COLORADO
Department of Transportation

Colorado Bridge Inspection Manual

Photo Credit: CDOT

The Below Bridge Access Vehicle

Purpose

The Bridge Inspection Manual documents the Colorado Department of Transportation (CDOT) specific policies and procedures used to inspect bridges (major structures), minor structures, and miscellaneous structures within Colorado.

Manual Maintenance

This manual is intended to be dynamic. Revisions will be incorporated as new material is added and as criteria evolve. Staff Bridge is the owner of this manual and is responsible for approving and publishing all revisions.

Suggestions for improving and updating this manual are encouraged. Anyone who would like to propose revisions should informally discuss changes with other stakeholders to further develop and refine their proposed revisions prior to submittal. Submit proposed revisions to the Bridge & Structures Inspection Engineer and the Structure Asset Management Engineer for review before approval by the Bridge Engineer.

Revisions

When a revision is made:

- The revision date will be updated in the lower right corner of the page.
- Revision bars will be added in the margin to identify the most recent revision.
- A memorandum describing the changes will be issued with the revision.
- The previous manual will be archived for future reference.

Manual Conventions

CDOT Clarification

Clarification is added where needed when the external source document or policy may have multiple interpretations by using the ***CDOT Clarification*** header followed by the CDOT interpretation.

CDOT Commentary

Commentary is added to provide background relevant to the current practice by using the ***CDOT Commentary*** header followed by an explanation.

CDOT Mission

To provide the best multimodal transportation system for Colorado
that most effectively and safely moves people, goods, and information.

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1 Policy

1.1 Major Structures

Major structures carry highway traffic on public roads within Colorado and include major bridges and major culverts.

Federal Regulation 23 CFR 650.305 (12/2022) defines a bridge as:

> 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.

CDOT uses the federal bridge definition as the definition for major structures within Colorado to avoid confusion between bridges and culverts.

Major structures are defined as those carrying vehicles and are to be inspected in accordance with the National Bridge Inspection Standards (NBIS) defined in Federal Regulation 23 CFR 650 Subpart C (05/2022).

Non-vehicular major structures are defined as those carrying pedestrian, railroad, or are parts of buildings.

Non-vehicular major structures are inspected by CDOT if the structures are within CDOT ROW or will impact CDOT ROW if the structure should fail.

Non-vehicular major structures are inspected in accordance with the National Bridge Inspection Standards (NBIS) defined in Federal Regulation 23 CFR 650 Subpart C (05/2022) except that the inspection interval is defined by CDOT in Section 3 Inspection Interval.

Non-vehicular major structures on the Off-System program may receive full inspections under contracts with the local agencies. Current CDOT guidance is Off-System Non-vehicular structures will receive vertical and lateral under clearance validations only.

Colorado specific guidance on major structure inspection is within:

- Colorado Bridge Inspection Manual (this manual)
- Colorado Structure Element Level Coding Guide
- Colorado SIA Item Coding Guide

National guidance on major structure inspection is within:

- AASHTO Manual for Bridge Evaluation
- AASHTO Manual for Bridge Element Inspection
- FHWA Bridge Inspector’s Reference Manual (FHWA NHI 12-049) (BIRM)
- FHWA Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation’s Bridges (FHWA-PD-96-001)

- Specifications for the National Bridge Inventory

1.2 Minor Structures

Minor structures (bridges and culverts with spans less than or equal to 20’ and greater than or equal to 4’) carry highway traffic on public roads within CDOT ROW.

Minor structures are to be inspected following the guidance outlined within the National Bridge Inspection Standards (NBIS) defined in Federal Regulation 23 CFR 650 Subpart C (05/2022) except that inspection interval is defined by CDOT in Section 3 Inspection Interval.

Minor structures are to be inspected following the same guidelines as major structures aside from exceptions noted here.

Colorado specific guidance on structure inspection is within:

- Colorado Bridge Inspection Manual (this manual)
- Colorado Structure Element Level Coding Guide
- Colorado SIA Item Coding Guide

National guidance on structure inspection is within:

- AASHTO Manual for Bridge Evaluation
- AASHTO Manual for Bridge Element Inspection
- FHWA Bridge Inspector’s Reference Manual (FHWA NHI 12-049) (BIRM)
- FHWA Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation’s Bridges (FHWA-PD-96-001)
- Specifications for the National Bridge Inventory
- NCHRP 14-26 Culvert and Storm Drain System Inspection Manual.

1.3 Miscellaneous Structures

Miscellaneous structures include pedestrian structures, railroad structures, overhead pipes, overhead cables, private drive structures, and overhead conveyor belts, etc., within CDOT ROW that do not fit into any other inspected asset type.

Miscellaneous structures are inspected if the structures are within CDOT ROW or will impact CDOT ROW if the structure should fail.

Miscellaneous structures are inspected in accordance with the National Bridge Inspection Standards (NBIS) defined in Federal Regulation 23 CFR 650 Subpart C (05/2022) except that the inspection interval is defined by CDOT in Section 3 Inspection Interval.

Colorado specific guidance on miscellaneous structure inspection is within:

- Colorado Bridge Inspection Manual (this manual)
- Colorado Structure Element Level Coding Guide
- Colorado SIA Item Coding Guide

National guidance on miscellaneous structure inspection is within:

- AASHTO Manual for Bridge Evaluation
- AASHTO Manual for Bridge Element Inspection
- FHWA Bridge Inspector's Reference Manual (FHWA-NHI-23-024) (BIRM) FHWA Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges (FHWA-PD-96-001)Specifications for the National Bridge Inventory 3/2022

1.4 Records and Record Keeping

There are four major reasons why accurate bridge records are necessary:

1. A structure history file facilitates the identification and/or monitoring of deficiencies.
2. To identify and assess bridge deficiencies and repair needs.
3. To be able to quickly obtain pertinent structure information to respond to emergency events such as fire on or below the structure, severe flooding, and navigational or vehicular collision.
4. To maintain a good bridge condition, including sufficient load carrying capacity to guarantee public safety and facilitate the routing of overweight/over-height vehicles.

Federal Regulation 23 CFR 650.307 (n) (05/2022) states in part:

> Each State transportation department, Federal agency, and Tribal government must prepare and maintain bridge files in accordance with Section 2.2, AASHTO Manual.

Each Major, Minor, and Miscellaneous structure previously had a hard-copy (tangible) structure file. CDOT is currently transitioning from electronic folders (e-folders) to SIMSA. Each structure file will contain (if available):

1. PDF file of Full Report:
    - Full Inspection Report consists of the following (in this order):
        - SIA / Element inspection report
        - Photos (inventory photos followed by substantiating photos)
        - Tally sheet (if applicable)
        - Structure sketch
        - NSTM Sheet (if applicable)
        - Vertical clearance sheet (if applicable)
        - Load rating summary sheet
        - Scour Screening Chart
        - Scour Plan of Action (if applicable)
        - Streambed profile sheet (if applicable)
        - Essential Repair Letter or Critical Finding Letter (if applicable)
2. PDF of Essential Repair Letter (if applicable)
3. PDF of Critical Inspection Findings (if applicable)
4. PDF of SIA / Element Inspection report
5. PDF of the Photo Sheet(s)
6. Excel file for NSTM Sheets (if applicable)
7. PDF of the NSTM Sheets (if applicable)
8. PDF of the last Underwater Inspection Report (if applicable)

9. PDF of the last Ultrasonic Pin Inspection Report (if applicable)
10. Excel file of Tally Sheet (Timber, Steel, or Concrete if applicable)
11. PDF of Tally Sheets (Timber, Steel, or Concrete if applicable)
12. PDF of Timber Girder Sheet(s) (if applicable)
13. PDF of Miscellaneous Structure Files (Design Calculations, etc.)
14. XML of Load Rating BrR Input File
15. Miscellaneous other Load Rating Files
16. PDF of Sketch
17. DGN file of Sketch
18. PDF of Structure Plans (if available)
19. DGN of Structure Plans (if available)
20. PDF of Load Rating Summary Sheet
21. PDF of Load Rating Calculation Package
22. Excel file of the Load Posting Signage Options (if posting is required)
23. PDF of the Load Posting Signage Options (if posting is required)
24. Excel file for Streambed Profile Sheet (if applicable)
25. PDF of Streambed Profile (if applicable)
26. PDF of Scour Item 113 Screening Chart
27. PDF of Scour Plan of Action (if applicable)
28. PDF of Scour Drainage Report (if applicable)
29. PDF of Scour Change Request Memo (if applicable)
30. PDF of Vertical Clearance Sheet (if applicable)
31. JPG file of all photos with full caption as name
32. PDF of any correspondence (e.g., essential repair notices, repair details, requests to hang utilities on structures, responses to overlay requests, etc.)

These will be filed in the e-folders by the Asset Management team, or in SIMSA by the inspectors.

1.5 File Naming

Correct file naming is essential to allow the Asset Management team to file documents in the proper location. If any submittal file is not addressed as a Document Type in this section, please contact the CDOT Bridge & Structures Asset Management Unit.

The number of characters in the filename is limited to 100 characters

File naming format:

[Structure number] [Document type] [Description] [Date]

- [Structure number]: NBI Item 8.
- [Document Type]: Described below.
- [Description]: Description as needed.

- [Date]: Date of the inspection, correspondence, plans, etc., in the following format YYYY MM DD.

Note: Some files may not change from year to year (ie; load ratings, sketch, ect.). If files do not change, they will not be resubmitted with a new file name containing the date of the latest inspection.
File type descriptions:

It is important that you remember not to use special characters when naming files. If there are any special characters in the file name, the file will not show in the web folder.

DO NOT use the following symbols in the description: \ / : * ? ‘ "<> | # % , & @

DO NOT use the inch symbol " and the foot symbol ‘, these should be spelled out.

- STREAMBED PROFILE, formerly Scour Charts

  File Name Example:

  E-17-FX STREAMBED PROFILE 2022 10 07.pdf

  E-17-FX STREAMBED PROFILE 2022 10 07.xls or .xlsx

- CORRESPONDENCE (PDF of Emails, Letters, Memos, etc. excluding Essential Repairs)

  File Name Example:

  E-17-FX CORRESPONDENCE 2022 10 07.pdf, .doc, or .docx

  E-17-FX EMAIL 2022 10 07.pdf

  E-17-FX MEMORANDUM 2022 10 07.pdf

  E-17-FX LTR 2022 10 07.pdf

  E-17-FX COST 2022 10 07.xls or .xlsx

- CRITICAL INSPECTION FINDINGS LETTERS (CIL)

  File Name Example:

  E-17-FX CIL Loss of Pile 3A 2022 10 07.pdf

- CRITICAL INCIDENT REPORT (CIR)

  File Name Example:

  E-17-FX CIR Emergency sounding 44th Ave under I-70 2022 10 07.pdf

- DEFECT, REPAIR, and OTHER NON-INVENTORY PHOTOS. Document Type is not required.

  File Name Example:

  E-17-FX 20 percent loss of bearing area at Girder 3A Pier 2 2022 10 07.jpg

  E-17-FX Impact damage Girder 3A 12 inches from Pier 2 2022 10 07.jpg

  A-15-A Downstream Channel Left 2022 10 07.jpg

  A-15-A Downstream Channel Middle 2022 10 07.jpg

  A-15-A Downstream Channel Right 2022 10 07.jpg

  A-15-A Load Posting Sign 2022 10 07.jpg

- DESIGN FILES (MicroStation or ACAD Design Files, excluding inspection sketch files)

  File Name Example:

  E-17-FX DGNFILES Design 2022 10 07.dwg

  E-17-FX DGNFILES Design 2022 10 07.dgn

- ESSENTIAL REPAIR LETTERS (ERL)

  File Name Example:

  E-17-FX ERL Loss of Bearing Area at Girder 3A Pier 2 2022 10 07.pdf

  E-17-FX ERL Loss of Bearing Area at Girder 3A Pier 2 – Yellow Priority 2022 10 07.pdf

- INACCESSIBLE FINDINGS LETTER (IAL)

  File Name Example:

  001A000040BL IAL Grated Inlet and Outlet prevent access 2022 10 07.pdf

  001A000040BL IAL Silted in preventing access 2022 10 07.pdf

  001A000040BL IAL High Water 2022 10 07.pdf

  001A000040BL IAL Grated Inlet and Outlet prevent access - Green Priority 2022 10 07.pdf

- INTERNAL QC DOCUMENTATION (On-System only)

  File Name Example:

  E-17-FX QC 2022 09 23.pdf

- INTER-GOVERNMENTAL AGREEMENTS (IGA)

  File Name Example:

  E-17-FX IGA 2022 10 07.pdf

- INVENTORY (Roadway photos)

  The name of the inventory photographs shall be the Structure Number (NBI Item 8) followed by -a, -b, -c, …, -x, -y, -z as required below.

- LOAD POSTING SIGNAGE OPTIONS

  File Name Example:

  E-17-FX RATING LPSO 2023 10 07. xlsx or xls

  E-17-FX RATING LPSO 2023 10 07.pdf

- LOAD POSTING CERTIFICATE
  [Year signed]_[Entity]_Load Posting Certificate

  File Name Example:

2022_Mesa County Load Posting Certificate

2022_Town of Buena Vista Load Posting Certificate

- MISC (Misc. Information)

  File Name Example:

  E-17-FX MISC 2022 10 07.pdf, .doc, or .docx

  E-17-FX MISC Structures Added or Removed 2022 10 07.pdf

  E-17-FX MISC Structures Added or Removed 2022 10 07.xlsx or .xls

  E-17-FX MISC Maintenance Inspections NBI Data Report 2022 10 07.pdf

  E-17-FX MISC Maintenance Inspections NBI Data Report 2022 10 07.xlsx or xls

  E-17-FX MISC Maintenance Activity Recommendations Report 2022 10 07.pdf

  E-17-FX MISC Maintenance Activity Recommendations Report 2022 10 07.xlsx or xls

  E-17-FX MISC Location Map [yyyy mm dd].kmz

- MOVIES (Video Files)

  File Name Example:

  E-17-FX MOVIES 2013 Flood CR21 and SH114 MP8.253 2022 10 07.avi, .mpg, or .mov

- OVERTOPPING (On-System only, Form 293)

  File Name Example:

  E-17-FX OVERTOPPING FORM 293 2022 09 23.pdf

- NONREDUNDANT STEEL TENSION MEMBER SHEET (NSTMSHEET)

  File Name Example:

  E-17-FX NSTMSHEET 2022 10 07.pdf

  E-17-FX NSTMSHEET 2022 10 07.xls or xlsx

- PHOTO SHEETS (Inventory and Inspection Photos)

  File Name Example:

  E-17-FX PHOTO SHEETS 2022 10 07.pdf

- PINS (Ultrasonic Pin Inspection Reports)

  File Name Example:

  E-17-FX PINS UT Pin Inspection 2022 10 07.pdf (for the Pin Inspection report)

  E-17-FX SIA UT Pin Inspection 2022 10 07.pdf (for the SIA+Pin Inspection report)

- PLANS and SHOPS (design plans, as-builts, shop drawings)

  File Name Example:

E-17-FX PLANS As-Builts 1970 03 15.pdf

E-17-FX SHOPS Girder Shop Drawings 1970 03 15.pdf

E-17-FX PLANS Design 1969 02 14.pdf

- RATING (Rating package and model files)

  [Date] shall be the stamped date. If there is no stamp, then the check date will be used. If there is no checked date, then it shall be the rating date.

  File Name Example:

  E-17-FX RATING Summary Sheet 2022 10 07.pdf

  E-17-FX RATING Package 2022 10 07.pdf

  E-17-FX RATING BrR Model 2022 10 07.xml

  E-17-FX RATING TYPE 3 CANDE Input File 2022 10 07.cid

  E-17-FX RATING CANDE Input Files 2022 10 07.zip

  E-17-FX RATING Corrugated Metal Culvert Field Measurement Form 2022 03 07.pdf (date on this file type is the date the measurements were taken)

- REPAIR or PROJECT (Any Information Regarding Repairs)

  File Name Example:

  E-17-FX REPAIR Corbel Repair at Girder 3A Pier 2 Typical 2022 10 07.pdf

  E-17-FX PROJECT Corbel Repair at Girder 3A Pier 2 Typical 2022 10 07.pdf

- SCOUR (Scour or POA information)

  File Name Example:

  E-17-FX SCOUR Drainage Report 2022 03 25.pdf

  E-17-FX SCOUR Screening Memo 2022 03 25.pdf

  E-17-FX SCOUR POA 2022 04 01.pdf

  E-17-FX SCOUR Item 113 Change Request Memo 2022 04 01.pdf

- SIA (PDF File of Inspection Report)

  File Name Example:

  E-17-FX SIA 2022 10 07.pdf

  E-17-FX SIA FULL REPORT 2022 10 07.pdf (includes all photos and supplementary information)

  E-17-FX SIA Removed from Inventory 2022 10 07.pdf

- SKETCH (Inspection Sketch)

  File Name Example:

  E-17-FX SKETCH 2022 10 07.pdf

E-17-FX SKETCH 2022 10 07.dgn or .dwg

- TALLY SHEET (for structures with multiple elements that use tally sheets, all should be recorded in one Excel file)

  File Name Example:

  E-17-FX TALLY SHEET 2022 10 07.pdf

  E-17-FX TALLY SHEET 2022 10 07.xls or .xlsx

- TIMBER GIRDER SHEETS

  File Name Example:

  E-17-FX TIMBER 2022 10 07.pdf

- UNDERWATER INSPECTION REPORTS

  File Name Example:

  E-17-FX UW Inspection 2022 10 07.pdf (for the Underwater Inspection report)

  E-17-FX SIA Underwater Inspection 2022 10 07.pdf (for the SIA and Underwater Inspection report)

  E-17-FX SIA Special UW 2022 10 07.pdf (for structures that received an Underwater Inspection but are not on the UW inspection program)

- VERTICAL CLEARANCE SHEET (VCLR)

  File Name Example:

  E-17-FX VCLR 2022 10 07.pdf

		Major Bridges	Minor Bridges	Culverts	SIGNC	SIGN	SIGND	SIGNB	Mastarms	HMLs	Tunnels	Retaining Walls	Sound Walls
-a	Roadway	X	X	X	X	X	X	X	X	X	X	X	X
-b	Elevation (a)	X	X									X	X
-c	Superstructure/General (b)	X	X	X							X		
-d	Culvert Inlet or Tunnel Portal			X							X		
-e	Culvert Outlet or Tunnel Portal			X							X		
-f	Pole Base 1				X	X	X	X	X	X			
-g	Pole Base 2					X	X						
-h	Upper Connection 1				X	X	X	X	X				
-i	Upper Connection 2					X	X						
-j	Splice (c)					X	X						
-k	Light Cluster									X			
-l	Pole to Base Plate weld (inside)									X			
...													
-p	Posting Signs (VCLR and Load)	X	X	X							X		
...													
-z													

(a) A number (1 to 5) can be added to the –b (i.e. b1 to b5) if additional Elevation photos are required, for example, a long bridge, a long retaining or sound wall, etc.

(b) A number (1 to 5) can be added to the –c (i.e. c1 to c5) if additional Superstructure/General photos are required, for example, a bridge with multiple superstructures types, a wall with multiple facings, a tunnel with multiple linings, culverts of different types, etc.

(c) A number (1 to 5) can be added to the –l (i.e. l1 to l5) if additional Splice photos are required.

File Name Example:

F-16-JX-b1 Spans 1 to 14 2022 10 07.jpg

F-16-JX-b2 Spans 15 to 27 2022 10 07.jpg

F-16-JX-b3 Spans 27 to 37 2022 10 07.jpg

B-16-FN-c1 Span 1 CSG 2022 10 07.jpg

B-16-FN-c2 Span 2, Pier 3 WGK 2022 10 07.jpg

040A032380BL-c1 CBC Under Roadway 2022 10 07.jpg

040A032380BL-c2 CMP Widening 2022 10 07.jpg

F-16-JX-p East Load Posting Sign 2022 10 07.jpg

F-16-JX-p Forward Load Posting Sign 2022 10 07.jpg

F-16-JX-p SH 58 East Bound Vertical Clearance Sign 2022 10 07.jpg

F-16-JX-p SH 58 West Bound Vertical Clearance Sign 2022 10 07.jpg

2 Inspection Types

2.1 Inspection Type Matrices

Table 2-1 Scheduled Inspection Types

Scheduled Inspection Type	Description
Routine	A regularly scheduled comprehensive inspection consisting of observations and measurements needed to determine the physical and functional condition of the structure, to identify any changes from "initial" or previously recorded conditions.
Nonredundant Steel Tension Member (NSTM)	A hands-on inspection of 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.
Complex Feature Structure	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.
Structure Pin Nondestructive Testing	A nondestructive ultrasonic test of structural pins whose failure could cause all or a portion of the entire structure to collapse.
Underwater	An inspection of the structural elements and surrounding channel that are underwater which cannot be inspected visually at low water or by wading or probing, utilizing diving or other appropriate procedures.
Special Element	An inspection of a specific structural element.
Special	An inspection scheduled at the discretion of the bridge owner, used to monitor a particular known or suspected deficiency, or to monitor special details or unusual characteristics of a bridge that does not necessarily have defects. Also used to finish a full inspection when the routine inspection could not be completed within one week of the start date of the inspection.
In-Depth	A close-up inspection of one or more members above or below the water level to identify any deficiencies not readily detectable using routine inspection procedures.

Table 2-2 Ad Hoc Inspection Types

Ad Hoc Inspection Type	Description
Initial	The first inspection of a structure when added to the inventory or when there has been a change in structure configuration or major rehabilitation.
Human Action Damage	Used to assess structural damage resulting from damage caused by human actions (e.g., vehicle impact).
Natural Event Damage	Used to assess structural damage resulting from damage caused by environmental factors (e.g., flood or fire).

2.2 Routine

Routine inspections are to be completed as scheduled and include the additional focus areas defined below.

Nonredundant Steel Tension Member (NSTM)

Inspections are to be completed at the same time as the routine inspection.

Complex Feature Structures

Complex Feature inspections are to be completed at the same time as the routine inspection in accordance with the inspection procedures defined in the structure record.

Structure Pins

Visual hands-on inspections are to be conducted on structure pins during each routine inspection.

Perform a visual hands-on inspection of the structure pins without removing pin covers. Include the condition observations within the inspection report.

Submit structure pin in-depth inspection recommendations to the CDOT Bridge & Structures Inspection Engineer.

Segmental Bridge Anchorage Zones

Visual hands-on inspections are to be conducted on segmental bridge anchorage zones during each routine inspection where the anchorage zones are accessible and not permanently encased in concrete.

Perform a hands-on inspection with sounding to detect concrete delamination and include a crack map with crack widths for any cracks in or near the anchorage zone within the inspection report.

Submit anchorage zone in-depth inspection recommendations to the CDOT Bridge & Structures Inspection Engineer.

Bridge Rail Anchorage Zones

Special attention shall be given to corrosion and deterioration in the anchorage zones of both concrete and steel bridge rails that lack longitudinal continuity. The condition of all elements on bridge rails shall be inspected and reported as per standard inspection procedures, but additional consideration is to be given to rails that do not have structural continuity across the length of the bridge.

Corrosion and deterioration in the bridge rail anchorage zones on these bridges should be reported to the Bridge Inspection Engineer for further evaluation. This evaluation will include determining whether an essential repair notification should be issued or if additional inspection or testing is warranted.

2.3 General Inspection Procedures

Visually inspect the entirety of the structure. It is recommended to inspect the structure in the order of inventory, or its reversed to ensure the entire structure is thoroughly inspected. It may be advantageous to inspect structures in the same sequence as the load path (i.e., the deck first, then the superstructure, and finally the substructure). Many inspections cannot follow this sequence due to traffic and lane-closure restrictions. It is useful to document somewhere in the report whatever sequence was used during the inspection. This information can be useful in planning future inspections and should also serve as a checklist to make sure that all elements and components were inspected.

Inspect the deck for signs of distress including cracking, deterioration, section loss, and leakage.

Inspect the superstructure members for signs of distress including cracking, deterioration, section loss, and malfunction and misalignment of bearings.

All substructure elements should be inspected for visible signs of distress including evidence of cracking, section loss, settlement, misalignment, scour, collision damage, and corrosion.

Photographs should be captured in the field to show deficiencies / defects, and cross reference in the report where deficiencies / defects are noted. Written notes should be supplemented with photographs to show position and physical characteristics of deficiencies, including a known object in the photograph for scale reference. Notes may also be supplemented with additional sketches.

If the inspection team encounters a water depth greater than three feet, inspect as much of the structure as possible. Note what could not be inspected in the report, then recommend the structure for the underwater inspection program to the CDOT Bridge & Structures Inspection Engineer and the Statewide Bridge Inspection Coordinator.

2.3.1 Concrete

Inspectors shall note any cracking, scaling, delamination, spalling, efflorescence, internal steel corrosion (commonly visually identified as rust staining), Alkali-Silica Reactivity (ASR), honeycombs, pop-outs, wear, collision damage, abrasion, loss of prestress, or other visually indicated issues (temperature changes, chemical attack, moisture absorption, differential

foundation movement, design and construction deficiencies, unintended objects in concrete, fire damage, and form streaking).

2.3.2 Steel

Inspectors shall note any corrosion, fatigue cracking, collision damage, overload damage, heat damage, and coating failures.

Inspectors should record both, the amount of section loss and the amount remaining, when documenting corrosion.

Inspectors should pay particular attention to welded locations, weld terminations, and any fatigue category D, E, or E'.

2.3.3 Timber

Inspectors shall note any checks, shakes, split members, cracked members, and rot or decay.

The actual depth of the check may be recorded on supplemental tally sheets or sketches. Shakes, rot, or decay may be shown on supplemental sketches.

2.3.4 Other

Inspectors shall note any defects in other types of materials in a manner consistent with all other material types.

2.3.5 Notes (General)

Element notes should be organized into the following order:

1. General description of the element, secondary members, and other general commentary in one paragraph. This can be multiple sentences. Defects/deterioration should not be included in this paragraph.
2. Notes that do not fall into a specific defect such as graffiti, debris accumulation, vagrants.
3. General (typical or widespread) defect notes about the element condition.
4. Individual member defect notes.
    a. Secondary members such as diaphragms will usually be included in this section.
5. Notes within each element section listed above (description, non-defect, general, Individual) should be listed in direction of inventory.

Other than the general description paragraph, each note within an element should be broken out into separate lines. Notes may be multiple sentences as needed. Add a blank line between each note.

Whenever possible, every defect note sentence should be written in the following order:

- Element member
- Location (from big to small)

- Defect Type
- Defect Size

Narrative descriptions of the conditions, both quantitative and qualitative, shall be provided indicating the extent of the affected areas and where they are situated. Each defect note should have the quantity, condition state, and defect # at the very end of each defect note that affects the condition states. This should go outside of the period at the end of the note. For notes with multiple sentences, put all condition state callouts at the end of the entire note, do not put these in the middle of a note between sentences.

- Format for condition state note: ([Quantity] CS# [defect number]). Examples:
  - (25 CS3 1080)
  - (10 CS2, 15 CS3 1080)
  - (100 CS3 1080) (50 CS2 1130)

All notes should be in present tense.

Conjecture shall not be included in the inspection notes.

Concrete and wearing surface crack widths should be reported in decimals.

- Cracks 1/8” or greater may be reported in fractions.

In lieu of a quantitative defect description, “Insignificant”, “Minor”, and “Moderate” may be used as a simplified callout for CS1, CS2, and CS3 defects respectively. (i.e. minor spall).

- Note that cracks also have specific callouts available for crack widths per the defect matrices (i.e. “medium width cracks” and “wide cracks”) and crack spacing (i.e. “medium map cracks” and “heavy map cracks”).
  - Be very clear with crack callouts since there are many different terms and “medium” can refer to either a crack width or a crack spacing.
- For CS3 defects, it is usually preferred to have specific dimensions documented rather than using “Moderate”.
  Off-system typically uses cardinal directions while on-system typically uses “forward”, “rear”, “left”, and “right” in reference to the direction of inventory.

Any load, speed, or traffic restrictions on the bridge should be noted. Inspectors should indicate if the signs are missing damaged, or incomplete. Inspectors should check for and note any advanced warning signs. Information about high water marks and unusual loadings should be included.

