the NTIS, collecting data in a data management program, and have an oversight program in place. The FHWA does believe there will be additional startup costs for implementation of NTIS, but those costs will be modest relative to the costs already incurred. Also, because NBIS does not include a requirement to inspect tunnels, does not provide procedures for inspecting tunnels, and does not identify the qualifications needed for tunnel inspectors, FHWA disagrees that the NTIS would be duplicative of the NBIS.

Virginia DOT commented that FHWA's conclusions regarding reported costs of inspections are based on a very low inspector hourly rate and recommended using \$32.50 per hour. Virginia DOT further commented that it believes the cost of inspecting a tunnel is more than the proposed upper limit of \$75.00/linear foot.

*The FHWA Response:* The FHWA appreciates the cost information and has increased the estimated hourly labor cost to \$32 per hour. In addition, the upper limit of the range of inspection costs has been increased to \$106 per linear foot.

Oregon DOT indicated that the cost to inspect one 2-lane tunnel each of the last 5 years was \$50,000 and that if inspections are required every 2 years then Oregon DOT's costs will increase fivefold.

*The FHWA Response:* Oregon DOT responded to the 2003 FHWA survey that they were performing tunnel inspections at a 24-month interval. Unless that has significantly changed, it is unclear why costs would increase fivefold due to the implementation of NTIS.

The AASHTO submitted the following cost information: "In Pennsylvania, the 3500-foot, four-lane Ft. Pitt Tunnel was inspected in 2006. The consultant used 1550 man-hours for a cost of \$270,000 or \$77.11 per LF [linear foot]. The four-lane Squirrel Hill Tunnel in Pennsylvania was inspected 2 years ago in 2330 man-hours for \$300,000 or \$71 per LF. The Massachusetts Department of Transportation estimates a typical tunnel inspection costs approximately \$30.64 per LF of tunnel (Ted Williams Tunnel). Also in Massachusetts, inspection of the complex Tip O'Neill Tunnel (I-93 NB) is estimated at \$106.23 per LF of tunnel. AASHTO further indicated that these costs and estimates do not include the cost of traffic control or police services."

*The FHWA Response:* The FHWA is very appreciative for the cost information and has increased the upper end of the range of inspection costs to accommodate this new data. The range of inspection costs is now estimated to be from \$5 to \$106 per linear foot.

The MTABT commented that the FHWA's conclusions regarding reported costs of inspection are underestimated and based on limited survey data. They recommended "a more pragmatic approach such as increasing the inspection interval and/or reducing inspection intensity."

*The FHWA Response:* Based on comments received on the SNPRM, FHWA has increased the upper end of the range of inspection costs. In addition, the estimated hourly labor cost was increased to \$32 per hour.

#### *Current Cost of Tunnel Inspections*

The FHWA lacks sufficient data on current tunnel inspection practices to accurately estimate the costs that will be incurred by tunnel owners as a result of the standards established in this final rule. The lack of knowledge concerning current tunnel inspection practices makes it difficult to accurately specify a baseline for this economic analysis. The below cost estimates are based on the limited data that was received from an informal 2003 survey of tunnel owners and the small number of comments that contained cost information. The 2003 survey was designed to collect information about the tunnel inventory, maintenance practices, inspection practices, and tunnel management practices of each State.<sup>16</sup> Of the 45 highway tunnel owners surveyed, 40 responses were received. Five of the tunnel owners surveyed did not respond. The survey results suggest that there are approximately 350 highway tunnels (bores) in the Nation and they are currently inspected by their owners at intervals ranging from 1 day to 10 years. These tunnels represent nearly 100 miles—running the distance of approximately 517,000 linear feet—of Interstate, State, and local routes. Tunnel inspection costs can vary greatly from tunnel to tunnel. The average inspection interval for the 37 responses that included data on this measure was a little over 24 months (2.05 years). Comments to the ANPRM, NPRM, and SNPRM suggested that current inspection costs range from \$5 to \$106 per linear foot depending on the complexity of the tunnel. Assuming that each highway tunnel includes 4 lanes, FHWA estimates that the total current

inspection cost for all tunnel owners could range between \$10,340,000 (4 lanes × 517,000 × \$5) and \$219,208,000 (4 lanes × 517,000 × \$106), or \$29,542 (\$10,340,000/350) and \$626,309 (\$219,208,000/350) per tunnel bore. These figures reflect current inspection costs and do not include the additional costs anticipated with this rulemaking.

#### *Costs Effects of the NTIS*

Based on data from the 2003 survey, and subsequent communications the agency had with the 2 tunnel owners, only (MTABT and Virginia DOT), that together own 15 tunnel bores, would be required to increase inspection frequency as a result of this action.<sup>17</sup> These 2 tunnel owners have inspection intervals that are longer than the proposed 24 months and would therefore experience an increase in costs. Using the estimated inspection cost range for a single tunnel bore above (\$29,542 to \$626,309), we can estimate the total aggregate cost increase for the 2 tunnel owners.

Owner A currently inspects 4 tunnel bores at a 10-year interval. We estimate the current annual inspection costs for Owner A are between \$2,954.2 (\$29,542/10) and \$62,630.9 (\$626,309/10) per tunnel bore. Under the rule, we estimate the annual inspection costs for Owner A will be between \$14,771 (\$29,542/2) and \$313,155 (\$626,309/2) per tunnel bore. As a result, Owner A would see an estimated annual cost increase of between \$11,817 (\$14,771 – \$2,954.2) and \$250,524 (\$313,155 – \$62,630.9) per tunnel bore. For all 4 tunnel bores we estimate the current annual inspection costs are between \$11,817 (4 × \$2,954.2) and \$250,524 (4 × \$62,630.9). Under the rule, we estimate the annual inspection costs for all 4 tunnel bores will be between \$59,084 (4 × \$14,771) and \$1,252,620 (4 × \$313,155). As a result, Owner A would see an estimated total cost increase of between \$47,267 (\$59,084 – \$11,817) and \$1,002,096 (\$1,252,620 – \$250,524).

