

A black and white photograph of a tunnel interior. The tunnel is carved into a rocky, layered rock face. The walls are rough and uneven. At the far end of the tunnel, there is a bright, arched opening, likely the exit. The perspective is from inside the tunnel, looking towards the light at the end.

IDAHO MANUAL FOR **Tunnel Evaluation**

2019 EDITION

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Section 1: Introduction

1.1 Purpose

The Idaho Manual for Tunnel Evaluation (IMTE) is written to comply with the requirements set forth from the National Tunnel Inspection Standards in support of the National Tunnel Inspection Program. The IMTE is not intended to override information already established from 23 CFR Part 650 Subpart E – National Tunnel Inspection Standards (NTIS); Specifications for the National Tunnel Inventory (SNTI); and the Tunnel Operations, Maintenance, Inspection, and Evaluation (TOMIE) Manual. It is intended to provide supplemental information specific to the State of Idaho. The IMTE also serves to meet compliance requirements set forth in the FHWA National Tunnel Inspection Program - Compliance Review Manual. This is a living document and is intended to reflect the most recent editions of the aforementioned documents and when these documents are updated the IMTE will be updated in a reasonable timeframe.

1.2 Tunnel Program

ITD's tunnel program encompasses the information in this document as well as all correlated and referenced information described in this manual, including the individual tunnel files for each tunnel.

As of 2019, there are eight tunnels within ITD's tunnel program. There are many similarities with the tunnels such as:

- All tunnels are located in District 1 in a mountainous area of northern Idaho
- All tunnels were built as part of a railroad. The portion of the railroad that encompasses the tunnels was converted to a road
- All tunnels are either unlined rock or cast-in-place concrete lined
- All tunnel roadways are at-grade, founded on rock
- There are no functional systems (electrical, mechanical, fire suppression) in any tunnel
- There are no original drawings available for any tunnel
- All tunnels were built in the early 1900s

1.3 Tunnel Files

Each file for tunnels in Idaho shall contain the following information:

- Any special qualifications necessary for team leader(s) of the inspection team. Currently (as of 2019), there are no qualifications needed beyond the team leader requirements described in the NTIS
- Tunnel inventory data
 - Location
 - Tunnel and roadway geometrics
- Inspection reports (current and previous)
 - Team leader(s) responsible in whole or in part for the inspection
 - Inspection findings including critical findings
 - Conditions of each structural and functional system component
- Relevant maintenance, repair, and rehabilitation recommendations and records to allow assessment of current tunnel condition
- Tunnel specific inspection procedures
- Documentation of relevant tunnel operational and/or restrictive items such as width restrictions, height restrictions, and/or traffic control devices
- Posted speed



- Photos (typically taken during one of the inspections and may be part of the inspection report or maintenance activity)
- Diagrams (sketches, cross sections, LIDAR data, plan and elevation layout describing the different lining systems and tunnel types; or as-built plans).

1.4 Quality Measures

1.4.1 Quality Review Procedures for ITD Performed Inspections

1.4.1.1 Field Review

Review of field inspections by the Program Manager is an effective quality control measure. It builds a strong communication link between the inspectors and the reviewer(s). The Program Manager or ITD designee (i.e., someone familiar with inspection procedures and coding) will conduct spot checks of Tunnel Inspectors working in the field at least once every 24 months. At least one (1) tunnel will be reviewed in the field for each Team Leader who conducts the tunnel inspections for each inspection cycle.

This field review will consist of the Program Manager assessing the correctness and completeness of the inspection, including coding, elements and quantities, maintenance recommendations, and photos as required by ITD's current procedures as well as those needed to depict critical conditions, etc. This review should be done with the inspector(s) present so that any improper coding or procedures can be discussed in the field and immediately corrected.

