U.S. Department of Energy
Washington, DC

ORDER

DOE O 437.1A

Approved 09-23-2024

SUBJECT: BRIDGE AND TUNNEL MANAGEMENT

1. PURPOSE. Ensure the safety, function, and efficient management of all Department of Energy (DOE) bridges, culverts, and tunnels in support of DOE missions through regular, comprehensive inspections and evaluations using resources effectively and efficiently and in compliance with the governing laws and regulations.[1]

2. CANCELS/SUPERSEDES. DOE O 437.1, *Bridge and Tunnel Management*, dated 12-11-2020. Cancellation of a directive does not, by itself, modify or otherwise affect any contractual or regulatory obligation to comply with the directive

3. APPLICABILITY.

   a. Departmental Applicability.

      (1) This Order applies to all DOE elements with responsibility for bridges, tunnels, or culverts where DOE has a legal interest or right to use such property except for the exemptions identified in paragraph 3.c. The requirements supplement those of DOE O 430.1, *Real Property Asset Management,* current version.

      (2) The Administrator of the National Nuclear Security Administration (NNSA) must assure that NNSA employees comply with their responsibilities under this directive. Nothing in this directive will be construed to interfere with the NNSA Administrator's authority under Section 3212(d) of Public Law 106 – 65 to establish Administration-specific policies, unless disapproved by the Secretary.

   b. DOE Contractors. Except for the equivalencies/exemptions in paragraph 3.c., the Contractor Requirements Document (CRD), Attachment 1, sets forth requirements of this Order that will apply to contracts that include the CRD. The CRD or its requirements must be included in contracts for the management or operation of DOE sites or facilities that include bridges, tunnels, or culverts in the real property asset inventory.

   c. Equivalencies and Exemptions for DOE O 437.1A. Equivalencies and exemptions to this Order are processed in accordance with DOE O 251.1, Departmental Directives Program, current version. Attachment 2 establishes the basis for equivalent requirements. The accountable Program Secretarial Officer must approve any equivalency or exemption to the requirements delineated in this

[1] 23 CFR Part 650, Subpart C, *National Bridge Inspection Standards (FHWA)*; 23 CFR Part 650, Subpart E – *National Tunnel Inspection Standards (FHWA)*; and 49 CFR Part 237, *Bridge Safety Standards (FRA)*.

Order except those stipulated by Federal regulation or implementing Department of Transportation guidance.

(1) Exemptions. The following are not subject to this Order:

(a) Federal Energy Regulatory Commission.

(b) Power Marketing Administrations. In accordance with Section 302 of the Department of Energy Organization Act of 1977, the Secretary operates and maintains the Power Marketing Administrations' (PMA) electric power transmission systems by and through the PMA administrators. The PMAs are uniquely established within the Department by nature of their administrators' obligations to meet statutory and public utility responsibilities for the safety, security, and reliability of electric power transmission. Administrators must determine the appropriate real property asset management program for their facilities, including consideration of appropriate parts of the criteria set forth in this Order and prudent utility industry practice. Except for assets subject to Federal regulation, the Power Marketing Administrations are exempt from the requirements in this Order.

(c) Accelerator facilities that are covered by DOE O 420.2, *Safety of Accelerator Facilities*, current version.

(d) Culverts not inventoried in the Facilities Information Management System with Usage Code 2629.

(2) Equivalency. In accordance with the responsibilities and authorities assigned by Executive Order 12344, codified at 50 U.S.C. sections 2406 and 2511 and to ensure consistency through the joint Navy/DOE Naval Nuclear Propulsion Program, the Deputy Administrator for Naval Reactors (Director) will implement and oversee requirements and practices pertaining to this Directive for activities under the Director's cognizance, as deemed appropriate. The notification requirements in section 5 do not apply.

4. REQUIREMENTS. The following paragraphs set forth the requirements for bridge and tunnel management including inspections, load rating and posting, scour appraisal, seismic vulnerability evaluation, vehicle traffic volume data collection, use of qualified personnel, quality management, records and reporting, and inventory and asset management. Attachment 2 provides acceptable approaches for implementing Federal regulation and for meeting the requirements of this Order. It references Federal regulations, DOE directives, and industry best practices. It also provides criteria for applying a graded approach to pedestrian bridges, tunnels, or culverts.

a. Inspections. Ensure timely inspections, assessments, studies, and evaluations of each vehicle, railroad, and pedestrian bridge, culvert, and tunnel as described in Attachment 2 are planned, conducted, and documented.

b. Seismic Vulnerability Evaluation. Ensure each vehicular, railroad, and pedestrian bridge and culvert is evaluated for vulnerability to seismic events and the need for seismic retrofitting using the criteria in Attachment 2.

c. Load Rating and Posting.

(1) Maintain a current load rating for each active vehicle, railroad, and pedestrian bridge, tunnel, and culvert using the criteria and methods in Attachment 2. At-grade roadways in tunnels are exempt from load rating.

(2) When necessary, post a vehicle, railroad, and pedestrian bridge, tunnel, or culvert for load restrictions or restrict access using the criteria in Attachment 2.

d. Scour Appraisal.

(1) Maintain a current scour appraisal for each active bridge and culvert that crosses a waterway using the criteria and methods in Attachment 2.

(2) Scour appraisals are a risk-based and data driven determination of a bridge or culvert's vulnerability to scour, resulting from the least stable result of scour that is either observed, or estimated, through a scour evaluation or a scour assessment.

e. Vehicle Traffic Volume Data Collection.

(1) For each active vehicle bridge:

(a) Determine the Average Daily Traffic (ADT) and the percentage that is truck traffic. Do not include vans, pickup trucks, and other light delivery trucks in this percentage. Update every five (5) years.

(b) Maintain a forecasted average daily traffic for the route at least 17 years but no more than 22 years from the year in which the forecast is made. The intent is to provide a forecast of the ADT 20 years in the future.

(2) For each active vehicle tunnel, determine the Annual Average Daily Traffic (AADT) and the Annual Average Daily Truck Traffic (AADTT). Do not include vans, pickup trucks, and other light delivery trucks in this percentage. Update every five (5) years.

f. Use of Qualified Personnel.

(1) Ensure each person performing an inspection or evaluation meets the qualification requirements specific to the inspection or evaluation conducted and understands the duties of the role he or she is expected to perform as described in Attachment 2.

(2) Document and certify all individual personnel qualifications including appropriate education, experience, licensure, and certifications, and current training, satisfy requirements in Attachment 2.

(3) Submit certified personnel qualifications to the Site and/or Field Office Manager. The Site and/or Field Office Manager will certify all personnel qualifications satisfy the requirements in Attachment 2. The Site and/or Field Office Manager will submit the certified personnel qualifications to the DOE Bridge and Tunnel Manager (BTM).

g. Quality Management.

(1) Establish quality management procedures or requirements necessary to produce accurate and consistent bridge inspections conforming with inspection standards and criteria; inspection plans; quality control procedures; DOE policy; and Federal and State requirements.

(2) Establish quality management procedures or requirements necessary to ensure that evaluation products such as calculations, reports, and studies are complete, accurate, and properly checked in accordance with applicable industry standards.

(3) Establish quality management procedures or requirements necessary to ensure that information and data supporting the Department's external reporting or implementation of bridge and tunnel management requirements is validated and provided in a timely manner.

h. Records and Reporting. Ensure records, reports, and data are prepared, maintained, and submitted using the criteria in Attachment 2.

i. Inventory and Asset Management.

(1) Integrate requirements for bridge and tunnel management with existing operating and management procedures for real property. Document any locally established policies, procedures, or inspection intervals for bridges, tunnels, or culverts.

(2) When available resources are inadequate to maintain an acceptable level of bridge, culvert, or tunnel safety, act to impose lane or load restrictions, or closures.

(3) Establish, document, and implement protocols for responding to a critical finding. Establish, document, and implement protocols for managing permit loads.

(4) Establish, document, and implement bridge closure and re-opening procedures. Once closed, a bridge may not be reopened until repairs are complete and a qualified engineer determines that the bridge is safe and if necessary, posted for load restrictions.

(5) For railroad bridges, establish, document, and implement procedures and issue instructions to personnel responsible for train operations to prevent operation of equipment that would exceed the capacity of the bridge.

5. RESPONSIBILITIES. DOE real property is operated and managed by qualified and experienced federal and contractor personnel at Headquarters and field locations. The paragraphs below describe the responsibilities and authorities for effective management of DOE bridges, culverts, and tunnels, and establish accountabilities for management of these assets.

a. Program Secretarial Officer/Program Office (PSO).

(1) Implement the requirements of this Order through DOE elements.

(2) Ensures validation and timely submission of information and data supporting the Department's requirements and external reporting.

(3) Determines which Management and Operating (M&O) and non-M&O contracts must include the CRD and notify Contracting Officers (COs) to incorporate the CRD. Determine which non-M&O contracts must include equivalent requirements to the CRD (in a contract clause or other contract provision, for example, in the Statement of Work) and notify COs to include the equivalent requirements in the contracts in a timely manner.

(4) Approves equivalencies or exemptions from bridge and tunnel management requirements as defined in Paragraph 3.c.

b. Director, Office of Environment, Health, Safety and Security. Provides advice and assistance for environment, health, safety, and security implementation.

c. Site and/or Field Office Manager. Integrates bridge and tunnel management requirements into existing quality assurance[2] and safety management systems,[3,4] as well as site operations or emergency operations plans and

[2] DOE O 414.1, Quality Assurance, current version.
[3] DOE O 450.2, Integrated Safety Management, current version.
[4] 48 CFR 970.5223-1, DEAR Clause: Department of Energy Acquisition Regulations, Integration of Environment, Safety and Health into Work Planning and Execution.

procedures. Certifies all qualified personnel satisfy the requirements of this Order.

d. Contracting Officer. Once notified of contract applicability, insert the CRD of this order or equivalent requirements to the CRD into applicable M&O and non-M&O contracts.

e. Head of Contracting Activity.[5] Issues direction to Contracting Officers to incorporate the CRD into contracts in a timely fashion upon notification of its applicability.

f. DOE Bridge and Tunnel Manager (BTM). Serves as the DOE official responsible for performing the duties of Bridge Program Manager and Load Rating Engineer as set forth in Code of Federal Regulations 23 CFR 650, Subpart C, and the duties of Tunnel Program Manager as set forth in Code of Federal Regulations 23 CFR 650.507 pertaining to agency-wide bridge inspection policies and procedures, quality control and quality assurance procedures, and preparation and maintenance of a bridge inventory.

6. INVOKED TECHNICAL STANDARDS. This Order does not invoke any DOE technical standards or industry standards as required methods. Any technical standard or industry standard mentioned in or referenced by this Order is not invoked by this Order. Note: DOE O 251.1, current version, provides a definition for "invoked technical standard."

7. DEFINITIONS. Federal requirements or industry standards establish definitions for many of the terms used in this Order. Attachment 3 lists the source of established definitions or establishes definitions for Departmental use.

8. REFERENCES.

a. 23 U.S.C. 101(a)(23), Public Road.

b. 23 CFR Part 650, Subpart C, Federal Highway Administration National Bridge Inspection Standards.

c. 23 CFR Part 650, Subpart E, Federal Highway Administration National Tunnel Inspection Standards.

d. 49 CFR Part 213, Track Safety Standards.

e. 49 CFR Part 214, Railroad Workplace Safety.

f. 49 CFR Part 237, Subpart D, Federal Railroad Administration Bridge Safety Standards.