Owner B currently inspects 11 tunnel bores at a 7-year interval. We estimate the current annual inspection costs for Owner B are between \$4,220.3 (\$29,542/7) and \$89,473 (\$626,309/7) per tunnel bore. Under the proposed rule, we estimate the annual inspection costs for Owner B will be between \$14,771 (\$29,542/2) and \$313,155 (\$626,309/2)

<sup>17</sup> In July 2012, Virginia DOT entered into a 58-year concession with Elizabeth River Crossings for the Downtown and Midtown tunnels in southern Virginia. The concession agreement requires Elizabeth River Crossings to meet or exceed Virginia DOT's standards for tunnel inspections, including frequency.

<sup>16</sup> A copy of the FHWA's 2003 Survey is available on the docket.

per tunnel bore. As a result, Owner B would see an estimated annual cost increase of between \$10,551 (\$14,771 – \$4,220) and \$223,682 (\$313,155 – \$89,473) per tunnel bore. For all 11 tunnel bores we estimate the current annual inspection costs are between \$46,423 (11 × \$4,220.3) and \$984,203 (11 × \$89,473). Under the rule, we estimate the annual inspection costs for all 11 tunnel bores will be between \$162,481 (11 × \$14,771) and \$3,444,705 (11 × \$313,155). As a result, Owner B would see an estimated total cost increase of between \$116,058 (\$162,481 – \$46,420) and \$2,460,502 (\$3,444,705 – \$984,203).

Based on the above analysis, FHWA estimates the current aggregate annual cost of tunnel inspections for the 2 affected tunnel owners is between \$58,240 (\$11,817 + \$46,423) and \$1,234,727 (\$250,524 + \$984,203). Under the inspection interval required by the rule, we estimate the aggregate annual cost will be between \$221,565 (\$9,084 + \$162,481) and \$4,697,325 (\$1,252,620 + \$3,444,705). As a result, FHWA estimates the aggregate annual cost increase of inspections for the 2 affected tunnel owners will be between \$163,325 (\$221,565 – \$58,240) and \$3,462,598 (\$4,697,325 – \$1,234,727). The discounted costs over 20 years (at 7 percent) are between \$1.73 million and \$36.683 million.

The FHWA notes that each tunnel owner must collect and submit inventory data information for all tunnels subject to this rule within 120 days of the effective date and when requested by FHWA. The total estimated cost to collect, manage, and report preliminary inventory data is \$89,856 (2,808 hours × \$32/hour = \$89,856). This is a one-time cost for the two affected tunnel owners. As a result, FHWA estimates the total aggregate first year cost increase of inspections for the 2 affected tunnel owners will be between \$253,181 (\$163,325 + \$89,856) and \$3,552,454 (\$3,462,598 + \$89,856). Over 20 years the discounted total would be between \$1.82 million and \$36.773 million.

The FHWA expects that the overall increase in costs of inspecting tunnels would be modest, as the vast majority of tunnel owners already inspect at the 24-month interval proposed by the NTIS. However, FHWA does not have sufficient information regarding the cost increase from other provisions of the final rule, such as fixing critical defects and closing tunnels and roads in order to conduct the inspections. The FHWA recognizes that the 2003 survey does not represent the full universe of tunnel owners and tunnels, but believes that it

is comprehensive enough to draw preliminary conclusions on the cost effects of this final rule. The FHWA also assumes that any increase in the cost per inspection resulting from the final rule would not cause the cost per inspection to exceed the upper end of the range of inspection costs in the analysis.

In addition to the costs associated with more frequent inspections, FHWA expects that tunnel owners may experience a modest increase in costs as a result of the training requirements contained in the final rule. Based on the training of bridge inspectors under the NBIS, we estimate that the cost to train a tunnel inspector will be approximately \$3,000 over a 10-year period (1 basic class and 2 refresher classes).

#### *Benefits Resulting From the NTIS*

Upon implementation, FHWA expects that this final rule would result in some significant benefits that are not easily quantifiable, but nonetheless deserve mention in this analysis. Timely and reliable tunnel inspection is likely to uncover safety problems and prevent failures. The structural, geotechnical, and functional components and systems that make up tunnels deteriorate and corrode due to the harsh environment in which these structures are operated. As a result, routine and thorough inspection of these elements is necessary to collect the data needed to maintain safe tunnel operation and to prevent structural, geotechnical, and functional failures. As our Nation's tunnels continue to age, an accurate and thorough assessment of each tunnel's condition is critical to avoid a decline in service and maintain a safe, functional, and reliable highway system. The agency is taking this action to respond to the statutory directive in MAP-21 and because it believes that ensuring timely and reliable inspections of highway tunnels will result in substantial benefits by enhancing the safety of the traveling public and protecting investments in key infrastructure. We believe that repairs or changes resulting from the inspections could lead to substantial economic savings.

Currently, State DOTs differ from State to State in the way they inspect their tunnels. The methods are inconsistent and these differences hinder accurate analysis of tunnel conditions at the national level. This final rule would establish uniform inspection practices. The final rule will also yield greater accountability because the mandated reporting would increase visibility and transparency by providing

the public with a more transparent view of the number and condition of the nation's tunnels. These benefits resulting from the final rule (*i.e.*, uniformity and greater accountability) would lead to improved tunnel conditions.

This final rule will also allow for more informed decisionmaking on tunnel condition-related project, program, and policy choices. The tunnel inventory data will allow FHWA to track and identify any patterns of tunnel deficiencies and facilitate repairs by States to ensure the safety of the public. Tunnel owners will also be able to integrate tunnel inventory data into an asset management program for maintenance and repairs of their tunnels. The data collection requirements in the NTIS are consistent with the performance-based approach to carrying out the Federal-aid highway program established by Congress in MAP-21. These requirements will fulfill the congressional directive to establish a data-driven, risk-based approach for the maintenance, replacement, and rehabilitation of highway tunnels. Such an approach will help to ensure the efficient and effective use of Federal resources.