Here are some note examples:

General description:

- Galvanized corrugated metal decking, butted edge to edge, not overlapped at joints.
- 6 inch thick concrete topping slab on prestressed concrete slab girders.
- (5) weathering steel wide flange beams with channel diaphragms at 1/3 points.
- Concrete stub-type abutments on drilled caissons.
- Galvanized Type Y bridge rail on concrete curb.
- Galvanized W-beam rail with flared end protection welded to I-beam spacer blocks, welded to galvanized I-beam posts, welded to spacers, welded to exterior girder webs.
- 14 foot diameter corrugated aluminum multiplate pipe on large skew with 20 feet cover.

General (typical or widespread) defect notes:

- Cracking with efflorescence, and cracking with rust stain, respectively as follows: (estimated square feet) (x CS2 x CS3 1120)
  Bay 1A ()() 1B ()() 1C ()() 1D ()()
  Bay 2A ()() 2B ()() 2C ()() 2D ()()
  Bay 3A ()() 3B ()() 3C ()() 3D ()()
  Left overhang ()() Right overhang ()()

Deck Topside:

- Deck has widespread heavy map cracks up to 0.03 inch wide. (150 CS2 1130)

Deck Soffit:

- Bay 3B, east end, spall 3 feet wide x 1 foot long x 2 inches deep with exposed rebar with R1 rust. (1 CS3 1080)
- Girder 2A, north end of bottom flange, R2 rust for 3 feet. (3 CS3 1000)
- Abutment 3, under Bay 2B, 0.06 inch wide vertical crack. (1 CS3 1130)
- Truss 2A, L3 interior gusset plate, R3 rust throughout. (1 CS3 1000)
- Truss 2A, L1U2, top surface of top flange, R3 rust throughout. (1 CS3 1000)
- Abutment 1 footing, north end, scour has undermined footing for 10 feet long x 8 inches vertically x up to 11 inches horizontally back. (10 CS3 6000)
- Pier 2, Girder 1A bearing, R1 rust throughout. (1 CS2 1000)
- Pier 2, Girder 2A bearing, R1 rust throughout. (1 CS2 1000)

2.4 Nonredundant Steel Tension Member (NSTM) Inspection

The NSTM inspection requirements defined below apply to both On-System and Off-System major structures unless otherwise noted.

On-System major structures currently have tangible structure folders, and electronic structure folders, which are used by the inspection teams during inspections. The structure records for Off-System major structures are in an electronic format only.

A NSTM structure contains one or more nonredundant steel tension members or components. A NSTM is 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. NSTM's generally include lower chords of trusses, two girder bridges, and steel pier caps between two supports.

Federal Regulation 23 CFR 650.313 (05/2022) states in part:

> NSTM inspection. Identify the locations of NSTMs in the bridge files. Perform hands-on inspections of NSTMs in accordance with Section 4.2, AASHTO Manual.

2.4.1 General NSTM Inspection Requirements

NSTM inspections are to be completed at the same time as the routine inspection. If for some reason the inspection team cannot complete a full NSTM inspection, the inspection should be started and the

inspection team shall inspect all feasible NSTM's. Notify the CDOT Bridge & Structures Inspection Engineer and the Statewide Bridge Inspection Coordinator explaining why the NSTM inspection could not be completed. Arrangements will be made to complete the inspection, which may require a re-visit to the bridge by the same inspection team.

The inspection of NSTM's requires a hands-on inspection of the NSTM and components. A hands-on inspection requires the inspector to be within arm's length of the member or components to identify any deficiencies not readily detectable using routine inspection procedures. The visual inspection shall be supplemented by applicable nondestructive testing (NDT) where required by the condition of the NSTM or component, or as indicated by the NSTM inspection procedure.

When a significant defect (e.g., >30% corrosion section loss, out of plane distortion, fatigue crack, impact damage, etc.) is found within a NSTM or component:

- An Essential Repair Letter (ERL) or Critical Inspection Findings Letter (CIL) is to be initiated with the appropriate priority
- The routine inspection Interval is to be reduced until the defect is repaired

2.4.2 NSTM Pre-Inspection Documentation

Major Structures with NSTMs or components shall be identified in the structure record. The NSTMs, components, and any special inspection procedures, shall be identified within the structure record. Inspection requirements shall include methods to access / the method used to access the specific NSTMs at the time of the inspection, and, if applicable, any consideration to risk factors. Risk factors include: fatigue and fracture prone details (E, E'), problematic materials, poor welding techniques, potential out-of-plane distortion details, previous cracking or repairs, source of prior cracking, cold service temperatures, posted for load, superstructure condition rating (NBI Item 59) equal to 4 or less, subjected to overloads or impact damage, older service life, debris build-up, and high ADTT.

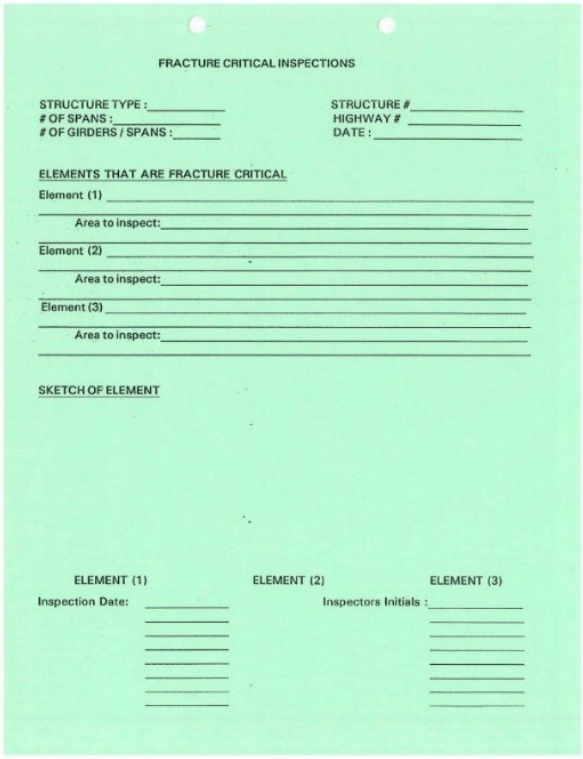
The NSTMs will be determined by an engineer and identified on the major structure sketches. Prior to the publication of this manual, they were identified using the symbol depicted in Figure 2-1 FCM Symbol. Beneath the Symbol shall be the member description (e.g., Bottom Chord, Floor Beam, etc.).

Any structures found to have NSTMs after 3/31/2024 will be identified with ✠ on the inspection sketch. The member and description shall be called out on the inspection sketch. Previous versions of the inspection sketch do not need to be updated to the NSTM format unless the sketch is updated due to significant repair or rehabilitation.

Figure 2-1 FCM Symbol

Prior to the publication of this manual, if the tangible structure folder exists for an On-System major structure, then the folder is to have a FCM inspection sheet, similar to the one depicted in Figure 2-2 Fracture Critical Inspection Sheet. Any structures found to have NSTMs after the date of this manual will

have a NSTM sheet similar to the one depicted in Figure 2-3 NSTM Sheet. All previous Fracture Critical inspection sheets will be updated to the NSTM sheet at their next scheduled inspection.



FRACTURE CRITICAL INSPECTIONS

STRUCTURE TYPE : _____ STRUCTURE # _____
OF SPANS : _____ HIGHWAY # _____
OF GIRDERS / SPANS : _____ DATE : _____

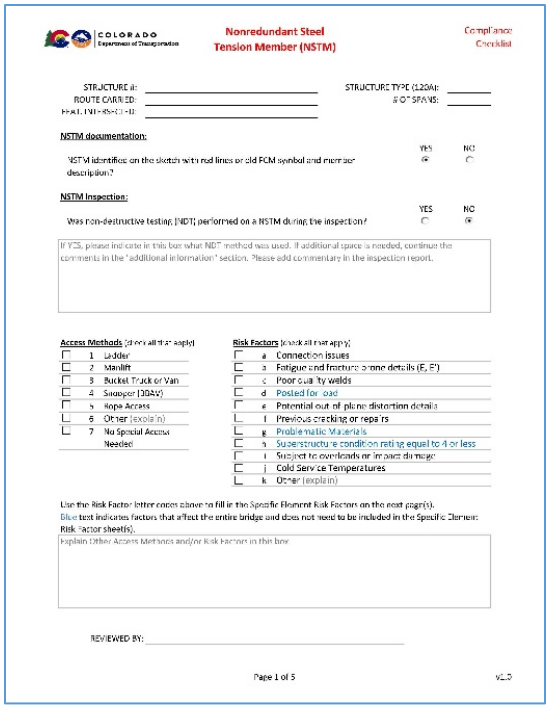
ELEMENTS THAT ARE FRACTURE CRITICAL

Element (1) _____
Area to inspect: _____
Element (2) _____
Area to inspect: _____
Element (3) _____
Area to inspect: _____

SKETCH OF ELEMENT

ELEMENT (1)	ELEMENT (2)	ELEMENT (3)
Inspection Date:	Inspectors Initials :	

Figure 2-2 FCM Sheet



COLORADO Department of Transportation

Nonredundant Steel Tension Member (NSTM)

Compliance Checklist

STRUCTURE #: _____ STRUCTURE TYPE (120A): _____
ROUTE CARRIED: _____ # OF SPANS: _____
FEAT. INTERSECTED: _____

NSTM documentation:

	YES	NO
NSTM identified on the sketch with red lines or old FCM symbol and member description?	◉	○

NSTM Inspection:

	YES	NO
Was non-destructive testing (NDT) performed on a NSTM during the inspection?	○	◉

If YES, please indicate in this box what NDT method was used. If additional space is needed, continue the comments in the "additional information" section. Please add commentary in the inspection report.

Access Methods (check all that apply)

- ☐ 1 Ladder
- ☐ 2 Manlift
- ☐ 3 Bucket Truck or Van
- ☐ 4 Snooper (120AV)
- ☐ 5 Rope Access
- ☐ 6 Other (explain)
- ☐ 7 No Special Access Needed

Risk Factors (check all that apply)

- ☐ a Connection issues
- ☐ b Fatigue and fracture prone details (E, E')
- ☐ c Poor quality welds
- ☐ d Posted for load
- ☐ e Potential out of plane distortion details
- ☐ f Previous cracking or repairs
- ☐ g Problematic Materials
- ☐ h Superstructure condition rating equal to 4 or less
- ☐ i Subject to overloads or impact damage
- ☐ j Cold Service Temperatures
- ☐ k Other (explain)

Use the Risk Factor letter codes above to fill in the Specific Element Risk Factors on the next page(s).
Blue text indicates factors that affect the entire bridge and does not need to be included in the Specific Element Risk Factor sheet(s).

Explain Other Access Methods and/or Risk Factors in this box:

REVIEWED BY: _____

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Figure 2-3 NSTM Sheet

2.5 Complex Feature Structure

The complex feature requirements below apply to both On-System and Off-System major structures unless otherwise noted.

2.5.1 General Complex Feature Major Structure Inspection Requirements

Complex Feature inspections are to be completed at the same time as the routine inspection. If for some reason the inspection team cannot complete the Complex Feature inspection, the Complex Feature inspection should be started (inspect what Complex Elements that can be inspected) and notify the CDOT Bridge & Structures Inspection Engineer and the Statewide Bridge Inspection Coordinator describing why the Complex Feature inspection could not be completed. Arrangements shall be made to complete the Complex Feature inspection. This may require a re-visit to the bridge by the same inspection team to complete the Complex Feature inspection.

Inspect the complex feature in accordance with the procedure within the structure records.

2.5.2 Complex Feature Structure Pre-Inspection Documentation

When a bridge with a complex feature is added to the system, the following must be included in the Structure Record:

- Identification of the complex features
- Documented inspection procedure for each complex feature
- Any additional inspector training and experience required for the complex feature inspection

- If a tangible structure folder exists for an On-System major structure, then:
  - The complex feature documentation is to be placed inside the left cover
  - The folder is to be marked on the front cover with “Complex”

Federal Regulation 23 CFR 650.313 (05/2022) states in part:

> *Develop and document inspection procedures for bridges which require NSTM, underwater, in-depth, and complex feature inspections in accordance with Section 4.2, AASHTO Manual (incorporated by reference,* see *§ 650.317).*

For national guidance on complex features inspections see:

- FHWA Bridge Inspector's Reference Manual Chapters 5 and 12

CDOT Commentary

> As of the last revision of this manual there are no complex feature major vehicular bridges identified as part of the CDOT On-System or Off-System major structure inspection program.

2.6 Structure Pin Nondestructive Testing

Structure Pin Nondestructive Testing requirements below apply to both On-System and Off-System major structures unless otherwise noted.

Structure pins are tested using the nondestructive testing procedure outlined in the CDOT Quality Assurance Procedure 5957, Ultrasonic Inspection Procedure for Bridge Pins.

An ASNT Board Examined Level III shall interpret the test reports and determine their disposition. The Level III shall report their interpretations in writing to the CDOT Bridge & Structure Engineer, or their designee.

In addition, structure pin visual hands-on inspections are required during each routine inspection.

2.7 Underwater

Underwater requirements below apply to both On-System and Off-System major structures unless otherwise noted.

CDOT makes use of an underwater inspection for any major structure with a water depth greater than three feet which cannot be inspected visually at low water by wading or probing.

2.7.1 General Underwater Inspection Procedures

- **General:** Perform a visual and tactile inspection of the structural elements below the waterline
  - Clean ten percent at a minimum of the structural elements of any obstructing vegetation or other material to facilitate the inspection
  - Clean piles in approximately one-foot-wide bands at the waterline, mud line and mid-height
  - Clean one foot square areas at the waterline, mud line and mid-height on pier noses, sides and tails

    - Clean one foot square areas at the waterline, mud line and mid-height on abutments noses, sides and tails
- **Dangerous Conditions:** If a dangerous situation is discovered, the Inspection Team Leader is to notify the CDOT Bridge & Structures Inspection Engineer of the situation and follow up in writing with the details and a recommended plan of action.
- **Recompression Chamber:** Utilize an on-site recompression chamber where deemed appropriate, or as specified by the CDOT Bridge & Structures Inspection Engineer.
- **Concrete Piles, Piers and Abutments:** Check all concrete for evidence of damage (e.g., cracks, discoloration, deformation, scaling, delamination, erosion, wear, abrasion, scaling, spalling, exposed reinforcing steel, reinforcing steel section loss, etc.).
- **Steel Piles and Steel Encased Piers:** Check all steel for evidence of damage (e.g., corrosion, misalignment, distortion,cracks, section loss, etc.).
- **All Timber:** Sound and probe with a heavy-duty minimum 6-inch blade ice pick or awl and check for evidence of damage (e.g., vermin damage, fungus decay, collision damage, over stress damage, excessive weathering, etc.).
- **Submerged Foundations:** Probe the channel bottom around the piers and abutments and note the presence, size and condition of any riprap.
- **Submerged Riprap, Fills, and Foundations:** Inspect for signs of displacement or erosion.
- **Submerged Rock Bolt Areas:** Identify any loose or damaged rock bolts by striking the bolt end and retainer plate with a hammer on a minimum of 25% of the rock bolts. Tested bolts should be tagged or otherwise identified in order to check untested bolts on future inspections.
- **Depth Soundings:** Take soundings around each pier, along both bridge fascias, and at a minimum of 2 Streambed Profiles between 50' and 200' upstream and downstream (depending on the size of the waterway).Streambed Profile
    - Utilize a continuous reading strip chart fathometer unless water conditions preclude use of a boat, in which case sounding poles or lead lines may be utilized.
    - Reference elevations to the brass cap located on the bridge or other point of known elevation, such as a bridge seat if a brass cap is not present.
- **Underwater Imaging:**
    - Capture digital color photos to document underwater conditions.
    - Capture digital color photos using a "clear water" box in murky water where appropriate
    - Use sonar imaging underwater where appropriate.
    - Use 3-D laser scanning (i.e., LiDAR) underwater where appropriate.
- **In-Depth Inspections:** Recommend In-Depth inspections where deficiencies are suspected that cannot be fully defined by the visual and tactile inspection.
- **Site Visits:** When the water depth is less than three feet at time of the scheduled underwater inspection, inspect all identified underwater elements defined in the previous underwater inspecton and report on those findings in a site visit inspection report.
- **Inspection Findings:** Address essential repair or critical inspection finding needs per Section 16 Inspection Findings.
- **Reporting:** Complete an inspection report for each structure to document:
    - Underwater inspection procedures
    - Underwater structural element locations
    - Inspected substructure unit conditions

- Adjacent channel bottom conditions
- Repair recommendations
- Recommendations for in-depth inspections

2.8 Special Element

Used for inspecting a specific structural element at an Interval less than 12 months.

Special Element requirements below apply to both On-System and Off-System major structures unless otherwise noted.

Special Element Inspections are in addition to the Routine Inspections and are intended for damaged or deteriorated elements until repaired or replaced.

2.8.1 General Special Element Inspection Procedures

- Inspect the identified element using the defined procedures
- Document the element condition in the element notes
- Document anything else discovered in the inspection notes as appropriate

2.8.2 Special Element Pre-Inspection Documentation

The following must be included in the Structure Record when a Special Element Inspection is required:

- Identification of the Special Elements
- An inspection procedure for each Special Element

2.9 Initial Inspections

Initial Inspections requirements below apply to both On-System and Off-System major structures unless otherwise noted.

Federal Regulation 23 CFR 650.313 (b) (05/2022) states in part:

- An initial inventory and condition assessment is to be performed for each new, replaced, rehabilitated, and temporary bridge as soon as practical, of the bridge opening to traffic.

2.9.1 On-System Major Structure Initial Inspection

The Staff Bridge PE II assigned to the Region will notify the CDOT Bridge & Structures Inspection Engineer and the Structure Asset Management Engineer when the Bridge Construction Review is scheduled to take place. An effort will be made by the Bridge Inspection Unit to perform the initial inventory and condition assessment during the bridge construction reviews.

2.9.2 Off-System Major Structures Initial Inspection

An initial inventory and condition assessment is to be performed for each new, replaced, rehabilitated, and temporary bridge as soon as practical, but within 3 months of the notification from the bridge owner.

The Contractor shall contact all bridge owners in their assigned area a minimum of once each quarter to learn of changes in their bridge inventory so that initial inspections can be scheduled within 3 months of final project acceptance.

2.9.3 Minor Structure Initial Inspection

Initial minor structure inspections are to be performed on newly constructed minor structures within 3 months of project final acceptance by CDOT or when discovered by the minor structure inspection team.

2.9.4 Miscellaneous Structure Initial Inspection

Initial miscellaneous structure inspections are to be performed on newly constructed miscellaneous structures within 3 months of project final acceptance by CDOT or when discovered by the miscellaneous structure inspection team.

2.10 Human Action Damage Inspection

Used to assess structural damage resulting from damage caused by human actions (e.g., vehicle impact)

Human Action Damage Inspection requirements below apply to both On-System and Off-System major structures unless otherwise noted.

The accident damage inspection is typically initiated after the event and scheduled as directed by the program manager considering accident severity.

2.10.1 Human Action Damage Inspection Procedures

Inspect and document all damage caused by the incident.

- Impact Damage – Inspect beyond the point of impact
    - Connections to adjacent girders, bearings, etc. may also be effected
- Document the date, approximate time of damage, and the reason for the Human Caused Damage Inspection in the Inspection Report Notes
- Take photos to document the damage in sufficient quality to aid the repair designer
- Prepare tally sheets or sketches to document the damage in sufficient detail to aid the repair designer

2.11 Natural Event Damage Inspection

Used to assess structural damage resulting from damage caused by environmental factors (e.g., flooding, scour, forest fires, rock fall, etc.)

Natural Event Damage Inspection requirements below apply to both On-System and Off-System major structures unless otherwise noted.

The natural event damage inspection is typically initiated after the natural event but can be requested during the event. The inspection is scheduled as directed by the program manager considering the event severity.

2.11.1 Natural Event Damage Inspection Procedures

Inspect and document all damage caused by the natural event.

- Inspect beyond the obvious damage. Other members may also be affected.
- Document the date and the reason for the Natural Event Damage Inspection in the Inspection Report Notes
- Take photos to document the damage in sufficient quality to aid the repair designer
- Prepare tally sheets or sketches to document the damage in sufficient detail to aid the repair designer

2.12 Special Inspection

Special inspections are those that do not fall into the other defined inspection types and are typically performed between routine inspections. An inspection scheduled at the discretion of the bridge owner, used to monitor a particular known or suspected deficiency, or to monitor special details or unusual characteristics of a bridge that does not necessarily have defects. Special inspections will also be used when a follow-up inspection is needed due to inaccessability or any other reason where an inspection could not be completed within one week of the start date of the inspection.

Special Inspection requirements below apply to both On-System and Off-System major structures unless otherwise noted.

The CDOT Bridge & Structures Inspection Engineer may designate other special inspection types beyond Special Element.

Special Inspection scheduling is determined by the CDOT Bridge & Structures Inspection Engineer or Inspection Consultants Program Manager.

2.13 In-Depth

An in-depth inspection is a close-up inspection of one or more members above or below the water level to identify any deficiencies not readily detectable using routine inspection procedures.

In-Depth requirements below apply to both On-System and Off-System major structures unless otherwise noted.

An in-depth inspection is not included in the typical contractor inspection task order. Therefore, a separate task order is typically required if an in-depth inspection is needed.

The following Non-Destructive testing methods are utilized by CDOT:

- Visual hands-on inspection for surface defects
- Magnetic-Particle Testing for steel cracks
- Dye-Penetrant Testing for steel cracks
- Ultrasonic Testing for steel cracks or flaws, and thickness measurements for section loss to corroded steel members
- Hammer sounding to detect concrete delamination
- Probing for timber rot using a heavy-duty minimum 6-inch blade ice pick or awl
- Probing for timber rot using a resistograph
- Consider a chain drag for exposed concrete deck delaminations

3 Inspection Interval

The inspection interval is the time interval between inspections.

3.1 Inspection Interval Matrixes

Table 3-1 Routine Inspection Intervals by Inspected Asset Type

Inspected Asset Types	Default	Reduced Condition	Maximum
Major Structures	24-months	12-months or less	72-months[2]
Minor Structures			
● **Minor Culvert**	48-months	12-months or less	72-months[1]
● **Minor Bridge w/fill depth ≥ 2ft**	48-months	12-months or less	72-months[1]
● **Minor Bridge or Minor Concrete Box Culvert w/fill depth < 2ft**	24-months	12-months or less	24-months
Miscellaneous Structures	48-months	12-months or less	72-months[1]

Table 3-2 Inspection Interval by Inspection Type

Inspection Type	Schedule	Default	Reduced Condition	Maximum
Routine	24-months	24-months	12-months or less	72-months[1]
Nonredundant Steel Tension Member Bridges	W/Routine	24-months	12-months or less	24-months
Complex Feature Structure	W/Routine	24-months	Case-by-case[1]	24-months
Structure Pin Nondestructive Testing	48-months	60-months	Case-by-case[1]	60-months
Underwater	48-months	60-months	24-months or less	72-months
Special Element	Case-by-case[1]	Case-by-case[1]	Case-by-case[1]	12-months
Special	Case-by-case[1]	Case-by-case[1]	12-months or less	Case-by-case[1]
In-Depth	Case-by-case[1]	Case-by-case[1]	Case-by-case[1]	N/A

[1] As approved by the CDOT Bridge & Structures Inspection Engineer
[2] CDOT currently has a maximum Routine, NSTM, and Complex Feature interval of 48 months.

3.2 Routine

3.2.1 Default Routine Inspection Interval Criteria

3.2.1.1 Major Structures

Federal Regulation 23 CFR 650.311(a)(1)(i) (05/2022) states:

> Each bridge must be inspected at regular intervals not to exceed 24 months, except as required in paragraph (a)(1)(ii) of this section and allowed in paragraphs (a)(1)(iii) of this section.

The default routine major structure inspection interval used by CDOT is 24-months. In order to remain at a 24-month interval, the structure condition NBI Items 58, 59, 60, and 62 or SNBI Items B.C.01, B.C.02, B.C.03, B.C.04, and B.C.11 must be at or above the minimum values listed in Table 3-3 below.

Table 3-3 Major Structure Default Inspection Interval Minimum Condition Values

NBI Item / SNBI Item	Bridge Minimum	Culvert Minimum
58 / B.C.01 Deck Condition	4	N
59 / B.C.02 Superstructure Condition	4	N
60 / B.C.03 Substructure Condition	4	N
62 / B.C.04 Culvert Condition	N	4
113 / B.C.11 Scour Condition Rating	4	4

If one or more structure condition NBI Items 58, 59, 60, and 62 or SNBI Items B.C.01, B.C.02, B.C.03, and B.C.04 drops below the minimum values listed in Table 3-3 above, then see subsection 3.2.2.1 for the major structure reduced condition inspection interval criteria.

See subsection 3.2.3.1 for the major structure maximum routine inspection interval criteria.

3.2.1.2 Minor Structures

Table 3-4 Minor Structure Default Inspection Intervals

Minor Structure	Fill Depth	Default Routine Inspection Interval
Minor Culvert	Any	48-months
Minor Bridge	≥ 24 inches	48-months
Minor Bridge or Minor Concrete Box Culvert	< 24 inches	24-months

In order to remain at the minor structure default inspection interval, the structure condition NBI Items 58, 59, 60, and 62 or SNBI Items B.C.01, B.C.02, B.C.03, and B.C.04 must be at or above the minimum values listed in Table 3-5 below.

Table 3-5 Minor Structure Default Inspection Interval Minimum Condition Values

NBI Item / SNBI Item	Bridge Minimum	Culvert Minimum
58 / B.C.01 Deck Condition	4	N
59 / B.C.02 Superstructure Condition	4	N
60 / B.C.03 Substructure Condition	4	N
62 / B.C.04 Culvert Condition	N	4

If one or more structure condition NBI Items 58, 59, 60, and 62 or SNBI Items B.C.01, B.C.02, B.C.03, and B.C.04 drops below the minimum values listed in Table 3-5 above, then see subsection 3.2.2.1 for the minor structure reduced condition inspection interval criteria.

See subsection 3.2.3.2 for the minor structure maximum routine inspection interval criteria.

CDOT Commentary

Fill depth on minor bridge structures can be difficult to determine without as-built plans, probing, or excavating a pothole. If there are headwalls, then the fill depth can be estimated with reasonable accuracy.

3.2.1.3 Miscellaneous Structures

The default routine miscellaneous structure inspection interval is 48-months.

In order to remain at the miscellaneous structure default inspection interval, the structure condition NBI Items 58, 59, 60, and 62 or SNBI Items B.C.01, B.C.02, B.C.03, and B.C.04 must be at or above the minimum values listed in Table 3-6 below.

Table 3-6 Miscellaneous Structure Default Inspection Freq Min Condition Values

NBI Item / SNBI Item	Bridge Minimum	Culvert Minimum
58 / B.C.01 Deck Condition	4	N
59 / B.C.02 Superstructure Condition	4	N
60 / B.C.03 Substructure Condition	4	N
62 / B.C.04 Culvert Condition	N	4

If one or more structure condition NBI Items 58, 59, 60, or 62 or SNBI Items B.C.01, B.C.02, B.C.03, and B.C.04 drops below the values in Table 3-6 above, then see subsection 3.2.2.1 for the miscellaneous structure reduced condition inspection interval criteria.

See subsection 3.2.3.3 for the miscellaneous structure maximum routine inspection interval criteria.

3.2.2 Reduced Routine Inspection Interval Criteria

3.2.2.1 Major, Minor, and Miscellaneous Structures

The following applies to all inspection types.

Major, minor, or miscellaneous structures meeting one of the following criteria will be inspected on a 12-month maximum interval:

Table 3-7 12-Month Inspection Interval Maximum Condition Values

NBI Item / SNBI Item	Maximum Value
58 / B.C.01 Deck Condition	3
59 / B.C.02 Superstructure Condition	3
60 / B.C.03 Substructure Condition	3
62 / B.C.04 Culvert Condition	3
113 / B.C.11 Scour Critical Bridges	3

Table 3-8 12-Month Inspection Interval Component Conditions

Component	Conditions that warrant a 12-month interval
Steel bridges	Active fatigue cracks in primary load bearing tension members that have not been arrested, Steel truss gussets with significant amounts of corrosion that reduces the capacity of the truss
Steel piles	Significant corrosion that reduces the capacity of the substructure
Timber bridges	Split stringers that have not been repaired
Timber piling	Advanced rot that reduces the structural capacity of the member.
Bearings	Greater than 50% bearing loss that have not been repaired (e.g., corbels have not been installed)
All	Any other criteria as determined by the team leader and agreed by the CDOT Bridge & Structures Inspection Engineer or the Inspection Consultant's Program Manager

Once deficiencies have been adequately repaired and there are no other defects requiring a lower condition rating, the inspection interval will return to a 24-month inspection interval.