1.4.1.2 Office Review

The Program Manager or ITD designee (i.e., someone familiar with inspection procedures and coding) will review at least three (3) tunnel files at least once every 24 months, in the office to ensure the information collected during bridge inspections is accurate, consistent, of the highest quality, and readily available. All documentation of inventory and inspection information should be kept in an orderly and retrievable manner in accordance with ITD's Asset Management Section's filing practices. The Program Manager will review for completeness and accuracy and compare the files to previous inspection reports with additional attention on any significant changes noted since the last inspection.

1.4.2 Quality Review Procedures for Consultant Performed Inspections

The Program Manager may delegate the quality review procedure for consultant tunnel inspectors to an ITD Team Leader to ensure the quality is acceptable. Consultants are responsible for internal QA/QC controls within their own organization and should be aligned with the QA/QC procedures described in this manual.

1.4.2.1 Field Review

The Program Manager or ITD designee (i.e., someone familiar with inspection procedures and coding) will conduct spot checks of consultant tunnel inspectors working in the field at least once every 24 months. The bridge/tunnel inspector will randomly choose at least one (1) tunnel to review in the field for each consultant tunnel inspector. This tunnel will typically have been previously inspected by said consultant bridge inspector.

This field review will consist of the Program Manager or ITD designee (i.e., someone familiar with inspection procedures and coding) assessing the correctness and completeness of the inspection, including coding, elements and quantities, maintenance recommendations, and photos as required by ITD's latest policies and procedures as well as those needed to depict critical conditions, etc. This review should be done with the consultant tunnel inspector(s)



present so that any improper coding or procedures can be discussed in the field and immediately corrected.

1.4.2.2 Office Review

The ITD Team Leader and/or the Database Manager will review all consultant tunnel inspection reports to ensure the information collected during tunnel inspections is accurate, consistent, and of the highest quality. Among items to be reviewed are:

- The appropriateness of the identified tunnel elements and their approximate quantities
- All necessary tunnel element defects have been identified and properly coded
- Work candidates, if needed, are present and appropriate
- Load restrictions, if present, correlate with load rating and recommended posting
- Traffic control devices are present and appropriate (i.e., height or width restrictions, etc.)
- All required photos are attached
- All items necessary for accurate reporting to the National Tunnel Inventory (NTI) are properly coded
- Any significant changes from the previous inspection reports
- File documentation is sufficient
- Tunnel owner was notified of any critical findings and the follow up documentation was received to indicate the critical finding has been resolved

The Database Manager will make completed consultant tunnel inspection reports readily available.

1.4.3 Disqualification

When the inspection review indicates that a consulting firm and/or consultant tunnel inspector continue to make the same or similar mistakes, omissions, etc., ITD may implement disqualification procedures as follows:

- Upon receiving notice of incorrect coding and significant findings, the consultant tunnel inspector shall address the findings and prepare a letter which explains the steps that will be taken to correct the problems to ensure they will not be repeated in the future.
- The consultant tunnel inspector will be placed on probation and reviewed again during the next round of tunnel inspections. This review will be conducted by a team consisting of the consultant tunnel inspector and the ITD Team Leader and/or Program Manager. A member of FHWA may also attend the review if they desire.
- If the same or similar mistakes are found during this second review, the consultant tunnel inspector shall be given notification that they shall be disqualified if these problems are not corrected and avoided in the future and placed on a secondary probation period until the next round of tunnel inspections.
- The consultant tunnel inspector shall be reviewed again during the next round of tunnel inspections by the reviewing team. If the same or similar problems are found, the consultant tunnel inspector and/or consulting firm will be notified that they are hereby disqualified for a minimum of two (2) years.
- A disqualified consultant tunnel inspector and/or firm may be re-qualified after the two-year period if they indicate in their term agreement proposal how they have corrected their deficiencies (i.e., refresher training, change in personnel, etc.).