The NTIS could protect investments in key infrastructure, as early detection of problems in tunnels could increase the longevity of these assets and avoid more costly rehabilitation and repair actions. It is generally accepted in the transportation structures community that inspection and maintenance are effective forms of avoiding substantial future costs. For example, a 2005 University of Minnesota study examined the benefits of pavement preservation and preventative maintenance and found that pavement preservation had many benefits, the most important of which is preserving a pavement's structural integrity and realizing a substantial maintenance cost-savings over the life of the pavement. The study found that it is much less expensive to repair a pavement when distresses are just beginning to appear. More specifically, the study concluded that, at a minimum, the costs of maintaining a runway were half those of not maintaining a runway when measured over the life of the asset.<sup>18</sup> However, the study's conclusions only considered the direct costs of

<sup>18</sup> "Pavement preservation: protecting your airport's biggest investment." AirTAP Briefings, Airport Technical Assistance Program of the Center for Transportation Studies at the University of Minnesota, summer 2005. An electronic version is located at: <http://www.airtap.umn.edu/publications/briefings/2005/Briefings-2005-Summer.pdf>

maintenance and construction and not the indirect costs associated with the mobility of the traveling public, goods, services, and freight. As tunnels provide mobility, which is vital to local, regional, and national economies, and to our national defense, it is imperative that these facilities are properly inspected and maintained to avoid the direct costs of rehabilitation and the indirect costs to users.

The above description of tunnel inspection benefits were summarized from the limited benefit data submitted by tunnel owners in response to the NPRM and compiled by FHWA.

#### Summary

The FHWA does not have sufficient information to estimate total costs and benefits of this final rule (e.g. any change in how a state inspects a tunnel). However, the FHWA's preliminary estimates regarding the inspection portion (excludes training) of the rulemaking are between \$1.82 million and \$36.773 million over 20 years (discounted at 7 percent).

#### Regulatory Flexibility Act

As required by the Regulatory Flexibility Act (Pub. L. 96-354, 5 U.S.C. 601-612), FHWA has evaluated the effects of this final rule on small entities and anticipates that this action will not have a significant economic impact on a substantial number of small entities. Because the regulations are primarily intended for States and Federal agencies, FHWA has determined that the action will not have a significant economic impact on a substantial number of small entities. States and Federal agencies are not included in the definition of small entity set forth in 5 U.S.C. 601. Therefore, the Regulatory Flexibility Act does not apply, and FHWA certifies that the action will not have a significant economic impact on a substantial number of small entities.

#### Unfunded Mandates Reform Act of 1995

The FHWA has determined that this final rule will not impose unfunded mandates as defined by the Unfunded Mandates Reform Act of 1995 (Pub. L. 104-4, March 22, 1995, 109 Stat. 48). The NTIS is needed to ensure safety for the users of the Nation's tunnels and to help protect Federal infrastructure investment. As discussed above, FHWA finds that this regulatory action will not result in the expenditure by State, local, and tribal governments, in the aggregate, or by the private sector, of \$143,100,000 or more in any one year (2 U.S.C. 1532). Additionally, the definition of "Federal mandate" in the Unfunded Mandates

Reform Act excludes financial assistance of the type in which State, local, or tribal governments have authority to adjust their participation in the program in accordance with changes made in the program by the Federal Government. The Federal-aid highway program permits this type of flexibility.

#### Executive Order 13132 (Federalism Assessment)

The FHWA has analyzed this final rule in accordance with the principles and criteria contained in Executive Order 13132. The FHWA has determined that a federalism summary impact statement is not required because this regulation is required by statute and will not preempt any State law.

#### Executive Order 12372 (Intergovernmental Review)

The regulations implementing Executive Order 12372 regarding intergovernmental consultation on Federal programs and activities apply to this program. Local entities should refer to the Catalog of Federal Domestic Assistance Program Number 20.205, Highway Planning and Construction, for further information.

#### Paperwork Reduction Act

Under the Paperwork Reduction Act of 1995 (PRA) (44 U.S.C. 3501, *et seq.*), Federal agencies must obtain approval from the Office of Management and Budget (OMB) for each collection of information they conduct, sponsor, or require through regulations. This action contains a collection of information requirement under the PRA. This information collection requirement has been previously submitted to OMB for approval, pursuant to the provisions of the PRA. The requirement has been approved through May 31, 2017; OMB Control No. 2125-0640.

The MAP-21 requires the Secretary to inventory all tunnels on public roads, on and off Federal-aid highways, including tribally owned and federally owned tunnels. In addition, each State, Federal agency, and tribal government is required to report to the Secretary on: the results of tunnel inspections and notation of any action taken pursuant to the findings of the inspections, and current inventory data for all highway tunnels reflecting the findings of the most recent tunnel inspection. In order to be responsive to the requirements of MAP-21 and in accordance with this final rule, FHWA will collect data to establish an NTI and require the submission of data on the results of tunnel inspections. A description of the collection requirements, the

respondents, and an estimate of the annual reporting burden are set forth below.

#### National Tunnel Inventory Collection

The FHWA will collect data to establish an NTI. Initially a subset of the Inventory Items defined in the Specifications of the National Tunnel Inventory will be collected. This information will be reported to FHWA on the Preliminary Tunnel Inventory Data Form which is available on the FHWA Web site at: <http://www.fhwa.dot.gov/bridge/inspection/tunnel/>.

The following is the data that will be collected under the NTI on the Preliminary Tunnel Inventory Data Form:

(1) Identification Items: Tunnel number, tunnel name, State code, county code, place code, highway agency district, route number, route direction, route type, facility carried, linear referencing system (LRS) inventory route number, LRS mile point, tunnel portal's latitude, tunnel portal's longitude, border tunnel State or county code, border tunnel financial responsibility, border tunnel number, and border tunnel inspection responsibility.

(2) Age and Service Items: Year built, year rehabilitated, total number of lanes, average daily traffic, average daily truck traffic, year of average daily traffic, detour length, and service in tunnel.

(3) Classification Items: Owner, operator, direction of traffic, toll, NHS designation, STRAHNET designation, and functional classification.

(4) Geometric Data Items: Tunnel length, minimum clearance over tunnel roadway, roadway curb-to-curb width, and left curb and right curb widths.

(5) Structure Type and Material Items: Number of bores, tunnel shape, portal shape, ground conditions, and complexity.