[5] DOE O 361.1, *Acquisition Career Management Program*, current version.

g. FHWA Specifications for the National Bridge Inventory (SNBI), FHWA-HIF-22-017, March 2022.

h. FHWA Specifications for the National Tunnel Inventory, HIF-15-006, July 2015.

i. FHWA Bridge Inspector's Reference Manual (BIRM), FHWA-NHI-23-024, March 2023.

j. FHWA Manual on Uniform Traffic Control Devices (MUTCD), 11th Edition, December 2023.

k. FHWA National Bridge Inspection Program Compliance Review Manual, HIBS-30, April 1, 2018 or current version.

l. FHWA Seismic Retrofitting Manual for Highway Structures: Part 1 – Bridges, FHWA-HRT-06-032, January 2006.

m. FHWA Seismic Retrofitting Manual for Highway Structures: Part 2 – Retaining Structures, Slopes, Tunnels, Culverts, and Roadways, FHWA-HRT-05-067, August 2004.

n. FHWA Tunnel Operations, Maintenance, Inspection, and Evaluation Manual (TOMIE), FHWA-HIF-15-005, July 2015.

o. FHWA Underwater Bridge Inspection, FHWA-NHI-10- 027, June 2010.

p. FHWA Bridge Preservation Guide, FHWA-HIF-11042, Spring 2018.

q. FHWA Traffic Monitoring Guide, December 2022.

r. FHWA Hydraulic Engineering Circular No. 17 (HEC-17), Highways in the River Environment: Extreme Events, Risk and Resilience, FHWA-HIF-16-018, June 2016.

s. FHWA Hydraulic Engineering Circular No. 18 (HEC-18) Evaluating Scour at Bridges, FHWA-HIF-12-003, April 2012.

t. FHWA Hydraulic Engineering Circular No. 20 (HEC-20) Stream Stability at Highway Structures, FHWA-HIF-12-004, April 2012.

u. FHWA Hydraulic Engineering Circular No. 23 (HEC-23), Bridge Scour and Stream Instability Countermeasures: Experience, Selection, and Design Guidance, FHWA NHI-09-111, September 2009.

v. FHWA Bridge Formula Weights, FHWA-HOP-06-105, August 2006; Revised May 2015.

w. AASHTO Culvert and Storm Drain Inspection Guide, CSDIM-1, 2020.

x. AASHTO LRFD Bridge Design Specifications, 9th Edition, Jan 2020.

y. AASHTO LRFD Guide Specifications for the Design of Pedestrian Bridges, 2nd Edition with 2015 Interim Revisions.

z. AASHTO Manual for Bridge Evaluation (MBE), 3rd Edition, 2018.

aa. AASHTO Manual for Bridge Element Inspection, 2nd Edition, 2024 Interim Revisions, 2024.

bb. AREMA Manual for Railway Engineering, current edition 2019, updated annually.

cc. AREMA Bridge Inspection Handbook, 2nd edition, 201.

dd. ASCE Underwater Investigations: Standard Practice Manual, March 2013.

ee. DOE O 226.1, Implementation of Department of Energy Oversight Policy, current version.

ff. DOE O 361.1, Acquisition Career Management Program, current version.

gg. DOE O 414.1, Quality Assurance, current version.

hh. DOE O 450.2, Integrated Safety Management, current version.

ii. International Organization for Standardization (ISO) 9000, Quality Management Systems.

9. CONTACT. Questions regarding the implementation of this Order should be directed to the Office of Asset Management at doe-bpm@hq.doe.gov.

BY ORDER OF THE SECRETARY OF ENERGY:

DAVID M. TURK
Deputy Secretary

ATTACHMENT 1: CONTRACTOR REQUIREMENTS DOCUMENT (CRD) DOE O 437.1A, *BRIDGE AND TUNNEL MANAGEMENT*

This Contractor Requirements Document (CRD) sets forth requirements applicable to the contract to which this CRD is inserted. It establishes the requirements for Department of Energy (DOE) contractors, including National Nuclear Security Administration contractors, whose contracts involve the management or operation of DOE sites or facilities that include bridges, tunnels, or culverts. Contractors are expected to meet these functional requirements through tailoring of their business processes and management practices and through use of nationally recognized industry standards and practices and voluntary consensus standards.

Regardless of the performer of the work, the contractor is responsible for complying with the requirements of this CRD. The contractor is responsible for flowing down the requirements of this CRD to subcontractors at any tier to the extent necessary to ensure the contractor's compliance with the requirements.

In addition to the requirements set forth in this CRD, contractors are responsible for complying with Attachments 2, 3, and 4 to DOE O 437.1, current version, referenced in and made a part of this CRD, which provide requirements and information applicable to contracts in which this CRD is inserted.

The contractor must establish and maintain a documented bridge and tunnel management approach satisfying Federal regulations, DOE directives, and industry standards and practices. Attachment 2 provides acceptable approaches for implementing Federal regulation and for meeting the requirements of this Order. It references Federal regulations, DOE directives, and industry best practices. It also provides criteria for applying a graded approach to pedestrian bridges, tunnels, or culverts.

The contractor's bridge and tunnel management approach must satisfy the following requirements for the following structures: public- and controlled-access vehicular bridges; public- and controlled-access railroad bridges; public- and controlled-access pedestrian bridges, including elevated walkways; public- and controlled-access vehicular tunnels; and culverts assigned Usage Code 2629 in the Facilities Information Management System. These include requirements specific to assets with Nonredundant Steel Tension Member (NSTM) bridges or complex features.

1. Inspections. Plan, conduct, and document timely inspections, assessments, studies, and evaluations of each bridge, culvert, or tunnel as described in Attachment 2.

2. Load Rating and Posting.

    a. Maintain a current load rating for each active bridge, tunnel, and culvert using the criteria and methods in Attachment 2. At-grade roadways in tunnels are exempt from load rating.

    b. When necessary, post a bridge, tunnel, or culvert for load restrictions or restrict access using the criteria in Attachment 2.

3. Scour Appraisal. Maintain a current scour appraisal for each active bridge and culvert that crosses a waterway using the criteria and methods in Attachment 2. Scour appraisals are a risk-based and data driven determination of a bridge or culvert's vulnerability to scour, resulting from the least stable result of scour that is either observed, or estimated, through a scour evaluation or a scour assessment.

4. Seismic Vulnerability Evaluation. Evaluate each bridge for vulnerability to seismic events and the need for seismic retrofitting using the criteria in Attachment 2.

5. Vehicle Traffic Volume Data Collection. Determine traffic forecasts for each bridge and tunnel using the criteria in Attachment 2.

6. Use of Qualified Personnel.

    a. Ensure each person performing an inspection or evaluation meets the qualification requirements specific to the inspection or evaluation conducted and understands the duties of the role he or she is expected to perform as described in Attachment 2.

    b. Certify, document and submit individual personnel qualifications including appropriate education, experience, licensure, and certifications, as applicable and current training, using criteria in Attachment 2, to the Site and/or Field Office Manager.

7. Quality Management.

    a. Establish and implement quality management procedures or requirements necessary to produce accurate and consistent bridge inspections conforming with inspection standards and criteria; inspection plans; quality control procedures; DOE policy; and Federal and State requirements.

    b. Establish and implement quality management procedures or requirements necessary to ensure that evaluation products such as calculations, reports, and studies are complete, accurate, and properly checked in accordance with applicable industry standards.

    c. Establish and implement quality management procedures or requirements necessary to ensure that information and data supporting the Department's external reporting and bridge and tunnel management is validated and provided in a timely manner.

8. Records and Reporting. Prepare, maintain, and provide records, reports, or data using the criteria in Attachment 2.

9. Inventory and Asset Management.

a. Integrate requirements for bridge and tunnel management with existing operating and management procedures for real property. Document any locally established policies, procedures, or inspection frequencies for bridges, tunnels, or culverts.

b. When available resources are inadequate to maintain an acceptable level of bridge, culvert, or tunnel safety, act to impose lane or load restrictions, or closures.

c. Maintain protocols for responding to a critical finding.

d. Maintain bridge closure and re-opening procedures. Once closed, a bridge may not be reopened until repairs are complete and a qualified engineer determines that the bridge is safe and if necessary, posted for load restrictions.

e. For railroad bridges, maintain procedures and issue instructions to personnel responsible for train operations to prevent operation of equipment that would exceed the capacity of the bridge.

ATTACHMENT 2: BRIDGE AND TUNNEL MANAGEMENT

The following paragraphs set forth the requirements for bridge and tunnel management including conduct of inspections and evaluations, use of qualified personnel, quality management, records and reporting, and inventory and asset management. Requirements are applicable and specific to the following structures: public- and controlled- access vehicular bridges, public- and controlled-access railroad bridges, public- and controlled- access pedestrian bridges including elevated walkways, public- and controlled- access vehicular tunnels, and culverts assigned Usage Code 2629 in the Facilities Information Management System. It includes requirements specific to assets with Nonredundant Steel Tension Members (NSTM) or complex features.

1. Inspections. The type and frequency of inspections performed may vary over the life of a bridge or tunnel to reflect the level of effort needed to document its condition.

   a. Types of Inspection.

      (1) DOE elements with a bridge, tunnel, or culvert structure among their real property holdings must plan, conduct, and document timely inspections[1,2] in accordance with applicable national[3,4,5,6,7,8,9] standards and the following requirements. Required inspections[10] may include the following types: Initial, Routine, In-Depth, Nonredundant Steel Tension Member, Underwater, Damage, or Special. Nonredundant Steel Tension Member inspections and Underwater inspections are not applicable to tunnels.

      (2) A graded approach is allowable for public- and controlled- access pedestrian bridges including elevated walkways, tunnels and culverts assigned Usage Code 2629 in the Facilities Information Management System (FIMS), when considering complexity of the bridge, level of use, degree of structural redundancy, history of acceptable performance, and stable condition over time. Document such approaches in local procedures and bridge and tunnel management plans. A graded approach may not be used to obtain exemptions from requirements, nor does it imply the omission of requirements.

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[1] 23 CFR Part 650, Subpart C, National Bridge Inspection Standards.
[2] 49 CFR Part 237, Bridge Safety Standards, Subpart D, Capacity of Bridges.
[3] FHWA, Bridge Inspector's Reference Manual (BIRM).
[4] FHWA, Specifications for National Bridge Inventory.
[5] AASHTO Manual for Bridge Evaluation (MBE).
[6] AASHTO, Manual for Bridge Element Inspection (MBE).
[7] AREMA, Manual for Railway Engineering.
[8] AREMA, Bridge Inspection Handbook.
[9] FHWA, Tunnel Operations, Maintenance, Inspection, and Evaluation Manual (TOMIE).
[10] Federal regulations for railroad bridges and highway bridges include slightly different terminology and requirements for type of inspections. The Department of Energy maintains consistent terminology for the various types of inspections as defined in Attachment 3.

(3) Identify bridges with Nonredundant Steel Tension Members, and bridges with complex features.

(4) Identify bridges with Critical Findings.

(5) Identify bridges requiring Underwater inspections,

(6) Identify bridges that are scour critical or have unknown foundations, and bridges where scour appraisals have not been conducted.

(7) Identify bridges on the National Highway System.

(8) Determine and document the inspection interval for all required inspections of each bridge.

(9) Determine and document seismic trigger events for prioritizing Damage Inspections after seismic events.

(10) Determine and document types of inspections required for each bridge, culvert, and tunnel.

b. Inspection Interval. The frequency of inspection is specific to each bridge, tunnel, or culvert based on factors effecting safety, reliability, and consequences of failure.