Reasons for Disqualification Typical reasons for disqualification may include, but are not limited to, the following:

- Lack of proper contact with the tunnel owner after finishing inspections in the area



- Lack of proper follow-up with the tunnel owner for critical findings
- Failure to report significant deterioration or damage such as critical findings and vehicular impacts
- Failure to perform tunnel inspections and produce inspection reports on time
- Failure to attend training provided by ITD

1.5 Complex Tunnels

In Idaho, a complex tunnel is any tunnel with unique structural and/or functional elements that require additional or advanced inspection techniques. ITD's Tunnel Program Manager shall be responsible for deciding whether a tunnel is complex. Complex tunnels shall require an approved Team Leader to be on-site during the inspection. A complex tunnel may also require personnel with subject matter expertise to inspect specific portions of a complex tunnel or specialized equipment in a complex tunnel. Complex tunnels may receive additional or unique inspection frequencies. Currently (as of 2019), there are no tunnels on the Idaho system that have been deemed as a complex tunnel. In Idaho, a complex tunnel would typically have one or more of the following functional systems:

- Extensive electrical systems such as switchgear, electrical distribution panels, computer and control systems/rooms, etc.
- Mechanical and ventilation systems such as pumps, fans, air monitors, etc.
- Fire suppression systems - such as sprinklers, hydrants, standpipes, fire alarm boxes, heat and smoke sensors, etc.
- Emergency Egress facilities – such as exit lighting/signage, exit corridors/passageways, refuge rooms, etc.
- Communication, monitoring, and security systems such as cameras, access restricted areas, phones, etc.
- Difficult inspection access methods
- Constructed of complex material or design methods.

All complex tunnels shall:

- Have documentation in the tunnel file indicating what features make the tunnel complex
- An inspection plan on how to access and inspect each complex feature
- Documentation establishing the inspection frequency of the complex feature(s)

1.6 Critical Findings

A critical finding is defined the same for tunnel as it is for a bridge, according to the CFR. Per CFR 650.305, a critical finding is a structural or safety related deficiency that requires immediate follow-up inspection or action.

A critical finding for a tunnel for ITD is one or more of the following conditions:

- When a tunnel has a significant structural problem that requires an emergency width, height, or speed restriction; lane closure; or tunnel closure.
- Any event causing immediate concern to the traveling public (e.g., a tunnel hit, fire in the tunnel or outside in the vicinity of the tunnel portals, earthquakes, etc.).
- A maintenance recommendation that the Team Leader has assigned an emergency priority. Emergency priority is assigned to correct deficiencies that jeopardize the safety of the traveling public.



Section 2: Inspection Types

Initial Inspection: 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.

Routine Inspection: Regularly scheduled inspections that help to ensure continued safe, reliable, and efficient service. The routine inspections consist of comprehensive observations and measurements that are used to determine the physical and functional condition of the tunnel. Routine inspections also determine if there are any changes that need to be made from the initial or previously recorded conditions.

In-Depth Inspection: Scheduled inspections used to identify hard-to-detect deficiencies. An in-depth inspection typically requires access equipment, traffic control, appropriate lighting, and the necessary tools to perform the work. The inspector shall get close enough to reach and assess known areas of defects or areas with suspected defects. This could require visual arms-reach, visual hands-on, and/or tactile inspection.

Special Inspection: An inspection scheduled at the discretion of the Program Manager to monitor a known or suspected deficiency.

Damage Inspection: Damage inspections are unscheduled inspections required when a tunnel has been damaged. A damage inspection must be conducted by an Inspection Team Leader. The inspection is typically performed to assess damage from extreme events such as impact, fire, flood, seismic, and blasts.

Following notification of potential damage to a tunnel, the Program Manager may request an onsite damage assessment be conducted by ITD or county personnel who are near the affected tunnel. Damage assessors typically do not meet the requirements of an Inspection Team Leader but serve an important role because they are often the first-responder(s) for ITD. Measurements and photographs of damage may be required so that the Program Manager can determine:

- whether or not to dispatch a tunnel inspection team
- if a tunnel should be closed or restricted until tunnel inspectors can get to the site and inspect the damage

No official report is required from damage assessors. A phone call or email to the Program Manager, or their designee, is sufficient documentation of a damage assessment.