The anticipated respondents include the 50 States, the District of Columbia, Puerto Rico, and any Federal agencies and tribal governments that own tunnels. The estimated burden on the States to collect, manage, and report this data is estimated to be 8 hours per tunnel for a total estimate of 2,808 hours for all 350 estimated tunnels in the Nation. This represents an average of 54 hours per respondent and so it is estimated that the burden will total 2,808 hours per year (52 responses × 54.00 hours per respondent = 2,808 hours).

#### Annual Inspection Reporting

In addition to the preliminary inventory information described above, tunnel owners are required to report to

the Secretary on the results of tunnel inspections and notations of any action taken pursuant to the findings of the inspections. For all inspections, tunnel owners will be required to enter the appropriate inspection data into the State DOT, Federal agency, or tribal government inventory within 3 months of the completion of the inspection. The number of responses per year is based on the total of 350 tunnels in the U.S., with approximately half inspected each year, based on the standard 24-month inspection interval. The annual responses are estimated at 175 for routine inspections. With the average time of 40 hours to collect, manage, and report routine inspection data, and an additional 2,080 hours to follow up on critical findings, it is estimated that the burden hours will total 9,080 hours per year (7,000 hours (175 responses × 40.00 hours per response) + 2,080 hours (for follow-up on critical findings) = 9,080 burden hours).

#### *Estimated Total Annual Burden Hours*

The FHWA estimates that the collection of information contained in this final rule will result in approximately 11,888 total annual burden hours (2,808 hours (preliminary inventory collection) + 9,080 (annual inspections) = 11,888 (total annual burden hours)). Since the majority of States are already inspecting their tunnels, they are likely to have much of the data needed to satisfy the preliminary inventory data collection burden. Likewise, since many States are already collecting and storing inspection data, they are likely to have much of the data needed to satisfy the routine inspection burden. As a result, FHWA expects that the additional burden on the States to report this data will be minimal.

A notice seeking public comments on the collection of information included in this final rule was published in the **Federal Register** on June 14, 2010, at 75 FR 33659. The FHWA received comments from four commenters, including one organization (AASHTO) and three State DOTs (New York, Oregon, and Virginia). These comments were addressed in the SNPRM.

In the SNPRM, FHWA renewed its request for comments on the collection of information. No additional comments on the information collection were received.

#### **National Environmental Policy Act**

The Department has analyzed this action for the purpose of the National Environmental Policy Act of 1969, as amended (42 U.S.C. 4321 *et seq.*), and has determined that this action would

not have a significant effect on the quality of the environment and qualifies for the categorical exclusion at 23 CFR 771.117(c)(20).

#### **Executive Order 12630 (Taking of Private Property)**

This action will not affect a taking of private property or otherwise have taking implications under Executive Order 12630, Governmental Actions and Interference with Constitutionally Protected Property Rights.

#### **Executive Order 12988 (Civil Justice Reform)**

This action meets applicable standards in section 3(a) and 3(b)(2) of Executive Order 12988, Civil Justice Reform, to minimize litigation, eliminate ambiguity, and reduce burden.

#### **Executive Order 13045 (Protection of Children)**

The FHWA has analyzed this action under Executive Order 13045, Protection of Children from Environmental Health Risks and Safety Risks. This rule does not concern an environmental risk to health or safety that may disproportionately affect children.

#### **Executive Order 13175 (Tribal Consultation)**

The FHWA has conducted a preliminary analysis of this action under Executive Order 13175. The FHWA believes that this final rule will not have substantial direct effects on one or more Indian Tribes, will not impose substantial direct compliance costs on Indian tribal governments, and will not preempt tribal law. To FHWA's knowledge, there are no tunnels that are owned, operated, or maintained by Indian tribal governments. In addition, no comments were received from Indian tribal governments in response to the SNPRM.

#### **Executive Order 13211 (Energy Effects)**

The FHWA has analyzed this final rule under Executive Order 13211, Actions Concerning Regulations That Significantly Affect Energy Supply, Distribution, or Use. The FHWA has determined that the rule will not constitute a significant energy action under that order because, although it is considered a significant regulatory action under Executive Order 12866, it is not likely to have a significant adverse effect on the supply, distribution, or use of energy.

#### **Executive Order 12898 (Environmental Justice)**

Executive Order 12898 requires that each Federal agency make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minorities and low-income populations. The FHWA has determined that this rule does not raise any environmental justice issues.

#### **Regulation Identifier Number**

A regulation identifier number (RIN) is assigned to each regulatory action listed in the Unified Agenda of Federal Regulations. The Regulatory Information Service Center publishes the Unified Agenda in April and October of each year. The RIN contained in the heading of this document can be used to cross reference this action with the Unified Agenda.

#### **List of Subjects in 23 CFR Part 650**

Bridges, Grant programs—transportation, Highways and roads, Incorporation by reference, Reporting and recordkeeping requirements.

Issued in Washington, DC, on July 2, 2015, under authority delegated in 49 CFR 1.85(a)(1):

**Gregory G. Nadeau,**

*Acting Administrator, Federal Highway Administration.*

In consideration of the foregoing, the FHWA amends title 23, Code of Federal Regulations, part 650, as set forth below:

#### **PART 650—BRIDGES, STRUCTURES, AND HYDRAULICS**

■ 1. The authority citation for part 650 is revised to read as follows:

**Authority:** 23 U.S.C. 119, 144, and 315.

■ 2. Add subpart E to read as follows:

##### **Subpart E—National Tunnel Inspection Standards**

Sec.	Purpose.
650.501	Purpose.
650.503	Applicability.
650.505	Definitions.
650.507	Tunnel inspection organization responsibilities.
650.509	Qualifications of personnel.
650.511	Inspection interval.
650.513	Inspection procedures.
650.515	Inventory.
650.517	Incorporation by reference.

##### **Subpart E—National Tunnel Inspection Standards**

###### **§ 650.501 Purpose.**

This subpart sets the national minimum standards for the proper

safety inspection and evaluation of all highway tunnels in accordance with 23 U.S.C. 144(h) and the requirements for preparing and maintaining an inventory in accordance with 23 U.S.C. 144(b).