The level of inspection will be as per the AASHTO Manual for Bridge Evaluation, AASHTO Manual for Bridge Element Inspection, and the FHWA Bridge Inspector's Reference Manual. If additional inspection procedures are required, then document the procedures in the structure record. The reason for the reduced inspection interval shall be documented in the Schedule Notes section of the inspection report.

Table 3-9 12-Month Inspection Interval Bridge Notes Examples

Schedule Notes Examples
2016-11-14: Inspection interval changed from 24-months to 12-months due to, Item 59 = 3.
2016-11-14: Inspection interval changed from 24-months to 12-months due to, timber piling with advanced rot that reduces the structural capacity of the member.
2016-11-14: Inspection interval changed from 24-months to 12-months due to, fatigue cracks in main members in tension have not been arrested.

3.2.3 Maximum Routine Inspection Interval Criteria

3.2.3.1 Major Structures

The maximum Major Structure routine inspection interval allowed by FHWA is 72-months using method 2 as described in Federal Regulation 23 CFR 650.311(a)(2). CDOT does not currently utilize method 2.

Federal Regulation 23 CFR 650.311(a) (05/2022) states in part:

> Each bridge must be inspected at regular intervals not to exceed the interval established using one of the risk-based methods outlined in paragraph (a)(l) or (2) of this section.

The 48-month inspection interval is optional, representing a maximum, and does not preclude inspections at a lesser interval. Major structures that are eligible for the 48-month inspection interval may, at the discretion of the owner, be inspected at more frequent intervals.

The major structures currently receiving 48-month inspections will be reviewed periodically to identify any major structures that no longer qualify for a 48-month inspection interval or will no longer qualify for a 48-month inspection interval at or before their next scheduled inspection using the 48-Month Inspection Interval Criteria.

All major structures that no longer qualify for a 48-month inspection interval or will no longer qualify for a 48-month inspection interval, at, or before their next scheduled inspection will be rescheduled to a 24-month inspection interval. Any structure that will not be late at the next inspection will have the interval changed at the time of the review. Structures found to be late if the interval is updated at the review will have a note placed in the Inspection Notes for the next inspector to update the interval at the next scheduled inspection. The following note will be used:

(date of review) (reviewer initials), inspector please revise the inspection interval from 48 to 24 during your next inspection and add the following note to the Inspection Schedule Notes: (enter inspection date), Routine Inspection interval changed to 24-month due to (reason).

Parallel major structures will both have the lowest inspection interval for which they are eligible.

Previously if a tangible structure folder for an On-System major structure existed, then the front cover was to be marked with the information in the following figure, Figure 3-1.

48 MONTH INSPECTION FREQUENCY
The bridge will no longer eligible in 20__
The bridge will no longer eligible for a 48 month inspection frequency if:
Age is greater than 50 years or if it has been more than 30 years since reconstruction.
Annual Average Daily Traffic (AADT) is greater than 30,000.
Annual Average Daily Truck Traffic (AADTT) is greater than 3,000.
AADT and AADTT restrictions do not apply to culverts with more than 2 feet of fill.
Item 41, Open Closed Posted, is not coded "A"
The following NBI Items are less than 6:

Item 58, Deck Condition	Item 67, Structural Evaluation
Item 59, Superstructure Condition	Item 68, Deck Geometry
Item 60, Substructure Condition	Item 69, Under Clearances
Item 61, Channel and Channel Protection	Item 71, Waterway Adequacy
Item 62, Culverts	Item 72, Approach Roadway Alignment

Inform the Bridge Inspection Engineer and the Bridge Asset Management Engineer if the bridge is no longer eligible for a 48 month inspection frequency.

Figure 3-1 48-Month Inspection Folder Label

Major structures with a 24-month inspection interval may be reviewed to determine if any are eligible for a 48-month inspection interval using the 48-Month Interval Criteria. For major structures, when the review by an inspector or Qualified Team Leader indicates that major structures are eligible to move to the 48-month inspection interval, the individual will send an email to the Colorado Bridge and Structures Engineer, Colorado Bridge Asset Manager, Statewide Bridge Inspection Coordinator, and the Statewide Structures Inspection Coordinator requesting the change. At a minimum the request will include the structure number, and all data fields reviewed for the 48-month inspection interval criteria.

If the review was completed by the Asset Management Team, an email will be sent to the Colorado Bridge and Structures Engineer, Colorado Bridge Asset Manager, Statewide Bridge Inspection Coordinator, and the Statewide Structures Inspection Coordinator requesting approval of the change. At a minimum the request will include the structure number, and all data fields reviewed for the 48-month inspection interval criteria.

The Asset Management Team will keep a running list of all structures on an extended interval. The list will include the structure number, and all data fields reviewed for the 48-month inspection interval criteria.

The structures will be listed and provided to the FHWA Colorado Division Bridge Engineer upon request.

If any Off-System major structure will be placed on a 48-month inspection interval, a notice to the Colorado county or municipality owner shall be by email, Certified Mail or any mail service that provides a similar proof of mailing.

Currently we are operating under our pre-SNBI 48-month inspection interval criteria as described above. There are new criteria in the NBIS regulations, 23 CFR 650.311(a)(1)(iii). Both criteria are similar but use different data fields. Until we get the bridge data updated to the new SNBI coding we will not be adding any bridges to the 48-month inspection interval. Once the data is updated the Asset Management Unit will evaluate all Major Vehicular Bridges and we will make changes to the intervals at that time. A bridge should still be removed from the 48-month inspection interval if it no longer meets one of the current pre-SNBI criteria.

3.2.3.1.1 Major Structure 48-Month Inspection Interval Criteria

The major structures eligible for a 48-month inspection interval are limited by structure type, structure condition, and structure capacity.

The structure types eligible for a 48-month inspection interval are defined by the following NBI Items and the codes in the table below:

- NBI Item 43 - Structure Type Main
- NBI Item 44- Structure Type Approach Spans

SNBI Items B.SP.04 – Span Material and B.SP.06 – Span Typeable 3-10 48-Month Inspection Interval Structure Types

43A & 44A Material 1st DIGIT (SNBI Item B.SP.04)	43B & 44B Design or Construction 2nd & 3rd DIGIT (SNBI Item B.SP.06)	DESCRIPTION
1, 2, 5, 6 – C01, C02, C03, C04, C05	01 – F01, S01, S02	Slabs and 3 Sided Frames
1,2,3,4,5,6 – C01, C02, C03, C04, C05, S01, S02, S03, S04, S05	02, 22 – G01, G02, G07, G08	Stringer/Multi beam/Girder
1,2,5,6 – C01, C02, C03, C04, C05	04 – G03, G04, G05, G06	Tee Beams
1,2,3,4,5,6 – C01, C02, C03, C04, C05, S01, S02, S03, S04, S05	05, 06, 22 – B02, B03, G01, G02, G03, G04, G05, G06, G08	Box beams/Box girder
1,2, 5, 6 – C01, C02, C03, C04, C05	19– A01, F02, P01, P02,	Culverts or Arches

The structure condition must be 6 or greater for the NBI / SNBI Items denoted in the following table in order to qualify for a 48-month inspection interval.

Table 3-11 48-Month Inspection Interval Minimum Condition NBI Items

NBI / SNBI Item	Description	Minimum Value
10	Max Clearance	≥14'-0"
53	Min Clr Ovr Brdg	≥14'-0"
54B	Min Underclr	≥14'-0"
58 / B.C.01	Deck	6
59 / B.C.02	Superstructure	6
60 / B.C.03	Substructure	6
61 / B.C.09	Channel	6
B.C.10	Channel Protection	6
62 / B.C.04	Culverts	6
67	Structural Evaluation	6
68	Deck Geometry	6
69	Under Clearances Vertical & Horizontal	6
71	Waterway Adequacy	6
72	Approach Roadway Alignment	6
134B	N/E Vertical Clearance Maximum	≥14'-0"
135B	S/W Vertical Clearance Maximum	≥14'-0"
B.H.13	Highway Minimum Vertical Clearance	≥14'-0"

The eligible structures must be capable of carrying Colorado legal loads at the inventory stress level which has been determined to be HS18 or greater for bridges; or HS15 or greater for concrete culverts under fill.

Where NBI Item 65, Method Used to Determine Inventory Rating, is 1, 2, or 3

Table 3-12 48-Month Inspection Interval Minimum Rating in Metric Tons

NBI Item	Structure Type	Minimum Value	Minimum Value	Minimum Value
		database value	metric tons	Customary U.S. tons
66	Bridge	294	29.4	32.4
66	Concrete culverts under fill	245	24.5	27.0

Where NBI Item 65, Method Used to Determine Inventory Rating, is 6, 7, or 8

Table 3-13 48-Month Inspection Interval Minimum Rating is RF

NBI Item	Structure Type	Minimum Value	Minimum Value
		database value	rating factor
66	Bridge	090	0.90
66	Concrete culverts under fill	075	0.75

Eligible major structures must not require any legal load restrictions.

Table 3-14 48-Month Inspection Interval Structure Open with No Restrictions

NBI / SNBI Item	Required Value	Description
41 / B.PS.01 Structure Open, Posted, or Closed to Traffic / Load Posting Status	A/ PO	Open, no restriction

The longest span may not exceed 100’.

Table 3-15 48-Month Inspection Interval Maximum Span Length

NBI / SNBI Item	Maximum Value (database value)	Minimum Value (meters)	Minimum Value (feet)
48 / B.G.03, Length of Maximum Span	00304	30.4	100

Major structures will not be considered for a 48-month inspection interval immediately following construction, reconstruction, or major rehabilitation. At least one routine NBIS inspection must be performed before a bridge qualifies for the 48-month program. The first routine inspection after the initial inspection must be performed at least one year after the construction was completed.

The eligible major structures must possess load path redundancy (i.e., no trusses, no two girder systems, and no single cell box girder type structures).

The eligible structure must: not be scour critical, have a scour evaluation, have a known foundation, and not have any open scour related essential repair notices.

Table 3-16 48-Month Inspection Interval Not Scour Critical

NBI / SNBI Item	Description	Eligible Values
113 / B.C.11	Scour Critical Bridges	N, T, 9, 8, 7, or 6
B.AP.03	Scour Vulnerability	= A or B

The Average Daily Traffic must not be greater than 30,000 and the Average Daily Truck Traffic must be less than 3,000. However, this restriction does not apply to culverts with more than 2 feet of cover.

Table 3-17 48-Month Inspection Interval Daily Traffic Limits

NBI / SNBI Item	Maximum Value	Maximum Calculated Value
29 / B.H.09, Average Daily Traffic (ADT)	30,000	---
109 / B.H.10, Average Daily Truck Traffic (ADTT)	Percentage of ADT	3000

Major structures of uncommon design, unusual design, or designs where there is limited performance history (e.g., segmental bridges) are not eligible.

The major structure must be less than 50 years old or reconstructed within the past 30 years.

Table 3-18 48-Month Inspection Interval Major Structure Age Limits

NBI / SNBI Item	Maximum calculated age from the current year
27 / B.W.01, Year Built	50
or	
106, Year Reconstructed	30

Discovery of unusual problems shall be cause for a major structure to revert back to a maximum 24-month inspection interval.

Major structures with repair histories that indicate a strong probability of future problems will not be eligible for a 48-month inspection interval (e.g., bridges that get hit often by high loads).

3.2.3.2 Minor Structures

The minor structure inspection interval may be increased beyond the default up to the maximums defined below if approved by the CDOT Bridge & Structures Inspection Engineer.

3.2.3.3 Miscellaneous Structures

The miscellaneous structure inspection interval may be increased beyond the default up to the maximum defined below if approved by the CDOT Bridge & Structures Inspection Engineer.

3.3 Major Structure NSTM Inspection Interval

The default and maximum routine Major Structure with NSTMs inspection interval is 24-months and is performed at the same time as the routine inspection.

Federal Regulation 23 CFR 650.311(a)(1)(iii)(3) (05/2022) states in part:

> *Regular intervals.* Each bridge must be inspected at regular intervals not to exceed 24 months, except as required in paragraph (a)(l)(ii) of this section and allowed in paragraphs (a)(l)(iii) of this section.

The level of inspection will be as per the AASHTO Manual for Bridge Evaluation, AASHTO Manual for Bridge Element Inspection, and the FHWA Bridge Inspector's Reference Manual. If additional inspection procedures are required, then document the procedures in the structure record.

3.4 Complex Feature Structure Inspection Interval

Complex Feature Structure inspections are to be completed at the same time as the routine inspection.

3.5 Structure Pin Nondestructive Testing Interval

The default Structure Pin Nondestructive Testing interval is 60-months but inspections are scheduled every 48-months to mitigate potential delays encountered in the past.

3.6 Underwater Inspection Interval

The default underwater inspection interval is 60-months, but inspections are scheduled every 48-months to mitigate potential delays encountered in the past.

Federal Regulation 650.311(b) states in part:

> *Underwater inspections.* Each bridge must be inspected at regular intervals not to exceed the interval established using one of the risk-based methods outlined in paragraph (b)(1) or (2) of this section.

Major structures requiring underwater inspections will be identified in Colorado's database. Underwater elements on these major structures shall be inspected by divers on an interval not to exceed 60-months.

The inspection level and interval of major structures requiring less than 60-month frequencies will be as determined by the CDOT Bridge & Structures Inspection Engineer or Inspection Contractors Program Manager. Reduced inspection intervals are to be determined considering:

- Open essential repair findings
- Foundation type

- Foundation defects
- Known scour issues
- Scour severity
- Potential for additional scour

3.7 Special – Element Inspection Interval

Special element inspections occur at an interval less than 12 months and are scheduled to occur between routine inspections as determined by the CDOT Bridge & Structures Inspection Engineer or Inspection Consultant Program Manager.

4 Inspection Scheduling

Structure inspections are scheduled to balance available budget and available inspection personnel and are grouped to limit total travel distance.

On-System major structures are assigned an inspection quarter (3-month period). In that inspection quarter they are assigned a "trip" and an inspection target month within that quarter. Required inspection months will be determined based on the historical inspection month, and the historical assigned inspection quarter.

Off-System major structures are assigned a target month and grouped by owner.

All other asset classes are scheduled based on the previous inspection date plus the inspection interval and generally grouped geographically.

Any changes to the inspection schedule outside the tolerance in the tables below require the Bridge & Structures Inspection Engineer's approval. Rare and unusual circumstances must be approved by FHWA in advance of the inspection due date plus the tolerance.

4.1 Inspection Scheduling Matrices

Table 4-1 Routine Inspection Scheduling by Asset Type

Asset Type	Routine Inspection Schedule	Tolerance
Major Structures	Within the required month	
24-Month interval or greater		Plus three months [3]
Less than 24-Month interval		Plus two months [3]
Minor Structures	Within the required month	Plus or minus two months
Miscellaneous Structures	Within the required month	Plus or minus two months

Table 4-2 Inspection Scheduling by Inspection Type

Inspection Type	Inspection Schedule	Tolerance
Routine	Within the required month	
24-Month interval or greater		Plus three months [3]
Less than 24-Month interval		Plus two months [3]
Nonredundant Steel Tension Member	Within the required month and coincident with routine inspection	None[Error! Bookmark not defined.]
Complex Feature Structure	Within the required month and coincident with the routine inspection	None[Error! Bookmark not defined.]

Inspection Type	Inspection Schedule	Tolerance
Structure Pin Nondestructive Testing	Within the required month	None[Error! Bookmark not defined.]
Underwater	Within the required year	None[Error! Bookmark not defined.]
Special Element	Within the required month	None[Error! Bookmark not defined.]
Special	Within the required month	None[Error! Bookmark not defined.]
In-Depth	Within the required month	None[Error! Bookmark not defined.]

[1] As approved by the CDOT Bridge & Structures Inspection Engineer

[2] CDOT currently has a maximum interval of 48 months.

[3] FHWA allows the tolerance, but CDOT will make every reasonable effort to inspect in the correct month.

Table 4-3 Initial Inspection Scheduling by Asset Type

Asset Type	Initial Inspection Schedule
Major Structures	Within 90-days of Project Acceptance
Minor Structures	Within 90-days of Project Acceptance or as discovered
Miscellaneous Structures	Within 90-days of Project Acceptance or as discovered

Table 4-4 Ad Hoc Inspection Scheduling by Inspection Type

Inspection Type	Ad Hoc Inspection Schedule
Human Action Damage	After the event Inspection to be scheduled as directed by the program manager considering damage severity
Natural Event Damage	After the event or during the event Inspection to be scheduled as directed by the program manager considering event severity

5 Inspection Access

Table 5-1 Inspection Access Type Matrix

Inspection Access Type	Description
Ladder	Used to access bridge elements above the ground level or above the structure roadway level
Aerial Work Platform (AKA bucket truck or aerial lift)	Used to access structure elements above ground level or above the roadway
Below Bridge Access Vehicle	Used to access bridge elements under a bridge that are not accessible from the ground below the bridge
Rope	Used to access bridge elements by climbing that are not accessible from the ground below the structure or the from the roadway on the structure

If any special access requirements are required, Item 133 will be coded 88 and any special inspection access notes will be recorded in USERBRDG table in the USER_BRDG_KEY08 field.

5.1 Ladder Access

Ladder access is used for inspection access where appropriate on any of the inspection subprograms or inspection types. A significant number of structures within Colorado require a ladder for a complete field inspection.

5.2 Aerial Work Platform

An aerial work platform (AKA bucket truck or aerial lift) is used to access structure elements that are not accessible using a ladder from the ground below the structure or the roadway surface on the structure. A number of structures within Colorado require an aerial work platform to complete the field inspection.

5.3 Below Bridge Access Vehicle

The below bridge access vehicle (Aspen Aerials A-40) is used to access structure elements under a bridge that are not accessible from the ground below the bridge using a ladder or an aerial work platform. A number of bridge structures within Colorado require the below bridge access vehicle to complete the field inspection.

5.4 Rope Access

Rope access is used for inspection access where other inspection access methods are not appropriate (e.g., Red Cliff Arch over the Eagle River, trusses where the A-40 can't be used to access the bottom chord,) on any of the inspection subprograms or inspection types.

All rope access inspections are to be performed following Society of Professional Rope Access Technicians (SPRAT) guidelines (https://sprat.org/).

6 Streambed Profile

Streambed Profiles were previously known as Scour Charts. Channel Cross Section is a more accurate term to describe what is being produced than Streambed Profile or Scour Chart and may be used in future versions of this manual. It was not used in this version to avoid having to change old file names to match.

Provide a Streambed Profile with each inspection report for structures that span across waterways, dry streambeds, gullies, or potential waterways.

Update the Streambed Profile during every routine inspection if the structure is scour critical, does not have a scour evaluation, the foundation is unknown, or there is an open scour related essential repair notice (i.e. NBI Item 113 = U, 6, 4, 3, 2, 1, or 0 or SNBI Item B.AP.03 = 0, C, D, E, U or SNBI Item B.C.11 = 5, 4, 3, 2, 1).

Update the Streambed Profile during every other routine inspection if the structure is not scour critical (i.e. NBI Item 113 = 9, 8, 7, or 5 or SNBI Item B.AP.03 = A, B or SNBI Item B.C.11 = 6, 7, 8, 9) unless there is a significant or noticeable change since the previous Streambed Profile (SNBI Item B.C.11 has changed from last inspection) that warrants an update at the inspection team leader's discretion.

The minimum Streambed Profile requirements are:

- Measure the Streambed Profile at the structure upstream side, or most restrictive feature if in a location other than the upstream side,
- Use the superstructure (e.g., girder underside, deck underside, or other relatively straight structural member underside) as the point of reference for the measurements. Point of reference shall be noted on the Streambed Profile sheet.
    - If the superstructure is arched and no other relatively straight structural member underside is available, then use a horizontal line that intersects the arch peak.
- Take channel depth measurements from the superstructure at the face of each abutment, the ¼ point of each span, the midpoint of each span, the ¾ point of the span, both sides of each pier, and appropriate intermediate locations (e.g., lowest point along the channel alignment (e.g., thalweg) under the superstructure soffit)
- Take additional channel depth measurements from the superstructure at areas of localized scour not occurring on the upstream side of the structures and record their location on the Streambed Profile.
- Streambed Profile s will be plotted over each subsequent Streambed Profileto determine if scour, channel degradation, or channel aggradation is occurring.

7 Clearance Measurements

Lateral clearances are to be updated during each routine inspection. The lateral clearances are typically measured using a handheld laser distance meter.

Vertical clearances are to be updated during each routine inspection unless the structure is measured using automated clearance measurement. If the vertical clearance measurement is required during a routine inspection, then a handheld laser distance meter mounted on a rod a fixed distance above the rod's base may be used, or a survey rod may be used, to take the measurement.

If a vertical clearance is not safe to measure due to traffic, then recommend the structure for automated vertical clearance measurements to the CDOT Bridge & Structures Asset Management Engineer.

Vertical clearances measured during a routine inspection are to be along each lane line (i.e. a pavement marking that delineates a traffic lane edge) and each pavement edge.

Prior to the publication of this manual vertical clearances for On-System structures was recorded on a VCLR Sheet. Use the appropriate vertical clearance report template for the structure type and highway crossed to report:

- The minimum vertical clearance measurements for each lane line and pavement edge
- The minimum lane vertical clearance for each travel direction
- The maximum lane vertical clearance for each travel direction

After the publication date of this manual new structures will collect and show this information in the Vertical Clearance tab in SIMSA.

Vertical Clearances are to be updated during a construction project when the pavement profile or lane configuration under a structure is affected. See the CDOT Construction Manual Appendix D Page D-10 for guidance.

7.1 Low Vertical Clearance Sign Requirements

For Interstates, US Highways, and State Highways, when the measured clearance over the roadway is less than or equal to 16'-3" low vertical clearance signs are required. It is recommended that structures with clearances less than or equal to 16'-3" be posted for 4" less than the measured clearance. For example, a bridge with a measured vertical clearance of 16'-4" does not require a sign, but a bridge with a measured vertical clearance of 16'-3" would require a sign for 15'-11". The 4" buffer is used to account for any future overlays, any variations in asphalt thickness, and to be consistent with the CDOT Oversize/Overweight (OSOW) permit office who used this buffer to account for any "bouncing" of the load.

Low vertical clearance signs may be installed on or in advance of the structure. An additional advanced warning low vertical clearance sign with a supplemental distance plaque should be placed at the nearest intersecting road or wide point in the road at which a vehicle can detour or turn around.

For all other Local Agency owned roads, it is recommended that low vertical clearance signs be required when the measured clearance over the roadway is less than or equal to 14’-3”. It is recommended that structures with clearances less than or equal to 14’-3” be posted for 4” less than the measured clearance. For example, a bridge with a measured vertical clearance of 14’-4” does not require a sign, but a bridge with a measured vertical clearance of 14’-3” would require a sign for 13’-11”. This meets or exceeds the C.R.S. and MUTCD referenced below. The 4” buffer is used to account for any future overlays, to account for any variations in gravel or asphalt thickness. If the Local Agency owner has different requirements, they should notify this office and the consultant performing inspection in thier area of the requirements.

Low vertical clearance signs may be installed on or in advance of the structure. An additional advanced warning low vertical clearance sign with a supplemental distance plaque should be placed at the nearest intersecting road or wide point in the road at which a vehicle can detour or turn around.

7.2 Low Vertical Clearance Sign Inspection Requirements.

Take photos of the vertical clearance signs or where vertical clearance signs should be at all approaches to the structure during each routine inspection.

Compare the vertical clearance sign value to the vertical clearance measurements taken during the routine inspection or the automated vertical clearance measurement report.

- Initiate an essential repair notification if the:
    - Required vertical clearance signs are not present
    - Vertical clearance sign value is greater than the vertical clearance measurements or clearance report

The color code of the ERL will depend on the height and road/traffic conditions. See Section 17.2.2 for color code guidelines.

8 Inaccessible Structures

Structures can be inaccessible for an inspection. Water borne or wind-borne debris such as silt, tumbleweeds, or logjams are the most common reasons for inspection inaccessibility. High water can also render a structure inaccessible for an inspection.

If a structure is deemed inaccessible for an inspection due to high water or other transient event, then notify the CDOT Bridge & Structures Inspection Engineer. Include photographs to document the inaccessibility where possible.

If a structure is deemed inaccessible for an inspection due to debris or other finding that requires correction prior to an inspection, then initiate an ERL. Include photographs to document the inaccessibility where possible. Document the original site visit and the condition encountered in "Inspection Notes".

Return trips and inspections are required once inspection access is regained. See Section 3 for allowed inspection interval tolerance.

9 Scour Assessment / Scour Critical Bridges

A scour analysis is required for all major structures that cross over a waterway, dry streambed, gully, or potential waterway.

9.1 Federal Guidance

Use a single-digit code as indicated in the Colorado SIA Item Coding Guide to identify the current status of the bridge regarding its vulnerability to scour. Evaluations shall be made by hydraulic/geotechnical/structural engineers. Guidance on conducting a scour evaluation is included in the FHWA Technical Advisory T 5140.23 titled, "Evaluating Scour at Bridges". Detailed engineering guidance is provided in the Hydraulic Engineering Circular No. 18 titled "Evaluating Scour at Bridges". Whenever a rating factor of 4 or below is determined for this item, the rating factor for Item 60 -- Substructure and other affected items (i.e., load ratings, superstructure rating) should be revised to be consistent with the severity of observed scour and resultant damage to the bridge. A plan of action should be developed for each scour critical bridge (see FHWA Technical Advisory T 5140.23, HEC-18 and HEC-23). A scour critical bridge is one with abutment or pier foundation rated as unstable due to (1) observed scour at the bridge site (rating factor of 2, 1, or 0) or (2) a scour potential as determined from a scour evaluation study (rating factor of 3). It is assumed that the coding of this item has been based on an engineering evaluation, which includes consultation of the NBIS field inspection findings.

9.2 CDOT Policy

There are to be no changes to the coding of Item 113, Scour Critical Bridges, unless it is fully documented and agreed to by the CDOT Bridge & Structures Inspection Engineer and the CDOT Structure Asset Management Engineer. The documentation shall include a memorandum (Figure 9-1) placed in the structure record that, with attachments where necessary, identifies the current Item 113 code, the proposed Item 113 code, and the basis for the proposed change. Future memos will be updated to include SNBI Items B.C.11 and B.AP.03. The memo will be signed by the CDOT Bridge & Structures Inspection Engineer and the CDOT Bridge Asset Management Engineer. Inleau of a memorandum, the same information may be submitted in an email to the CDOT Bridge & Structures Inspection Engineer and the CDOT Bridge Asset Management Engineer. Once the email is agreed to by the CDOT Bridge & Structures Inspection Engineer and the CDOT Bridge Asset Management Engineer, A copy of the email will be printed to PDF and stored in the electronic structure file. This documentation will also be provided whenever the current coding is confirmed by an updated hydraulic analysis for the bridge. In this case the memorandum will document the updated analysis and the decision not to change the coding.

See the Colorado SIA Item Coding Guide for Item 113 Coding Guidelines

9.3 NBI Item 113 Coding Change Memorandum

<Requesting Organization Header> Memorandum

Date: <MM/DD/YYYY>

To: *<Name>*, CDOT Structure Inspection Engineer

<Name>, CDOT Structure Asset Management Engineer

From: <Name>, <Title>

Reference: NBI Item 113 Coding Change for *<Structure ID>*

The information below documents the background and basis for our request to change the NBI Item 113 coding for the above referenced structure. Additional attachments (if any) are noted.