Section 3: Inspection Intervals

Initial Inspections shall be performed following the construction of a new tunnel and prior to the tunnel opening to traffic. When a tunnel is added to the system an initial inspection must be performed within 90 days of being added to the system.

Routine Inspections for all tunnels shall be performed every 24 months or more frequently. Criteria for more frequent routine inspections shall be based on a risk analysis. Currently, all tunnels in Idaho are located on non-NHS routes with low ADT and were built of similar construction; unlined rock or cast-in-place concrete lined. The governing risk factor is condition. More frequent inspections shall be based on the condition of a Structural Element, as defined in Section 3.2 of the SNTI. The criteria used to determine a more frequent inspection are as follows:

- A significant portion of a Structural Element is in Condition States 3 or 4; or
- During an inspection, the quantity(ies) in Condition States 3 or 4 of a Structural Element increases by more than 10%; or
- During an inspection, any increase in quantity(ies) in Condition States 3 or 4 in critical areas of a



Structural Element.

If one or more of these criteria above are met/observed during an inspection a possible increased frequency shall be triggered based upon the Team Leader's recommendation and consultation with the Program Manager. In some instances, it might be prudent to perform a special inspection in between routine inspections instead of performing a full routine inspection at an increased frequency. An increased routine inspection frequency shall start at 12 months but could be more frequent if needed. At any time, if a more frequent routine inspection is warranted, the inspection frequency and cause for the frequency change shall be documented in the tunnel file.

In-depth Inspections shall be performed every 72 months or more frequently based upon the Team Leader's recommendation and consultation with the Program Manager. If a more frequent in-depth inspection is warranted it shall be documented in the tunnel file.

Special Inspections shall be performed at a frequency established at the discretion of the Program Manager. Some special inspections are not recurring. If a special inspection is warranted, it shall be documented in the tunnel file.

Damage Inspections occur promptly after a significant damage event occurs. If a damage inspection occurs, the event shall be documented in the tunnel file.

Section 4: Inspection Personnel

4.1 Qualifications of Tunnel Personnel.

- a. Program Manager - The Program Manager is responsible for the Tunnel Inspection Program for ITD. The Program Manager may delegate duties to qualified delegates but remains responsible for ensuring compliance. Section 650.509 of the NTIS governs how someone qualifies as a Program Manager and ITD shall use the same qualifications for approving a Program Manager.
- b. Team Leader - The Team Leader oversees the onsite inspection team. The Team Leader is primarily responsible for the inspection planning, preparing, performing, and reporting on tunnel inspections. Section 650.509 of the NTIS governs how someone qualifies as a Team Leader and ITD shall use the same qualifications for approving Team Leaders. In order to be qualified as a Team Leader for initial, damage, in-depth, and special inspections; a Team Leader must meet the NTIS Team Leader qualifications and must be approved by the Program Manager for the specific type of inspection prior to performing the inspection.
- c. Team Leaders for in-depth, special, and damage inspections shall be qualified Team Leaders as described in Section 4.1.b for Team Leaders. If additional qualifications are needed based on a specialized type of inspection work, it shall be defined by the Program Manager.
- d. There are no qualifications for a person who performs a cursory or initial damage assessment (damage assessor).
- e. Team Leader for Complex Tunnels – Currently, there are no complex tunnels in Idaho. Qualifications for a Team Leader to lead an inspection of a complex tunnel shall be developed prior to the inspection of a complex tunnel in Idaho.
- f. Database Manager - ITD uses the same data management system for tunnels as is used for bridges. The Database Manager is responsible for the accuracy and integrity of the data. The Database Manager is also responsible for the yearly update of the NTIS of Idaho's tunnel data to the National Tunnel Inventory. Additional responsibilities include:
 - Creating reports for ITD management, other sections, and outside agencies requesting tunnel data



- Coordinating data from ITD and consultant inspectors
- Assigning permissions to users for access to tunnel data
- Overseeing the critical findings process
- Overseeing the restricting and closing of tunnels
- Quality assurance of inspection reports

Qualifications of the Database Manager are established by the Program Manager.