(1) Using Table 2.1, determine and document the inspection interval of each required inspection for each active asset.

(a) Establish a baseline month for Routine, Underwater, or Nonredundant Steel Tension Member Inspections. Conduct all subsequent inspections in the baseline month unless granted a one-time exception in advance from the DOE BTM. Subsequent inspections must revert to the previous schedule.

(b) Identify those structures requiring variations from the established intervals and document rational for determination.[11]

[11] Code of Federal Regulations, 23 CFR Part 650.311 Inspection interval. Regular Inspection intervals, reduced inspection intervals, and extended inspection intervals for Routine Inspections, NSTM Inspections, and Underwater Inspections were determined using Method 1.

<table>
<tr><th colspan="6">TABLE 2.1
ESTABLISHED INSPECTION INTERVALS</th></tr>
<tr><th>Requirement</th><th>Vehicle Bridge</th><th>Short Span Bridge or Culvert</th><th>Pedestrian Bridge incl. Elevated Walkway</th><th>Railroad Bridge</th><th>Vehicular Tunnel</th></tr>
<tr><td>Initial</td><td colspan="5">Within 90 days of:
▪ Date Placed in Service, or
▪ acquisition, or
▪ change in configuration, or
▪ construction due to repair or retrofit</td></tr>
<tr><td>Routine</td><td colspan="3">Regular intervals not to exceed 24 months</td><td>One inspection per calendar year, with not more than 540 days between successive inspections</td><td>Regular intervals not to exceed 24 months</td></tr>
<tr><td>In-Depth</td><td colspan="5">As determined by the cognizant Responsible Engineer</td></tr>
<tr><td>Nonredundant Steel Tension Member (NSTM)</td><td colspan="4">Regular intervals not to exceed 24 months</td><td></td></tr>
<tr><td>Underwater</td><td colspan="4">Regular intervals not to exceed 60 months</td><td></td></tr>
<tr><td>Damage</td><td colspan="5">▪ As soon as practicable after damage occurs
▪ Before structure is re-opened to traffic, or
▪ Per the site’s emergency action plan following an established seismic trigger event</td></tr>
<tr><td>Special</td><td colspan="5">As established</td></tr>
</table>

(2) Inspection Interval Variance. The inspection interval may be adjusted based on the condition of the bridge. The Routine Inspection interval may be increased up to 48 months for a public- or controlled- access vehicle bridge. Inspection intervals may be increased to up to 60 months for a short span bridge or a culvert in good condition and with low consequences of failure. Routine Inspection intervals may be increased up to 60 months for a low-risk pedestrian bridge in good condition. Use the following guidelines to determine if a bridge is a likely candidate for variance approval:

(a) Increased Inspection Interval. The Routine Inspection interval may be increased (i.e. less frequent inspection) if all the following criteria are met:

1 Deck Condition Rating (NBI Item B.C.01) ≥ 6

2 Superstructure Condition Rating (NBI Item B.C.02) ≥ 6

3 Substructure Condition Rating (NBI Item B.C.03) ≥ 6

4 Culvert Condition Rating (NBI Item B.C.04) ≥ 6

5 Channel Condition (NBI Item B.C.09) ≥ 6

6 Channel Protection Condition (NBI Item B.C.10) ≥ 6

7 Inventory Load Rating Factor (NBI Item B.LR.05) ≥ 1.0

8 Routine Permit Loads (NBI Item B.LR.08) = A or N.

9 Fatigue Details (NBI Item B.IR.02) = N.

10 Highway Minimum Vertical Clearance (NBI Item B.H.13) ≥ 14.0

11 Span Material (NBI Item B.SP.04) = C01-C05 or S01- S05

12 Span Type (NBI Item B.SP.06) = A01, B02-B03, F01- F02, G01-G08, P01-P02, or S01-S02.

13 Scour Vulnerability (NBI Item B.AP.03) = A or B

14 Scour Condition Rating (NBI Item B.C.11) ≥ 6.

15 A new or newly rehabilitated structure must have had an initial inspection plus at least one cycle (24-month interval) routine inspection.

16 Inspection interval may not extend beyond 24 months for:

a Bridges with a Structure Length greater than 100 feet.

b Bridges with little documented performance history.

c Bridges susceptible to vehicular damage, for example those with vertical over or under clearances less than 14'-0", or those with restricted horizontal clearances on or under the structure.

d Bridges with Nonredundant Steel Tension Members or Complex Features.

e Bridges constructed of timber , masonry or fiberglass.

f Bridges that carry heavy permit loads.

g Bridges known to experience overloaded trucks.

h Bridges with steel or timber decks.

i Bridges with rocker bearings.

j Bridges with no as-built drawings.

(b) Decreased Inspection Interval. The Routine Inspection interval for bridges must be reduced (i.e. more frequent inspection) to 12 months or less when any Condition Rating for the Deck, Superstructure, Substructure, Culvert, or Scour (NBI Items: B.C.01, 02, 03, 04, or B.C.11) is less than 4 or where the rate of deterioration is of a magnitude where safety may be impacted beyond that interval. Other considerations for reducing inspection intervals include:

1 State requires more frequent inspection of bridges on public roads.

2 Bridge requires repair work.

3 Bridge is subject to frequent overloads.

4 Bridge has unique or unusual details, unique structure types, or unknown performance history.

5 Large bridge carrying a significant amount of traffic.

6 Bridge with temporary supports.

7 Bridge is subject to significant substructure movement or settlement.

8 Bridge with potential foundation or scour problems.

(3) In-Depth Inspection. An In-Depth Inspection may be scheduled[12] with or independently of a Routine Inspection or conducted as a follow-up to a

[12] Conditions that may prompt an In-Depth Inspection of a bridge include apparent cracks in steel members; apparent cracks, de-bonding or loss of tendon section in prestressed concrete members; suspected frozen bearings or failed hold down devices; severe section loss from steel members; buckled or bent steel girders or beams; disconnected or loose members; or visual fretting rust on the pin of a pin and hanger connection.

Damage or other type of inspection. Schedule In-Depth Inspection of railroad bridges in consultation with the cognizant Railroad Bridge Engineer.

(4) Nonredundant Steel Tension Member (NSTM) Inspection.

(5) NSTM inspections may be performed as part of a Routine Inspection or as an independent inspection effort. Use the following guidelines to determine if a bridge is a likely candidate for variance approval:

(a) Increased Inspection Interval. The NSTM Inspection interval may be increased (i.e. less frequent inspection) up to 48 months if all the following criteria are met:

1 Year Built (NBI Item B.W.01) ≥ 1979 and fabricated in accordance with a fracture control plan.

2 NSTMs have no fatigue details with finite life, history of fatigue cracks, nor pin and hanger assemblies.

3 NSTM Inspection Condition (NBI Item B.C.14) ≥ 6

4 Inventory Load Rating Factor (NBI Item B.LR.05) ≥ 1.0

5 Routine Permit Loads (NBI Item B.LR.08) = A or N.

(b) Decreased Inspection Interval. The NSTM Inspection interval will be reduced to 12 months or less where cracks are discovered in Nonredundant Steel Tension members and the Inspection Team Leader has determined the function of these members will not be impacted over the inspection interval or when the NSTM Inspection Condition (NBI Item B.C.14) is less than 5. The interval may be restored to up to 24 months if a fatigue/fracture analysis shows a safe life for the interval proposed.

(6) Underwater Inspection. Underwater inspections may be performed as part of a Routine Inspection or as an independent inspection effort. An Underwater Inspection interval greater than 60 months (not to exceed 72 months) may be acceptable for a vehicle bridge on public roads in good condition. An Underwater Inspection interval greater than 60 months (not to exceed 72 months) may be acceptable for controlled-access vehicle bridges, railroad bridges, short span bridges, culverts, or pedestrian bridges in good condition with advance approval of the DOE Bridge and Tunnel Manager.

(a) Increased Inspection Interval. The Underwater Inspection interval may be increased (i.e. less frequent inspection, not to exceed 72 months) if all the following criteria are met.

1 Underwater Inspection Condition (NBI Item B.C.15) ≥ 6.

2 Channel Condition (NBI Item B.C.09) ≥ 6.

3 Channel Protection Condition (NBI Item B.C.10) ≥ 6.

4 Scour Vulnerability (NBI Item B.AP.03) = A or B.

5 Scour Condition Rating (NBI Item B.C.11) ≥ 7.

6 Pier protection is present and in good condition where a bridge crosses a navigable waterway.

7 Bridge substructure elements are not constructed of steel or timber.

(b) Decreased Inspection Interval. Underwater Inspection interval will be decreased to 24 months or less when any Condition Rating for Underwater Inspection Condition (NBI Item B.C.15), Channel Condition (NBI Item B.C.09), Channel Protection Condition (NBI Item B.C.10) or Scour Condition Rating (NBI Item B.C.11) is 3 or less. If the deterioration causing the low Condition Rating is localized, then consider scheduling a Special Inspection focused on the localized area. Additional factors to consider when selecting underwater inspection interval include:

1 The bridge is on a waterway with rapid stream flows.

2 Significant debris accumulates at structure.

3 The bridge has constricted waterway openings.

4 Erodible or unstable streambed or bank material present.

5 Meandering channels exist.

(7) Damage Inspection. Schedule immediately following an accident or trigger event involving the structure to determine if it should be closed. May be followed with an In-Depth Inspection to document the full extent of the damage as well as the urgency and scope of repairs.

(8) Scour Monitoring Inspection. An inspection performed during or after a triggering storm event as required by a Scour Plan of Action (Scour POA).

(9) Special Inspection. Scheduled at the discretion of the responsible DOE Element considering the severity of a known deficiency. Changes in condition between inspections should be a factor in determining the frequency for conduct of Special Inspections. Conduct inspections more frequently as conditions deteriorate. Apply the following guidelines when determining the Special Inspection interval:

(a) For a bridge not capable of carrying State legal loads, set inspection interval of no more than 12 months.

(b) For a bridge with an NBI Condition Rating of 4 for the deck, superstructure, substructure, or a primary load carrying member, set inspection interval at six to 12 months.

(c) For a bridge with an NBI Condition Rating of 3 or less for the deck, superstructure, substructure, or a primary load carrying member, set inspection interval of six months or less.

(d) For a bridge with known load-carrying deficiencies, inspection interval as determined in coordination with the DOE BTM.

(e) For a bridge with advanced deterioration, inspection interval as determined in coordination with the DOE BTM.

(10) Complex Feature Inspection. An inspection interval less than 24 months may be required for deficient members as determined in coordination with the Site and/or Field Office Manager and DOE BTM.

(11) Vehicular Tunnels. Apply the following criteria for selecting a Routine Inspection interval of less than 24 months: poor condition, damage, change in condition between inspections, unknown capacity or history of performance, known problems, consequences of failure, and existence of temporary supports or necessary repairs.

(12) Inspection Interval Variation Approval.

(a) Any variation from the inspection intervals in Table 2.1 requires documentation. A less frequent inspection schedule requires advance approval. Any change to a more frequent inspection schedule requires notification.

(b) Less Frequent Inspections. Submit a request to the DOE BTM via Line Management prior to increasing the inspection interval. The DOE BTM will review the request and determine its merit, or when appropriate, submit to FHWA for review and approval. For bridges included in the National Bridge Inventory or tunnels included in the included in the National Tunnel Inventory, final

determination is subject to FHWA approval. The request must include:

1 the structure Real Property Unique ID Number,

2 the proposed inspection interval in months,

3 a list of criteria used to justify the request and how each criterion is met, and

4 any other explanation as to why the proposed inspection interval is suitable.

c. Inspection Procedures.