Owner: <Entity Name>

County: <County Name>

Facility Carried: *<from NBI Item 7>*

Feature Intersected: *<from NBI Item 6>*

Last Inspection Date: *<MM/DD/YYYY>*

Current Item 113 Code: *<#>*

Proposed Item 113 Code: *<#>*

Basis for the Recommendation: *<Reason for the change>*

Documentation Attached: *<Item list or n/a>*

Concurrence:

<Name>, CDOT Bridge & Structures Inspection Engineer Date

<Name>, CDOT Structure InspectionAsset Management Engineer Date

<Name>, CDOT Structure Asset Management Engineer Date

Figure 9-1 NBI Item 113 Coding Change Memorandum

10 Off-System Scour Screening Chart

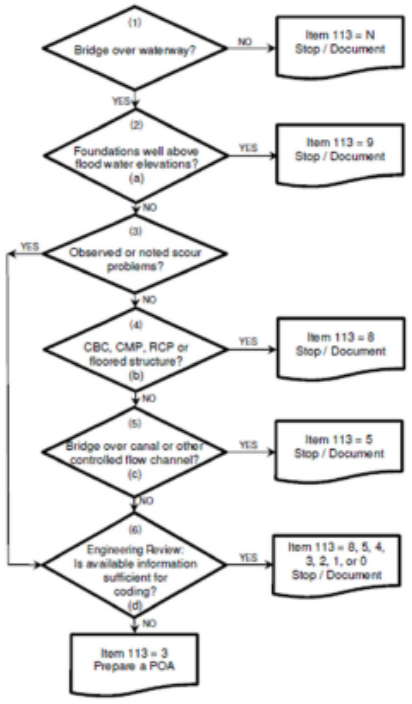
Coding Of Item 113, Scour Critical Bridges
BR 02 Coding of Item 113 Scour Critical Bridges 2020 11 24.docx

11/10/2021

Attachment 2

CDOT OFF-SYSTEM BRIDGE SCOUR SCREENING CHART FOR NEW INVENTORY

COLORADO
Department of Transportation
Office of the Chief Engineer



STRUCTURE ID: _____
FACILITY CARRIED: _____
FEATURE INTERSECTED: _____
STRUCTURE TYPE: _____

ITEM 113 = _____
POA REQUIRED (Y/N): _____
POA COMPLETION DATE: _____

EVALUATED BY: _____
ORGANIZATION: _____
DATE: _____

REVIEWER COMMENTS:
Include the following information. Attach addt'l if needed.
Structure type and year built:
Type of construction plans available (bid set, as-built, etc.):
Scour information shown in the plans:
Geotechnical information shown in the plans:
Structure foundation type(s):
Depths / pile lengths /material bearing upon:
Type of foundation protection (riprap, cutoff wall, etc):
Extents of the protection:
Is the protection appropriate size, gradation, thickness, placement, etc:
Channel condition, bed material type, alignment with opening:
Are there any known or visible scour issues:
Basis or reasoning for selected 113 code:

(a) Well above flood waters means that there is no way water would ever reach the foundations, e.g. the Red Cliff Arch (F-11-T).

(b) All pipe and box culverts (and other floored structures) are to be coded either 8 (stable) or 4 (repairs needed). After repairs are completed, the code should be changed back to 8.

Examples of scour problems that would merit a code of 4 include:

- Undermining of cutoff walls or aprons. Exposure of cutoff walls or wingwall footings without undermining is generally not sufficient to merit a code of 4. A Maintenance Recommendation should be made instead.
- Evidence of piping (flow is going through the embankment on the outside of the pipe). If not repaired, the structure or roadway may suddenly fail when enough of the surrounding fill is washed out.

Open bottom culverts should be analyzed and coded as bridges.

(c) Bridges that cross irrigation canals or other controlled waterways should be coded 5 unless other findings indicate that a lower code should be used. If the canal structure is a pipe or box culvert, follow the coding system for (b).

(d) Sufficient information for coding of 8 or 5 means that:

- Construction plans showing the foundations and the calculated scour depths are available. Scour information is typically shown on the Hydraulic Data sheets or drawn on the bridge profile drawing.

or

- Construction plans with geotechnical information are available that show the foundations are on scour resistant bedrock and (if on piles) not anticipated to fail from buckling if exposed.

or

- The foundations are unknown, but they are protected with riprap or other material of sufficient size and extent to withstand a major flow event (100 to 500-year).

Unknown, unprotected foundations are considered to be vulnerable to scour failure. The bridge should be coded 3.

[structure number] SCOUR Screening flow chart v10 2020 11 24.xlsx

Last Revised: 11/24/2020

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Figure 10-1 Off-System Scour Screening Chart

10.1 Off-System Scour Screening Chart Instructions

A Scour Screening Chart is to be completed for all new and existing Off-System major structures that do not already have a completed chart.

The intent of the scour screening chart is to provide a one-page worksheet that the structure inspector/engineer can use to assign a scour rating to a bridge or to determine that the structure requires a more detailed scour analysis and a Plan of Action (POA) report. The completed form is to be filed in the bridge record to document the basis for the code assigned to NBI Item 113 - Scour Critical Bridges.

The chart was developed using Microsoft Excel. The most recent Excel spreadsheet should be obtained and then used.

The decision blocks have been numbered following the path from the top of the chart to the bottom to facilitate cross-reference with these instructions. The following is a description and instructions for each numbered Decision Block of Figure 10-1 Off-System Scour Screening Chart.

1. Is the bridge over a waterway?

   If NO, then:

   - NBI Item 113 = N
   - NBI Item 71 (Waterway Adequacy) = N
   - Stop and compete the Scour Screening Chart

   If YES, then:

   - NBI Item 71 should be any code other than N
   - Proceed to Decision Block 2

2. Are the foundations well above flood water elevations?

   Well above flood waters means that there is no way water would ever reach the foundations, e.g., the Red Cliff Arch (F-11-T).

   If YES, then:

   - NBI Item 113 = 9
   - Stop and complete the Scour Screening Chart

   If NO, then

   - Proceed to Decision Block 3

3. Are there any observed or noted scour problems?

   If YES, then proceed to Decision Block 6

   If NO, then proceed to Decision Block 4

4. Is the structure a CBC, CMP, RCP or floored structure?

   All pipe and box culverts (and other floored structures) are to have NBI Item 113 coded either 8 (stable) or 4 (repairs needed). After repairs are completed, the NBI Item 113 code should be changed back to 8.

If YES, then:

- NBI Item 113 = 8 unless repairs are needed
- If repairs are needed then NBI Item 113 = 4
    - Examples of scour problems that would merit a code of 4 include:
        - Undermining of cutoff walls or aprons. Exposure of cutoff walls or wingwall footings without undermining is generally not sufficient to merit a code of 4. A Maintenance Recommendation should be made instead.
        - Evidence of piping (flow is going through the embankment on the outside of the pipe). If not repaired, the structure or roadway may suddenly fail when enough of the surrounding fill is washed out.
- NBI Item 62 (Culverts) would have any value other than N
- Item 120A would not be = AAC, CAC, RAC, or SAC
- Stop and complete the Scour Screening Chart

If NO, then:

- Proceed to decision block 5

5. Is the bridge over a canal or other controlled flow channel?

If YES, then:

- NBI Item 113 = 5 unless other findings indicate a lower coding should be used
- Stop and complete the Scour Screening Chart

If NO, then:

- Proceed to decision block 6

6. Engineering Review: Is available information sufficient for coding?

This step requires individual Engineering Review of the bridge record. All available information (inspection reports, construction plans, geotechnical data, design reports, photographs, interview with field Team Leader/Inspector, etc.) will be examined to see if there is basis for a determination of bridge stability.

If sufficient information is available confirm stability as determined by the reviewing engineer, then:

- NBI Item 113 = 8 or 5
- Stop and complete Scour Screening Chart

Sufficient information for coding of 8 or 5 means that:

Construction plans showing the foundations and the calculated scour depths are available. Scour information is typically shown on the Hydraulic Data sheets or drawn on the bridge profile drawing.

Construction plans with geotechnical information are available that show the foundations are on scour resistant bedrock and (if on piles) not anticipated to fail from buckling if exposed.

The foundations are unknown, but they are protected with riprap or other material of sufficient size and extent to withstand a major flow event (100 to 500-year).

If the available information indicates that the structure should go directly to repair without further analysis, then:

- NBI Item 113 = 4, 2, 1, or 0
- Prepare an appropriate Plan of Action for the structure
- Stop and complete the Screening Chart

If the available information is insufficient for coding NBI Item 113 then:

- NBI Item 113 = 3
- Prepare a Plan of Action
- Stop and complete the Scour Screening Chart

Unknown, unprotected foundations are considered to be vulnerable to scour failure. The bridge should be coded 3.

To complete the Scour Screening Chart, circle the action block on the chart that corresponds to the screening result and fill out the information along the right side of the sheet.

Structure ID: from NBI Item 8

Facility Carried: from NBI Item 7

Feature Intersected: from NBI Item 6

Item 113 =: the code assigned to the structure after completing the screening process

POA Required: Yes, or No; as determined after completing the screening process

POA Completion Date: date the POA is completed and accepted by CDOT

Evaluated by: person responsible for filling out the Scour Screening Chart

Organization: entity the screener is associated with (contractor firm name, CDOT, etc.)

Date: date the Screening Chart was completed

Reviewer Comments:

Include the following information to support the assigned NBI Item 113 code

Structure type and year built:

Type of construction plans available (bid set, as-built, etc.):

Scour information shown in the plans:

Geotechnical information shown in the plans:

Structure foundation type(s):

Depths/ pile lengths /material bearing upon:

Type of foundation protection (riprap, cutoff wall, etc.):

Extents of the protection:

Is the protection appropriate size, gradation, thickness, placement, etc.:

Channel condition, bed material type, alignment with opening:

Known or visible scour issues:

Basis or reasoning for selected 113 code:

Attach additional sheets if needed.

When the Screening Chart is complete, it is placed in the bridge file and becomes a permanent part of the bridge record. The Scour Screening Chart is to be reviewed at every inspection cycle and updated (if necessary).

If Item 113 is revised, an NBI Item 113 Coding Change Memorandum, or email, shall be sent to the CDOT Bridge & Structures Inspection Engineer and the Structure Asset Management Engineer documenting the justification for changing the scour rating. Once the coding change is approved and a new scour screening chart shall be produced and will be placed in the bridge file. Additionally, the approved memorandum file name will be recorded in the Scour Item 113 Documentation (Inspection > CDOT Bridge) section of the inspection report.

11 Structure Component Naming

11.1 Structure Component Naming

Structure component naming is outlined in Section1.13 of the CDOT Bridge Detail Manual.

The CDOT Bridge Detail Manual may be found at:

https://www.codot.gov/programs/bridge/bridge-manuals/bridge_detail_manual

12 Load Rating

All major structures that carry vehicular traffic on public roads require a load rating per the CDOT Bridge Rating Manual and Federal Regulation 23 CFR 650.313(k) (05/2022).

Load ratings will be completed during the design phase of new structures.

If new structures are discovered by inspectors, a new load rating will be completed as soon as practical, but no later than 3 months after the inspection or after plans have been received.

12.1 Re-Rating

If the inspection team discovers a dead load change or advanced deterioration (i.e. NBI condition rating of 3 or lower, or an element condition state of 4) on a structure, then a re-rating may be warranted.

See the CDOT Bridge Rating Manual subsection 1.17, Re-Rating Existing Bridges, for guidance.

The CDOT Bridge Rating Manual may be found at:

https://www.codot.gov/programs/bridge/bridge-manuals/rating_manual

CDOT Commentary

> Substructures are not normally load rated. Repairing or temporarily supporting a substructure is frequently the best option when deteriorated conditions in the substructure that affect the major structure load carrying capacity are discovered by the inspection team. However, re-rating may be the best option if: temporary support is not possible, repair is not possible, or a repair will take considerable time to accomplish.

12.1.1 On-System Re-Rating Procedure

The Inspection Team Leader shall bring the dead load change or advanced deterioration to the CDOT Bridge & Structures Inspection Engineer's attention. A re-rating request is to be forwarded to the CDOT Rating Engineer by the CDOT Bridge & Structures Inspection Engineer, if a re-rating is warranted.

- If the re-rating results indicate the need for structure repair, then an essential repair notification will be issued
- If the re-rating results indicate the need for load restriction on an On-System structure, then a Color Code Change notification shall be issued by the Rating Engineer per the CDOT Bridge Rating Manual subsection 1.16, Overload Color Code Rating
- If the re-rating results indicate the need for load posting, then a notification shall be issued by the Rating Engineer per the CDOT Bridge Rating Manual subsection 1.15.1, Posting Load Vehicles
- If the re-rating results indicate the need to close the structure to traffic, then the bridge shall be closed per the Plan of Action referenced in the CDOT Bridge Rating Manual subsection 1.15.3, Closure of a Bridge Due to a Rating Report of Legal Load Vehicles

12.1.2 Off-System Re-Rating Procedure

The Inspection Team Leader shall bring the dead load change or advanced deterioration to the Inspection Consultant Program Manager's attention. The Inspection Consultant Program Manager will initiate a re-rating based on the task order work scope, if a re-rating is warranted. If the task order work scope does not provide for re-rating, then the Inspection Consultant Program Manager will bring the re-rating need to the CDOT Bridge & Structures Inspection Engineer's attention.

- If the re-rating results indicate the need for structure repair, then an essential repair notification will be issued
- If the re-rating results indicate the need for load posting, then an essential repair notification will be issued
- If the re-rating results indicate the need to close the structure to traffic, then the bridge shall be closed per subsection 1.2, Off-System Procedures

13 Load Posted Structures

Structures are load posted if the operating load rating is less than the gross vehicle weight for any of the legal load vehicles per the CDOT Bridge Rating Manual subsection 1.15.1, Posting Legal Load Vehicles.

13.1 On-System Load Posting Procedure

Per the Bridge Rating Manual subsection 1.15.1, Posting Legal Load Vehicles:

- The State Bridge Engineer makes the final determination for posting
- The Bridge Rating Engineer initiates the formal notification of load posting
- The CDOT Bridge & Structure Inspection Engineer sends an essential repair notification to the Region Traffic Engineer and Region Maintenance personnel. Include in the notification:
    - The reason that the structure requires load posting
    - The recommended load posting values
    - The MUTCD Weight Limit sign requirements
    - Direction to have all posting signs in place as soon as possible but no later than 30 days from the date of essential repair notification
    - Direction to the Region Traffic Engineer and Region Maintenance personnel to send in photos of both of the corrected load posting signs

13.2 Off-System Load Posting Procedure

If an Off-System major structure requires load posting but is not posted as required, then:

- Send an essential repair notification to the Colorado county or municipality structure owner.
- Include in the notification:
    - The reason that the structure requires load posting
    - The recommended load posting values
    - The MUTCD Weight Limit sign requirements
    - Direction to the owner to have all posting signs in place as soon as possible but no later than 30 days from the date of essential repair notification
    - Direction to the Colorado county or municipality structure owner to send in photos of both of the corrected load posting signs to the contractor

13.3 Load Posting Sign Requirements

See MUTCD Section 2B.59 – Weight Limit Signs for guidance and example signs.

13.4 Load Posting Sign Inspection Requirements

During each routine inspection of major structures that require load posting:

- Take photos of the posting signs or where posting signs should be at all approaches to the major structure for inclusion within the inspection report
- Note the location of the posting sign photo in the photo description

- Note the status of the posting in the inspection report General Remarks

If the load posting is not correctly implemented, then:

- Initiate an essential repair notification to the responsible region maintenance superintendent or Colorado county or municipality structure owner that includes:
    - The reason that the structure is not properly posted
    - The recommended posted values per the load rating summary sheet
    - The MUTCD load posting sign requirements
    - Direction to have all posting signs in place within 30 days from the date of the essential repair notification
    - Direction to send in photos of the corrected load posting signs to the CDOT Bridge & Structures Inspection Engineer or Inspection Consultant Program Manager

When the photos of the corrected load posting are received:

    - Include the new posting sign photos in the inspection report
    - Forward photos of corrected load posting to CDOT CDOT Bridge & Structures Inspection Engineer for Off-System load posted structures

13.5 Off-System Load Posting Certificate

During the final presentation of inspection reports to the bridge owners, the bridge inspection contractor shall:

- Give the owner a copy of the load posting certificate, which lists all of their structures that require posting
- If there are no load posted structures within the agency's inventory, then indicate that on the load posting certificate
- Remind the owner about any remaining posting deficiencies, i.e. any remaining NBI Item 41 coded B, or SNBI Item B.PS.01 coded PA, TA, SA, PD, TD, SD, PM, TM, or SM, posting is required but not legally implemented

The Colorado county or municipality major structure owner is responsible for:

- Posting the major structure with the values shown on the essential repair letter/load rating summary sheet
- Documenting the posting with photographs of the posting signs at the bridges
- Sending a copy of the load posting sign photos to the inspection contractor
- Sending the signed and dated load posting certificate to the inspection contractor

When the contractor receives the signed load posting certificate or photos of the corrected load posting the inspection contractor shall:

- Include the owners posting sign photos in the inspection report
- Forward a copy of the signed load posting certificate to the CDOT CDOT Bridge & Structures Inspection Engineer and the Statewide Bridge Inspection Coordinator

13.5.1 Load Posting Certificate

Use the following template for the Final Presentation submittal first page:

[Date]
[Colorado county or municipality representative]
[Street Address]
[City, State Zip Code]
[phone number]
[email address]

Subject: Off-System Inspection Program

[Colorado county or municipality representative],

Enclosed please find the following information regarding the inspection of bridges in _____ County or City/Town of _____:

1. A file for each bridge in your jurisdiction containing:
    a. Bridge Inspection Report containing National Bridge Inventory (NBI) data, AASHTOWare Bridge Management (BrM) Element Level information and a summary of recommended maintenance
    b. Bridge sketch and waterway profile spreadsheet
    c. Load rating summary
    d. Photographs taken at the time of inspection with descriptions
2. A "Load Posting Certification" (see next page). Within 90 days of receipt of this letter, please sign, date and return one copy to the Colorado Department of Transportation at the address indicated.

_____ _____

Date of Presentation

Signature of Presenter
<Typed Name of Presenter>
<Title of Presenter>
<Presenter Contact Information>

Figure 13-1 Inspected Structures Final Presentation Page 1

Use the following Load Posting Certificate template:

LOAD POSTING CERTIFICATION

CITY or TOWN OF _____, _____ COUNTY

Owner Notification

This document is required to certify compliance with the requirements of the National Bridge Inspection Standards and The National Bridge Inventory. Noncompliance with the following posting requirements may affect your entities eligibility for funding from all Federal Aid Projects.

Based on the current load rating data, the bridge(s) below cannot accept the weight of Colorado Legal Trucks, or the Specialized Hauling Vehicles, or the Emergency Vehicles, at the operating stress levels per AASHTO and CDOT specifications and are recommended for Weight restrictions.

Note: The structures requiring posting below may change in the future if structures are rerated.

Required Posting	
Structure Number	**NBI Item 41 Posting Status at the time of the inspection**
ABCDEFG	**P - Legally Posted for load**
HIJKLMNO	**B - Posting Required but not legally implemented**
PQRSTUV	**K - Closed to all traffic**

Refer to the Essential Repair Letter (ERL), or the structure inspection report, for the correct posting requirements for each of the structures.

[Typed Name] [Title] Date of Notification

[Consulting Firm]

[Contact Information]

Owner Acceptance

I certify that any structure(s) listed in the Required Posting Table have been Load Posted correctly per the Load Ratings, or per the Load Posting recommendation in the emailed ERL's, or have been closed and/or repaired so that a Load Posting is no longer required. Structure(s) with a Posting Status of B have legally implemented Load Postings, or signs have been ordered and will be installed when received.

Signature Date of Certification

Printed Name

Title

Contact Information (email, phone number)

WITHIN 90 DAYS OF NOTIFICATION PLEASE RETURN ALL PAGES OF THE COMPLETED DOCUMENT TO:

(CDOT EMPLOYEE NAME HERE)
Statewide Bridge Inspection Coordinator
Colorado Department of Transportation
(CDOT EMPLOYEE EMAIL ADDRESS HERE)
2829 West Howard Place
Denver, CO 80204

14 Closing a Structure to Trucks

The following describes the procedure for closing a structure to all trucks but leaving the structure open to passenger vehicles. This applies to Major and Minor structures.

14.1 Criteria

Close the structure to all trucks when the following criteria are both true:

- Any legal load vehicle rating factors are less than 0.3
- All legal load vehicle rating ton values are greater than 3 tons customary U.S.

See the CDOT Bridge Rating Manual for additional load rating guidance.

See the AASHTO Manual for Bridge Evaluation Subsection 6A.8.3 – Posting Analysis for reference.

14.1.1 On-System Procedure

If a structure is required to be closed to all trucks, then follow the procedure defined in subsection 13.1 On-System Load Posting Procedure except that the required sign is defined in subsection 14.1.3 No Trucks Sign Requirements.

14.1.2 Off-System Procedures

If an Off-System major structure is required to be closed to all trucks, then follow the procedure defined in subsection 13.2 Off-System Load Posting Procedure except that the required sign is defined in subsection 14.1.3 No Trucks Sign Requirements.

Include any structures closed to all trucks on the Load Posting Certificate defined in 13.5 Off-System Load Posting Certificate.

14.1.3 No Trucks Sign Requirements

See MUTCD Section 2B.39 Selective Exclusion Signs for guidance. Use No Trucks sign R5-2 or R5-2a.

14.1.3.1 No Trucks Sign Inspection Requirements

Follow the inspection procedure defined in 13.4 Load Posting Sign Inspection Requirements.

15 Closing a Structure

The following describes the procedure for handling structure closures. The procedure can also be applied to minor structure closures. These criteria and procedures apply to issues found during all regularly scheduled inspections and re-ratings.

15.1 Criteria

Per the CDOT Bridge Rating Manual subsection 1.15.3, Closure of a Bridge Due to a Rating Report of Legal Load Vehicles, structures not capable of carrying a minimum gross legal live load weight of three tons must be closed.

Close major structures to traffic if the CDOT Bridge & Structures Inspection Engineer or Inspection Consultant Program Manager believes the structure is not safe to cross over or to travel under based on their engineering judgement (e.g., a pier is washed out by a flood).

15.2 On-System Procedure

When the Inspection Team Leader in collaboration with the inspector determines that a major structure should be closed to all traffic, the Bridge Inspection Team Leader shall inform the CDOT Bridge & Structures Inspection Engineer.

15.2.1 Simple Bridge Closure Plan of Action

Establish a review committee consisting of the Inspection Team Leader, the CDOT Bridge & Structures Inspection Engineer, the Staff Bridge Design and Construction Unit Leader responsible to the Region, the CDOT Structure Asset Management Engineer and the Project Support, Rating, Standards & Overloads Engineer to review the closure recommendation.

If the review committee agrees with the need to close the structure to all traffic, then notify the Staff Bridge Branch Manager of the need to close the bridge.

If the Staff Bridge Branch Manager agrees that the bridge needs to be closed, then the CDOT Bridge & Structures Inspection Engineer will write a Critical Inspection Finding to the Region recommending that the bridge be closed. As the same time the Staff Bridge Branch Manager will contact the Region upper management to discuss closing the bridge.

The Structures Asset Management Engineer will then issue an official memorandum of the bridge closure to the Permit Office Project Support, Rating, Standards, & Overloads Engineer, Region Maintenance Personnel, Chief Engineer, Director of Staff Services, Region Transportation Director, Region Traffic Engineer, the Public Relations Office, and the Colorado FHWA Division Bridge Engineer.

Any additional notifications, i.e. media, Risk Management, etc., will be made by the Regions as per the Notification for Serious Accident or Event Policy available from Risk Management.

The above procedure also applies to a partial closure (e.g., exterior girder damaged by an over height vehicle necessitating a shoulder or lane closure until repaired).

Emergency closure procedures for other issues (e.g., damage due to bridge hits, flood, fire, etc.) are handled by the responsible region maintenance section personnel in accordance with the Notification for Serious Accident or Event Policy available from Risk Management.

15.3 Off-System Procedures

When the Bridge Inspection Team Leader, in collaboration with the bridge inspector, determines that a major structure should be closed to all traffic, the Bridge Inspection Team Leader will bring it to the immediate attention of the Inspection Consultant Program Manager.

If the Inspection Consultant Program Manager agrees that the major structure needs to be closed, then the structure owner and the CDOT Bridge & Structures Inspection Engineer shall be verbally informed. The Bridge Inspection Team Leader, in collaboration with the bridge inspector, will make every reasonable effort to stop traffic from accessing the structure, or route under the structure until the owner arrives on-site to take responsibility. The Consultant's Program Manager shall then follow-up within three business days with a written Critical Inspection Finding letter to the structure owner recommending that the bridge be closed.

16 Inspection Photographs

Major Structures, Minor Structures and Miscellaneous Structure Photographs

Capture photographs during inspections using a GPS-enabled digital camera with Geotagging turned on.

CDOT Commentary

The inspection teams are encouraged to keep a photo log during the inspection for use when naming the photos for filing.

Some inspection tools function to collect inspection photographs and serve the photo log function.

16.1 Inventory Photographs

The minimum required inventory photos are indicated by a ● in the table below to be taken at every routine inspection.

Table 16-1 Inventory Photograph Matrix

Description	Major Bridges	Minor Bridges	Major Culverts	Minor Culverts	Miscellaneous
Roadway	●	●	●	●	●
Elevation	●	●			●
Superstructure	●	●	●	●	
Culvert Inlet			●	●	
Culvert Outlet			●	●	
Channel Upstream	●		●		
Channel Downstream	●		●		
Load Posting Signs	●		●		
Vertical Clearance Signs	●		●		●

In all cases the photo description shall identify the direction in which the photo was taken.

16.1.1 Inventory Photo Update Interval

16.1.1.1 On-System Structures Inventory Photo Update Interval

The inventory photos are to be updated during each routine inspection unless otherwise directed by the CDOT Bridge & Structures Inspection Engineer.

16.1.1.2 Off-System Major Structure Inventory Photo Update Interval

The inventory photos are to be updated during each routine inspection unless otherwise directed by the CDOT Bridge & Structures Inspection Engineer.

16.1.2 Roadway View

The roadway photo is to be taken to show the entire roadway surface on top of the bridge or culvert looking in the direction of inventory including approach rail. The roadway photo may be taken looking in the opposite direction during a subsequent routine inspection and alternate between the two directions, thereafter.

16.1.3 Elevation View

The elevation view is to be taken of the upstream side when the bridge crosses a waterway. A second elevation view may be taken from the downstream side if that view of the bridge is less obstructed (e.g., vegetation, debris, etc.)

The elevation view of bridges that do not cross waterways may be taken on the side that best depicts the structure.

Multiple elevation view photographs are required on long structures where one photo does not capture the entire structure.

16.1.4 Superstructure View

Bridge Structures

The superstructure view is taken from beneath the bridge showing the bottom of the superstructure and oriented to look down the center of the roadway. (Consider capturing the pier caps and overhangs).

Multiple superstructure views are required if the superstructure type changes in any subsequent span.

Culvert Structures

The superstructure view is a photo taken inside the culvert to show a general view of the culvert. The top slab, side walls, and bottom slab should be visible in photo. Alternatively, the crown, spring lines, and invert should be visible in the photo.

Multiple superstructure views are required if the culvert type changes along the barrel.

16.1.5 Culvert Inlet and Outlet Views

Take photos of culvert inlets and culvert outlets within the ROW. If either of these are outside the ROW, a photo from this inside of the culvert at the ROW junction is required instead.

16.1.6 Stream Channel Photos

An upstream photo and a downstream photo are required for those bridges or culverts that are over waterways. If a single photo does not sufficiently show the channel and banks it may be necessary to take upstream left, center, and right, and a downstream left, center, right photos.

16.1.7 Load Posting Signs

Load posting sign photographs are to be taken during each routine inspection of installed or missing load-posting signs where applicable. See subsection 13.4, Load Posting Sign Inspection Requirements.

16.1.8 Low Vertical Clearance Signs

Low vertical clearance sign photographs are to be taken during each routine inspection of installed or missing vertical clearance signs where applicable. See subsection 7.2, Low Vertical Clearance Sign Inspection Requirements.

16.2 Damage and Deterioration Photographs

Damage and deterioration photographs shall be taken that provide a clear view of the damage/deterioration. Photographs should be taken for all condition state 3 and 4 defects.