- g. Load Rating Engineer - Currently there are no tunnels that require a load rating in Idaho. Requirements for a Load Rating Engineer in Idaho are as defined in the NTIS.

4.2 Personnel Files

ITD maintains files for all personnel (including consultants) serving in roles defined by the NTIS. All personnel are required to provide information demonstrating they meet the qualifications defined in the NTIS and this program manual to the Program Manager. Items that are to be provided to ITD include:

- Name, position title, and contact information
- Summary of tunnel experience and responsible duties
- Tunnel training completed including copies of completion certificates
- Professional License registration/renewals (when applicable)

ITD will maintain and submit this information periodically to a National Certified Tunnel Registry.

Section 5: Inspection Procedures & Reporting

Overall, all tunnel inspection procedures shall follow the guidance in the National Tunnel Inspection Standards (NTIS); Tunnel Operations, Maintenance, Inspection, and Evaluation (TOMIE) Manual; and the Specifications for the National Tunnel Inventory (SNTI). Tunnel specific inspection procedures are documented for each tunnel in the inspection report in the Tunnel Notes Section.

5.1 Initial Inspection Procedures & Reporting

The effort and intensity should be sufficient to accurately document the baseline condition of the tunnel. Traffic control and special access equipment may be needed for an initial inspection. The inspection team should have a set of as-built drawings (if available) to refer to when performing the inventory inspection. When tunnel plans are not available, the inspection team shall take field measurements to complete the inventory inspection.

5.2 Routine Inspection Procedures & Reporting

The inspection team shall provide all inventory items and element data needed to determine the condition in sufficient detail to clearly establish the tunnel's condition and to ensure its continued safe operation.

The level of effort required to perform a routine inspection shall vary according to the tunnel type, size, design complexity, and existing conditions. To provide a reasonable level of confidence in the safety of the tunnel, knowledge of the structure and sound judgement are necessary to determine those portions that shall receive close-up scrutiny during a routine inspection. Routine inspections are generally conducted from ground level and progress from end portal to end portal. Team Leaders may use access equipment (e.g., ladder) to access portions of the tunnel that need close-up scrutiny.



5.3 In-Depth Inspection Procedures & Reporting

In-depth inspection reports shall generally contain sufficient detail to understand what elements were inspected at an in-depth level, description of findings (including sketches and photos as appropriate), and any other pertinent information to facilitate future inspections such as equipment and/or methods used to analyze and assess elements. Traffic control and special access equipment (e.g., bucket truck) are typically needed for an in-depth inspection.

If an in-depth inspection is not performed in association with a routine inspection and report, it should be recorded on a Supplemental Inspection Form.

5.4 Damage Inspection Procedures & Reporting

The scope of damage inspections varies widely depending on the extent of the damage, the volume of traffic encountered, the location of the damage on the structure, and documentation needs. At a minimum, photographs and measurements shall be taken to show the extent of the damage.

The inspector shall obtain sufficient information for the program manager to accurately assess the condition of the tunnel and determine a course of action. Potential courses of action include, but are not limited to:

- Placement of emergency restrictions
- Partial or full closure of the tunnel to traffic
- Repairs

A damage inspection should be recorded on a Supplemental Inspection Form.

5.5 Special Inspection Procedures & Reporting

Special inspection reports shall generally contain sufficient detail to understand what elements were inspected for the special inspection, description of findings (including sketches and photos as appropriate), and any other pertinent information to facilitate future inspections such as equipment and/or methods used to analyze and assess elements.

If a special inspection is not performed in association with a routine inspection and report, it should be recorded on a Supplemental Inspection Form.

5.6 Critical Finding Procedures & Reporting

5.6.1 Emergency Notification to Police and Public

If the inspector determines that there is an immediate danger to the traveling public and/or state or local law enforcement, the Program Manager shall be contacted immediately. The tunnel shall be closed.