(1) Prepare a plan for each inspection specific to the intended inspection type and addressing each of the following phases of the inspection. Identify all specialized procedures necessary to inspect bridges with Nonredundant Steel Tension Members or all the complex features or special features of a bridge. Inspect each bridge according to established procedures and structure-specific inspection plan addressing:

(a) Pre-inspection phase – planning and coordination activities;

(b) on-site inspection phase – worker safety; public safety; traffic management; field inspection equipment, tools, and materials; inspection techniques including nondestructive tests and/or other physical and chemical tests; and documentation techniques; and

(c) post-inspection phase – recording, reporting, recommendations, archiving, and follow-up to critical findings.

(2) Each Public or Controlled Access Vehicle Bridge, Railroad Bridge, or Tunnel inspection will be conducted under the full time, on-site supervision of an Inspection Team Leader or Railroad Bridge Inspector who is responsible for the accuracy of the results and is accompanied by at least one other inspector.

(3) Conduct underwater inspections[13,14] to determine member condition where conditions are such that the stream bottom elevation around the foundations cannot be accurately measured by use of rods, poles, weighted sounding lines or other means, or if any portion of a substructure is

[13] American Society of Civil Engineers (ASCE), Underwater Investigations: Standard Practice Manual, and FHWA-NHI-10-027, Underwater Bridge Inspection, June 2010.

[14] Among other factors used to determine type and extent of inspection, include structure type, materials of construction, foundation type, footing location relative to channel bottom, known or suspected problems, waterway characteristics, superstructure and substructure redundancy, and scour susceptibility.

exposed to water deeper than 3 feet during periods of normal low water. A qualified diver must complete this inspection if the waterway cannot be waded safely.

(4) Upon discovery of a Critical Finding, determine what action is required, how quickly that action needs to be implemented, the extent to which the bridge can be used (e.g., partial lane closures, load limits) or if it should be closed. Provide notifications and submit a Follow-up to Critical Findings Report detailing the intended recovery strategy with planned actions and milestone dates to ensure the safety of personnel and continuance of site operations.

(5) If a crack in a Nonredundant Steel Tension Member is detected during an inspection, a Responsible Engineer will determine the necessity for a fatigue or fracture evaluation. When needed, complete the evaluation under the direction of a qualified engineer to determine the useful life and the critical crack size. Document and initiate monitoring procedures or necessary repairs.

(6) Review existing load rating during each routine inspection to ensure conditions and assumptions are still valid. Perform a new load rating if conditions and assumptions used for the existing load rating are not valid, or when recommended by inspectors, or when concern for reduced structural capacity is caused by unexpected events.

(7) Review existing scour appraisal during each routine inspection to confirm conditions and assumptions are still valid. Perform a new scour appraisal if conditions and assumptions used in the existing scour appraisal are not valid, or after any bridge-specific trigger event, following a flood event, or when conditions affecting the flow change.

(8) Review existing seismic vulnerability evaluation during each routine inspection to ensure conditions and assumptions used are still valid.

(9) Promptly following structural damage resulting from environmental factors or human action, conduct a Damage Inspection[15] sufficient to determine whether there is a need for emergency load restrictions or closure of part or all of the structure to traffic as well as the level of effort necessary to repair the damage.

[15] May require collection of detailed measurements and descriptions of damage necessary to assess the impacts to strength and function of the affected member as well as on-site calculations needed to establish emergency load restrictions. May be followed by a more refined analysis to establish or adjust interim load restrictions.

2. Load Rating and Posting. The intent of load rating and posting is to ensure that bridges are appropriately evaluated to determine their safe live load carrying capacity and any load restrictions are appropriately posted.

   a. Rate each active vehicle bridge, railroad bridge, pedestrian bridge, culvert, and vehicular tunnel for its load carrying capacity. Load rate each newly acquired bridge within ninety (90) days of the date place in service or acquired.

   b. Review existing load rating during each routine inspection to ensure conditions and assumptions are still valid. Perform a new load rating if conditions and assumptions used for the existing load rating are not valid, or when recommended by inspectors, or when concern for reduced structural capacity is caused by unexpected events.

   c. Vehicle Bridges.

      (1) Rate a vehicle bridge or short span bridge for its safe load carrying capacity of all unrestricted State legal loads, including State routine permits loads in accordance with Section 6A of the AASHTO Manual for Bridge Evaluation.

      (2) The load rating must reflect the condition of the bridge as reported in the most recent bridge inspection report. Reflect any deficiencies that reduce member capacity in the load capacity determination. If the effects of condition on capacities is unknown or uncertain, conduct a Special Inspection[16] to adequately quantify location and extent of deficiencies. Account for any modifications to the bridge that affect loading on (e.g., change in dead loads) or response of the member being rated.

      (3) Base load ratings on as-built drawings that have been verified by field measurements. When these drawings are not available, take field measurements and perform field-testing. When as-built drawings do not exist and field measurements cannot adequately quantify capacity (e.g., bridges with reinforced concrete members), base the load rating on a field evaluation and documented engineering judgment in accordance with FHWA guidance. Document basis of assumptions to include: some evidence that a search for design or as-built data has been attempted or other efforts to provide some background or history of the structure; a discussion of load history that confirms the load assumptions for normal traffic. Specifically identify the assumed normal traffic. Coordinate with State agencies to identify State legal loads and if they comply with federal weight limits and the Bridge Formula[17] (also known as Formula B).

[16] Performed when a structure requires more frequent inspection than is given by the Routine Inspection cycle, typically for a known defect or condition severe enough to warrant extra scrutiny. The frequency of Special Inspections is determined on a case-by-case basis.

[17] FHWA, FHWA-HOP-06-105, Bridge Formula Weights, August 2006.

(4) Evaluate bridge for the AASHTO HL 93 design vehicle for determining NBI Items B.LR.06 Operating Load Rating Factor and B.LR.05 Inventory Load Rating Factor and to determine the need for evaluating State legal loads.

(a) If the Inventory Rating Factor is less than 1.0 and the State does not comply with federal weight limits and the Bridge Formula, rate for State legal loads.

(b) In States that comply with federal weight limits and the Bridge Formula, rate for State legal loads when the Operating Rating Factor is less than 1.0.

(5) Determine load ratings and rating factors for Specialized Hauling Vehicles (SHVs).

(6) If the Inventory Rating Factor for the AASHTO HL 93 design vehicle is less than 0.9 using the Load and Resistance Factor Design (LRFD) method[18], determine load ratings and rating factors for Emergency Vehicles (EV2 and EV3).

d. Railroad Bridges.

(1) Rate each railroad bridge for the applicable limit states defined in the AREMA Manual for Railway Engineering.

(2) Base load ratings on as-built drawings that have been verified by field measurements. When these drawings are not available, take field measurements and perform field-testing. When as-built drawings do not exist and where field measurements cannot adequately quantify required dimensional data, base the load capacity on a field evaluation and the documented engineering judgment of the Railroad Bridge Engineer. Determinations by judgment can be based on history and current use of the bridge. For example, the bridge could be rated based on known weight of passing loads if there is no evidence of distress.

(3) Evaluate each bridge for the Cooper E-80 Loading as defined in Figure 15-1-2 AREMA Manual for Railway Engineering. Consider other standard loading or loading consisting of specific equipment based on normal use of the bridge. The load rating must consider capacity of the superstructure as well as the substructure.

(4) Conduct a Fatigue Evaluation on each bridge with Fatigue Susceptible Details following the procedures in Chapter 15 of AREMA Manual for Railway Engineering. Live load stresses and traffic volumes must be

[18] AASHTO, LRFD Bridge Design Specifications, 7th Edition with Interim Revisions, or current version.

known. A qualitative analysis may be completed for bridges with low traffic volumes and low stresses.

(5) Determine Normal Rating both with and without fatigue considerations. If there is a need to allow infrequent operation of loads greater than normal, determine Maximum Rating in accordance with AREMA Manual for Railway Engineering. Fatigue need not be considered for maximum rating.

e. Pedestrian Bridges.

(1) Determine[19] the design strength of the bridge considering the existing condition, geometry, and materials.

(2) Determine required strength for loads prescribed in the LRFD Guide Specifications for the Design of Pedestrian Bridges or as required by the State within which the bridge is located or actual loads.

(a) When vehicular access is not prevented on the pedestrian bridge, use the design vehicle and limit state specified in 3.2 of LRFD Guide Specifications for the Design of Pedestrian Bridges.

(b) If vehicular access is prevented on the pedestrian bridge, do not consider the design vehicle.

(3) Where the design strength is determined to be less than the required strength, and where:

(a) Vehicular access is not prevented, conduct an iterative process to determine if the design strength is adequate with a lesser design vehicle load (using standard AASHTO H or known loading). If the design strength is acceptable for a lesser vehicle load, then the bridge must be posted. If it is determined that the design strength is less than required with no vehicle loading, develop a plan of action to prevent unsafe access.

(b) Vehicular access is prevented, develop a plan of action to prevent unsafe pedestrian access.

(c) A Fatigue Evaluation is required, evaluate for the AASHTO LRFD Fatigue I Limit State for applicable loads specified in 3.5 of LRFD Guide Specifications for the Design of Pedestrian Bridges.

(4) Alternatively, post each pedestrian bridge for the allowed vehicle load where vehicular access is not prevented. If vehicular access is prevented,

[19] AASHTO LRFD Guide Specifications for the Design of Pedestrian Bridges, current version.

post for the maximum number of people allowed on the bridge at one time.

f. Culverts. Rate each culvert for its safe load carrying capacity. For a culvert with sufficient fill to minimize live load effects, showing no signs of distress, and the consequences of failure are low, rate in accordance with Section 6.1.4 of the AASHTO Manual for Bridge Evaluation[20]. For a culvert with a depth of fill greater than either eight (8) feet or its span length whichever is greater, the live load is considered negligible, so live load analysis is not required.

g. Vehicular Tunnels. Rate each tunnel's safe vehicular load-carrying capacity in accordance with Sections 6 or 8 of the AASHTO Manual for Bridge Evaluation.

h. Refined Analyses and Testing. When the load rating results in intolerable deficiencies and posting will result in severe impacts to site operations, consider conducting more refined analyses or testing. This analysis will typically consist of detailed three-dimensional finite element analyses of varying complexities. It may be conducted in conjunction with a load test or material testing to determine material properties, strength, or condition. The refined analyses or load testing may provide a more realistic distribution of loads to the various members and overall system response. See Section 5 of the AASHTO Manual for Bridge Evaluation for guidelines on testing. Alternatively, the bridge can be proof tested. See Chapter 8 of the AASHTO Manual for Bridge Evaluation for load and proof test procedures. These procedures are highly specialized and must be performed only by qualified individuals with documented experience in performing this type of analysis.

i. Re-rate a bridge within ninety (90) days when:

(1) There is a change in the condition of the bridge that would affect its load carrying capacity;

(2) There is a change in the configuration of the bridge through construction, alteration, or rehabilitation that would affect its load carrying capacity;

(3) Damage occurs to the bridge either through physical or environmental conditions, i.e. corrosion has resulted in significant section loss on load carrying steel members or components, cracking in primary members, losses at critical connections, or strength has changed due to damage from vessel or vehicular collision, fire, flood, or earthquake;

[20] Section 6.1.4 of the AASHTO Manual for Bridge Evaluation is specifically for reinforced concrete bridges. It is acceptable for application to concrete culverts and to culverts constructed from other materials where the structure has carried normal traffic for an appreciable period of time and shows no distress.