Include sufficient detail in the photo description to provide a clear understanding of the damage.

See also subsection 2.10.1, Human Action Damage Inspection Procedures, and subsection 2.11.1, Natural Event Damage Inspection Procedures.

16.3 Other Photographs

Take any other photographs that are needed to complete the inspection report.

17 Inspection Findings

Inspection Findings include repair needs discovered during inspection, damage discovered by other parties, an event that results in structure damage (e.g., flood, vehicle impact, etc.), structures that are inaccessible for an inspection (e.g., debris that requires removal to facilitate inspection), or other finding that impacts the strength or serviceability of the structure and requires corrective action.

17.1 Procedure

Major Structures (NBIS)

Federal Regulation 23 CFR 650.313 (05/2022) states in part:

> (q) Critical findings. (1) Document procedures to address critical findings in a timely manner. Procedures must:
>
> - Define critical findings considering the location and the redundancy of the member affected and the extent and consequence of a deficiency.
> - Develop and document timeframes to address critical findings identified.
> - Notify FHWA within 24 hours of discovery of each critical finding on the National Highway System.
> - Provide monthly, or as requested, a written status report for each critical finding.

17.1.1 Procedure for On-System Structures

17.1.1.1 Identification of Critical Inspection Findings

Problems with structures are typically discovered by the bridge inspectors and maintenance employees. Occasionally other CDOT employees and non-CDOT personnel observe and report problems. Structure damage discovered by a person outside of CDOT is typically reported to CDOT through the Public Relations office which in turn forwards the finding to the CDOT Bridge & Structure Inspection Engineer. The region will contact Staff Bridge for evaluation and follow-up of any findings discovered outside of the department's bridge inspection program. All Critical Inspection Findings discovered by the bridge inspectors will be **immediately** reported to the CDOT Bridge & Structure Inspection Engineer, in person or by phone, and contact the State Patrol as appropriate.

The classification of a reported structure problem as a Critical Inspection Finding will be made by the senior inspector on site or the CDOT Bridge & Structure Inspection Engineer if reported by any means other than an onsite inspector.

17.1.1.2 Notification of Critical inspection Findings

The process for documenting, processing, notification, and tracking Critical Inspection Findings is as follows.

1. The inspector on site will immediately notify the region, in person or by phone.

2. The inspector will notify the CDOT Bridge & Structure Inspection Engineer by phone directly following the notification to the region.

3. The CDOT Bridge & Structure Inspection Engineer will notify the FHWA Colorado Division Bridge Engineer within 24 hours.

4. The inspector stays on site until region maintenance personnel or Colorado State Patrol arrives and assumes responsibility of keeping traffic from accessing the structure or part of the structure that is unsafe.

5. The inspector will collect all photos necessary to sufficiently document the structural or safety related deficiency.

6. No more than 5 working days later, the inspector will send official notification by email to the region's maintenance superintendents. Those copied on the notification include the region program engineers, the FHWA Colorado Division Bridge Engineer, the Staff Bridge Branch Manager, the CDOT Bridge & Structure Asset Management Engineer, the applicable Staff Bridge Branch design & construction unit leader, bridge inspectors who identified the critical inspection finding, and the Statewide Bridge Inspection Coordinator. Currently the following individuals are also copied on the transmittal: Region Transportation Director, Chief Engineer, Director of Staff Branches, and other maintenance personnel identified by the regions.

7. No later than 10 calendar days from the initial letter sent, the inspector will follow up with the region requesting a status update, current photos, and any additional documentation of repairs or plan of action addressing the deficiency. All information collected will be forwarded to those on the official notification email.

•

8. If the inspector has not received confirmation the repair has been completed, or a plan of action, they will follow up 10 days from the first follow up to request that information.

9. If after the second follow up there has been no communication, the inspector will notify the CDOT Bridge & Structures Engineer and the Statewide Bridge Inspection Coordinator for escalation.

17.1.1.3 Tracking Critical Inspection Findings

The process for the tracking of Critical Inspection Findings is as follows.

1. Tracking spreadsheets, one for each region, are maintained by the CDOT Bridge & Structure Inspection Engineer, or their designee.

a. The spreadsheets are kept at \\public\Bridge Essentials Repairs. They are available to anyone in the department for reading purposes.
b. The columns identifying the structure, the needed repairs, and the follow-up inspection are maintained by the Bridge Inspection Program Manager.
c. The columns documenting the action taken are maintained by the region Maintenance Superintendents, or their designees. The region Maintenance Superintendents and their designees may access the sheet at any time to maintain these columns.
d. The applicable tracking sheet is updated by the Bridge Inspection Program Manager, or their designee, with each critical inspection finding memo submittal, and is updated by the Maintenance Superintendent, or designee, whenever any follow-up action is taken.

2. When the regions complete the repairs, they will notify the CDOT Bridge & Structure Inspection Engineer and update the applicable tracking spreadsheet by filling in the date the finding was repaired. Notification should include pictures of the action taken to address the finding, i.e. removal of loose concrete, closing the bridge, posting the bridge, etc.

3. Repairs reported by the regions as completed may require a special follow-up inspection as determined necessary by the CDOT Bridge & Structure Inspection Engineer.

4. The Bridge & Structure Inspection Engineer will document in their inspection report that the issue has been addressed. If the CDOT Bridge & Structure Inspection Engineer determines the repair has not been addressed, a follow-up repair notice to the applicable region will be sent out.

17.1.1.4 Staff Bridge Design and Construction Unit Leaders' Responsibilities for CIFs

The Staff Bridge PE II assigned to the applicable region shall provide any engineering needed for repairs. On receiving critical inspection finding notices, the applicable Staff Bridge PE II shall review the notice to determine what engineering work is needed. As needed, the PE II shall provide exploratory inspections, repair options, cost estimates, design details, specifications, and/or repair instructions. The engineering work should be completed within a timeframe appropriate of the repair, and as necessary to ensure region personnel are not waiting for repair details.

Any final engineering instructions and advisements to the region shall be documented via e-mail and filed in the structure folder. Where plans or specifications are needed, they shall be submitted to the region with a Final Details Letter.

If the Staff Bridge PE II is contacted directly by the region regarding a critical inspection finding with an existing structure, follow-up action shall include contacting the CDOT Bridge & Structure Inspection Engineer. The CDOT Bridge & Structure Inspection Engineer shall provide the classification, prioritization, and tracking for any needed essential repairs.

17.1.1.5 Identification of Essential Repair Findings

Problems with structures are typically discovered by the bridge inspectors and maintenance employees. Occasionally other CDOT employees and non-CDOT personnel observe and report problems. For on-system structures, the region or owner will contact Staff Bridge for evaluation and follow-up of any findings discovered outside of the department's bridge inspection program. The classification of a reported structure problem as an Essential Repair Finding will be made by the CDOT Bridge & Structures Inspection Engineer, or their designee, and will be made as a follow-up to inspection program findings or evaluations requested by the region.

17.1.1.6 Notification and Tracking of Essential Repairs

The process of documenting and processing On-System Essential Repair Findings from the bridge inspection program is as follows:

1. An essential repair need is discovered by the bridge inspector during bridge inspection.

2. The inspector will make every reasonable effort to stop traffic from accessing the structure or part of the structure.

    a. This may include involving State Patrol or Local Law Enforcement.

3. Draft essential repair letters (ERL's), which includes the damage or deficiency, appropriate recommendations, timeframe to complete recommendations, supplemental photos, sketches, or tally sheets, are delivered to the Bridge Inspection Program Manager, or their designee, for evaluation.

4. Currently, if the Bridge Inspection Program Manager, or their designee, determines the repair is essential, the bridge inspector assigns a double asterisk to the essential repair finding maintenance item in the inspection report. Example: **354.01 is an essential repair finding due to collision damage sustained by the bridge's girders or truss members. When CDOT fully migrates to SIMSA the double asterisk will no longer be an option. The essential repair will be noted by using an Urgent or High priority maintenance item.

The CDOT Bridge Inspection Program Manager, via the inspector, will notify the regions of essential repair needs. The process for notification and tracking of Essential Repair Findings is as follows.

10. Notifications go out by e-mail and are sent to the region's maintenance superintendents. Those copied on the notification include the region program engineers, the FHWA Colorado Division Bridge Engineer, the Staff Bridge Branch Manager, the Staff Bridge Asset Management Engineer, the applicable Staff Bridge Branch design & construction unit leader, bridge inspectors who identified the Essential Repair Finding, and the Statewide Bridge Inspection Coordinator. Currently the following individuals are also copied on the transmittal: Region Transportation

Director, Chief Engineer, Director of Staff Branches, and other maintenance personnel identified by the regions.

11. Tracking spreadsheets, one for each region, are maintained by the Bridge Inspection Program Manager, or their designee.

    a. The spreadsheets are kept at \\public\Bridge Essentials Repairs. They are available to anyone in the department for reading purposes.
    b. The columns identifying the structure, the needed repairs, and the follow-up inspection are maintained by the Bridge Inspection Program Manager.
    c. The columns documenting the action taken are maintained by the region Maintenance Superintendents, or their designees. The region Maintenance Superintendents and their designees may access the sheet at any time to maintain these columns.
    d. The applicable tracking sheet is updated by the Bridge Inspection Program Manager, or their designee, with each essential repair memo submittal, and is updated by the Maintenance Superintendent, or designee, whenever any follow-up action is taken.

12. When the regions complete the repairs, they update the applicable tracking spreadsheet by filling in the date the finding was repaired.

13. Repairs reported by the regions as completed are confirmed by the bridge inspectors during regularly scheduled inspections. Special follow-up inspections will be made when requested by the region or as determined necessary by the Bridge Inspection Program Manager.

14. The bridge inspectors will document, in their inspection report, whether or not any Essential Repair Findings previously identified have been addressed and forward the report to the Bridge Inspection Program Manager for evaluation. If the manager concurs that the essential repair has been addressed, the manager updates the tracking spreadsheet accordingly. If the manager determines the repair has not been addressed, the manager will issue a follow-up repair notice to the applicable region.

17.1.1.7 Staff Bridge Design and Construction Unit Leaders' Responsibilities for ERLs

The Staff Bridge PE II assigned to the applicable region shall provide any engineering needed for Essential Repair Findings. On receiving essential repair notices, the applicable Staff Bridge PE II shall review the notice to determine what engineering work is needed. As needed, the PE II shall provide exploratory inspections, repair options, cost estimates, design details, specifications, and/or repair instructions. The engineering work should be completed within a timeframe appropriate for the priority of the repair and as necessary to ensure region personnel are not waiting for repair details.

Any final engineering instructions and advisements to the region shall be documented via e-mail and filed in the structure folder. Where plans or specifications are needed, they shall be submitted to the region with a Final Details Letter.

If on review of the structural problem the PE II determines the work needed, or the priority of the work, is different from what is given in the repair notice, the Bridge Inspection Program Manager shall be contacted for concurrence and modification of the original repair notice.

If the Staff Bridge PE II is contacted directly by the region regarding a problem with an existing structure, follow-up action shall include contacting the Bridge Inspection Program Manager. The Bridge Inspection Program Manager shall provide the classification, prioritization, and tracking for any needed Essential Repair Findings.

17.1.1.8 On-System Structures Other than Major Bridges

In addition to the department's bridge inspection program, the policy and procedures in section 17.1.1 also apply to the department's culvert and sign/signal/HML (high-mast-lights) inspection programs and to other non-bridge structures such as tunnels, retaining walls and sound barriers. Minor culverts and minor bridges are those where the length of the crossing parallel to the centerline of roadway is greater than or equal to 4 feet and less than or equal to 20 feet.

The tracking sheet for each region has a tab for each type of structure:

- Major bridges
- Minor culverts & minor bridges
- Overhead signs, signals, and high mast lights
- Walls (retaining walls and sound barriers)
- Miscellaneous structures
- Tunnels (see Colorado Tunnel Inventory & Inspection Manual)

17.1.2 Procedure for Off-System Structures

CDOT is responsible for the administration of the Colorado off-system federal bridge inspection program and accordingly is responsible for establishing a process for the identification, notification and tracking of Critical Inspection Findings by the program. This program applies only to major vehicular bridges owned by the cities and counties in the state of Colorado. For off-system Tunnels, see the Colorado Tunnel Inventory & Inspection Manual.

Colorado's off-system bridges are currently inspected using consultants and by dividing the state into three sections; north, south, and central, with one consulting firm assigned to each section. The CDOT Bridge & Structure Inspection Engineer is also the manager for the off-system bridge inspection program. The Statewide Bridge Inspection Coordinator is currently the project manager for the bridge inspection consultant contracts.

17.1.2.1 Identification of Critical Inspection Findings

The process for identification of Critical Inspection Findings is as follows:

1. A critical finding is discovered by the bridge inspector during bridge inspection.

2. The inspector will make every reasonable effort to stop traffic from accessing the structure or part of the structure.

    a. This may include involving State Patrol or Local Law Enforcement.

17.1.2.2 Notification of Critical inspection Findings

The process for notification of Critical Inspection Findings is as follows:

1. The inspector will immediately notify the consultant's senior inspection engineer by phone.

2. If the consultant's senior inspection engineer determines that the identified finding is critical, the consultant's senior inspection engineer will instruct the inspector on site to do everything they can to stop traffic from accessing the structure or part of the structure that is unsafe.

3. The owner is immediately notified, in person or by phone by the inspector or consultants senior inspection engineer.

4. The consultant's senior inspection engineer will notify the CDOT Bridge & Structure Inspection Engineer by phone directly following the notification to the owner.

5. The CDOT Bridge & Structure Inspection Engineer will notify the FHWA Colorado Division Bridge Engineer within 24 hours.

6. The inspector stays on site until a representative of the owner arrives and assumes responsibility of keeping traffic from accessing the structure or part of the structure that is unsafe.

7. No more than 5 working days later, the inspector will send official notification by email to the owner. Those copied on the notification include the FHWA Colorado Division Bridge Engineer, the Staff Bridge Branch Manager, the CDOT Bridge & Structure Asset Management Engineer, bridge inspectors who identified the critical inspection finding, and the Statewide Bridge Inspection Coordinator.

8. No later than 10 calendar days from the initial letter sent, the inspector will follow up with the owner requesting a status update, current photos, and any additional documentation of repairs or plan of action addressing the deficiency. All information collected will be forwarded to those on the official notification email.

9. If the inspector has not received confirmation the repair has been completed, or a plan of action, they will follow up 10 days from the first follow up to request that information.

10. If after the second follow up there has been no communication, the inspector will notify the CDOT Bridge & Structures Engineer and the Statewide Bridge Inspection Coordinator for escalation.

17.1.2.3 Tracking of Critical Inspection Findings

1. The Statewide Bridge Inspection Coordinator will maintain a tracking spreadsheet of all the critical inspection finding notices that are issued by the consultants. Entries in the sheet shall record the structure number, The inspection date, the date notification was sent to the local agency, the local agency, the road carried by the structure, the structural problem, the color coded prioritization, the date that the repair finding was addressed by the local agency, or, the dates of the follow up emails, and if repaired, the date the consultant's senior inspection engineer confirmed the repair had been completed.

2. When the local agency completes the repairs, they shall notify the consulting firm. The consulting firm shall forward the notification via e-mail to the Statewide Bridge Inspection Coordinator to be used in updating the tracking spreadsheet by filling in the date the finding was reported as repaired.

3. The bridge inspectors will document in their inspection report the extent of the damage or deficiencies, date, and time, the critical finding was observed.

4. Critical findings reported to be completed or addressed are confirmed by the consultant's inspection team with a follow up inspection.

5. The bridge inspectors will document in their inspection report the repairs, or plan of action to address the damage or deficiencies. In lieu of a follow up inspection, photographs may be provided as proof of repairs or completed plan of action.

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17.1.2.4 Identification of Essential Repair Findings

Problems with structures are typically discovered by the bridge inspectors. Occasionally local owners observe and report problems.

17.1.2.5 Notification of Essential Repairs

The process for notification of off-system essential bridge repairs is as follows:

1. Draft essential repair letters (ERL's), which includes the damage or deficiency, appropriate recommendations, timeframe to complete recommendations, supplemental photos, sketches, or tally sheets, are delivered to the consultant's senior inspection engineer for evaluation.

1. If the consultant's senior inspection engineer determines the repair is essential, the bridge inspector assigns a double asterisk to the essential repair finding maintenance item in the inspection report. Example: **354.01 is an essential repair finding due to collision damage sustained by the bridge's girders or truss members. When CDOT fully migrates to SIMSA the double asterisk will no longer be an option. The essential repair will be noted by using an Urgent or High priority maintenance item.

2. If the consultant's senior inspection engineer determines the repair is essential, the engineer classifies the repair and notifies the local agency. The color-coded prioritization described in page two of this document is used for classification. Notifications shall be sent by e-mail to the local agencies' public works or road and bridge departments within 10 days of the inspection date. Those copied on the notification include other local agency contacts as determined by the consulting firm, the FHWA Colorado Division Bridge Engineer, the State Bridge Engineer, the Staff Bridge Branch Manager, the Staff Bridge Inspection Program Manager and the Statewide Bridge Inspection Coordinator.

3. If the local agency does not respond within 14 calendar days of the first ERL email notification, the consultant shall send a follow up email at that time. If the local agency does not respond within 14 calendar days of the second email notification, the consultant shall attempt to reach the local agency by phone. If the consultant is unable to get a response at this time, they shall contact the CDOT Staff Bridge. CDOT Staff Bridge shall send the ERL to the local agency by certified mail.

17.1.2.4 Process for Tracking of Essential Repairs for Off-System Bridges

1. The Statewide Bridge Inspection Coordinator will maintain a tracking spreadsheet of all the essential repair notices that are issued by the consultants. Entries in the sheet shall record the structure number, the inspection date, the date notification was sent to the local agency, the local agency, the road carried by the structure, the structural problem, the color coded prioritization, the date that the repair finding was addressed by the local agency, or, the dates of the follow up emails, and if repaired, the date the consultant's senior inspection engineer confirmed the repair had been completed.

2. When the local agency completes the repairs, they shall notify the consulting firm and provide photos of the repair and any engineering plans. The consulting firm shall submit all documentation of the repair, or upload all documentation of the repair when SIMSA is live. The consulting firm shall update the tracking spreadsheet by filling in the date the finding was reported as repaired.

3. Essential Repair Findings reported by the local agency as completed are confirmed by bridge inspectors during regularly scheduled inspections. The Statewide Bridge Inspection Coordinator may request the consultant to conduct a special follow-up inspection. The consulting firm assigned to the section may recommend a special inspection for follow-up. If the consulting firm assigned to the section recommends a special inspection for follow-up, it must be pre-approved by the Statewide Bridge Inspection Coordinator before the follow-up inspection takes place.

4. The bridge inspectors will document in their inspection report, in the Inspection Notes, whether or not any Essential Repair Findings previously identified have been addressed and forward the report to the consultant's senior inspection engineer for evaluation. If the inspection engineer concurs that the essential repair has been addressed, the engineer will update the tracking spreadsheet accordingly.

17.2 Inspection Finding Classification and Prioritization

Critical Findings are Immediate Priority Repair Needs.

17.2.1 Critical Inspection Finding (CIF)

A structural or safety related deficiency that requires immediate follow-up inspection or action.

Critical Inspection Findings are a structural or safety related deficiency that requires **immediate** action to ensure public safety. Deficiencies that compromise the ability of the structure to safely convey traffic are deemed to be Critical Inspection Findings and requiring **immediate** identification, notification, correction, and follow-up.

The criticality of the deficiency will result in one or more of the following actions:

- Close the bridge until the defect is removed or repaired, if the defect may impact users or user safety.
- Restrict the area from public access until the defect can be removed or repaired.
- Repair the structural member or address the functional or safety issue.

Examples of Critical Inspection Findings include but are not limited to:

- Loose armor on an expansion joint in the traffic lanes.
- Delaminated or spalling concrete over traffic or that could fall and/or roll into traffic.
- NSTM's within the Structure Record and which are damaged by natural or impact forces that may result in partial or full failure.
- A condition which results in a restriction of the maximum acceptable load carrying capacity of the structure to a value less than 3 Tons at the operating level and closing the structure.
- Three or more adjacent cracked or split timber stringers in one span that have not been repaired.
- 40% rot in adjacent timber piles that affect the load carrying capacity of the structure.
- Concrete girders sheared at the ends to the extent that displacement has occurred.
- 40% section loss of prestress strands.
- Trusses with misalignment of a compression member in an amount that exceeds half the width of the member.
- Any severed tension member in a truss.
- The tension flange of a steel girder that is severed or has 100% section loss.
- Corrosion in steel piling with 60% section loss of the pile that affects the carrying-capacity of the structure.

- Scour which has caused loss of the approach roadway or affects the ability of the structure to carry traffic.
- NSTM member is serious or worse condition.
- Deck, super, sub, or culvert component condition in critical or worse condition.
- Channel condition or scour component condition in critical or worse condition.
- Girder damaged by the over-height vehicle enough so that a portion of the bridge must be closed to traffic

If there is a Critical Inspection Finding, a Critical Inspection Finding Letter (CIF) will be prepared and sent to the owner within 5 working days of the finding.

NBI Items shall be coded a 1 for any item that requires a full closure.

17.2.2 Essential Repair Finding (ERF)

Essential Repair Findings are the repairs necessary to ensure the safe and continued service of the department's structures. They are a structural or safety related deficiency that requires follow-up inspection or action, in a recommended time period.

Examples of Essential Repair Findings include but are not limited to:

- NSTMs within the Structure Record, which are damaged by natural or impact forces.
- A condition which results in a restriction of the maximum acceptable load carrying capacity of a structure resulting in required load posting above 3 Tons.
- Missing or incorrect load posting signs.
    - Must be an Orange ERL and resolved within 30 days.
- Three adjacent crushed timber stringers.
- Any cracked or split timber stringers.
- Timber stringers with rot at the ends, which may cause the stringer to fall off the timber cap. "Mushrooming" for a depth of 2 inches on three adjacent stringers. Rot in the top of 80% of all stringers in one span, which reduces the effective depth by 25%.
- Rot in timber piles that affect the carrying-capacity of the structure.
- Concrete girders with over 30% loss of the primary moment steel.
- Loss of section in beam-ends and/or spalls in concrete girder supports where girders have less than 35% bearing area remaining.
- Any steel member with over 30% section loss.
- Steel or aluminum culverts including super spans with section displacement and/or gaps at the point of overlap and cracks in bolt lines that allow fill to spill through.
- Steel or aluminum culverts including super spans with perforations in the bottom third.
- Scour since the last inspection, which has caused vertical or horizontal displacement. Scour under a spread footing which has caused a loss of 15% of the bearing area.

If there is an Essential Repair Finding, an Essential Repair Letter (ERL) will be prepared and sent to the owner within 10 working days of the finding.

Table 17-1 Inspection Finding Classifications and Priorities

Classification	Legacy Color Code	Target Time Frame for Completion	Priority	Federal NBIS	Initial Notification	E-Mail Notification Time Frame	Follow-up Time Frame
Critical Inspection Findings							
Immediate Priority Repair	Red	Immediate or Within a timely manner	Immediate	Critical Finding	Immediate (phone call, in-person, etc.)	Within 5 working days of finding	10 Calendar days of E-Mail
Essential Repair Findings							
Urgent Priority Repair	Orange	Within 30 days	Urgent		E-Mail Notification	Within 10 working days of finding	14 Calendar days of E-Mail
High Priority Repair	Yellow	Within 90 days	High		E-Mail Notification	Within 10 working days of finding	14 Calendar days of E-Mail
Moderate Priority Repair	Green	Within one year	Moderate		At presentation	As needed (not required)	As needed or At next inspection
Monitor	Blue	Specified in the letter	Monitor		E-Mail Notification	Within 10 working days of finding	As suggested in the notification
Low Priority Repair (maintenance item)	No Color	As funding allows	Low		Included with transfer files to Owner	N/A	At next inspection

17.2.3 Urgent Priority Repair Needs

An Urgent Priority Repair Need is damage or an immediate threat of damage that is creating an unsafe condition or imminent danger to the traveling public. If this priority is used, an Orange ERL must be generated.

Examples of Urgent priority conditions include but are not limited to:

- A girder severely damaged by an over-height vehicle requiring a bridge closure or partial bridge closure
- Expansion joint armor projecting above the deck and in the travel lane.
- Localized bridge deck failure (i.e. punch through)
- Sign, signal or high mast light pole damaged enough by a traffic impact that collapse is possible
- Loose or missing bolts in any connection
- Tension members identified as NSTM which are damaged by natural or impact forces
- New or active crack discovered in a NSTM
- Load posting signs – Signs are missing/fallen over/illegible/incorrect (too high)
- Steel Piles – Several piles have severe section loss resulting in significant loss of support capacity
- Metal decks – Large areas of severe section loss/cracking, Loss of strength, or local failures are possible
- Corrugated Metal Pipe (CMP) – Large areas of perforations, deformation of culvert from original shape, or severe piping/soil loss

17.2.4 High Priority Repair Needs

A High Priority Repair Need is when conditions or advanced deterioration of key elements which has affected the current capacity, serviceability, and anticipated service life of the element or structure requiring action to prolong the service life. If left uncorrected, the deterioration will likely accelerate resulting in increased repair costs or scope or both. Does not significantly affect safety of the traveling public at the time of inspection. If this priority is used, a Yellow ERL may be generated.

Examples of high priority conditions include but are not limited to:

- Collections of debris and failed protective systems on NSTM's
- Joints – Major leakage/failures
- Steel Piles – Widespread advanced corrosion, areas of severe section loss. Minor loss in capacity.
- Metal deck – Widespread advanced corrosion, areas of severe section loss.
- CMP – Widespread advanced corrosion/section loss. Numerous perforations. Minor piping may exist
- Roadway erosion – Large erosion ditch, encroaching well into the traveled way
- Channel debris –Large amounts of debris. Waterway severely restricted. Culverts nearly blocked.
- Structure inaccessible for an inspection due to debris or other finding that requires correction prior to an inspection

17.2.5 Moderate Priority Repair Needs

A Moderate Priority Repair Need is when conditions or deterioration exist which may affect the current capacity or shorten the service life of the element. If left uncorrected these conditions may accelerate deterioration of the element, system, or structure resulting in additional deterioration, maintenance, or increased repair cost or scope or both in the near future. Does not affect safety at the time of inspection. These will be maintenance items.

Examples of medium priority conditions include but are not limited to:

- Joints – Moderate debris or minor leakage
- Steel Piles – Moderate corrosion, moderate section loss may exist. Structural elements are sound.
- Metal deck – Moderate corrosion, minor to moderate section may exist
- CMP – Moderate corrosion, areas of section loss. Isolated small perforations in invert may exist
- Roadway erosion – Moderate erosion, may start encroaching into traveled way
- Dirt/Debris build-up – Large amount of dirt/debris built up on elements
- Failed protective system on a steel element
- Channel debris – Moderate to Large amounts of debris build up. Minor constriction of waterway.

17.2.6 Low Priority Repair Needs

Low Priority Repair Need is when conditions or minor deterioration exist which may shorten the service life of the element but has minimal to no effect on the current capacity or serviceability of the element.

If left uncorrected, these conditions may accelerate deterioration of the localized defect and may result in an increase in future repair costs and / or scope. The low priority repair need does not affect safety at the time of the inspection.

Examples of low priority conditions include but are not limited to:

- Joints – Minor debris.
- Steel Piles – Minor corrosion
- Metal decks – Minor corrosion
- CMP – Minor corrosion
- Roadway erosion – Minor erosion, does not encroach into traveled way
- Dirt/Debris build-up – Minor to moderate dirt/debris built up on elements
- Channel debris – Minor to moderate debris build up.

17.2.7 Monitor

Monitor is used when no maintenance is required immediately, or maintenance action cost-benefit is not efficient at this time. Conditions need to be monitored to assure that conditions are not worsening. This code is not to be used to address routine inspection procedures. The owners plan to monitor will be documented in the report along with any records of the monitoring.

Examples of monitor recommendations include but are not limited to:

- Scour – Minor scour may exist, but repairs are not warranted yet
- Scour NBI Item 113 = 4 but no notable scour exists

17.3 Maintenance Item Numbers

The whole number/integer maintenance activity numbers are based on the CDOT Manual of Maintenance Procedures, Maintenance Program Area Activity Numbers 150, 200, 250, 350, and 500.