#### § 650.503 Applicability.

The National Tunnel Inspection Standards (NTIS) in this subpart apply to all structures defined as highway tunnels on all public roads, on and off Federal-aid highways, including tribally and federally owned tunnels.

#### § 650.505 Definitions.

The following terms used in this subpart are defined as follows:

*American Association of State Highway and Transportation Officials (AASHTO) Manual for Bridge Evaluation.* The term “AASHTO Manual for Bridge Evaluation” means the “Manual for Bridge Evaluation”, incorporated by reference in § 650.517.

*At-grade roadway.* The term “at-grade roadway” means paved or unpaved travel ways within the tunnel that carry vehicular traffic and are not suspended or supported by a structural system.

*Bridge inspection experience.* The term “bridge inspection experience” has the same meaning as in § 650.305.

*Complex tunnel.* The term “complex tunnel” means a tunnel characterized by advanced or unique structural elements or functional systems.

*Comprehensive tunnel inspection training.* The term “comprehensive tunnel inspection training” means the FHWA-approved training that covers all aspects of tunnel inspection and enables inspectors to relate conditions observed in a tunnel to established criteria.

*Critical finding.* The term “critical finding” has the same meaning as in § 650.305.

*Damage inspection.* The term “damage inspection” has the same meaning as in § 650.305.

*End-of-course assessment.* The term “end-of-course assessment” means a comprehensive examination given to students after the completion of a training course.

*Federal-aid highway.* The term “Federal-aid highway” has the same meaning as in 23 U.S.C. 101(a)(5).

*Functional systems.* The term “functional systems” means non-structural systems, such as electrical, mechanical, fire suppression, ventilation, lighting, communications, monitoring, drainage, traffic signals, emergency response (including egress, refuge room spacing, or carbon monoxide detection), or traffic safety components.

*Hands-on inspection.* The term “hands-on inspection” has the same meaning as in § 650.305.

*Highway.* The term “highway” has the same meaning as in 23 U.S.C. 101(a)(11).

*In-depth inspection.* The term “in-depth inspection” means a close-up inspection of one, several, or all tunnel structural elements or functional systems to identify any deficiencies not readily detectable using routine inspection procedures. In-depth inspections may occur more or less frequently than routine inspections, as outlined in the tunnel-specific inspection procedures.

*Initial inspection.* The term “initial inspection” means the first inspection of a tunnel to provide all inventory, appraisal, and other data necessary to determine the baseline condition of the structural elements and functional systems.

*Inspection Date.* The term “Inspection Date” means the date established by the Program Manager on which a regularly scheduled routine inspection begins for a tunnel.

*Legal load.* The terms “legal load” means the maximum legal load for each vehicle configuration permitted by law for the State in which the tunnel is located.

*Load rating.* The term “load rating” means the determination of the safe vehicular live load carrying capacity within or above the tunnel using structural plans, and information gathered from an inspection. The results of the load rating may include the need for load posting.

*Operating rating.* The term “operating rating” has the same meaning as in § 650.305.

*Portal.* The term “portal” means the entrance and exit of the tunnel exposed to the environment; portals may include bare rock, constructed tunnel entrance structures, or buildings.

*Procedures.* The term “procedures” means the written documentation of policies, methods, considerations, criteria, and other conditions that direct the actions of personnel so that a desired end result is achieved consistently.

*Professional Engineer (P.E.).* The term “Professional Engineer (P.E.)” means an individual who has fulfilled education and experience requirements and passed examinations that, under State licensure laws, permits the individual to offer engineering services within areas of expertise directly to the public.

*Program Manager.* The term “Program Manager” means the individual in charge of the inspection program who has been assigned or delegated the duties and responsibilities for tunnel inspection, reporting, and inventory. The Program Manager provides overall

leadership and guidance to inspection Team Leaders and load raters.

*Public road.* The term “public road” has the same meaning as in 23 U.S.C. 101(a)(21).

*Quality assurance (QA).* The term “quality assurance (QA)” means the use of sampling and other measures to ensure the adequacy of quality control procedures in order to verify or measure the quality of the entire tunnel inspection and load rating program.

*Quality control (QC).* The term “quality control (QC)” means the procedures that are intended to maintain the quality of a tunnel inspection and load rating at or above a specified level.

*Routine inspection.* The term “routine inspection” means a regularly scheduled comprehensive inspection encompassing all tunnel structural elements and functional systems and consisting of observations and measurements needed to determine the physical and functional condition of the tunnel, to identify any changes from initial or previously recorded conditions, and to ensure that tunnel components continue to satisfy present service requirements.

*Routine permit load.* The term “routine permit load” means a vehicular load that has a gross weight, axle weight, or distance between axles not conforming with State laws for legally configured vehicles, and is authorized for unlimited trips over an extended period of time to move alongside other heavy vehicles on a regular basis.

*Special inspection.* The term “special inspection” means an inspection, scheduled at the discretion of the tunnel owner, used to monitor a particular known or suspected deficiency.

*State transportation department (State DOT).* The term “State transportation department (State DOT)” has the same meaning as in 23 U.S.C. 101(a)(28).

*Team Leader.* The term “Team Leader” means the on-site individual in charge of an inspection team responsible for planning, preparing, performing, and reporting on tunnel inspections.

*Tunnel.* The term “tunnel” means an enclosed roadway for motor vehicle traffic with vehicle access limited to portals, regardless of type of structure or method of construction, that requires, based on the owner’s determination, special design considerations that may include lighting, ventilation, fire protection systems, and emergency egress capacity. The terms “tunnel” does not include bridges or culverts inspected under the National Bridge

Inspection Standards (subpart C of this part).

*Tunnel inspection experience.* The term “tunnel inspection experience” means active participation in the performance of tunnel inspections in accordance with the National Tunnel Inspection Standards, in either a field inspection, supervisory, or management role.

*Tunnel inspection refresher training.* The term “tunnel inspection refresher training” means an FHWA-approved training course that aims to improve the quality of tunnel inspections, introduce new techniques, and maintain the consistency of the tunnel inspection program.