(4) There are changes to dead loads, for example from deck resurfacing or utility additions, changes in traffic loadings and/or traffic volume, or temporary construction loads exceed traffic loads;

(5) Soil and substructure settlement or slope instability has occurred; or

(6) Required by additional guidance.

j. Posting.

(1) Post bridge load restrictions in accordance with the Manual for Uniform Traffic Control Devices[21] or State requirements.

(2) Post a vehicle bridge for load restrictions where State legal loads exceed the calculated load capacity of the bridge.

(3) Post bridges for speed to reduce impact loading where necessary.

(4) Post a vehicle bridge for load restrictions when evaluated for emergency vehicles. Post appropriately for both the governing single axle weight limit and tandem axle weight limit derived for each emergency vehicle configuration.

(5) For railroad bridges that have Normal Load Ratings less than normal load requirements, determine and document necessary operational restrictions. These may involve speed restrictions, coordination with track operation personnel, or other operational constraints. Issue instructions to the personnel who are responsible for the configuration and operation of trains to prevent the operation of cars, locomotives, or other equipment over a bridge that would exceed the capacity or dimensions of the bridge.

(6) For each pedestrian bridge where the design strength is less than required strength, post for the allowed vehicle load where vehicular access is not prevented. For a pedestrian bridge where vehicular access is prevented and the design strength is less than 60 pounds per square foot or less than the required strength, determine a safe posting that limits the number of pedestrians on the bridge at one time. Select site-appropriate posting and enforcement procedures.

(7) Post or restrict the highways in or over a tunnel when the maximum unrestricted legal loads or State routine permit loads exceed those allowed under the operating rating or equivalent rating factor.

k. Bridge Restrictions or Closure.

[21] FHWA Manual on Uniform Traffic Control Devices, 11th Edition. December 2023.

(1) Immediately close to traffic any vehicle bridge with a load rating of 3 tons or less. Close to traffic any vehicle bridge when an imminent failure is possible. Bridge closure requires some combination of barrier, signage, and flagging or other means of controlling bridge access. The closure could be limited to specific lanes or it could be a complete closure to all traffic. Follow State guidelines for closure and detour traffic control requirements.

(2) When the load rating evaluation reveals that a vehicle bridge requires posting, but is not, posting must be complete within thirty (30) days of load capacity determination. Where posting is insufficient to ensure compliance with weight restrictions, engage law enforcement or install monitoring devices, including cameras, weigh-in-motion sensors, or radar stations.

(3) For railroad bridges that have Normal Load Ratings less than normal load requirements, document necessary operational restrictions within ninety (90) days of load capacity determination.

l. Load Rating Report.

(1) Report must include information about who performed the load rating, when the rating was performed, date of determination, assumptions and known information about the bridge used in rating the bridge, loading information, capacity calculations, load rating methodology, load rating calculations and any computer input and output used to calculate the loads and the capacities. Identify formulas used in the analysis and reference sources. Identify State legal loads as well as the State's compliance with federal weight limits and the Bridge Formula. Define terms and nomenclature used.

(2) All calculations must be checked and initialed by the engineer who developed the calculations and by the engineer who checked them.

(3) Document use of computer programs to include description of model (i.e. elements, boundary conditions, and load application) and comparison of differences between the model and actual behavior. Calculations developed by computer analysis must include a cover page explaining the analysis performed and must be initialed by the engineer who developed the input and the engineer who checked the input and results. State why the differences are acceptable and how the results might be affected. Results should include load effect diagrams and deflection plots, as applicable.

(4) For vehicle bridges, include a summary of the calculation results including the inventory and operating ratings for the AASHTO Design vehicle, State

legal loads if evaluated, and any required posting values for each vehicle type. Identify the controlling member(s).

For vehicle bridges, identify recommended data entries for NBI Items: B.LR.01 through 08, and B.PS.01 and B.PS.02 in accordance with the FHWA Specifications for the National Bridge Inventory. [22]

(5) For railroad bridges, include a summary of the calculation methodology and results including the normal and maximum ratings for the Cooper E-80 loading, or any modified loading that is normal for the track. Identify the controlling member(s) for each load rating.

(6) A qualified Load Rating Engineer must certify the rating as complete, accurate, and in accordance with applicable standards. Include the qualifications of Load Rating Engineer or Railroad Bridge Engineer and Load Rating Reviewer.

(7) Include quality control documentation.

m. Bridge File.

(1) Place all documents, including evaluator's qualifications, load rating calculations and reports in the Bridge File.

(2) When the bridge requires load limit posting, place evidence of bridge posting in the Bridge File.

(3) When operational restrictions are necessary, place evidence of such restrictions and enforcement procedures in the Bridge File.

3. Scour Appraisal. A scour appraisal is a risk-based and data-driven determination of a bridge or culvert's vulnerability to scour, resulting from the least stable result of scour that is either observed, or estimated through a scour evaluation or a scour assessment. Appraise[23,24] each active bridge and culvert that crosses a waterway for vulnerability to scour and stream instability from floods. Appraise each new and newly acquired bridge and culvert within ninety (90) days of the date placed in service or acquired.

a. Approach. The extent of each scour appraisal depends upon existing site conditions. A complete appraisal may include a qualitative assessment (Level 1) only, a quantitative evaluation (Level 2 or Level 3), or a hydraulic engineering analysis.

[22] FHWA Specifications for the National Bridge Inventory, March 2022.
[23] FHWA Publication No. FHWA-HIF-12-003, Hydraulic Engineering Circular No. 18 (HEC-18) Evaluating Scour at Bridges, April 2012.
[24] FHWA Publication No. FHWA-HIF-12-004, Hydraulic Engineering Circular No. 20 (HEC-20) Stream Stability at Highway Structures, April 2012.

(1) Level 1 Assessment. A Level 1 Field Assessment identifies the susceptibility of a bridge or culvert to scour and accurately records the present condition of the culvert, bridge foundations and stream stability. Each bridge or culvert is evaluated by viewing all available data including as-built plans, hydraulic studies, soundings and other underwater investigations, streambed and foundation soils, and historical use. If needed, HEC-18, Evaluating Scour at Bridges, and HEC-20, Stream Stability at Highway Structures, include guidance for collecting site data. The Level 1 Assessment results in bridge or culvert classification for scour vulnerability as Low Risk, Scour Critical, or Scour Susceptible.

(a) Bridge with Low Risk for Scour. Low Risk bridges are monitored for scour during Routine Inspections and after significant events. They are re-evaluated for scour after significant flood events and when site conditions change. Bridge types and locations often considered Low Risk when there is no history of scour are:

1 Single span bridge with protected abutments

2 Bridge with foundations well above the flood plain

3 Bridge over dams or pools with small flows

4 Bridge over lined channels

5 Bridge with spread footings on non-erodible bedrock

6 Bridge length culvert with a floor.

(2) Level 2 or Level 3 Evaluation. Further analysis must be completed within ninety (90) days when a Level 1 Assessment determines the bridge is Scour Susceptible, has unknown foundations, or is over tidal waters. Hydrologic data and streambed material properties must be obtained to conduct the Level 2 analysis. Level 3 analysis uses more detailed hydrologic and streambed material property data to complete mathematical or physical model studies.

(a) Bridge susceptibility to scour cannot be determined unless the construction details of the foundation are known. Make every attempt to determine the foundation type and depth, including a search for bridge records or conducting foundation testing. Once the foundation has been determined, perform a scour evaluation to determine potential scour depths and scour classification. Until the foundation is determined and the potential scour depths are known, implement a Scour Plan of Action with a scout monitoring inspection plan and closure protocols.

b. Scour Appraisal Results. Determine appropriate rating for NBI Items B.C.11, B.AP.02, B.AP.03, and B.AP.04 (Scour Condition Rating, Overtopping Likelihood, Scour Vulnerability, and Scour Plan of Action) in accordance with FHWA Specification for the National Bridge Inventory. Record the results of the scour evaluation in the Structure Inventory and Appraisal (SI&A) data. Review existing scour appraisal concurrent with each routine inspection.

(1) Re-appraise each bridge for changes in vulnerability to scour after any bridge-specific trigger event, following a flood event or when conditions affecting the flow change.

(2) Develop and execute a bridge-specific Scour Critical Plan of Action (Scour Critical POA) for each bridge where NBI Item B.AP.04 (Scour Plan of Action) is coded N or Y.

(3) Immediately close to traffic any bridge where the recommended rating code for NBI Item B.C.11 (Scour Condition Rating) is 1 or where the recommended rating code for NBI Item B.C.03 is 1 based on scour.

(4) Where NBI Item B.C.11 (Scour Condition Rating) is coded 0, retain evidence of bridge closure.

(5) Bridge File. Place the completed scour appraisal, including qualifications for the Responsible Engineer and Inspection Team Leader, information required to do the appraisal, any Scour Critical POA, and evidence of any mitigation efforts in the Bridge File.

4. Seismic Vulnerability Evaluation.

a. Evaluate[25,26] each bridge for vulnerability to seismic events and need for seismic retrofitting. Evaluate each newly acquired bridge within ninety (90) days of the date placed in service or acquired. A bridge is exempt from retrofitting for both levels of ground motion if it:

(1) has 15 years or less of Anticipated Service Life (ASL), or

(2) is temporary, or

(3) is closed to traffic and does not cross an active highway, rail, or waterway.

b. Review existing seismic vulnerability evaluation during each routine inspection to ensure conditions and assumptions used are still valid.

[25] FHWA Seismic Retrofitting Manual for Highway Structures: Part 1 – Bridges, January 2006.
[26] FHWA Seismic Retrofitting Manual for Highway Structures: Part 2 – Retaining Structures, Slopes, Tunnels, Culverts, and Roadways, August 2004.

c. Re-evaluate a bridge within 60 days of a change in configuration or seismic retrofit.

d. Seismic Vulnerability Evaluation Results. Document the conduct and results of seismic vulnerability evaluations and reviews.

(1) Identify evaluation assumptions, methods and formulas, calculations, and terms or nomenclature used. Identify resultant seismic retrofit category for both upper and lower ground motion levels.

(2) If the bridge meets the criteria for Seismic Retrofit Category A for the upper-level ground motion, document justification for retrofit exemption in the Bridge File.

(3) If the bridge meets the criteria for Seismic Retrofit Category B, C, or D, identify Bridge Rank and Priority Index. Where the need for retrofit is determined, document the retrofit strategy.

(4) Include qualifications for the Responsible Engineer.

e. Bridge File. Place the completed seismic evaluations, including qualifications for the Responsible Engineer and evidence of any retrofit efforts in the Bridge File.

5. Vehicle Traffic Volume Data Collection.

a. For each active vehicle bridge:

(1) Determine the Average Daily Traffic (ADT) and the percentage that is truck traffic. Do not include vans, pickup trucks and other light delivery trucks in this percentage. Update every five (5) years.

(2) Maintain a forecasted average daily traffic for the route at least 17 years but no more than 22 years from the year in which the forecast is made. The intent is to provide a forecast of the ADT 20 years in the future.

b. For each active vehicle tunnel, determine the Annual Average Daily Traffic (AADT) and the Annual Average Daily Truck Traffic (AADTT). Do not include vans, pickup trucks, and other light delivery trucks in this percentage. Update every five (5) years

c. Record the results in the SI&A or NTI data. Place data collection[27] results and forecasts in the Bridge File or Tunnel File.