The decimal maintenance activity numbers were added by CDOT Staff Bridge to further define the repair activities and do not exist within the CDOT Manual of Maintenance Procedures.

The limits of the bridge maintenance activities are from the abutment back face to abutment back face and the adjacent approach slabs. These activities include but are not limited to the following:

ROADWAY		Possible Corresponding Activities
Wearing Surface Repairs		
	152.00 - Flexible Pavement Patching/Minor repair	Patch Potholes, Feather Patching
	353.20 - Install waterproof membrane and Overlay	
	158.00 - Rotomilling Flexible Pavement	Grinding of asphalt only
	156.00 - Flexible Pavement Crack/Joint Sealing	Seal asphalt cracks
Joint Repairs		
	364.00 - Repair/replace expansion joints and seals	Repair/replace glands, joint seals, and headers or joints in entirety.
	364.01 - Clean expansion joints and seals	Clean debris from expansion joints.
	353.07 - Repair joints (non-expansion) i.e. "D" cracking/spalling	Repair to concrete headers. Construction Non-expansion joint repair is captured under concrete repairs, 200.31 or 200.32
Sidewalk and Curb & Gutter		
	356.02 - Replace curb/sidewalk/wheel guard	
	356.00 - Repair curb/sidewalk/wheel guard	
Approach Slabs and Slope Protection		
	360.00 - Approach Slabs	Feather patching, or expanding foam injection (mudjacking), or crack sealing in exposed approach slabs
	152.01 - Fill settled areas at corners of bridge to prevent erosion	Gravel, asphalt or other settlement, drainage, erosion repair/prevention
	360.03 - Place/replace/repair berms/fill slopes and slope protect.	Riprap haul and placement, Erosion behind wings, approach roadway, etc..
Install or Revise Signs		
	302.01 - Signs Install new, repair missing/ broken	Install, reset, repair signs of all material and intent, such as vertical clearance or load posting
	302.02 - Signs Replace incorrect posting	Replace incorrect signs of all material and intent, such as vertical clearance or load posting
Install or Repair Bridge Railing		
	306.00 - Bridge Rail/Approach Rail/Guardrail - Installation, Replace	Incorporates all Bridge railing needs for upgrading or replacing railings to current AASHTO standards.
	306.01 - Bridge Rail/Approach Rail/Guardrail - Collision Repair Maintenance	Incorporates all Bridge railing needs from collision.
Install or Repair Roadside Railing		
	306.02 - Roadside Guardrail - Installation, Replace	Incorporates all railing needs for upgrading or replacing railings to current AASHTO standards. Includes guardrail over culverts (not attached)
	306.03 - Roadside Guardrail - Collision Repair Maintenance	Incorporates all railing needs from collision. Includes guardrail over culverts (not attached)
STRUCTURE		
Deck Repairs		
	353.99 - Miscellaneous bridge deck work	
	353.04 - Seal concrete deck surfaces	Seal Concrete Surfaces
	353.30 - Replace deck (concrete, steel, timber)	
Superstructure Repairs		
	354.99 - Miscellaneous superstructure work	
Substructure Repairs		
	358.99 - Miscellaneous substructure work	
	358.02 - Repair/shore up/replace damaged substructure where it could cause bridge to fail (Imminent danger)	
Wingwall and Retaining Wall Repairs		
	358.06 - Repair/replace/extend/raise/construct wingwalls, with piles, backing planks, closure strips, deadmen, etc.	
Bearing Repairs		
	357.00 - Bearings	Clean debris from bearing area (per substructure unit)
Concrete Repairs		
	200.31 - Concrete repair, including removal of spalled, delaminated, deteriorated concrete, may include rebar cleaning/replacement	
	200.32 - Concrete patching, voids/honeycombing	Voids or mechanical spalls, reinforcement corrosion not initial cause of required repair
	159.00 - Rotomilling Rigid Pavement	Sidewalk or other rigid pavement, concrete, grinding. Possibly due to trip hazard within City's standard limits
	200.38 - Crack sealing in concrete, may require epoxy injection	Structural repair
Culvert (CBC/CMP/RCP) Lining		
	200.35 - CMP lining (cleaning of corrosion and rust preventative lining)	
	200.36 - Installation of concrete invert (CMP) or floor overlay (CBC)	
	200.34 - Repair/straightening/sectional replacement of damaged CMP	
	200.37 - Repair/installation of concrete headwalls (CMP/CBC)	
Clean or Paint Bridge		
	355.00 - Clean and Paint Bridge	Clean (to bare metal) prime and paint structural steel
	352.00 - Cleaning or Washing	Cleaning of deck drains. Washing bridge decks of chlorides, etc.
Miscellaneous Structure Repairs		
	200.99 - Miscellaneous culvert repair (CMP/CBC/Timber)	Application of penetrating concrete sealant to top slab. Other repair actions which are not captured herein.
	398.00 - Miscellaneous Bridge Work	
CHANNEL		
Debris Removal		
	206.01 - Remove debris/other obstructions/brush/trees/fence from channel or around bridge.	Debris at nose of pier, debris between girders, etc.
Vegetation Removal		
	260.00 - Tree/Brush/Grass Removal and Trimming	Remove tree from beneath, on, or near structure.
Scour or Erosion Control		
	206.00 - Maintenance of Ditches/Streambed/Channel	Channel maintenance not captured by debris/vegetation removal and/or scour mitigation.
	358.03 - Fill scour holes around piers, abutments, and at ends of CBC's.	RipRap (grouted or ungrouted)
	351.01 - Monitor Scour	Monitor scour
Engineering		
	351.00 - Structural visual inspection, monitoring.	Monitor other than scour
	399.00 - Maintenance requiring engineering.	Structure Replacement, Hydraulic Analysis, Roadway/Bridge Widening, Structural Analysis, decisions requiring engineering judgement and study

* All Action Items ending in "*.20" were developed by CDOT for the Off-System Bridge Inspections. Intent may utilize only a portion of full code.
* All Action Items ending in "*.3" were developed as part of the City's Maintenance Program and are supplemental to the existing CDOT utilized codes.

Table 17 2 Maintenance Activity Numbers

18 Inspection Quality Control and Quality Assurance

18.1 Major Structure Inspection Quality Control/Quality Assurance

Federal Requirement

Federal Regulation 23 CFR 650.313(p) (05/2022), Quality control and quality assurance, states:

Assure systematic QC and QA procedures identified in Section 1.4, AASHTO Manual are used to maintain a high degree of accuracy and consistency in the inspection program.

Definitions:

Quality Control (QC)

- Procedures intended to maintain quality of a bridge inspection.

Quality Assurance (QA)

- The process, by use of sampling, to verify QC procedures are working, or address inconsistencies / deficiencies in the QC procedures.

Qualified Team Leader

- An individual meeting the team leader requirements of 23-CFR § 650.309(b).

Inspector

- An individual assisting a Qualified Team Leader with inspections, or, an individual performing inspections under the direct supervision of a Qualified Team Leader. The Inspector may be a Qualified Team Leader.

18.1.1 Major Structure Inspection Quality Control

A QC plan shall be prepared to ensure that the required standards of quality for the On-System and Off-System contract task orders are met. The QC plan must be provided to the CDOT PM by each contractor prior to the start of any field work. In the QC plan, the contractor defines the procedures by which they will manage and control their own, along with all subcontractor's and suppliers' activities so that the completed project complies with contract requirements. To guide our contractors in this task the minimum standards are outlined in this document.

Internal QC will be recorded as the official QC date reported to FHWA when applicable. This individual does not need to be a Qualified Team Leader.

18.1.1.1 Team Leaders

For On-System Bridges, the Bridge & Structures Inspection Engineer, or, Statewide Bridge Inspection Coordinator will make reasonable effort to rotate inspection teams so that no more than two sequential inspections are done by the same inspection team or inspector. If two sequential

inspections are done by the same inspection team, the second inspection will be done by a different Qualified Team Leader if possible, or Inspector under the direct supervision of a Qualified Team Leader.

For Off-System bridges, the regional assignments to contract inspectors shall be at minimum rotated every four years. The contractor will make reasonable effort to rotate inspection teams so that no more than two sequential inspections are done by the same inspection team.

18.1.1.2 Final Inspection Reports

The Colorado Department of Transportation (CDOT) has adopted a practice of using color codes on the Structure Inspection and Inventory (SI&A) Report to clearly define which group (Asset Management, Inspectors, or Rating Unit) is responsible for validating the code or information and performing the internal QC.

The bridge inspection team leader shall check all bridge inspection reports before making the final submittal. See section 18.1.1.3 for the process for review and tracking. The review of reports will consist of the following validation for accuracy and consistency:

- Inspection Type(s) – The appropriate inspection type(s) are identified and entered correctly.
- Inspection Date – Ensure that bridges are inspected on time (within the same month according to the assigned inspection interval using USERKEY4).
- Inspection Interval – Verify that inspection interval is based on condition or policy (i.e., 48-month interval criteria, reduced interval criteria, etc.). If the interval exceeds 24-months, confirm that the bridge still qualifies for an extended inspection interval.
- Organization of Report – Verify that the report is organized in the correct format, understandable, uses terminology and verbiage consistent with the latest coding guide(s).
- Supporting documentation – Verify that the appropriate supporting documentation is included in the reports (example – VCLR Sheet, Streambed Profile, Tally Sheet, etc.). Verify all Elements with Condition State (CS) 3 and 4 defects have corresponding photos. Verify all recommended maintenance recommendations have corresponding photos.
- SI&A Codes – Verify that the codes are supported by inspection report content.
- Elements – Verify that the structure elements are complete and accurate.
- Condition States – Verify that the condition states are supported by the inspection report content.
- Repair Recommendation and Priorities – Verify that appropriate repairs and repair priorities are recommended based on inspection report content.
- Essential Repairs/Critical Findings – Ensure deficiencies have had the proper parties notified in the assigned timeframe, and if applicable, follow-up per Sections 17.2.1 or 17.2.2.
- Load rating/posting information.
- Structure features.

For On-System structures, if any Asset Management fields are found to contain incorrect information, the inspector shall notify the CDOT Asset Management team for correction. If any Load

Rating information is missing or incorrect for On-System structures, the inspector will notify the CDOT Load Rating unit for correction.

For Off-System structures, if any Asset Management fields, or Load Rating fields, outside the required Inspection fields are found to contain incorrect information, the contractor's administrator shall update / correct the Asset Management fields and Load Rating data in their assigned regional area. They shall notify the respective Unit of these updates.

After confirming the full report and all required inspection data entries are accurate, the Qualified Team Leader certifies this by signing the report and archiving it. This shall be completed within 3 months after the month when the field portion of the inspection is completed.

18.1.1.3 Records and Tracking

On-System:

The Inspector will enter the initials, or names, of all inspection members in the Inspection Notes section of the report, or as directed by the Bridge & Structures Inspection Engineer, or, Statewide Bridge Inspection Coordinator, along with the time, estimated temperature (or actual if known, recorded in Fahrenheit), and weather conditions. The person performing the inspection will be listed first. The Team Leader only needs to be listed first if they are the one performing the inspection. See examples below:

- Time: 09:50 Temp: 72 degrees Weather: Clear / Cloudy Team: DN/JS
- Time: 09:50 Temp: 72 degrees Weather: Clear / Cloudy Team: J. Snuffy / D. Fluffy

After the inspection data is entered, the inspector will provide the Team Leader a copy of the updated report and their field notes for review via electronic or hard copy. The Team Leader will make notes and or comments in a different color than the Inspector's written field notes or electronic field notes. They will note the date of the review, and the initials of the reviewer. Once the review comments are provided to the Inspector, the Inspector will save an electronic copy of the review comments. This document will be filed on the electronic folder using the following file naming convention:

- (Structure Number) QC (Year Month Date of the inspection)
- E-17-FX QC 2022 09 23

All changes made or suggested for any particular report during the QC review process must be agreed upon by the Team Leader responsible for the final submittal of the report. In the event of a disagreement, the Bridge Engineer shall intervene as arbitrator to determine a final solution to the matter.

Off-System:

Contractors will outline how they will track their QC process, and how they will keep records of the process, in their provided QC plan. Documentation of the QC practices shall be made available to CDOT upon request.

18.1.1.4 Load Rating Quality Control:

Shall be completed using Appendix B of the CDOT Load Rating Manual dated September 2022, or latest edition.

18.1.2 Major Structure Inspection Quality Assurance

18.1.2.1 Team Leaders

Team Leaders performing inspections for the State of Colorado must meet the qualifications listed in 23 CFR 650.309. Team Leader status must be approved by the CDOT Bridge & Structures Inspection Engineer, or Statewide Bridge Inspection Coordinator prior to acting in the role of a Team Leader. The CDOT Bridge & Structures Inspection Engineer, or Statewide Bridge Inspection Coordinator will collect, review, track, and approve, all Team Leader qualifications in a registry. CDOT will accept up to 1/20th of the CFR required inspection experience as:

- construction
- bridge design
- bridge load rating

CDOT Bridge Inspector Process

Once an individual believes they meet the minimum requirements, they will set up a meeting with the Bridge & Structures Inspection Engineer and their current Team Leader to discuss the possible status change. If the Bridge & Structures Inspection Engineer agrees the individual meets the requirements, and is fully capable of performing Team Leader duties, they will instruct the individual to email a formal request to the Bridge & Structures Inspection Engineer, or Statewide Bridge Inspection Coordinator.

Use the following file naming convention when sending all request documents;

- (last name)_(Course number or Resume or Degree or License)_(year month completed)
- Brown_ 130101a _2016 05

Contractor Bridge Inspector Process

Prior to adding a new Team Leader each contractor PM will submit a formal request to the Bridge & Structures Inspection Engineer, or Statewide Bridge Inspection Coordinator.

Minimum Requirements to be included with the formal request:

- All NHI, or approved alternate class, certificates.
- A resume that must:
  - Clearly outline relevant experience
  - Clearly state how long they have been inspecting bridges

    - Provide an estimated number of bridges inspected
- If applicable, provide documentation of an Engineering Degree, E.I.T. or P.E. status

Use the following file naming convention when sending all request documents;

- (last name)_(Course number or Resume or Degree or License)_(year month completed)
- Brown_130101a _2016 05

18.1.2.2 Inspector Training

As required by the CFR, all Qualified Team Leaders shall have successfully completed a FHWA-approved comprehensive bridge inspection training course. Beginning June 6, 2024, in order to maintain team leader status, CDOT requires all team leaders shall complete a cumulative total of 18 hours of FHWA-approved bridge inspection refresher training over each 60-month period and score 70 percent or greater on an end-of-course assessment.

CDOT requires that for NSTM inspections, the Qualified Team Leader must have successfully completed the FHWA-approved training course on the inspection of NSTMs and score 70 percent or greater on an end-of-course assessment. Beginning June 6, 2024, in order to continue to perform NSTM inspections, CDOT requires that the team leaders complete the FHWA-approved training course on the inspection of NSTMs each 120-month period.

CDOT requires that for underwater inspections, the Qualified Team Leader must have successfully completed the FHWA-NHI-130091 Underwater Bridge Inspection course and score 70 percent or greater on an end-of-course assessment. Current underwater inspectors may keep their team leader status if they completed and passed the FHWA-NHI 130055 Safety Inspection of In-Service Bridges course and were approved by CDOT as an Underwater Bridge Inspection Diver prior to June 6, 2022.

CDOT requires that for ancillary inspections, the Qualified Team Leader must have successfully completed the FHWA-NHI-130087 Inspection and Maintenance of Ancillary Highway Structures course every 120-months.

CDOT Staff Bridge will make every reasonable effort to sponsor a FHWA comprehensive bridge inspection training course or FHWA approved bridge inspector refresher course every 60-months. Bridge Inspector Training will be tracked by the Bridge & Structures Inspection Engineer or the Statewide Bridge Inspection Coordinator.

Other CDOT considerations: **CDOT requires individuals to be a Qualified Team leader, or under the direct supervision of a Qualified Team Leader, to perform Inspections of Signs, Signals, High Mast Lights, Walls, Minor Structures, and Underwater Bridge Inspections**.

The above listed courses may be substituted with a FHWA approved alternative. CDOT accepts all FHWA approved alternate classes.

18.1.2.3 Inspection Report Quality Assurance

Inspection Reports

The Statewide Bridge Inspection Coordinator shall perform, or the Bridge & Structures Inspection Engineer shall assign a Senior Qualified Team Leader Bridge Inspector to perform selective independent reviews of inspection reports. This individual cannot have been directly involved with the inspection. Inspection reports will be flagged for potential review if any of the following applies.

- All NSTM structures
- NBI Item 41, Coded a B, P, R, D or K, or SNBI Item B.PS.01, Coded TO, SO, PA, TA, SA, PP, TP, SP, PR, TR, SR, PD, TD, SD, PM, TM, SM, or C.
- NBI Item 113, Coded 6, 4, 3, 2, 1, or 0, or SNBI Item B.C.11 Coded 4, 3, 2, 1, or B.AP.03 Coded 0, C, D, E, U .
- Any structure on less than 24-month inspection interval.
- A change of 2 or more since the previous inspection when the condition rating was 6 or greater of the following Items:
  - Deck, NBI Item 58, or SNBI Item B.C.01
  - Superstructure, NBI Item 59, or SNBI Item B.C.02
  - Substructure, NBI Item 60, or SNBI Item B.C.03
  - Culverts, NBI Item 62, or SNBI Item B.C.04
- A change of 1 or more since the previous inspection when the condition rating was 5 or less of the following Items:
  - Deck, NBI Item 58, or SNBI Item B.C.01
  - Superstructure, NBI Item 59, or SNBI Item B.C.02
  - Substructure, NBI Item 60, or SNBI Item B.C.03
  - Culverts, NBI Item 62, or SNBI Item B.C.04
  - Other criteria as determined by the Bridge & Structures Inspection Engineer or the Statewide Bridge Inspection Coordinator.

The review procedure is the same as the QC procedure detailed in Section 18.1.1.2.

The reviewer will review the QC documentation for a percentage of the structures reviewed in the QA process. The percentage will be determined by the workload and available time at the time of the review.

18.1.2.4 Records and Tracking

The percentage of the inspection reports reviewed shall be tracked in an Excel spreadsheet. The results of the Quality Assurance review will be documented upon completion of the review. The review documentation, including the team leader or contractor's response, and the date of the Quality Assurance review will be documented in the Excel spreadsheet and archived. The FHWA Colorado Division Bridge Engineer will be included in all correspondence of the QA reviews. Any additional reviews that the FHWA representative would like to see will be provided upon request.

18.1.2.5 Load Rating Quality Assurance

Shall be completed using Appendix B of the CDOT Load Rating Manual dated September 2022, or latest edition.

18.1.3 Major Structure Field Audit

The CDOT Bridge & Structures Inspection Engineer, or designee shall make a reasonable effort to audit the work of each CDOT inspection team, and at least one inspection contractor annually. QA of the contractors will rotate each year if only one is audited. Contractor task orders may be used to audit the CDOT inspection teams. The audits shall include:

- Field inspection of bridges to check the coding, comments, and overall inspection report quality.
- The bridges will be selected randomly. The audit of CDOT inspections will consist of day trips only.
- If possible, at least one bridge containing a nonredundant steel tension member will be included in each review.

The Bridge & Structures Inspection Engineer, or, the Statewide Bridge Inspection Coordinator will review the results of the audit with the CDOT team. The Statewide Bridge Inspection Coordinator will review the results of the audit with the contractors. They will provide guidance and training as necessary to improve the accuracy and consistency of future inspections. The results of the audit and the review meeting will be documented upon completion of the audit and review meeting. The date of the field review will be documented in the inspection notes. The following format will be used: Field Review - <month and year of the review>.

The Bridge & Structures Inspection Engineer and the Statewide Bridge Inspection Coordinator will participate in annual field reviews with the FHWA Colorado Division Bridge Engineer as part of the annual Metric review process. The Bridge & Structures Inspection Engineer will review the audit results as applicable with any CDOT inspection teams. The Statewide Bridge Inspection Coordinator will review the audit results as applicable with any contractor.

18.2 Minor Structure Inspection Quality Control/Quality Assurance

The minor structure inspection team leader is responsible for inspection quality control. By archiving the report or making the final submittal, the team leader certifies that the full report and all entries are accurate.

The minor structure contractor inspection program manager is responsible for quality assurance.

The Statewide Non-Bridge Inspection Coordinator is responsible for auditing the minor structure inspections.

18.3 Miscellaneous Structure Inspection Quality Control/Quality Assurance

The miscellaneous structure inspection team leader is responsible for inspection quality control. By archiving the report or making the final submittal, the team leader is certifying that they have checked the full report and all entries are accurate.

The miscellaneous structure contractor inspection program manager is responsible for quality assurance.

The Statewide Non-Bridge Inspection Coordinator is responsible for auditing the miscellaneous structure inspections.

19 Entering Railroad Right of Way

Before entering railroad ROW or light rail ROW and inspecting structures that carry a railroad track or are over a railroad track a Right-of-Entry Permit is required from the railroad agency that owns the railroad track. Planning ahead is important because a Right of Entry Permit can take five or more months to obtain.

The major Colorado railroads and their Right-of-Entry Permit requirements are:

- Regional Transportation District - RTD
  - https://www.rtd-denver.com/
- Union Pacific Railroad - UPRR
  - https://www.up.com/index.htm
  - https://www.up.com/real_estate/tempuse/index.htm
- BNSF Railway Company
  - https://www.bnsf.com/
  - http://m.bnsf.com/about-bnsf/pdf/temporary.pdf

19.1 Required Safety Training

Safety training is typically required before entering railroad ROW with a Right of Entry Permit. Check with the railroad agency for their required training.

The major Colorado railroads known safety training is listed below:

- RTD On-Track-Safety-Training (OTST) is required for any work near RTD Light Rail Tracks
  - http://www.rtd-denver.com/RailroadSafety.shtml
- CRT RTDC-NM Safety Training is required for any work near RTDC-NM Commuter Rail Tracks
- CRT RTDC-DTO Safety Training is required for any work near EAGLE Commuter Rail Tracks
- eRailSafe safety training for BNSF and UPRR
- BNSF RR Safety Training/Contractor Orientation
  - https://bnsfcontractor.com/Default.asp
- UPRR Contractor Orientation
  - https://contractororientation.com/Default.asp

19.2 Background Checks

eRailSafe background checks may be required to meet the U.S. Department of Homeland Security requirements before entering railroad right of way. Confirm with the railroad.

UPRR and BNSF are known to require an eRailSafe background check.

20 Non-Permit Required Confined Space Safety

See OSHA 29 CFR 1910.146 (12/2011) for Permit Required Confined Space Safety

Confined spaces are spaces which are not designed for continuous occupancy of a worker or have a restricted entry or exit. A non-permit required confined space is one that does not contain nor, with respect to atmospheric hazards, has the potential to contain any hazard capable of causing death or serious physical harm.

There are situations where inspection access is required within a non-permit confined space (e.g., inside box girder bridges, inside tied arch box members, etc.).

Before entering a non-permit confined space, the inspectors shall perform pre-entry air tests utilizing a gas monitor to ensure oxygen levels are acceptable for safe entry. Proceed only if the non-permit confined space is determined to be acceptable for safe entry.

Table 20-1 Recommended Minimum Conditions for Entry of Non-Permit Confined Spaces

Hazard	Requirement
Oxygen	Minimum 19.5% and Maximum 23.5%
Flammable Gases	No greater than 10% of lower flammable limit (LFL)
Hydrogen sulfide (H_2S)	No greater than 10ppm (parts per million)
Carbon monoxide (CO)	No greater than 25ppm
Other toxic substances	No greater than Permissible Exposure Limit (PEL) for substance
Flammable Dusts	Must not reduce visibility <5’ Does not have a concentration that meets or exceeds its lower flammable limit (LFL)
Engulfment hazards	No engulfment hazard may be present
Hazardous flows	Must be secured and locked/tagged out
Hazardous energies	Must be secured and locked/tagged out
External hazards	External hazards must be controlled

Before entering the non-permit required confined space the inspection team must determine who will be the attendant and who will be the entrant.

Attendant: An individual stationed outside the non-permit required confined space who monitors the authorized entrants inside the non-permit-required confined space. Attendants may rotate duties with the entrant.

Entrant: An individual that enters the non-permit required confined space. Entrants must carry a gas monitor while inside the non-permit required confined space set to alarm if hazardous gas levels are detected. Entrants may rotate duties with the attendant.

21 On-System Inspection Itineraries

Inspection trip itineraries should be sent out at least one week prior to the inspection trip, if possible. The itinerary should be sent to the Region Maintenance Superintendent and copied to the people in the following positions:

- Region Deputy Maintenance Superintendent
- Region Bridge Crew
- CDOT Bridge & Structures Inspection Engineer
- Statewide Bridge Inspection Coordinator
- And any others identified by Region Maintenance

21.1 Suggested Wording for Routine/NSTM Inspection Itinerary Notification

< Region Maintenance Superintendent >,

[Consultant] currently has a contract with the CDOT Staff Bridge Inspections Unit to inspect On-System [Bridges, Culverts, Overhead Signs, Mast-Arm Signals, High Mast Lights].

We are planning to inspect ## structures in Region(s) ____ the week of _____. Please see attached itinerary for details.

Our activities will not involve any lane closures or have any impact to traffic. If you have any questions or concerns, please don't hesitate to contact me.

Please let me know if you have any special concerns or issues with these structures.

My cell phone number is xxx-xxx-xxxx.

We welcome any CDOT personnel that would like to accompany us on our inspections.

If you need anything else, please let me know.

Thanks.

21.2 Suggested Wording for A-40 Inspection Itinerary Notification

< Region Maintenance Superintendent >,

We are planning to inspect ## bridges in Region ___ the week of _____. Please see the attached itinerary for the bridges that will be inspected using the A-40 and the traffic control necessary for each structure.

As we conduct inspections all over the state and do not have regular contact with the groups providing traffic control, we have found that in a few instances the group responsible for the traffic control is unaware we are coming. CDOT is a large organization with many different patrols and we understand that. To help facilitate smooth operations, please let me know you have received this email and include the following information: who will be providing traffic control (name of lead TM), and a contact number so I may confirm the week prior.

Please forward this information to the appropriate patrols that will be doing the traffic control. Also, please cc me on your response so I can contact them to discuss specifics regarding the inspection.

Please let me know if you have any special concerns or issues with these structures.

My cell phone number is xxx-xxx-xxxx.

We welcome any CDOT personnel that would like to accompany us on our inspections.

If you need anything else, please let me know.

Thanks.