*Tunnel Operations, Maintenance, Inspection and Evaluation (TOMIE) Manual.* The term “Tunnel Operations, Maintenance, Inspection and Evaluation (TOMIE) Manual” means the “Tunnel Operations, Maintenance, Inspection and Evaluation (TOMIE) Manual” (incorporated by reference, see § 650.517).

*Tunnel-specific inspection procedures.* The term “tunnel-specific inspection procedures” means the written documentation of the directions necessary to plan for, and conduct an inspection. Directions include coverage of inspection methods, frequency of each method, inspection equipment, access equipment, identification of tunnel elements, components and functional systems, traffic coordination, and specialized qualifications for inspecting personnel.

**§ 650.507 Tunnel inspection organization responsibilities.**

(a) Each State DOT shall inspect, or cause to be inspected, all highway tunnels located on public roads, on and off Federal-aid highways, that are fully or partially located within the State’s boundaries, except for tunnels that are owned by Federal agencies or tribal governments.

(b) Each Federal agency shall inspect, or cause to be inspected, all highway tunnels located on public roads, on and off Federal-aid highways, that are fully or partially located within the respective agency’s responsibility or jurisdiction.

(c) Each tribal government shall inspect, or cause to be inspected, all highway tunnels located on public roads, on and off Federal-aid highways, that are fully or partially located within the respective tribal government’s responsibility or jurisdiction.

(d) Where a tunnel is jointly owned, all bordering States, Federal agencies, and tribal governments with ownership interests should determine through a

joint formal written agreement the inspection responsibilities of each State, Federal agency, and tribal government.

(e) Each State that contains one or more tunnels subject to these regulations, or Federal agency or tribal government with a tunnel under its jurisdiction, shall include a tunnel inspection organization that is responsible for all of the following:

(1) Statewide, Federal agency-wide, or tribal government-wide tunnel inspection policies and procedures (both general and tunnel-specific), quality control and quality assurance procedures, and preparation and maintenance of a tunnel inventory.

(2) Tunnel inspections, written reports, load ratings, management of critical findings, and other requirements of these standards.

(3) Maintaining a registry of nationally certified tunnel inspectors that work in their State or for their Federal agency or tribal government that includes, at a minimum, a method to positively identify each inspector, documentation that the inspector’s training requirements are up-to-date, the inspector’s current contact information, and detailed information about any adverse action that may affect the good standing of the inspector.

(4) A process, developed under the direction of a Professional Engineer and approved by FHWA, to determine when an inspection Team Leader’s qualifications must meet § 650.509(b)(4) in order to adequately and appropriately lead an inspection of a complex tunnel or a tunnel with distinctive features or functions. At a minimum, the process shall consider a tunnel’s type of construction, functional systems, history of performance, and physical and operational conditions.

(f) A State DOT, Federal agency, or tribal government may delegate functions identified in paragraphs (e)(1), (2), and (3) of this section through a formal written agreement, but such delegation does not relieve the State DOT, Federal agency, or tribal government of any of its responsibilities under this subpart.

(g) The State DOT, Federal agency, or tribal government tunnel inspection organization shall have a Program Manager with the qualifications listed in § 650.509(a), who has been delegated responsibility for paragraphs (e)(1), (2), and (3) of this section.

**§ 650.509 Qualifications of personnel.**

(a) A Program Manager shall, at a minimum:

(1) Be a registered Professional Engineer, or have 10 years of tunnel or bridge inspection experience;

(2) Be a nationally certified tunnel inspector;

(3) Satisfy the requirements of paragraphs (a)(1) and (2) of this section by August 13, 2017; and

(4) Be able to determine when a Team Leader’s qualifications must meet the requirements of paragraph (b)(1)(i) of this section in accordance with the FHWA approved process developed in accordance with § 650.507(e)(4).

(b) A Team Leader shall, at a minimum:

(1) Meet at least one of the four qualifications listed in paragraphs (b)(1)(i) through (iv) of this section:

(i) Be a registered professional engineer and have six months of tunnel or bridge inspection experience.

(ii) Have 5 years of tunnel or bridge inspection experience.

(iii) Have all of the following:

(A) A bachelor’s degree in engineering or engineering technology from a college or university accredited or determined as substantially equivalent by the Accreditation Board for Engineering and Technology.

(B) Successfully passed the National Council of Examiners for Engineering and Surveying Fundamentals of Engineering examination.

(C) Two (2) years of tunnel or bridge inspection experience.

(iv) Have all of the following:

(A) An associate’s degree in engineering or engineering technology from a college or university accredited or determined as substantially equivalent by the Accreditation Board for Engineering and Technology.

(B) Four years of tunnel or bridge inspection experience.

(2) Be a nationally certified tunnel inspector.

(3) Provide documentation supporting the satisfaction of paragraphs (b)(1) and (2) of this section to the Program Manager of each State DOT, Federal agency, or tribal government for which they are performing tunnel inspections.

(4) Be a registered Professional Engineer and have six months of tunnel or bridge inspection experience if the Program Manager determines through the approved process developed under § 650.507(e)(4) that the tunnel being inspected is complex or has distinctive features or functions that warrant this level of qualifications.

(c) Load ratings shall be performed by, or under the direct supervision of, a registered Professional Engineer.

(d) Each State DOT, Federal agency, and tribal government shall determine inspection personnel qualifications for damage, cursory, and special inspections.

(e) A nationally certified tunnel inspector shall:

(1) Complete an FHWA-approved comprehensive tunnel inspection training course and score 70 percent or greater on an end-of-course assessment;

(2) Complete a cumulative total of 18 hours of FHWA-approved tunnel inspection refresher training over each 60 month period; and

(3) Maintain documentation supporting the satisfaction of paragraphs (e)(1) and (2) of this section, and, upon request, provide documentation of their training status and current contact information to the Tunnel Inspection Organization of each State DOT, Federal agency, or tribal government for which they will be performing tunnel inspections.

(f) Acceptable tunnel inspection training includes the following:

(1) *National Highway Institute training.* NHI courses on comprehensive tunnel inspection training.