6. Use of Qualified Personnel. Required education, experience, licensure, certifications, and current training is specific to inspection type or evaluation and role. Submit

[27] FHWA Traffic Monitoring Guide presents methodology for gathering data on traffic volumes.

documentation supporting the satisfaction of all qualifications for Inspection Team Leaders or Railroad Bridge Inspector to the Site and/or Field Office Manager. The Site and/or Field Office Manager shall certify all Inspection Team Leaders or Railroad Bridge Inspectors meet the qualification requirements. The Site and/or Field Office Manager shall forward Inspection Team Leader or Railroad Bridge Inspector supporting documentation, with a certification letter stating the Inspection Team Leader(s) or Railroad Bridge Inspector(s) meet all qualification requirements of DOE 437.1A to the DOE BTM. Minimum qualifications include:

a. Inspection Team Leader or Railroad Bridge Inspector.

(1) Confirmation[28] of passing an eye examination, with or without corrective lenses, to prove near vision acuity of Jaeger[29] J-2 at 300 mm to 430 mm [12 in to 17 in] within the past three years.

(2) For Public- or Controlled-Access Vehicle Bridges, the Inspection Team Leader also must meet the requirements of Code of Federal Regulations 23 CFR 650.309(b).

(3) For structures with Nonredundant Steel Tension Members (NSTM), the Inspection Team Leader must meet the requirements of Code of Federal Regulations 23 CFR 650.309(c).

(4) For bridges with Complex Features or requiring Special Inspection, the Inspection Team Leader must have additional qualifications including:

(a) A current registration as a Professional Engineer (Civil or Structural),

(b) At least 5 years of experience in inspection of bridge type being inspected, and

(c) Completed training specific to type of bridge being inspected.

(5) For Short Span Bridges, Culverts, and Pedestrian Bridges, the Inspection Team Leader must hold a current registration as a Professional Engineer (Civil or Structural) and meet the requirements of Code of Federal Regulations 23 CFR 650.309(b).

(6) For Railroad Bridges, the Railroad Bridge Inspector must also:

[28] Do not collect medical records.

[29] The results of visual acuity tests are used to prescribe eyeglasses or other corrective measures. The Grafco Jaeger Eye Chart has print samples of different sizes that are used to determine one's near vision. Eye examinations shall be administered by an Ophthalmologist, Optometrist, Medical Doctor, Registered Nurse or Certified Physician's Assistant or by other ophthalmic medical personnel and must include the state or province license number.

(a) Complete training from an accredited university or industry-related organization such as American Railway Engineering and Maintenance-of-Way Association (AREMA),

(b) Have at least 5 years of experience similar to that identified in Code of Federal Regulations 49 CFR 237.53, and

(c) Demonstrate familiarity with Code of Federal Regulations 49 CFR Part 214, *Railroad Workplace Safety,* through successful completion of an employer-provided or industry training course.

(7) For Vehicular Tunnels, the Inspection Team Leader must meet Code of Federal Regulations 23 CFR 650.509(b) requirements. When the tunnel is complex or has distinctive features the Inspection Team Leader must hold a current registration as a Professional Engineer (Civil or Structural).

b. Inspection Team Members.

(1) Passed an eye examination, with or without corrective lenses, to prove near vision acuity of Jaeger J-2 at 300 mm to 430 mm [12 in to 17 in] within the past three years.[30]

(2) For Railroad Bridges, demonstrated familiarity with Code of Federal Regulations 49 CFR Part 214, Railroad Workplace Safety through successful completion of employer-provided training or course provided by an industry-related organization such as AREMA.

c. Underwater Bridge Inspection Diver

(1) Completed an FHWA approved comprehensive bridge inspection training course or other FHWA approved underwater diver bridge inspection training course and holds current dive qualifications (e.g., Association of Diving Contractors International (ADCI) or equivalent certificate) in addition to the inspection team member qualifications.

d. Load Rating Engineer or Railroad Bridge Engineer.

(1) For Public- or Controlled-Access Vehicle Bridges, Short Span Bridges, Culverts, and Pedestrian Bridges:

(a) Current registration as a Professional Engineer,

[30] Do not collect medical records.

(b) At least 5 years of experience similar to load rating being performed,

(c) Completed NHI Load Rating of Highway Bridges course or equivalent training, and

(d) Demonstrates working knowledge of the AASHTO Manual for Bridge Evaluation (MBE) and of rating methodology used in the given load rating through submission of a personnel qualifications statement identifying work on a similarly constructed and loaded structure.

(2) For railroad bridges:

(a) Current registration as a Professional Engineer,

(b) At least 10 years of experience similar to that identified in Code of Federal Regulations 49 CFR 237.51(a), and

(c) Demonstrates working knowledge of the AREMA Manual and of rating methodology used in the given load rating through submission of a personnel qualifications statement identifying work on a similarly constructed and loaded structure.

(3) For tunnels. A registered Professional Engineer must perform or directly supervise the conduct of tunnel load rating per Code of Federal Regulations 23 CFR Part 650.509(c).

e. Responsible Engineer.

(1) Current registration as a Professional Engineer,

(2) Demonstrates at least 5 years of experience similar to evaluation undertaken through submission of a personnel qualifications statement identifying similar work experience.

(3) Completed training specific to the evaluation type performed, such as –

(a) NHI Stream Stability and Scour at Highway Bridges course or equivalent training for conducting scour evaluations, or

(b) NHI Design and Evaluation of Bridges for Fatigue and Fracture course or equivalent training for conducting fatigue and fracture evaluations, or

(c) Multidisciplinary Center for Earthquake Engineering Research (MCEER) Seismic Retrofit of Highway Bridges course or equivalent training for conducting seismic screening evaluations.

f. Railroad Bridge Supervisor. Demonstrates at least 10 years of supervisory experience similar to that identified in Code of Federal Regulations 49 CFR 237.55 through submission of a personnel qualifications statement identifying similar work experience.

g. Quality Management Personnel. Individuals conducting quality control or quality activities on inspection or evaluation products for service providers *assurance* must meet the same qualification requirements as those responsible for conducting the inspections or evaluations. Submit documentation supporting the satisfaction of all qualifications for individuals conducting quality control or quality assurance activities to the Site and/or Field Office Manager. The Site and/or Field Office Manager shall certify the qualifications and submit them to the DOE BTM.

7. Quality Management.

a. Establish and maintain quality management procedures or requirements necessary to ensure bridge inspections conform with inspection standards and criteria, inspection plans, quality control procedures, DOE policy, and Federal[31, 32] and State requirements.

b. Establish and maintain quality management procedures or requirements necessary to ensure that evaluation products such as calculations, reports, and studies are complete, accurate, and properly checked in accordance with applicable standards[33]. The individual conducting the quality control (QC) review must verify compliance with applicable references and criteria, that reasonable assumptions were used, and results were properly applied. The QC review of each evaluation product must include an engineering technical review for accuracy of calculations and appropriateness of methods applied.

c. Ensure service provider's inspection and evaluation activities include independent[34] quality assurance (QA) processes necessary to assure that QC activities are accomplished as planned and that those activities are effective in producing a product that meets the desired end quality.

d. Develop and execute a Plan of Corrective Actions (PCA) when quality management activities or an external review reveals that activities and systems do not comply with requirements.

e. Develop, document, and implement methods to determine that each member of the bridge and tunnel inspection organization holds current qualifications. Document the method by which each Inspection Team Leader or Railroad Bridge

[31] 23 CFR 650.313, Inspection Procedures.
[32] 49 CFR 237.111, Review of bridge inspection reports.
[33] 49 CFR 237.71, Determination of bridge load capacities.
[34] Independent means the reviewer did not participate or assist in any of the inspection activities.

Inspector qualified for the role. Submit Inspection Team Leader or Railroad Bridge Inspector qualifications to the Site and/or Field Office Manager. The Site and/or Field Office Manager shall certify the qualifications and submit them to the DOE BTM.

f. Develop, document, and implement methods to determine when an Inspection Team Leader's qualification must meet Code of Federal Regulations 23 CFR Part 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 must consider a tunnel's type of construction, functional systems, history of performance, and physical and operational conditions.

8. Records and Reporting.

a. Document the education, experience, licensure, certifications, and training of each Qualified Personnel member in the Bridge or Tunnel File.

b. Document inspection activities to include inspection planning, inspection field documentation, inspection report and recommendations, QC/QA documents and checklists, Follow-up to Critical Findings Report with status reports, and all other documents related to each inspection.

c. Document recommendations for corrective actions intended to ensure the safety and integrity of the bridge, culvert, or tunnel; to maintain it in good condition; and, to extend its service life. For each recommendation provide an estimated cost and timeframe to complete.

d. Prepare and submit SI&A data following each inspection in accordance with national standards[35,36] and Departmental guidance, for all public- and controlled-access bridges to the DOE BTM

e. Prepare and submit National Tunnel Inventory data items following each inspection in accordance with national standards[37] and Departmental guidance. to the DOE BTM.

f. Document inspection and evaluation used to assess the condition, functionality, safety, or vulnerability of the bridge, culvert, or tunnel.

(1) Each report will include a cover page; a title page; an executive summary stating the purpose of the evaluation, overall results, and recommendations such as additional analyses, repairs, monitoring, or load posting; a list of assumptions used; and all calculations and supporting documentation.

[35] FHWA Specifications for the National Bridge Inventory, March 2022.
[36] FHWA Metrics for the Oversight of the National Bridge Inspection Program, May 2017 and revisions.
[37] FHWA Specifications for the National Tunnel Inventory, and revisions.

(2) Each report will specifically note recommended entries for NBI or NTI Data Items when related.

(3) The performing registered Professional Engineer and Quality Management Personnel shall seal and sign any inspection report and evaluation product.

(4) Include personnel qualifications for each Qualified Personnel responsible for or associated with the inspection or evaluation report.

g. Prepare[38] and maintain a Bridge File or Tunnel File for each bridge, vehicular tunnel, and culvert in local records and in the Facilities Information Management System.

h. Submit documentation and complete notifications in a timely manner to the Site and/or Field Office Manager. Adhere to the following submission dates:

(1) Initial SI&A data or NTI data within ninety (90) days of completing construction, rehabilitation, or repair.

(2) Inspection reports with SI&A or NTI data within thirty (30) days of the inspection.

(3) Load rating report or scour evaluation report within thirty (30) days of completing the evaluation. When load rating report includes determination to post, provide a sign installation schedule or photo of completed installation.

(4) Plan of Corrective Action within thirty (30) days of non-compliance notification. For each deficiency cited, the PCA must include-

(a) The deficiency and date of notification,

(b) A description of the action and schedule required to resolve the deficiency, and

(c) A procedure for periodically reporting status updates, milestone completions, and completion of corrective actions to cognizant line management and the DOE BTM.

(5) Notification within seven (7) days of the determination to close a bridge based on scour. Notification to include evidence of bridge closure and an initial plan of action to mitigate impact on site operations. Submit a Scour Critical Plan of Action within thirty (30) days of determination. Submit POA close-out report documenting completion of countermeasures and

[38] See the Section 2 of the AASHTO Manual for Bridge Evaluation for specific information to include in the Bridge File.

revised codes for NBI Items B.C.11 (Scour Condition Rating), B.AP.02 (Overtopping Likelihood), B.AP.03 (Scour Vulnerability), and B.AP.03 (Scour Plan of Action) once complete.