5.6.2 Critical Finding Procedures for Tunnel Owners

When a critical finding(s) is discovered during the inspection, the following procedures shall be followed:

- Notification: The Inspection Team Leader shall notify the tunnel owner/district personnel of all critical findings immediately. Due to the urgent nature, notification may be initially done through a phone call, meeting, or an email. However, formal written notification shall occur shortly thereafter (no later than 24 hours from discovery of the critical finding) by completing and sending a Local Agency Communication Verification Form (refer to Appendix 4.8 in the IMBE for a blank form) to local tunnel owners. The purpose of these forms is to provide added visibility and attention for tunnel owners so that they can quickly and diligently take actions to resolve. Typically, the Local Agency Communication Verification Form will be shared and



signed at the initial meeting with the tunnel owner. Copy the Program Manager and the Database Manager when sending critical findings notification forms to local agencies. In addition, the Program Manager or their designee, shall notify FHWA within 24 hours of discovery of a critical finding.

A complete list of highway officials is contained in the Directory of Idaho Government Officials published yearly by the Association of Idaho Cities, www.idahocities.org

In addition to completing these forms, the following information shall be documented in the Inspection Notes section of the inspection report:

- A brief summary of the critical finding
 - Contact information for the tunnel owner representative (name, title, phone number, etc.)
 - Date of conversation with tunnel owner representative
 - Brief summary of interim actions that were/are to be taken (e.g., tunnel closure, lane restrictions, load posting, etc.)
 - Assign a priority (2 days, 10 days, 30 days, etc.) for follow-up action
- Action: The local agency shall be required to perform the necessary actions within the prescribed timeframes on the form and contact the Database Manager when proper action has been taken. Once the Program Manager is notified, the tunnel database shall be updated to reflect the current tunnel condition.
- Follow Up: If the local agency fails to notify the Program Manager within the timeframes identified above, a follow-up letter shall be sent by the Program Manager. At this point the tunnel shall be added to the Critical Deficiency Tracking System. If the local agency fails to notify the Program Manager within five business days that corrective action has been taken, a second follow-up letter shall be sent by the Chief Engineer or designee. This letter shall inform the local agency that Federal and State funds may be suspended until appropriate corrective actions are taken. The FHWA Division Administrator and Local Highway Technical Assistance Council (LHTAC) shall be copied on the letter in addition to appropriate ITD personnel. Additionally, the appropriate ITD District Engineer shall be contacted and either he/she or designee shall follow-up with local highway agency personnel and offer assistance to get proper action taken.

5.6.3 Critical Findings Tracking System

ITD shall maintain a system that tracks all critical findings. When a critical finding has been resolved, the tracking system shall be updated to indicate the critical finding has been closed. A historical record of resolved critical findings shall be maintained in order to track the types of critical findings found and to identify other tunnels which may have similar structural details. At the discretion of the Program Manager, inspection of other tunnels with similar structural details may be scheduled to verify that the critical finding is isolated to the identified tunnel(s).

Section 6: Load Ratings

Currently, all tunnels in Idaho have at-grade roadways. As a result, there are no tunnels in Idaho that require a load rating.

Section 7: References

- a. Code of Federal Regulation, Publication No. 23 CFR Part 650 Subpart E, "National Tunnel Inspection Standards (NTIS)," 2015



- b.** Federal Highway Administration, Publication No. FHWA-HIF-15-006, "Specifications for National Tunnel Inventory," 2015 edition
- c.** Federal Highway Administration, Publication No. FHWA-HIF-15-005, "Tunnel Operations, Maintenance, Inspection and Evaluation (TOMIE) Manual," 2015 edition
- d.** Federal Highway Administration, Publication No. HIBS-30, "National Tunnel Inspection Program - Compliance Review Manual," 2019 edition
- e.** Idaho Transportation Department, "Idaho Manual for Bridge Evaluation (IMBE)," 2018 edition