(2) *FHWA approval of alternate training.* A State DOT, Federal agency, or tribal government may submit to FHWA a training course as an alternative to the NHI course. The FHWA shall approve alternative course materials and end-of-course assessments for national consistency and certification purposes. The Program Manager shall review the approved alternative training course every 5 years to ensure the material is current. Updates to approved course materials and end-of-course assessments shall be resubmitted to FHWA for approval.

(g) In evaluating the tunnel inspection experience requirements under paragraphs (a) and (b) of this section, a combination of tunnel design, tunnel maintenance, tunnel construction, and tunnel inspection experience, with the predominant amount in tunnel inspection, is acceptable. Also, the following criteria should be considered:

(1) The relevance of the individual's actual experience, including the extent to which the experience has enabled the individual to develop the skills needed to properly lead a tunnel safety inspection.

(2) The individual's exposure to the problems or deficiencies common in the types of tunnels being inspected by the individual.

(3) The individual's understanding of the specific data collection needs and requirements.

#### **§ 650.511 Inspection interval.**

(a) *Initial inspection.* A State DOT, Federal agency, or tribal government tunnel inspection organization shall conduct, or cause to be conducted, an initial inspection for each tunnel described in § 650.503 as follows:

(1) For existing tunnels, conduct a routine inspection of each tunnel according to the inspection guidance provided in the Tunnel Operations, Maintenance, Inspection and Evaluation (TOMIE) Manual (incorporated by reference, *see* § 650.517) by August 13, 2017.

(2) For tunnels completed after these regulations take effect, the initial routine inspection shall be conducted after all construction is completed and prior to opening to traffic, according to the inspection guidance provided in the Tunnel Operations, Maintenance, Inspection and Evaluation (TOMIE) Manual (incorporated by reference, *see* § 650.517).

(b) *Routine inspections.* A State DOT, Federal agency, or tribal government tunnel inspection organization shall conduct, or cause to be conducted, routine inspections for each tunnel described in § 650.503 as follows:

(1) Establish for each tunnel the NTIS routine Inspection Date in a month and year (MM/DD/YYYY) format. This date should only be modified by the Program Manager in rare circumstances.

(2) Inspect each tunnel at regular 24-month intervals.

(3) For tunnels needing inspection more frequently than 24-month intervals, establish criteria to determine the level and frequency to which these tunnels are inspected, based on a risk analysis approach that considers such factors as tunnel age, traffic characteristics, geotechnical conditions, and known deficiencies.

(4) Certain tunnels may be inspected at regular intervals up to 48 months. Inspecting a tunnel at an increased interval may be appropriate when past inspection findings and analysis justifies the increased inspection interval. At a minimum, the following criteria shall be used to determine the level and frequency of inspection based on an assessed lower risk: Tunnel age, time from last major rehabilitation, tunnel complexity, traffic characteristics, geotechnical conditions, functional systems, and known deficiencies. A written request that justifies a regular routine inspection interval between 24 and 48 months shall be submitted to FHWA for review and comment prior to the extended interval being implemented.

(5) Inspect each tunnel in accordance with the established interval. The acceptable tolerance for inspection interval is within 2 months before or after the Inspection Date established in paragraph (b)(1) of this section in order to maintain that date. The actual month, day, and year of the inspection are to be

reported in the National Tunnel Inventory.

(c) *Damage, in-depth, and special inspections.* The Program Manager shall establish criteria to determine the level and frequency of damage, in-depth, and special inspections. Damage, in-depth, and special inspections may use non-destructive testing or other methods not used during routine inspections at an interval established by the Program Manager. In-depth inspections should be scheduled for complex tunnels and for certain structural elements and functional systems when necessary to fully ascertain the condition of the element or system; hands-on inspection may be necessary at some locations.

#### **§ 650.513 Inspection procedures.**

Each State DOT, Federal agency, or tribal government tunnel inspection organization, to carry out its inspection responsibilities, shall perform or cause to be performed all of the following:

(a) Inspect tunnel structural elements and functional systems in accordance with the inspection guidance provided in the Tunnel Operations, Maintenance, Inspection and Evaluation (TOMIE) Manual (incorporated by reference, *see* § 650.517).

(b) Provide at least one Team Leader, who meets the minimum qualifications stated in § 650.509, at the tunnel at all times during each initial, routine, and in-depth inspection. The State DOT, Federal agency, or tribal government shall report the nationally certified tunnel inspector identification for each Team Leader that is wholly or partly responsible for a tunnel inspection must be reported to the National Tunnel Inventory.

(c) Prepare and document tunnel-specific inspection procedures for each tunnel inspected and inventoried that shall:

(1) Take into account the design assumptions and the tunnel complexity; and

(2) Identify the—  
(i) Tunnel structural elements and functional systems to be inspected;  
(ii) Methods of inspection to be used;  
(iii) Frequency of inspection for each method; and

(iv) Inspection equipment, access equipment, and traffic coordination needed.

(d) Establish requirements for functional system testing, direct observation of critical system checks, and testing documentation.

(e) For complex tunnels, identify specialized inspection procedures and additional inspector training and experience required to inspect complex tunnels. Inspect complex tunnels

according to the specialized inspection procedures.

(f) Conduct tunnel inspections with qualified staff not associated with the operation or maintenance of the tunnel structure or functional systems.

(g) Rate each tunnel's safe vehicular load-carrying capacity in accordance with the Sections 6 or 8, AASHTO Manual for Bridge Evaluation (incorporated by reference, *see* § 650.517). A State DOT, Federal agency, or tribal government shall conduct a load rating evaluation as soon as practical, but not later than three months after the completion of the inspection, if a change in condition is identified. Post or restrict the highways in or over the tunnel in accordance with Section 6, AASHTO Manual for Bridge Evaluation (incorporated by reference, *see* § 650.517), or in accordance with State law, when the maximum unrestricted legal loads or State routine permit loads exceed those allowed under the operating rating or equivalent rating factor. Postings shall be made as soon as possible but not later than 30 days after a valid load rating determines a need for such posting. At-grade roadways in tunnels are exempt from load rating. A State DOT, Federal agency, or tribal government, shall maintain load rating calculations or input files with a summary of results as a part of the tunnel record.