(6) Initial Follow-up to Critical Findings Report within 24 hours of discovery. Submit a Follow-up to Critical Findings Report detailing the intended recovery strategy within thirty (30) days of initial report. Thereafter, provide status reports on Follow-up to Critical Findings Report quarterly through finding resolution.

(7) Notification no less than thirty (30) days in advance of the anticipated delay that an inspection will not occur within the established interval.

(8) Data to support FHWA Metrics Compliance assessments, as requested.

(9) Report within sixty (60) days of completing any seismic vulnerability evaluation, traffic volume data collection, or any other engineering studies or evaluations.

i. Use Department of Energy standard document formats and reporting tools when available. Find standard reporting tools and templates as well as quality management checklists at: https://powerpedia.energy.gov/wiki/Bridge_Management_Program or Energy Hub.

9. Inventory and Asset Management.

a. Integrate requirements for bridge and tunnel management with existing operating and management procedures.

b. Develop, document, and implement procedures to take action to address recommendations for corrective actions intended to ensure the safety and integrity of the bridge, culvert, or tunnel; to maintain it in good condition; and, to extend its service life. For each recommendation provide an estimated cost and timeframe to complete.

c. When available resources are inadequate to maintain an acceptable level of bridge, culvert, or tunnel safety, act to impose lane or load restrictions, or closures.

d. Establish, document, and implement protocols for responding to a critical finding.

e. Establish, document, and implement protocols for managing permit loads.

f. Develop, document, and implement bridge closure and re-opening procedures. Once closed, a bridge may not be reopened until repairs are complete and a qualified engineer determines that the bridge is safe and if necessary, posted.

g. Develop, document, and implement procedures and issue instructions[39] to personnel responsible for train operations to prevent operation of equipment that would exceed the capacity of the bridge.

[39] 49 CFR 237.73, Protection of bridges from over-weight and over-dimension loads.

ATTACHMENT 3: DEFINITIONS

This Attachment provides information associated with DOE O 437.1A as well as information applicable to contracts in which the associated Contractor Requirements Document (Attachment 1 to DOE O 437.1A) is inserted.

1. Anticipated Service Life (ASL). Selection of the Anticipated Service Life is the responsibility of the Responsible Engineer in consultation with site management. See FHWA-HRT-06-032, Seismic Retrofitting Manual for Highway Structures, Part 1-Bridges, January 2006.

2. Average Daily Traffic (ADT). Identifies the average volume of traffic for the average one day (24-hour period) during a data reporting year at a specific location or specific segment of road. See FHWA Traffic Monitoring Guide, December 2022.

3. Annual Average Daily Traffic (AADT). The total annual volume of traffic passing a point or segment of a highway in both directions divided by the number of days in a year. See FHWA-HIF-22-017, Specifications for the National Bridge Inventory (SNBI), March 2022.

4. Annual Average Daily Truck Traffic (AADTT). The total annual volume of truck traffic passing a point or segment of a highway in both directions divided by the number of days in a year. FHWA-HIF-22-017, Specifications for the National Bridge Inventory (SNBI), March 2022.

5. Bridge. See Vehicle Bridge, Pedestrian Bridge or Railroad Bridge.

6. Bridge Evaluation. An assessment of the performance of an existing bridge. See AASHTO, Manual for Bridge Evaluation, 3rd Edition, 2018.

7. Bridge or Tunnel File. A full history of the structure, including all design, construction, maintenance, repair, rehabilitation, use, and damage records. The Bridge File or Tunnel File contains inventory data, inspection, testing, and evaluation records, load rating and evaluation data and reports. See AASHTO, Manual for Bridge Evaluation, 3rd Edition, 2018.

8. Bridge Inspection Report. An inspection-specific summary including information pertinent to bridge inventory management. The report serves as a summary of the inspection, inspection findings, and recommendations; as a historical record for future reference; and, as a legal record that documents inspection activity.

9. Bridge and Tunnel Inspection Organization. Personnel assigned responsibility for implementing the Department of Energy bridge management requirements or who conduct inspections or evaluations.

10. Bridge or Tunnel Inspection. Determination of the physical and functional condition of a bridge, tunnel, or culvert by identifying, quantifying, and documenting existing defects.

Performed by qualified technical personnel familiar with relevant methods and procedures, tools and equipment, safety requirements, and documentation practices.

11. Bridge or Tunnel Inspection Findings. Observations or measurements describing the overall condition of the bridge or tunnel and defects collected during an inspection.

12. Bridge or Tunnel Inspection Report Recommendations. Corrective actions intended to ensure the safety and integrity of the bridge, culvert, or tunnel; to maintain it in good condition; and, to extend its service life. Actions may include additional inspection or evaluation, maintenance and repair, modernization, or operational activities.

13. Complex Feature. Bridge component(s) or member(s) with advanced or unique structural members or operational characteristics, construction methods, and/or requiring specific inspection procedures. This includes mechanical and electrical elements of moveable spans and cable-related members of suspension and cable-stayed superstructures.

14. Countermeasures. Materials or systems intended to prevent, delay, or reduce the severity scour and stream instability.

15. Critical Finding. A structural or safety related deficiency that requires immediate action to ensure public safety. See 23 CFR 650.305. Levels of Critical Findings and corresponding response times follow:

    a. Emergency: used to report the failure or imminent failure of a critical primary structural component. An Emergency Critical Finding means that a failure is likely within a short time period. A re-inspection or repair should be scheduled, and the structure may require a Prompt Interim Action (PIA), load posting, or closure. Immediate action required.

    b. Urgent: used to report a potentially hazardous condition, which, if left unattended beyond the next anticipated inspection, would likely become dangerous to persons or property. Also used to report the actual or imminent failure of a non-critical structural component. Such failures may reduce the reserve capacity or redundancy of the structure but would not result in a structural collapse. A re-inspection or repair should be scheduled, and the structure may require load posting. Action required prior to next routine inspection.

16. Critical Findings Protocols. A site-specific plan minimally identifying:

    a. members of the Critical Findings team and alternates,

    b. team member contact information and responsibilities,

    c. procedures for notifying team members upon discovery of a Critical Finding,

    d. procedures for notifying:

        (1) local agencies,

(2) local law enforcement agencies, and the Public Affairs Officer where local roads and traffic are affected,

(3) Site/Program leadership and the DOE BTM,

e. procedures for implementing temporary measures and,

f. guidelines on timeliness of actions, reporting requirements, and documentation procedures.

17. Culvert. A transverse structure, pipe, or series of multiple pipes, box(es), or arch(es) constructed to convey water or utilities under a road or railway.

a. Culvert assets under a road with a Structure Length equal to or greater than 20 linear feet meet the FHWA definition of a bridge. These assets are inventoried in FIMS with Usage Code 1768 or 1769.

b. Culvert assets under railway with a Structure Length equal to or greater than 10 feet and located at such a depth that it is affected by live loads meet the Federal Railroad Administration (FRA) definition of a bridge. These assets are inventoried in FIMS with Usage Code 1468 or 1469.

c. Culvert assets with a Structure Length less than FHWA or FRA bridge length and an Opening Area of more than 20 square feet are inventoried in FIMS with Usage Code 2629. The FIMS Users Guide provides addition guidance for selecting real property asset Usage Codes.

18. Design Strength. The capacity of the structure or structural member being designed or analyzed (i.e. the Nominal strength) multiplied by the appropriate resistance factor.

19. DOE Elements. Headquarters elements or first-tier organizations as listed in the *Correspondence Style Guide*, Office of the Executive Secretariat. [DOE O 251.1, *Department Directives Program,* current version]

20. Elevated Walkway. See Pedestrian Bridge.

21. Graded Approach. The process of ensuring that the levels of analyses, documentation, and actions used to comply with requirements are commensurate with: the relative importance to safety, safeguards, and security; the magnitude of any hazard involved; the life-cycle stage of a facility or item; the programmatic mission of a facility; the particular characteristics of a facility or item; the relative importance to radiological and non-radiological hazards; and, any other relevant factors. See 10 CFR Part 830.3.

22. Inspection – Damage. Unscheduled inspection to access structural damage resulting from environmental factors or human actions. See 23 CFR 650.305. Analogous to a Special or Emergency Inspection for railroad bridges. See AREMA Manual for Railway Engineering.

23. Inspection – Nonredundant Steel Tension Member. A type of In-Depth Inspection conducted at regularly scheduled intervals specifically to inspect Nonredundant Steel Tension Member(s) or member components. It requires close-up access, hands-on inspection, and may require non-destructive testing by qualified personnel to determine location and extent of cracking or other defects. See CFR 650.305.

24. Inspection – In-Depth. A hands-on, close-up inspection of one or more structure elements above or below the water level to identify any deficiencies not readily detectible using Routine Inspection procedures. An In-Depth Inspection is also used to identify developing problems that impact present service requirements or to obtain detailed information needed to facilitate the preparation of structure rehabilitation plans. This inspection may result in a full investigation including structural analysis to determine member capacity that will be used in a revised load rating. It may be performed independently from a Routine Inspection at intervals other than 24 months. It can be at a longer interval or one time only. Analogous to a Special Inspection for railroad bridges. See 23 CFR 650.305.

25. Inspection – Hands-on. A visual or manual inspection technique made at a distance no greater than arm's length from the entire member or member component surface. Includes examination of all surfaces of the members and member components. May require use of specialized equipment to access members or member components. See 23 CFR 650.305.

26. Inspection – Initial. Inspection conducted after construction or rehabilitation of a bridge or when the configuration or geometry of the structure changes (examples include, widening, lengthening, and change in vertical clearance). It is the baseline inspection with which all future inspections will be compared. Performance may be coincident with the final construction inspection but must be done by a qualified inspection team._See 23 CFR 650.305.

27. Inspection – Routine. Regularly scheduled inspection consisting of observations and/or measurements needed to determine the physical and functional condition of the bridge, to identify any changes from initial or previously recorded conditions and to ensure that the structure continues to satisfy present service requirements. See 23 CFR 650.305. Analogous to a Periodic Inspection for railroad bridges. See AREMA Manual for Railway Engineering, current edition 2019, updated annually.

28. Inspection – Special. An inspection scheduled at the discretion of the bridge owner, used to monitor a particular known or suspected deficiency See 23 CFR 650.305. Analogous to an Interim Inspection for railroad bridges. See AREMA Manual for Railway Engineering, current edition 2019, updated annually.

29. Inspection – Underwater. Inspection of the underwater portion of a bridge substructure and the surrounding channel, which cannot be inspected visually at low water by wading or probing, generally requiring diving or other appropriate techniques See 23 CFR 650.305.

30. Inspection Team Leader. Individual in charge of an inspection team responsible for planning, preparing, and performing field inspection of the bridge. See 23 CFR 650.305, Subpart C and 23 CFR 650.505, Subpart E.

31. Length. The measured opening along the center of the structure between under copings of abutments or spring lines of arches, or extreme ends of openings for multiple boxes; it includes multiple pipes, where the clear distance between openings is less than half of the smaller contiguous opening. For vehicular bridges, also known as NBIS Bridge Length. See FHWA-HIF-22-017, Specifications for the National Bridge Inventory (SNBI), March 2022.

32. Load and Resistance Factor Design (LRFD). A design method used by AASHTO, based on limit states of material with increased loads and reduced member capacity based on statistical probabilities. See FHWA Bridge Inspector's Reference Manual (BIRM), FHWA-NHI-23-024, March 2023.