22 Inspection Personnel Minimum Qualifications

22.1 Minimum Qualification Matrices

Table 22-1 Minimum Qualifications by Inspected Asset

Inspected Asset Type	Program Manager	Project Manager / Project Engineer / Inspection Coordinator	Team Leader	Team Member
Major Structure	Colorado PE 23 CFR 650.309(a) (05/2022) FHWA-NHI-130055[2]	23 CFR 650.309(b) (05/2022) FHWA-NHI-130055[2]	23 CFR 650.309(b) (05/2022) FHWA-NHI-130055[2]	
Minor Structure	Colorado PE FHWA-NHI-130055[2]	FHWA-NHI-130055[2]	FHWA-NHI-130055[2]	
Miscellaneous Structure	Colorado PE FHWA-NHI-130055[2]	FHWA-NHI-130055[2]	FHWA-NHI-130055[2]	

Table 22-2 Minimum Qualifications by Inspecton Type

Inspection Type	Program Manager	Project Manager / Project Engineer / Inspection Coordinator	Team Leader	Team Member
Nonredundant Steel Tension Member Bridges	Colorado PE 23 CFR 650.309(a) (05/2022) FHWA-NHI-130055[2] FHWA-NHI-130078	23 CFR 650.309(b) (05/2022) FHWA-NHI-130055[2] FHWA-NHI-130078	23 CFR 650.309(b) (05/2022) FHWA-NHI-130055[2] FHWA-NHI-130078	N/A
Underwater Inspection[3]	Colorado PE 23 CFR 650.309(a) (05/2022) FHWA-NHI-130055[2]	23 CFR 650.309(b) (05/2022) 23 CFR 650.309(e) (05/2022) (FHWA-NHI-130055[2] or FHWA-NHI-130091)	23 CFR 650.309(b)(c) (05/2022) 23 CFR 650.309(e) (05/2022) (FHWA-NHI-130055[2] or FHWA-NHI-130091)	23 CFR 650.309(e) (05/2022) (FHWA-NHI-130055[2,6] or FHWA-NHI-130091[6])
Pin Inspection / Non-Destructive Testing[4]	Colorado PE 23 CFR 650.309(a) (05/2022) FHWA-NHI-130055[2] FHWA-NHI-130078	23 CFR 650.309(b) (05/2022) FHWA-NHI-130055[2] FHWA-NHI-130078	23 CFR 650.309(b)(c) (05/2022) FHWA-NHI-130055[2] FHWA-NHI-130078	N/A
Damage	N/A	N/A	N/A	N/A

[2] FHWA-NHI-130056 is an acceptable substitute for registered professional engineers. FHWA-NHI-130053 is required every 60-months after completion of the standard course

[3] The divers on the Dive Team who will perform the underwater inspections must at least be an ADCI certified diver by a recognized commercial diving school

[4] Pin inspections require ASNT NDT ultrasonic Certified personnel

[6] FHWA-NHI-130056 was acceptable inleau of FHWA-NHI-130091 prior to 05/2022

Inspection Type	Program Manager	Project Manager / Project Engineer / Inspection Coordinator	Team Leader	Team Member
Special	Colorado PE 23 CFR 650.309(a) (05/2022) FHWA-NHI-130055[2]	23 CFR 650.309(b) (05/2022) FHWA-NHI-130055[2]	23 CFR 650.309(b) (05/2022) FHWA-NHI-130055[2]	N/A

Table 22-3 Minimum Qualifications by Inspection Access

Inspection Access	Program Manager	Project Manager / Project Engineer / Inspection Coordinator	Team Leader	Team Member
Rope Access Inspection	Colorado PE 23 CFR 650.309(a) (05/2022) FHWA-NHI-130055[2]	23 CFR 650.309(b) (05/2022) FHWA-NHI-130055[2]	23 CFR 650.309(b) (05/2022) FHWA-NHI-130055[2] SPRAT Certified	SPRAT Certified

22.2 Major Structure Inspection Minimum Qualifications

All FHWA-NHI courses listed in this section may be substituted with a FHWA approved alternative course. CDOT accepts all FHWA approved alternative courses.

22.2.1 Major Structure Inspection Program Manager

The Major Structure Program Manager must meet the requirements in Federal Regulations 23 CFR 650.309(a) (05/2022), Program Manager.

The minimum qualifications described below apply to CDOT or contractor Major Structure Inspection Program Managers responsible for major structure inspection.

- Registered Professional Engineer within the State of Colorado
- Successful completion of the following NHI courses:
  - FHWA-NHI-130055 Safety Inspection of In-Service Bridges[2]

Successful completion of periodic bridge inspection refresher training. The current course number is:

- FHWA-NHI-130053 Bridge Inspection Refresher Training

22.2.2 Major Structure Project Manager

The Major Structure Project Manager (aka Project Engineer or Inspection Coordinator) (PM) must meet the requirements in Federal Regulation 23 CFR 650.309 (b) (05/2022), Team leader.

The PM must successfully complete the following training course:

- FHWA-NHI-130055 Safety Inspection of In-Service Bridges

The PM must successfully complete periodic bridge inspection refresher training as assigned by the CDOT Bridge & Structures Inspection Engineer to maintain a Team Leader status. The current NHI training course number is:

- FHWA-NHI-130053 Bridge Inspection Refresher Training

22.2.3 Major Structure Inspection Team Leader

Each Major Structure Inspection Team Leader (TL) must meet the requirements in Federal Regulation 23 CFR 650.309 (b) (05/2022), Team leader.

The TL must successfully complete the following training course:

- FHWA-NHI-130055 Safety Inspection of In-Service Bridges

TL's must successfully complete periodic bridge inspection refresher training as assigned by the CDOT Bridge & Structures Inspection Engineer to maintain a Team Leader status. The current NHI training course number is:

- FHWA-NHI-130053 Bridge Inspection Refresher Training

22.2.4 Major Structure Inspection Team Member

There are no minimum requirements in Federal Regulation 23 CFR 650 for a Team Member.

For CDOT On-System Team Members are defined as Team Leaders in training and are expected to continually make progress towards ataining their Team Leader status.

For CDOT Off-System there is no definition for a Team Member.

22.3 Minor Structure Inspection Minimum Qualifications

22.3.1 Minor Structure Inspection Program Manager

The Minor Structure Program Manager must meet the requirements in Federal Regulations 23 CFR 650.309(a) (05/2022), Program Manager.

The minimum qualifications described below apply to CDOT or contractor Minor Structure Inspection Program Managers responsible for major structure inspection.

- Registered Professional Engineer within the State of Colorado
- Successful completion of the following NHI course:
  - FHWA-NHI-130055 Safety Inspection of In-Service Bridges[2]

Successful completion of periodic bridge inspection refresher training. The current course number is:

- FHWA-NHI-130053 Bridge Inspection Refresher Training

22.3.2 Minor Structure Project Manager

The Minor Structure Project Manager (aka Project Engineer or Inspection Coordinator) (PM) must meet the requirements in Federal Regulation 23 CFR 650.309 (b) (05/2022), Team leader.

The PM must successfully complete the following training course:

- FHWA-NHI-130055 Safety Inspection of In-Service Bridges

The PM must successfully complete periodic bridge inspection refresher training as assigned by the CDOT Bridge & Structures Inspection Engineer to maintain a Team Leader status. The current NHI training course number is:

- FHWA-NHI-130053 Bridge Inspection Refresher Training

22.3.3 Minor Structure Inspection Team Leader

Each Minor Structure Inspection Team Leader (TL) must meet the requirements in Federal Regulation 23 CFR 650.309 (b) (05/2022), Team leader.

The TL must successfully complete the following training course:

- FHWA-NHI-130055 Safety Inspection of In-Service Bridges

TL's must successfully complete periodic bridge inspection refresher training as assigned by the CDOT Bridge & Structures Inspection Engineer to maintain a Team Leader status. The current NHI training course number is:

- FHWA-NHI-130053 Bridge Inspection Refresher Training

22.4 Miscellaneous Structure Inspection Minimum Qualifications

22.4.1 Miscellaneous Structure Inspection Program Manager

The Miscellaneous Structure Program Manager must meet the requirements in Federal Regulations 23 CFR 650.309(a) (05/2022), Program Manager.

The minimum qualifications described below apply to CDOT or contractor Miscellaneous Structure Inspection Program Managers responsible for major structure inspection.

- Registered Professional Engineer within the State of Colorado
- Successful completion of the following NHI courses:
  - FHWA-NHI-130055 Safety Inspection of In-Service Bridges[2]

Successful completion of periodic bridge inspection refresher training. The current course number is:

- FHWA-NHI-130053 Bridge Inspection Refresher Training

22.4.2 Miscellaneous Structure Project Manager

The Miscellaneous Structure Project Manager (aka Project Engineer or Inspection Coordinator) (PM) must meet the requirements in Federal Regulation 23 CFR 650.309 (b) (05/2022), Team leader.

The PM must successfully complete the following training course:

- FHWA-NHI-130055 Safety Inspection of In-Service Bridges

The PM must successfully complete periodic bridge inspection refresher training as assigned by the CDOT Bridge & Structures Inspection Engineer to maintain a Team Leader status. The current NHI training course number is:

- FHWA-NHI-130053 Bridge Inspection Refresher Training

22.4.3 Miscellaneous Structure Inspection Team Leader

Each Miscellaneous Structure Inspection Team Leader (TL) must meet the requirements in Federal Regulation 23 CFR 650.309 (b) (05/2022), Team leader.

The TL must successfully complete the following training course:

- FHWA-NHI-130055 Safety Inspection of In-Service Bridges

TL's must successfully complete periodic bridge inspection refresher training as assigned by the CDOT Bridge & Structures Inspection Engineer to maintain a Team Leader status. The current NHI training course number is:

- FHWA-NHI-130053 Bridge Inspection Refresher Training

22.5 NSTM Structure Inspection Minimum Qualifications

22.5.1 NSTM Structure Inspection Program Manager

The Program Manager responsible for NSTM Structure inspections must meet the requirements in Federal Regulations 23 CFR 650.309(a) (05/2022), Program Manager.

The minimum qualifications described below apply to CDOT or contractor Program Managers responsible for NSTM structure inspection.

- Registered Professional Engineer within the State of Colorado
- Successful completion of the following NHI courses:
  - FHWA-NHI-130055 Safety Inspection of In-Service Bridges[2]
  - FHWA-NHI-130078 Bridge Inspection Techniques for Nonredundant Steel Tension Members

Successful completion of periodic bridge inspection refresher training. The current course number is:

FHWA-NHI-130053 Bridge Inspection Refresher Training

22.5.2 NSTM Structure Project Manager

The NSTM Structure Project Manager (aka Project Engineer or Inspection Coordinator) (PM) must meet the requirements in Federal Regulation 23 CFR 650.309 (b) (05/2022), Team leader.

The PM must successfully complete the following training courses:

- FHWA-NHI-130055 Safety Inspection of In-Service Bridges
- FHWA-NHI-130078 Bridge Inspection Techniques for Nonredundant Steel Tension Members

The PM must successfully complete periodic bridge inspection refresher training as assigned by the CDOT Bridge & Structures Inspection Engineer to maintain a Team Leader status. The current NHI training course number is:

- FHWA-NHI-130053 Bridge Inspection Refresher Training

22.5.3 NSTM Structure Inspection Team Leader

Each Team Leader (TL) responsible for NSTM structure Inspections must meet the requirements in Federal Regulation 23 CFR 650.309 (b) (05/2022), Team leader.

The TL must successfully complete the following training courses:

- FHWA-NHI-130055 Safety Inspection of In-Service Bridges
- FHWA-NHI-130078 Bridge Inspection Techniques for Nonredundant Steel Tension Members

TL's must successfully complete periodic bridge inspection refresher training as assigned by the CDOT Bridge & Structures Inspection Engineer to maintain a Team Leader status. The current NHI training course number is:

- FHWA-NHI-130053 Bridge Inspection Refresher Training

22.6 Underwater Inspection Minimum Qualifications

22.6.1 Underwater Inspection Program Manager

The Program Manager responsible or underwater structure inspections must meet the requirments in Federal Regulations 23 CFR 650.309(a) (05/2022), Program Manager.

The minimum qualifications described below apply to CDOT or contractor Program Managers responsible for underwater structure inspection.

- Registered Professional Engineer within the State of Colorado
- Successful completion of the following NHI courses:
  - FHWA-NHI-130055 Safety Inspection of In-Service Bridges[2,6]
  - FHWA-NHI-130091 Underwater Bridge Inspection

Successful completion of periodic bridge inspection refresher training. The current course number is:

- FHWA-NHI-130053 Bridge Inspection Refresher Training

22.6.2 Underwater Inspection Project Manager

The Underwater Inspection Project Manager (aka Project Engineer or Inspection Coordinator) (PM) must meet the requirements in Federal Regulation 23 CFR 650.309 (b) (05/2022), Team leader, and 23 CFR 650.309(d) (05/2022).

The PM must successfully complete one of the following training courses:

- FHWA-NHI-130055 Safety Inspection of In-Service Bridges[2,6]
- FHWA-NHI-130091 Underwater Bridge Inspection

The PM must successfully complete periodic bridge inspection refresher training as assigned by the CDOT Bridge & Structures Inspection Engineer to maintain a Team Leader status. The current NHI training course number is:

- FHWA-NHI-130053 Bridge Inspection Refresher Training

22.6.3 Underwater Inspection Team Leader

Each Team Leader (TL) responsible for underwater inspections must meet the requirements in Federal Regulations 23 CFR 650.309 (b) (05/2022), Team leader, and 23 CFR 650.309(d) (05/2022).

Each team leader must successfully complete of at least one of the following required NHI training courses:

- FHWA-NHI-130055 Safety Inspection of In-Service Bridges[2,6]
- FHWA-NHI-130091 Underwater Bridge Inspection

Each team leader must:

- Be certified by the Association of Diving Contractors International (ADCI) as a surface supplied air diver
- Meet the qualifications of a bridge inspector and underwater bridge inspector in accordance with the NBIS requirements
- Have a minimum of five years of experience in underwater structure inspection assignments in a responsible capacity

TL's must successfully complete periodic bridge inspection refresher training as assigned by the CDOT Bridge & Structures Inspection Engineer to maintain a Team Leader status. The current NHI training course number is:

- FHWA-NHI-130053 Bridge Inspection Refresher Training

22.6.4 Underwater Inspection Dive Team

The Dive Team must have at least three members.

All members of the Dive Team performing inspections must successfully complete either the FHWA approved comprehensive bridge inspection training course or the FHWA approved underwater diver bridge inspection training course. The current NHI course numbers are:

- FHWA-NHI-130055 Safety Inspection of In-Service Bridges[2,6]
- FHWA-NHI-130091 Underwater Bridge Inspection

The divers on the Dive Team who will perform the underwater inspections must:

- Be certified by the Association of Diving Contractors International (ADCI) as a surface supplied air diver
- Have a minimum of two years' experience in underwater structure inspection

22.7 Structure Pin Non-Destructive Testing Minimum Qualifications

22.7.1 Pin Inspection Program Manager

The Program Manager responsible for structure pin non-destructive testing must meet the requirments in Federal Regulations 23 CFR 650.309(a) (05/2022), Program Manager.

The minimum qualifications described below apply to CDOT or contractor Pin Inspection Program Managers responsible for major structure inspection.

- Registered Professional Engineer within the State of Colorado

- Successful completion of the following NHI courses:
  - FHWA-NHI-130055 Safety Inspection of In-Service Bridges[2]
  - FHWA-NHI-130078 Fracture Critical Inspection Techniques for Steel Bridges

Successful completion of periodic bridge inspection refresher training. The current course number is:

- FHWA-NHI-130053 Bridge Inspection Refresher Training

22.7.2 Structure Pin Non-Destructive Testing Project Manager

The Structure Pin Non-Destructive Testing Project Manager (aka Project Engineer or Inspection Coordinator) (PM) must meet the requirements in Federal Regulation 23 CFR 650.309 (b) (05/2022), Team leader.

The PM must successfully complete the following training courses:

- FHWA-NHI-130055 Safety Inspection of In-Service Bridges
- FHWA-NHI-130078 Fracture Critical Inspection Techniques for Steel Bridges

The PM must successfully complete periodic bridge inspection refresher training as assigned by the CDOT Bridge & Structures Inspection Engineer to maintain a Team Leader status. The current NHI training course number is:

- FHWA-NHI-130053 Bridge Inspection Refresher Training

22.7.3 Structure Pin Non-Destructive Testing Team Leader

Each Team Leader (TL) responsible for structure pin non-destructive testing must meet the requirements in Federal Regulation 23 CFR 650.309 (b) (05/2022), Team leader.

Each team leader must successfully complete the following NHI training courses:

- FHWA-NHI-130055 Safety Inspection of In-Service Bridges
- FHWA-NHI-130078 Fracture Critical Inspection Techniques for Steel Bridges

TL's must successfully complete periodic bridge inspection refresher training as assigned by the CDOT Bridge & Structures Inspection Engineer to maintain a Team Leader status. The current NHI training course number is:

- FHWA-NHI-130053 Bridge Inspection Refresher Training

22.7.4 Structure Pin Non-Destructive Testing Technician

Each non-destructive testing technician must be certified as ASNT NDT Level II or III ultrasonic.

22.7.5 Structure Pin Non-Destructive Test Result Interpreter

The person responsible for interpreting the test results shall be an ASNT Board Examined Level III.

22.8 Rope Access Inspection Minimum Qualifications

22.8.1 Rope Access Inspection Program Manager

The Program Manager responsible for rope access inspection must meet the requirments in Federal Regulations 23 CFR 650.309(a) (05/2022), Program Manager.

The minimum qualifications described below apply to CDOT or contractor Inspection Program Managers responsible for rope access inspection.

- Registered Professional Engineer within the State of Colorado
- Successful completion of the following NHI courses:
  - FHWA-NHI-130055 Safety Inspection of In-Service Bridges[2]
  - FHWA-NHI-130078 Fracture Critical Inspection Techniques for Steel Bridges
    - Required if the structure being inspected is fracture critical

Successful completion of periodic bridge inspection refresher training. The current course number is:

- FHWA-NHI-130053 Bridge Inspection Refresher Training

22.8.2 Rope Access Inspection Project Manager

The Rope Access Inspection Project Manager (aka Project Engineer or Inspection Coordinator) (PM) must meet the requirements in Federal Regulation 23 CFR 650.309 (b) (05/2022), Team leader.

The PM must successfully complete the following training courses:

- FHWA-NHI-130055 Safety Inspection of In-Service Bridges
- FHWA-NHI-130078 Fracture Critical Inspection Techniques for Steel Bridges

The PM must successfully complete periodic bridge inspection refresher training as assigned by the CDOT Bridge & Structures Inspection Engineer to maintain a Team Leader status. The current NHI training course number is:

- FHWA-NHI-130053 Bridge Inspection Refresher Training

22.8.3 Rope Access Inspection Team Leader

Each Inspection Team Leader (TL) responsible for rope access inspection must meet the requirements in Federal Regulation 23 CFR 650.309 (b) (05/2022), Team leader.

Each team leader must successfully complete of the following NHI courses:

- FHWA-NHI-130055 Safety Inspection of In-Service Bridges
- FHWA-NHI-130078 Fracture Critical Inspection Techniques for Steel Bridges
  - Required if the structure being inspected is fracture critical

TL's must successfully complete periodic bridge inspection refresher training as assigned by the CDOT Bridge & Structures Inspection Engineer to maintain a Team Leader status. The current NHI training course number is:

- FHWA-NHI-130053 Bridge Inspection Refresher Training

22.8.4 Rope Access Inspection Team

Each rope access inspector (i.e. Team Leader and/or Team Member) must be Society of Professional Rope Access Technicians (SPRAT) certified.

The designated person in charge of the Rope Access work site must be a SPRAT certified Level III Technician (Rope Access Supervisor) or a SPRAT certified Level II Technician (Rope Access Lead Technician) under the direction of a SPRAT certified Level III Technician (Rope Access Supervisor) if permitted work is performed (confined space, live electrical work, etc.). For non-permitted work, a SPRAT certified Level II Technician (Rope Access Lead Technician) may be the designated person in charge.

23 Structure Inspector Training and Supporting Certifications

23.1 Training and Certifications Matrices

Table 23-1 Required FHWA NHI Inspection Training Courses

Course Number[5]	Course Title
FHWA-NHI-130053	Bridge Inspection Refresher Training
FHWA-NHI-130055	Safety Inspection of In-Service Bridges (FHWA-NHI-130056 is an acceptable substitute for Colorado Registered Professional Engineers)
FHWA-NHI-130056	Safety Inspection of In-Service Bridges for Professional Engineers
FHWA-NHI-130078	Fracture Critical Inspection Techniques for Steel Bridges
FHWA-NHI-130091	Underwater Bridge Inspection

Table 23-2 Inspector Certifications

Inspector Certifications	Description
ASNT NDT Level II	An individual qualified to perform a required NDT test and certified in accordance with the current edition of the American Society for Nondestructive Testing Recommended Practice No. SNT-TC-1A.
ASNT NDT Level III	An individual who, having passed ASNT administered Basic and Method(s) Examinations, holds a current, valid ASNT Level III certificate in at least one method and is qualified to administer an NDT testing program.
CWI[6]	Certified Welding Inspector is an individual qualified and certified in conformance with the provisions of AWS QC1, Standard for AWS Certification of Welding Inspectors to inspect welds on structures for which the inspectors have the appropriate endorsements.
SCWI	Senior Certified Welding Inspector is an individual who is in a supervisory position and has attained a higher level of experience than a CWI.
SPRAT Level I Technician **(Rope Access Worker)**	An individual who performs rope access work. A Level I Technician may only work under the direct, on-site supervision of a Rope Access Lead Technician or Supervisor

[5] See the NHI course description for the prerequisites that are not listed here.
[6] In Table 23-2, only CWI is tracked by CDOT

Inspector Certifications	Description
SPRAT Level II Technician (Rope Access Lead Technician)	An individual who is responsible for physically conducting rope access operations and/or safety evaluations of rope access operations, including maintenance of associated access equipment and performs all Rope Access Lead Technician duties as assigned in the employer's rope access work program
SPRAT Level III Technician (Rope Access Supervisor)	An individual who is responsible for the overall rope access work site and performs all Rope Access Supervisor duties as assigned in the employer's rope access work program
Underwater Commercial Diver	Certified by the Association of Diving Contractors International (ADCI) as a surface supplied air diver

23.2 Training Plan

Approximately every five years CDOT Staff Bridge will make a reasonable effort to sponsor a FHWA comprehensive bridge inspection training course or a FHWA approved bridge inspection refresher training course within Colorado. The comprehensive bridge inspection training course will be required training for any program manager or team leader that has not already successfully completed the course. The bridge inspection refresher training course will be required for any program manager or team leader doing structure inspection work for the Department.

Approximately once a year the CDOT Staff Bridge will make a reasonable effort to sponsor at least one training event relevant to structure inspectors with the intention of improving structure inspection quality. The training may be required for any program manager or team leader doing structure inspection work for the Department at the CDOT Bridge & Structures Inspection Engineer's discretion.

As needed, CDOT Staff Bridge will sponsor a structure inspection and asset management software related training class and make the class available to all program managers, team leaders, structure inspectors and asset management personnel. The training may be required for any program managers, team leaders, or structure inspectors doing inspection work for the Department at the CDOT Bridge & Structures Inspection Engineer's discretion. The training may be required for any asset management personnel doing asset management work for the Department at the Structure Asset Manager's discretion.

The CDOT Bridge & Structures Inspection Engineer will retain structure inspector training records required to satisfy NBIS.

The contractor inspection program managers are expected to retain structure inspector training records and to make them available to the CDOT Bridge & Structures Inspection Engineer.

Each inspector is expected to retain their inspection training or supporting certification records and provide them to the CDOT Bridge & Structures Inspection Engineer or contractor inspection program manager when requested.

24 References

24.1 Publications

The latest version of the following publications shall be used when referenced elsewhere in this manual.

NOTE: The referenced publication will govern in any case where there is a conflict with the excerpts from the referenced publications shown in this manual.

Table 24-1 CDOT Staff Bridge Publications

CDOT Bridge Rating Manual
Colorado Structure Element Level Coding Guide
Colorado SIA Item Coding Guide

Table 24-2 CDOT Publications External to CDOT Staff Bridge

CDOT Standard Specifications for Road and Bridge Construction
Colorado Travel Map
CDOT M&S Standard Plans

Table 24-3 AASHTO Publications

AASHTO Manual for Bridge Element Inspection
AASHTO Manual for Bridge Evaluation
AASHTO/AWS D1.5M/D1.5:2015 Bridge Welding Code

Table 24-4 FHWA Publications

FHWA Bridge Inspector's Reference Manual (FHWA NHI 12-049) (BIRM)
FHWA Culvert Inspection Manual (FHWA-IP-86-2) **(This manual has been archived by FHWA. It may be useful for researchers doing further work in this area as well as those developing improved testing and design procedures and is included because of its historical value)** **(To be replaced by NCHRP 14-26 Culvert and Storm Drain System Inspection Manual)**
FHWA HEC-18 Evaluating Scour at Bridges (FHWA-HIF-12-003)
FHWA HEC-20 Stream Stability at Highway Structures (FHWA-HIF-12-004)
FHWA HEC-23 Bridge Scour and Stream Instability Countermeasures
FHWA Inspection of Fracture Critical Bridge Members
FHWA Manual for the Safety Inspection of In-Service Bridges **(This manual is received by attending** **FHWA-NHI-130055 Safety Inspection of In-Service Bridges)**
FHWA Manual on Uniform Traffic Control Devices for Streets and Highways
FHWA Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges (FHWA-PD-96-001)

FHWA Memorandum: ACTION: Clarification of Requirements for Fracture Critical Members dated 6/20/2012
FHWA Memorandum: Guidance for Plans of Corrective Action dated January 3, 2017
FHWA Memorandum: Information – NTSB Recommendation on Corrosion and Voids in Concrete Railing dated January 27, 2011 from FHWA Division Administrator to CDOT Chief Engineer
FHWA Memorandum: Information – NTSB Recommendation on Corrosion and Voids in Concrete Railing dated January 10, 2011 from FHWA Assoc. Admin. for Infrastructure to FHWA Division Administrators.
FHWA Memorandum: NBIS Clarification of Recording and Coding Guide – Item 113 dated October 6, 1993
FHWA Memorandum: Revision of Coding Guide, Item 113 - Scour Critical Bridges
FHWA Memorandum: "Scourability of Rock Formations," dated July 19, 1991 NOTE: This document is canceled. See HEC 18 Chapter 4, Section 4.6 for current information
FHWA Memorandum: Timeframe for Installing Load Posting Signs at Bridges dated April 17, 2019
FHWA Metrics for the Oversight of the National Bridge Inspection Program
FHWA Specifications for the National Bridge Inventory (SNBI)
FHWA Technical Advisory T 5140.23 Evaluating Scour at Bridges dated October 28, 1991
FHWA Underwater Inspection of Bridges (FHWA-DP-80-1)
FHWA Underwater Bridge Inspection Manual (FHWA-NHI-10-027)
FHWA Underwater Bridge Repair, Rehabilitation, and Countermeasures (FHWA-NHI-10-029)

Table 24-5 Other Publications External to CDOT

American Railroad Engineering and Maintenance-of-Way Association (AREMA) Manual for Railway Engineering (MRE) (Current Edition)
CFR – Code of Federal Regulations https://www.ecfr.gov/cgi-bin/ECFR?page=browse
Clearance Master 3000™ Operation Manual – Bridge Diagnostics, Inc.
NCHRP 14-26 Culvert and Storm Drain System Inspection Manual (to be a replacement for the FHWA Culvert Inspection Manual (FHWA-IP-86-2))
NCHRP Report 575 - Legal Truck Loads and AASHTO Legal Loads for Posting
NCHRP Synthesis 474 - Service Life of Culverts
NCHRP Web Only Document 107: Risk-Based Management Guidelines for Scour at Bridges with Unknown Foundations
NTSB's recommendations to FHWA regarding the 8/10/2008 bridge rail accident on the William Preston Lane Memorial Bridge near Annapolis, Maryland dated November 23, 2010

Abbreviations

Abbreviation	Description
AADT	Annual average daily traffic
AADTT	Annual average daily truck traffic
AASHTO	American Association of State Highway and Transportation Officials
ADT	Average Daily Traffic
BIRM	Bridge Inspector's Reference Manual (FHWA)
CDOT	Colorado Department of Transportation
CFR	Code of Federal Regulations
CoRE	Commonly Recognized Structural Elements
FC	Fracture Critical
FCM	Fracture Critical Member
FHWA	Federal Highway Administration
FIPS	Federal Information Processing Series
GPR	Ground Penetrating Radar
GPS	Global Positioning System
GRS	Geosynthetic reinforced soil
HEC	Hydraulic Engineering Circulars
IRT	Infrared Thermography
LRFD	Load Resistance Factor Design
LRFR	Load and Resistance Factor Rating
LRS	Linear Referencing System
MASH	Manual for Assessing Safety Hardware (AASHTO)
MBE	Manual for Bridge Evaluation (AASHTO)
MSE	Mechanically stabilized earth
MT	Magnetic Particle Testing
MUTCD	Manual of Uniform Traffic Control Devices
NBI	National Bridge Inventory
NBIS	National Bridge Inspection Standards
NCHRP	National Cooperative Highway Research Program
NDE	Non-destructive Evaluation
NDT	Non-destructive Testing
NHI	National Highway Institute
NHS	National Highway System
NRHP	National Register of Historic Places
PCA	Plan of Corrective Action
POA	Plan of Action
PPE	Personal Protection Equipment
PT	Liquid Penetrant Testing
PTFE	Polytetrafluoroethylene
QA	Quality Assurance
QC	Quality Control
RF	Rating Factor
SI&A	Structure Inventory and Appraisal