(h) Prepare tunnel inspection documentation as described in the Tunnel Operations, Maintenance, Inspection and Evaluation (TOMIE) Manual (incorporated by reference, *see* § 650.517), and maintain written reports or electronic files on the results of tunnel inspections, together with notations of any action taken to address the findings of such inspections. Maintain relevant maintenance and inspection data to allow assessment of current tunnel condition. At a minimum, information collected will include data regarding basic tunnel information (*e.g.*, tunnel location, posted speed, inspection reports, repair recommendations, and repair and rehabilitation work completed), tunnel and roadway geometrics, interior tunnel structural features, portal structure features, and tunnel systems information. When available, tunnel data collected shall include diagrams, photos, condition of each structural and functional system component, notations of any action taken to address the findings of such inspections, and the national tunnel inspector certification registry identification for each Team Leader responsible in whole or in part for the inspection.

(i) Use systematic quality control and quality assurance procedures to maintain a high degree of accuracy and consistency in the inspection program. Include periodic field review of inspection teams, data quality checks, and independent review of inspection reports and computations.

(j) Establish a Statewide, Federal agency-wide, or tribal government-wide procedure to ensure that critical findings are addressed in a timely manner. Notify FHWA within 24 hours of any critical finding and the activities taken, underway, or planned to resolve or monitor the critical finding. Update FHWA regularly or as requested on the status of each critical finding until it is resolved. Annually provide a written report to FHWA with a summary of the current status of the resolutions for each critical finding identified within that year or unresolved from a previous year.

(k) Provide information at least annually, or more frequently upon request, in cooperation with any FHWA review of State DOT, Federal agency, or tribal government compliance with the NTIS. The FHWA will assess annually State DOT compliance using statistical assessments and well-defined measures based on the requirements of this subpart.

#### § 650.515 Inventory.

(a) *Preliminary inventory.* Each State, Federal agency, or tribal government shall collect and submit the inventory data items described in the Specifications for the National Tunnel Inventory (incorporated by reference, *see* § 650.517) for all tunnels subject to the NTIS by December 11, 2015.

(b) *National Tunnel Inventory.* Each State, Federal agency, or tribal government shall prepare, maintain, and make available to FHWA upon request, an inventory of all highway tunnels subject to the NTIS that includes the preliminary inventory information submitted in paragraph (a) of this section, reflects the findings of the most recent tunnel inspection conducted, and is consistent and coordinated with the Specifications for the National Tunnel Inventory.

(c) *Data entry for inspections.* For all inspections, each State DOT, Federal agency, or tribal government shall enter the appropriate tunnel inspection data into its inventory within 3 months after the completion of the inspection.

(d) *Data entry for tunnel modifications and new tunnels.* For modifications to existing tunnels that alter previously recorded data and new tunnels, each State DOT, Federal agency, or tribal government shall enter the appropriate data into its inventory

within 3 months after the completion of the work.

(e) *Data entry for tunnel load restriction and closure changes.* For changes in traffic load restriction or closure status, each State DOT, Federal agency, or tribal government shall enter the data into its inventory within 3 months after the change in status of the tunnel.

#### § 650.517 Incorporation by reference.

(a) Certain material is incorporated by reference into this part with the approval of the Director of the Federal Register under 5 U.S.C. 552(a) and 1 CFR part 51. To enforce any edition other than that specified in this section, the FHWA must publish notice of change in the **Federal Register** and the material must be available to the public. All approved material is available for inspection at 1200 New Jersey Avenue SE., Washington, DC 20590. For questions regarding the availability of this material at FHWA, call the FHWA Regulations Officer, Office of the Chief Counsel, HCC-10, 202-366-0761. This material is also available for inspection at the National Archives and Records Administration (NARA). For information on the availability of this material at NARA, call 202-741-6030 or go to [http://www.archives.gov/federal-register/code\\_of\\_federal\\_regulations/ibr\\_locations.html](http://www.archives.gov/federal-register/code_of_federal_regulations/ibr_locations.html).

(b) American Association of State Highway and Transportation Officials (AASHTO), Suite 249, 444 N. Capitol Street NW., Washington, DC 20001, 800-231-3475, <https://bookstore.transportation.org>.

(1) "The Manual of Bridge Evaluation," Section 6 "Load Rating" and Section 8 "Nondestructive Load Testing," Second Edition, 2011, copyright 2011, incorporation by reference approved for §§ 650.505 and 650.513(a).

(2) 2011 Interim Revisions to "The Manual of Bridge Evaluation," Section 6 "Load Rating," Second Edition, 2010, copyright 2011, incorporation by reference approved for §§ 650.505 and 650.513(a).

(3) 2013 Interim Revisions to "The Manual of Bridge Evaluation," Section 6 "Load Rating," Second Edition, 2010, copyright 2013, incorporation by reference approved for §§ 650.505 and 650.513(a).

(4) 2014 Interim Revisions to "The Manual of Bridge Evaluation," Section 6 "Load Rating," Second Edition, 2010, copyright 2013, incorporation by reference approved for §§ 650.505 and 650.513(a).

(5) 2015 Interim Revisions to "The Manual of Bridge Evaluation," Section 6

“Load Rating,” Second Edition, 2010, copyright 2014, incorporation by reference approved for §§ 650.505 and 650.513(a).

(c) Office of Bridges and Structures, Federal Highway Administration, U.S. Department of Transportation, 1200 New Jersey Avenue SE., Washington, DC 20590.

(1) FHWA–HIF–15–005, “Tunnel Operations, Maintenance, Inspection and Evaluation (TOMIE) Manual,” 2015 edition, available in electronic format at <http://www.fhwa.dot.gov/bridge/inspection/tunnel/>. Incorporation by reference approved for §§ 650.505, 650.511(a), and 650.513(a) and (h).

(2) FHWA–HIF–15–006, “Specifications for National Tunnel Inventory,” 2015 edition, available in electronic format at <http://www.fhwa.dot.gov/bridge/inspection/tunnel/>. Incorporation by reference approved for § 650.515(a) and (b).

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