33. Load Rating. The analysis to determine the safe vehicular live load carrying capacity of a bridge using bridge plans and supplemented by measurements and other information gathered from an inspection. See 23 CFR 650.305.

34. Lower Level Earthquake Ground Motion. A small earthquake that has a reasonable probability of occurrence within the life of the bridge (assume 75 years). This ground motion may also be called the frequent earthquake, the expected earthquake (NCHRP 12-49-ATC/MCEER 2003), or the functional evaluation earthquake (Caltrans Seismic Design Methodology (Caltrans 1999). See FHWA-HRT-06-032, Seismic Retrofitting Manual for Highway Structures, Part 1-Bridges, January 2006 and FHWA-HRT-06-032, Seismic Retrofitting Manual for Highway Structures, Part 1-Bridges, January 2006.

35. National Bridge Inventory (NBI). A database of Structure Inventory and Appraisal data collected by each state or Federal bridge-owning agency to fulfill the requirements of the National Bridge Inspection Standards. See 23 CFR 650.305.

36. National Bridge Inventory Bridge or Reportable Bridge. A structure including supports erected over a depression or an obstruction, such as water, highway, or railway, and having a track or passageway for carrying traffic or other moving loads, and having an opening measured along the center of the roadway of more than 20 feet between under copings of abutments or spring lines of arches, or extreme ends of openings for multiple boxes; it includes multiple pipes, where the clear distance between openings is less than half of the smaller contiguous opening. See 23 CFR Part 650.305, Subpart C.

37. National Bridge Inspection Standards (NBIS). The national standard for the proper safety inspection and evaluation of all highway bridges . See 23 CFR 650.305.

38. National Tunnel Inventory (NTI). A database maintained by the Federal Highway Administration containing inventory and inspection data for all highway tunnels located on public roads, on and off Federal-aid highways.

39. Non-Destructive Testing (NDT). Any of a variety of methods used to assess the strength and condition of materials or structural components of a real property asset that does not result in any damage or change to the material or part under examination.

40. Nonredundant Steel Tension Member (NSTM). A primary steel member fully or partially in tension, and without load path redundancy, system redundancy or internal redundancy, whose failure may cause a portion of or the entire bridge to collapse. See 23 CFR 650.305.

41. Pedestrian Bridge. A structure that carries primarily pedestrian, bicycle, and equestrian traffic but may include light maintenance vehicles over a chasm, waterway, ditch, or other obstacle or convey pedestrian traffic from one building or structure to another including enclosed walkways. It does not include work or machinery platforms, stairways, platforms, boardwalks, or docks or similar type structures.

42. Performance Level (PL) or Performance Criteria. A level of performance, expressed in terms of post-earthquake service and damage, expected to be achieved during and immediately following an earthquake of a specified size. See FHWA-HRT-06-032, Seismic Retrofitting Manual for Highway Structures, Part 1-Bridges, January 2006.

43. Permit Load. A vehicle or load that exceeds the legal size or weight limits established by each state for operation on state roads. Each state has established procedures for reviewing the safety and serviceability of bridges along the planned route and for providing permission for transit.

44. Plan of Corrective Action (PCA). Written plan identifying individual deficiencies or areas where bridge and tunnel management does not comply with Federal or Departmental policy. It describes actions required to correct each deficiency and the schedule for completing each action. [adapted from FHWA memorandum HIBS-30, National Bridge Inspection Standards Plan of Corrective Action(s) Guidelines, January 3, 2017.

45. Prompt Interim Action (PIA). Any action, including repairs, load limits, or partial or full bridge closure that is enacted to alleviate a significant safety problem on the bridge. Prompt means as soon as possible or practical given the conditions and consequences of inaction. Interim means that the action may be temporary but is to the extent necessary to ensure safe use of the bridge.

46. Professional Engineer (PE). An individual, who has fulfilled education and experience requirements and passed examinations for professional engineering and/or structural engineering license that, under State licensure laws, permits the individual to offer engineering services within areas of expertise directly to the public.

47. Public Road. Any road or street under the jurisdiction of and maintained by a public authority and open to public travel. See 23 U.S.C. 101(a)(23).

48. Qualified Personnel. Persons performing an inspection or evaluation who meet the qualification requirements specific to the inspection or evaluation being conducted and

who understand the duties of the role he or she is expected to perform. Document and submit individual personnel qualifications including appropriate education, experience, licensure, and certifications, and current training, as required.

49. Railroad Bridge. See Code of Federal Regulations 49 CFR 237.5.

50. Required Strength. Structural capacity needed to meet or exceed the demands put on the structure by the loads.

51. Responsible Engineer. An engineer charged with the overall responsibility for conducting bridge evaluations other than load ratings. This may include scour evaluations, fatigue and fracture evaluations, or seismic evaluations.

52. Scour. Erosion of streambed or bank material or erosion of soil surrounding a bridge foundation due to flowing water. Often the erosion is localized around the bridge piers or abutments. See 23 CFR 650.305.

53. Scour Appraisal. A risk-based and data-driven determination of a bridge's vulnerability to scour, resulting from the least stable result of scour that is either observed, or estimated through a scour evaluation or a scour assessment.

54. Scour Assessment. The determination of an existing bridge's vulnerability to scour which considers stream stability and scour potential as described in HEC 20 and other scour-related data sources.

55. Scour Critical Bridge. A bridge with a foundation that is unstable, or may become unstable, as determined by the scour appraisal.

56. Scour Evaluation. The application of hydraulic analysis as described in HEC 18 and HEC 20 to estimate scour depths and determine bridge and substructure stability considering potential scour.

57. Scour Monitoring Inspection. An inspection performed during or after a triggering storm event as required by a Scour Plan of Action (Scour POA), by personnel with qualifications required by the agency.

58. Scour Plan of Action (Scour POA). Procedures for DOE Site personnel, bridge inspectors, and engineers in managing each bridge determined to be scour critical or that has unknown foundations. The Scour POA should explain why the preferred actions of the procedures were selected, include a scour monitoring plan, possibly a plan for design and construction of countermeasures with a schedule, and a commitment to quarterly progress reporting until corrective actions are satisfied.

59. Seismic Retrofitting Category (SRC). Used to recommend minimum screening requirements, evaluation methods and retrofitting measures for deficient bridges. Four categories, A through D, are determined by the anticipated service life, bridge importance, and the seismic and geotechnical hazards at the site. See FHWA-HRT-06-032, Seismic Retrofitting Manual for Highway Structures, Part 1-Bridges, January 2006

and FHWA-HRT-06-032, Seismic Retrofitting Manual for Highway Structures, Part 1-Bridges, January 2006.

60. Service Life. See FHWA-HIF-11042, Bridge Preservation Guide, Spring 2018.

61. Short Span Bridge. A vehicular bridge with a structure length less than 20 feet.

62. Structure Inventory and Appraisal (SI&A) Data. Data recorded and stored for each bridge as standardized by the Federal Highway Administration to effectively monitor and manage a bridge inventory. For data submissions guidelines see FHWA-HIF-22-017, Specifications for the National Bridge Inventory (SNBI), March 2022.

63. Tunnel – Pedestrian. An underground passageway, dug through the surrounding soil/earth/rock and enclosed except for entrance and exit, commonly at each end, and used exclusively for pedestrian or bicycle traffic. It does not include vehicular tunnels that have sidewalks. A tunnel used by both vehicles and pedestrians should be counted in one of the vehicular tunnel categories. A similar tunnel between two buildings may be inventoried with one of the buildings.

64. Tunnel – Public Access Vehicular. Enclosed roadway for motor vehicle traffic with vehicle access limited to portals, regardless of type of structure or method of construction, and located on a public road. May include lighting, ventilation, fire protection systems, and emergency egress capacity.

65. Tunnel – Train. Tunnel used exclusively by trains.

66. Tunnel – Controlled Access Vehicular. Enclosed roadway for motor vehicle and pedestrian traffic with vehicle access limited to portals, regardless of type of structure or method of construction. May include lighting, ventilation, fire protection systems, and emergency egress capacity.

67. Upper Level Earthquake Ground Motion. A large earthquake that has a finite, but remote, probability of occurrence within the life of the bridge. This ground motion may also be called the rare earthquake, maximum considered earthquake (MCE) (NCHRP 12-49-ATC/MCEER 2003), or the safety evaluation earthquake (Caltrans Seismic Design Methodology (Caltrans 1999). The upper level motion has a 7 percent probability of exceedance in 75 years, which corresponds to a return period of about 1,000 years. See FHWA-HRT-06-032, Seismic Retrofitting Manual for Highway Structures, Part 1-Bridges, Jan 2006 and FHWA-HRT-06-032, Seismic Retrofitting Manual for Highway Structures, Part 1-Bridges, January 2006.

68. Vehicle Bridge. A structure including supports erected over a depression or an obstruction, such as water, highway, or railway, and having a track or passageway for carrying traffic or other moving loads.

    a. Controlled Access Vehicle Bridge. A vehicle bridge where a traveler must pass through a staffed entry point and present identification to traverse this structure. These structures are not included in the National Bridge Inventory.

b. Public Access Vehicle Bridge. A vehicle bridge where a traveler may traverse the structure without ever passing through a staffed entry point or presenting identification. Public access vehicle bridges with a Structure Length of more than 20 feet (6.1 meters) will be included in the National Bridge Inventory unless permanently closed.

ATTACHMENT 4: ACRONYMS

AADT	Annual Average Daily Traffic
AADTT	Annual Average Daily Truck Traffic
AASHTO	American Association of State Highway and Transportation Officials
ADCI	Association of Diving Contractors International
ADT	Average Daily Traffic
ADTT	Average Daily Truck Traffic
ANSI/EIA	American National Standards Institute/Electronic Industries Alliance
AREMA	American Railway Engineering and Maintenance-of-Way Association
ASL	Anticipated Service Life
BTM	DOE Bridge and Tunnel Manager
CO	Contracting Officer
CFR	Code of Federal Regulations
CRD	Contractor Requirements Document
DED	Data Element Dictionary
DOE	Department of Energy
DOE BTM	Department of Energy Bridge and Tunnel Manager
E	Seismic Hazard Rating
EO	Executive Order
EV	Emergency Vehicles
FHWA	Federal Highway Administration
FIMS	Facilities Information Management System
FRA	Federal Railway Administration
HEC	Hydraulic Engineering Circular
LL	Lower Level
LRFD	Load and Resistance Factor Design
MA-50	Department of Energy, Office of Asset Management
MBE	AASHTO Manual for Bridge Evaluation
MCEER	Multidisciplinary Center for Earthquake Engineering Research
M&O	Management and Operating
NBI	National Bridge Inventory
NBIS	National Bridge Inspection Standards
NDT	Non-Destructive Testing
NHI	National Highway Institute
NHS	National Highway System
NNSA	National Nuclear Security Administration

NSTM	Nonredundant Steel Tension Member
NTI	National Tunnel Inventory
OMB	Office of Management and Budget
OSF	Other Structures and Facilities
PCA	Plan of Corrective Action
PL	Performance Level
POA	Plan of Action
PSO	Program Secretarial Officer
QA	Quality Assurance
QC	Quality Control
SHL	Seismic Hazard Level
SHV	Specialized Hauling Vehicles
SI&A	Structure Inventory and Appraisal
SNBI	Specifications for the National Bridge Inventory
SNBIBE	Specification for the National Bridge Inventory Bridge Elements
SRC	Seismic Retrofit Category
TOMIE	Tunnel Operations, Maintenance, Inspection, and Evaluation
UL	Upper Level