SIMSA	System for Inspection and Management of Structural Assets
STIP	Statewide Transportation Improvement Program
STRAHNET	Strategic Highway Network
TL	Team Leader
UBIV	Under Bridge Inspection Vehicle
UT	Ultrasonic Testing
UTG	Ultrasonic Thickness Gage
UW	Underwater

24.2 Definitions

Term	Definition
A-40	An below bridge inspection vehicle manufactured by Aspen Aerials
AADT	Annual Average Daily Traffic.
AASHTO	American Association of State Highway and Transportation Officials https://www.transportation.org/
AASHTOWare	An enterprise software suite designed by transportation professionals for transportation professionals. https://www.aashtoware.org/
Abutment	A structure that supports the end of a bridge, provides lateral support for fill material on which the roadway rests immediately adjacent to the bridge, and transfers the loads from the superstructure into the ground.
ADE	Agency Defined Element. A CDOT defined element collected during inspection to support asset management or other programs
ADI	Agency Defined Item
ADT	Average Daily Traffic. Used as equivalent to AADT.
AIMS	Asset Investment Management System
Alpha	An Alphabetic Code or an Item that will accept only alphabetic Characters
Ancillary Structure	Ancillary structures are overhead signs, mast arm signals, and high-mast lights
Approach Slab	A concrete slab that provides a transition between roadway pavement and the bridge and is used to alleviate problems with settlement of the bridge approaches relative to the bridge deck.
AREMA	American Railroad Engineering and Maintenance of Way Association https://www.arema.org/
As-Built Plans	Plans that show the state of the structure at the end of construction
ASNT	American Society for Nondestructive Testing https://www.asnt.org/
AWS	American Welding Society https://www.aws.org/
Back face	The face of a retaining wall that is adjacent to the backfill.
Back wall	The abutment back wall retains the approach roadway sub-base and keeps it from sliding onto the bridge seat. It also provides support for the approach slab and for the expansion joint, if one is present.
Barrel Length	The total culvert length from the inlet to the outlet

Term	Definition
BARS	AASHTOWare BARS. A legacy Bridge Analysis and Rating System Program historically used to rate bridges for inventory and operating load carrying capacity using allowable stress or load factor
Batter	Inclination of a vertical surface (typically wall or pile) in relation to a horizontal plane.
Bent	A rigid frame transverse to the longitudinal axis of the superstructure that typically supports the superstructure at the end of a span.
Bent Angle	Angle between the centerline of a support and a layout line. This angle is typically used as a bridge description skew and a culvert skew.
BME	Bridge Management Element. An element collected during inspection to support asset management
BMS	Bridge Management System
BRIAR	Bridge Ratings, Inspections and Records
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
Bridge Asset	An asset that meets the definitions of a bridge and a Structural Asset
Bridge Inspection	The act of sending an inspection team to a major or minor structure (i.e. bridge or culvert) so that they can acquire National Bridge Inventory Item data and National Bridge Element data
Bridge Inspection Experience	Active participation in bridge inspections in accordance with the NBIS, in either a field inspection, supervisory, or management role. A combination of bridge design, bridge maintenance, bridge construction and bridge inspection experience, with the predominant amount in bridge inspection, is acceptable.
Bridge inspection refresher training	The National Highway Institute "Bridge Inspection Refresher Training Course" 1 or other State, local, or federally developed instruction aimed to improve quality of inspections, introduce new techniques, and maintain the consistency of the inspection program.
Bridge Key	See Structure Key
Bridge Length	The measurement taken at the centerline of the roadway between the abutment front faces
Bridge Management	The act of managing bridge assets through set practices and procedures
Bridge Only Replacement Cost (SI_N)	Bridge replacement cost, structural items only, per square foot, of the new bridge projected using Colorado Construction Cost Index (CCI) from bridge replacement projects between 2000 and 2011.
Bridge Rating	See Load Rating
Bridge Survey	Structure information determined in the field as opposed to construction plans
Bridge Total Length	The measurement taken at the centerline of the roadway between the abutment back faces (see NBI Item 49 Structure Length)
Bridge Walls	Retaining Walls that contributes to the stability of the bridge or bridge approach. Bridge walls exclude wingwalls and culvert headwalls.
Bridge Width	The most restrictive minimum distance between curbs or rails on the structure measured perpendicular to the roadway centerline (see NBI Item 51 Bridge Roadway Width)

Term	Definition
BrM	AASHTOWare Bridge Management System. A Bridge Management System (BMS) owned and licensed by AASHTO.
BrR	AASHTOWare Bridge Rating. A bridge load rating software owned and licensed by AASHTO.
Carried	This is the route that traffic travels on a structure
CBE	Colorado Bridge Enterprise. A government owned business within CDOT with the purpose to finance, repair, reconstruct and replace designated major structures as defined by SB-09-108
CCI	Colorado Construction Cost Index prepared by CDOT EEMA
CCI	Colorado Counties Incorporated https://ccionline.org/
CDOT	Colorado Department of Transportation
CDOT Permit Office	Provides information about extra-legal vehicle rules and provides a process for obtaining extra-legal vehicle permits for traveling on Colorado Highways and Interstates.
CFR	Code of Federal Regulations Where a CFR is referenced the month and year the regulation was adopted is in parenthesis following the reference. https://www.ecfr.gov/cgi-bin/ECFR?page=browse
Streambed Profile	A survey taken on the upstream side of a bridge. The bridge inspector takes readings at defined intervals, documents the results and compares to previous readings to determine stream migration, scour, stream degradation or aggradation and current water depths.
Clear Water Box	A “clear water” box provides a path of clear water through which a camera can capture a photo in murky water. It allows a diver to take clear underwater photos of objects or structural elements.
Clearance Master 3000™	The name of Bridge Diagnostics, Inc.’s laser based vertical clearance measurement system
CML	Colorado Municipal League https://www.cml.org/
Code Scheme	A System of numbers, letters or combination of numbers and letters used to identify specific information rather than using a narrative description
Colorado Cost Factor (COCF)	A factor used to account for all Project costs other than the Bridge Only Replacement Cost and the Design and Construction Engineering costs calculated from bridge replacement projects between 2000 and 2011.
Column	In a database a column is a specific list of information collected under a designated title. In this database the title is designated as an Item #
Complex Bridge	Movable, suspension, cable stayed, and other bridges with unusual characteristics.
Comprehensive Bridge Inspection Training	Training that covers all aspects of bridge inspection and enables inspectors to relate conditions observed on a bridge to established criteria (see the Bridge Inspector's Reference Manual for the recommended material to be covered in a comprehensive training course).
Condition Rating	An overall assessment of the physical condition of the deck, the superstructure and the substructure of a bridge or culvert

Term	Definition
Construction Engineering Cost Factor (CECF)	A factor used to account for Construction Engineering (CE) costs calculated from bridge replacement projects between 2000 and 2011.
Critical Finding	A structural or safety related deficiency that requires immediate follow-up action.
C.R.S.	Colorado Revised Statues https://leg.colorado.gov/agencies/office-legislative-legal-services/colorado-revised-statutes
Culvert	A structure, conduit, or drain that passes underneath a road, railroad track, or other obstruction to allow water to be directed away from travel corridors. Some large culverts can carry pedestrian and vehicle traffic
Culvert Length	The measurement taken along the culvert centerline from inlet to outlet or the ROW limits in cases where the culvert extends beyond the ROW
Culvert Span	The box culvert clear span or pipe diameter or the measurement between spring lines of arches taken along the roadway centerline
CWI	Certified Welding Inspector
Damage Inspection	This is an unscheduled inspection to assess structural damage resulting from environmental factors or human actions.
Data Limits	The length and character type of the field created in the database for a particular Item
Database	The computer storage of all the items of information described in this manual
Deck	The riding surface of the bridge
Design Engineering Cost Factor (DECF)	A factor used to account for Design Engineering (DE) costs calculated from bridge replacement projects between 2000 and 2011.
Diaphragm (integral)	Concrete block encasing free ends of girders at abutments or piers. Usually provided to resist lateral forces and to ensure proper load distribution to points of support.
Diaphragm (intermediate)	A vertically oriented solid transverse member connecting adjacent longitudinal flexural components to transfer and distribute vertical and lateral loads and to provide stability to the compression flanges.
Direction of Inventory	Direction of increasing mile post or direction of increasing reference point. Highways in Colorado are inventoried from South to North and from West to East, except for a stub route which starts at a junction with another highway and is inventoried outward to its terminus.
DTD	CDOT Division of Transportation Development
E-470	The E-470 Public Highway Authority is a political subdivision of the State of Colorado. E-470 is toll highway that forms a 47-mile semi-circular beltway around the eastern perimeter of the Denver metropolitan area and provides access to Denver International Airport. E-470 connects in the south to the I-25/C-470 interchange in Douglas County, and connects in the north to the I-25/Northwest Parkway interchange in Adams County. https://www.e-470.com/
EEMA	CDOT Engineering Estimates and Market Analysis
Efflorescence	White deposit on concrete caused by the crystallization of soluble salts brought to the surface by moisture in the concrete.
Element	A structural component at a greater detail level of than NBI

Term	Definition
Embankment	A bank of earth constructed above the natural ground surface to carry a road
Extra Legal Vehicle	A vehicle that exceeds legal size or weight
FAST Act	Fixing America's Surface Transportation Act is the federal legislation signed into law on December 4, 2015 that replaced MAP-21
Fathometer	A depth finder for determining depth of water or a submerged object by means of ultrasound waves.
Feature Intersected	This is the feature that the bridge or culvert crosses.
Federal Aid Highway	Highways on the Federal Aid Highway System (the National Highway System and the Dwight D. Eisenhower National System of Interstate and Defense Highways) and all other public roads not classified as local roads or rural minor collectors.
FHWA	Federal Highway Administration https://www.fhwa.dot.gov/
Field	Refers to the area set aside in the database for an item of information. It can be from one digit to thirty digits in length
Field Log of Structures	A legacy report that was published annually by Staff Bridge listing the structures, signs, overhead pipes, junctions with other highways, city limits, county and state lines, on all of the State Highways in highway and reference point order.
FIPS	Federal Information Processing Standards
FLOC	An alternate structure identification term used in SAP by CDOT. The primary structure identification term is Structure Key. Alternate structure identification terms are Structure Number, and Structure Alias.
Functional Location (FLOC)	A legacy structure identification term used in SAP by CDOT that has since been replaced by FLOC. The FLOC value is Identical to the Functional Location value. The primary structure identification term is Structure Key. Alternate structure identification terms are Structure Number, and Structure Alias.
Geotag	Add geographical coordinate metadata to media such as digital photographs
Girder	A main horizontal structural member that supports vertical loads.
GPS	Global Positioning System
Hands On	Inspection within arm's length of the component. Inspection uses visual techniques that may be supplemented by nondestructive testing.
Haunch	The section of concrete between the top of girder and the underside of deck.
HBRRP	Highway Bridge Replacement and Rehabilitation Program. This is a legacy program that existed prior to MAP-21
Hierarchy	The order of importance of a highway within the State Highway System
Highway	(A) a road, street, and parkway; (B) a right-of-way, bridge, railroad highway crossing, tunnel, drainage structure including public roads on dams, sign, guardrail, and protective structure, in connection with a highway; and (C) a portion of any interstate or international bridge or tunnel and the approaches thereto, the cost of which is assumed by a State transportation department, including such facilities as may be required by the United States Customs and Immigration Services in connection with the operation of an international bridge or tunnel.

Term	Definition
HML	High Mast Light - A truss or pole type tower that provides lighting at heights greater than 55ft, typically using four to twelve luminaires.
HPMS	Highway Performance Monitoring System
IGA	Inter-Governmental Agreement. When projects are funded with Federal and Local Agency funds, an IGA is required between CDOT and the Local Agency to define project scope, project responsibilities, detailed funding amounts, encumbered project funds, and payment obligations. Maintenance responsibilities must also be defined.
In-Depth Inspection	An in-depth inspection is a close up, inspection of one or more members.
Initial Inspection	An initial inspection is the first inspection of a structure as it is added to the inventory.
IRATA	Industrial Rope Access Trade Association that formed in the UK in the late 1980's https://irata.org/
Item	Refers to one information field in the database
Landscape Walls	Walls retaining soil measuring below 4 ft. in height from the finished grade to the top of the wall at any point along the length of the wall. No requirements are applicable at this time
Lane	The area on a highway where vehicles travel, does not include the shoulder and is usually 12 feet wide
Lane Line	A pavement marking that delineates a traffic lane edge
Latitude	In geography, latitude is a geographic coordinate that specifies the north–south position of a point on the Earth's surface. Latitude is an angle (defined below) which ranges from 0° at the Equator to 90° (North or South) at the poles. Lines of constant latitude, or parallels, run east–west as circles parallel to the equator.
Lead Line	Ropes or lines with graduated depth-markings and a weight attached to the end used to measure water depth.
Leading Zeros	Used to fill the beginning portion of a field
Left Justify	Refers to data beginning at the far left of the field
Legal Load	The maximum legal load for each vehicle configuration permitted by law for the State in which the bridge is located.
LiDAR	A surveying technology that measures distance by illuminating a target with a laser light
Load Rating	The determination of the live load carrying capacity of a bridge or culvert using plans and supplemented by information gathered from a field inspection.
Local Agency (LA)	Local Agency (LA) is a public agency, local public agency, established publicly owned organization, or private interest that can legally enter into an agreement with CDOT for a transportation project involved in the design, construction and management of State and Federally funded projects. Colorado county or municipality Colorado county or municipality 23 CFR 635.102 (8/1991) defines a Local Public Agency as any city, county, township, municipality, or other political subdivision that may be empowered to cooperate with the State transportation department in highway matters.

Term	Definition
Logjam	Any woody vegetation, with or without other debris, which obstructs a stream channel. A logjam under a structure can render it inaccessible for an underwater inspection.
Longitude	Longitude, is a geographic coordinate that specifies the east-west position of a point on the Earth's surface. It is an angular measurement, usually expressed in degrees. Meridians (lines running from the North Pole to the South Pole) connect points with the same longitude. The Prime Meridian (i.e. 0° longitude) passes through the Royal Observatory, Greenwich, England. The longitude of other places is measured as the angle east or west from the Prime Meridian, ranging from 0° at the Prime Meridian to +180° eastward and −180° westward. Specifically, it is the angle between a plane through the Prime Meridian and a plane through both poles and the location in question.
Major Structure	A culvert or bridge structure, including supports, erected over a depression or an obstruction, such as water, a highway, or a railway, having a track or passageway for carrying vehicular traffic or other moving loads, and having an opening measured along the center of the roadway greater than 20 feet between undercopings of abutments or spring lines of arches, or extreme ends of the openings for multiple boxes; it may include multiple pipes where the clear distance between openings is less than half of the smaller contiguous opening. Major structures include both major bridges and major culverts.
MAP-21	The federal legislation Moving Ahead for Progress in the 21st Century Act (P.L. 112-141), was signed into law on July 6, 2012.
Mile Point	A post placed along a roadway to mark a distance in miles
Military Quadrangle	An area of a map of 15 minutes of latitude by 15 minutes of longitude
Mini Minor Structure	A culvert or bridge that has a clear span less than 4 ft. measured along the centerline of the roadway. Most mini minor structures are culverts. These structures are not inspected by the Inspection Unit and their replacement is typically funded by the surface treatment program.
Minimum Performance Level (MPL)	The probability of failure that a bridge must outperform, based on the functional classification of the roadway (NBI Item 26). The MPL is equivalent to a Threshold Probability of Failure
Minor Structure	A bridge structure having an opening measured along the center of the roadway of greater than or equal to 4 feet and less than or equal to 20 feet between abutment front faces or a culvert having an opening measured along the center of the roadway of greater than or equal to 4 feet and less than or equal to 20 feet between arch spring lines or box culvert walls. Minor structures include minor culverts and minor bridges. These structures are inspected under the minor structure inspection program.
Miscellaneous Structure	A structure in CDOT ROW that does not fit into any of the other inspection subprograms. Examples include pedestrian/bike structures, overhead pipes, overhead cables, private drive structures, overhead conveyor belts, and overhead snow sheds.
MLOS	Maintenance Levels of Service is a performance-based budgeting tool that is used in conjunction with the SAP Maintenance Modules to plan, execute and track expenditures associated with the maintenance branch activities related to maintenance of CDOT roadway systems.

Term	Definition
MPO	Metropolitan Planning Organization
MUTCD	FHWA Manual on Uniform Traffic Control Devices for Streets and Highways
NAUI	National Association of Underwater Instructors – A Not-For-Profit Worldwide Education Association, incorporated under the laws of the State of California. https://www.naui.org/
NBE	National Bridge Element - The FHWA identified elements that are also collected during major structure inspections in addition to the NBI items
NBI	National Bridge Inventory - The aggregation of structure inventory and appraisal data collected to fulfill the requirements of the National Bridge Inspection Standards.
NBIS	National Bridge Inspection Standards - Federal regulations establishing requirements for inspection procedures, interval of inspections, qualifications of personnel, inspection reports, and preparation and maintenance of a State bridge inventory. The NBIS applies to all major structures on public roads.
NDT	Nondestructive testing
NHPP	National Highway Performance Program. A federal aid transportation program to provide support for the condition and performance of the NHS and bridges on the federal aid system, provide support for the construction of new facilities on the NHS and ensure that the investments of federal aid funds in highway construction are directed to support progress toward the achievement of performance targets established in a state's asset management plan for the NHS.
NHS	National Highway System. A route designated by FHWA to be part of the NHS
NICET	National Institute for Certification in Engineering Technologies. NICET provides nationally applicable voluntary certification programs covering several broad engineering technology fields and a number of specialized subfields
Noise Walls	Noise Walls of all types including other highway partitions and walls that do not typically retain soil. Refer to CDOT Retaining and Noise Wall Inspection and Asset Management Manual if a noise wall retains soil
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.
Nonredundant Steel Tension Member Inspection	A hands-on inspection of a Nonredundant Steel Tension member or member components that may include visual and other nondestructive evaluation. See 7.4.3 Nonredundant Steel Tension Member Inspections
NWP	Northwest Parkway is a toll road that connects E-470 in the east, at I-25 (north of 144th Ave), with U.S. 36, in the west.
Off-System	Any major structure or roadway owned by a Colorado county or municipality per CDOT. FHWA defines Off-System as NOT on the National Highway System.
OFMB	Office of Financial Management and Budget
On-System	Any major structure or roadway owned by CDOT. Alternatively, FHWA defines On-System as on the National Highway System
Operating Rating	The maximum permissible live load to which the structure may be subjected for the load configuration used in the rating.

Term	Definition
OTIS	Online Transportation Information System
Overhead Sign Structures	Sign structures, such as sign bridges, cantilevers, and butterflies extending over traffic
PADI	Professional Association of Diving Instructors® https://www.padi.com/
PAM	Performance and Asset Management Branch of the Division of Transportation Development
Pier	The part of a bridge structure that provides intermediate support to a superstructure
POA	Plan of Action - A plan for scour critical bridges that includes instructions regarding the type and interval of inspections to be made at the bridge, particularly in regard to monitoring the performance and closing of the bridge, if necessary, during and after flood events. (See HEC 18, Chapter 7.) and a schedule for the timely design and construction of scour countermeasures determined to be needed for the protection of the bridge. (See HEC 18, Chapter 7.)
Position	Refers to the location of data within a field of information
ppm	parts per million
Professional Engineer (PE)	An individual, who has fulfilled education and experience requirements and passed rigorous exams that, under State licensure laws, permits them to offer engineering services directly to the public. Engineering licensure laws vary from State to State, but, in general, to become a PE an individual must be a graduate of an engineering program accredited by the Accreditation Board for Engineering and Technology, pass the Fundamentals of Engineering exam, gain four years of experience working under a PE, and pass the Principles of Practice of Engineering exam.
Program Manager	The individual in charge of the program, that has been assigned or delegated the duties and responsibilities for bridge inspection, reporting, and inventory. The program manager provides overall leadership and is available to inspection team leaders to provide guidance.
Public Road	Any road under the jurisdiction of and maintained by a public authority and open to public travel.
QA	Quality Assurance is the use of sampling and other measures to assure the adequacy of quality control procedures in order to verify or measure the quality level of the entire bridge inspection and load rating program.
QC	Quality Control is procedures that are intended to maintain the quality of an inspection or load rating at or above a specified level.
RBAMP	Risk Based Asset Management Plan
Recompression Chamber	A machine that increases the amount of atmospheric pressure exerted on an individual inside of it. The machine is often used to help treat divers with decompression illness, commonly called the “bends”.
Rehabilitation	A structure project to improve condition, geometrics, or load-carrying capacity to a minimum standard that is expected to provide a long-term benefit and reduce the need for additional investments. Projects that cost more than 30 percent of a structure replacement are generally considered major rehabilitation projects. Projects that include deck replacement, structure widening, substructure

Term	Definition
	replacement or superstructure replacement are considered major rehabilitation projects.
Replacement	Total structure replacement meeting current design requirements
Replacement Deck Area Growth Factor (GF)	A calculated ratio of replacement major structure deck area to replaced major structure deck area based on a population of bridge replacements between 2000 and 2011.
Retaining Walls	Walls retaining soil measuring at least 4 ft. in height from the finished grade to the top of the wall at any point along the length of the wall
Right Justify	Refers to data that occupies the right hand most position in a field
Right of Way (ROW)	A privately owned strip of land granted or reserved by the owner for construction of facilities, such as highways, railroads, power lines, and other infrastructure.
Riprap	Protective covering material deposited on river stream beds or banks to prevent erosion and scour.
Roadway	Generally, refers to travel lanes and shoulders
Route Oriented	That information referring to the highway, road or street, rather than the bridge
Routine Inspection	Regularly scheduled inspection consisting of observations and 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
Routine Permit Load	A live load, which has a gross weight, axle weight or distance between axles not conforming with State statutes for legally configured vehicles, authorized for unlimited trips over an extended period of time to move alongside other heavy vehicles on a regular basis.
SAP	An Enterprise Resource Planning (ERP) software used by CDOT.
Scour	Erosion of streambed or bank material due to flowing water; often considered as being localized around piers and abutments of bridges.
Scour Critical Bridge	A bridge with a foundation element that has been determined to be unstable for the observed or evaluated scour condition.
Select List	A legacy title for the Off-System Bridge Program eligible major structures listing
SHC	Special Highway Committee
Shovel-Ready	A project where all design work is complete, and the project is ready for construction. This includes: Railroad (RR) is cleared, utilities are cleared, Right of Way (ROW) is cleared, and all environmental clearances are approved. In addition, all clearances must have been received through CDOT following the federal process.
SI&A	Structure Inventory and Appraisal
Signals	Any highway traffic signal by which traffic is alternately directed to stop and permitted to proceed
Skew Angle	Angle between the centerline of a support and a line normal to the layout line. This angle is typically used in Structure Inspection Reports and Bridge Geometry
Sleeper Slab	A strip of concrete that supports the free end of the approach slab.
SMM	Structure Management Manual
Soffit	Underside of a construction element. Typically used in the manual to refer to the underside of a superstructure.

Term	Definition
Sonar Imaging	Imaging sonars transmit sound pulses and convert the returning echoes into digital images, much like a medical ultrasound sonogram. The advantage is that they can "see" what's going on through dark or turbid (cloudy) water in zero visibility conditions.
Sounding Pole	A long rod, usually wood or aluminum, that is used to measure depths. They are primarily used to measure bodies of water but can be used to measure the depths of holes, snow, and soil deposits in certain areas.
Special Inspection	An inspection scheduled at the discretion of the bridge owner, used to
SPRAT	Society of Professional Rope Access Technicians https://sprat.org/
State Highway System	Those highways that are on the Interstate, Primary, Secondary, and Non-Federal Aid Highway, as described in State Highway Mileage Record, published by the Division of Transportation Development
State Transportation Department	The department, commission, board, or official of any State charged by its laws with the responsibility for highway construction.
STIP	Statewide Transportation Improvement Program is the planning document that identifies the transportation projects CDOT intends to fund over a six year period
STRAHNET	Strategic Highway Network
Structural Asset	Structures managed and assigned a structure number or ID by Staff Bridge
Structure Alias	Agency Defined Item 8A – Structure Alias is an alternate structure identification term typically used for common structure names (e.g., Red Cliff Arch, Bronco Arch, Bob, etc.). The primary structure identification term is Structure Key. Other alternate structure identification terms are Structure Number, and Functional Location (FLOC).
Structure Inventory	The collection of all structures in a state that are managed by that state's DOT and other local entities
Structure Key	Structure Key is the unique identifier used within the structure database and CDOT's primary structure identification term. The Structure Key value may change if the structure ownership changes. The Structure Key value is frequently identical to Structure Number unless ownership has changed. Alternate structure identification terms are Structure Number, Structure Alias, and Functional Location (FLOC).
Structure Number	NBI Item 8 - Structure Number is a unique 15 character alphanumeric assigned to a structure which cannot be changed for any structure that is submitted to FHWA as part of the NBI update or NBE update. The primary structure identification term is Structure Key. Structure Number is frequently identical to Structure Key unless ownership has changed. Other alternate structure identification terms are Structure Alias, and Functional Location (FLOC).
Structure Record	The collection of a Structure's information in either electronic or tangible format that is retained by Staff Bridge.

Term	Definition
	On-System major structures are currently the only inspected asset type that has tangible structure folders.
Substructure	The part of a bridge structure that supports the superstructure (e.g., piers and abutments).
Sufficiency Rating (SR)	A legacy numerical rating of a bridge based on its structural adequacy and safety, essentiality for public use, and its serviceability and functional obsolescence.
Superstructure	The part of a bridge structure that directly supports traffic loads and includes elements such as bridge rail, bridge deck, and girders.
TAMP	Transportation Asset Management Plan
Tangible Structure Folder	The hard copy On-System major structure folder typically containing past inspection reports, structure plans, correspondence, photos, and load rating. The folders typically have been used by the inspectors when they go into the field to inspect the structures. The existing tangible structure folders are being converted to an electronic format.
TC	Transportation Commission - The state's transportation system is managed by the Colorado Department of Transportation under the direction of the Transportation Commission.
Text	Means any alphabetic or numeric characters that may be used in a field
Thalweg	A line connecting the lowest points of successive Cross Sections along the course of a valley or river.
TIP	Transportation Improvement Program is developed by an MPO in Colorado similar to the STIP.
TL	Team Leader - Individual in charge of an inspection team responsible for planning, preparing, and performing a field structure inspection
TOMIE	Tunnel Operations, Maintenance, Inspection, and Evaluation Manual
Traveled Way	The portion of the roadway for vehicle movement of vehicles, exclusive of the shoulders, berms, sidewalks, and parking lanes.
Tumbleweed	The above-ground anatomy of a plant that, once it is mature and dry, detaches from its root or stem, and tumbles away in the wind. The wind-borne tumbleweeds can collect under or in structures and render them inaccessible for an inspection. This problem occurs most often on the eastern plains.
Tunnel	An enclosed roadway for motor vehicular traffic with vehicle access limited to portals, regardless of type of structure or method of construction. Tunnels are structures that may include lighting, ventilation, fire protection systems, and emergency egress capacity.
Underwater Diver Bridge Inspection Training	Training that covers all aspects of underwater bridge inspection and enables inspectors to relate the conditions of underwater bridge elements to established criteria
Underwater Inspection	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.
USGS	United States Geological Survey
VCLR	Vertical Clearance

Term	Definition
Vertical Clearance	The measurement in feet and inches from the top of the pavement to the lowest portion of the bridge over the roadway. Typical is measured from the pavement straight up to the bride component over it
Wingwall	A retaining wall adjacent to an abutment or a culvert that serves to retain earth in an embankment
Zero Filled	Any unused portion of an item filled with zeros
Bridge Condition	**Good (G), Fair (F), Poor(P):** These terms are defined in accordance with the Pavement and Bridge Condition Performance Measures final rule, published in January of 2017. Bridge Condition is determined by the lowest rating of National Bridge Inventory (NBI) condition ratings for Item 58 (Deck), Item 59 (Superstructure), Item 60 (Substructure), or Item 62 (Culvert). If the lowest rating is greater than or equal to 7, the bridge is classified as Good; if it is less than or equal to 4, the classification is Poor. Bridges rated 5 or 6 are classified as Fair

24.3 Index

25 Latest Updates

25.1 Updates