

Colorado Department of Transportation
Scope of Work for Statewide Ancillary, Minor, Miscellaneous and Non-
Qualifying Structure Inspections

I. GENERAL

The goal of this project is to update the inventory and inspect the Ancillary, Minor, Miscellaneous and Non-Qualifying structures on Colorado's state highway system, and to report the conditions of the individual structures to the Colorado Department of Transportation (CDOT), Staff Bridge. Minor structures are bridges and culverts that have span lengths that range from four feet to twenty feet. Ancillary structures are overhead signs, signals, and high-mast lights. Miscellaneous structures are non-bridge structures crossing a state highway, e.g. pipes that carry ditches, conveyer belt structures, etc. Non-Qualifying structures are pedestrian and rail road bridges crossing a state highway. Ancillary, Minor, Miscellaneous and Non-Qualifying structures will be referred to as "structures" hereafter in this Scope of Work (Scope). The Colorado Department of Transportation will be referred to as the "Owner" hereinafter in this Scope.

The purpose of this scope is to perform inspections, update the inventory, and report the findings to the Owner on the state's structures in accordance with the following documents and as directed by the CDOT Project Manager or his/her designee:

- A. Ancillary structures: the most current version of the Recording and Coding Guide for the Inventory and Inspection of Colorado's Overhead Signs, Signals and High Mast Lights (CDOT Sign and Signal Coding Guide) for overhead signs, signal mast-arms and high-mast lights.
- B. Minor, Miscellaneous, and Non-Qualifying structures: the requirements of the National Bridge Inspection Standards (NBIS).

Performing inspections, updating the inventory data, and reporting the findings to the Owner shall be referred to as "the work" henceforth in this Scope.

The CDOT Project Manager or his/her designee may also direct the Consultant to inspect other structures as necessary. It is anticipated that yearly task orders will be written to this contract for a period of four years.

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II. DEFINITIONS

- A. **AASHTO** – American Association of State Highway and Transportation Officials.
- B. **ELECTRONIC DATA FILES** – Electronic files containing inventory and inspection data for structures in the specified version of Pontis AASHTOWARE, AASHTOWare Bridge Management, or other database format, specified by the CDOT Project Manager or his/her designee.
- C. **ENGINEER** – CDOT Staff Bridge Program Manager or his/her designee.
- D. **FHWA** – Federal Highway Administration.
- E. **FY** – Fiscal Year.
- F. **NEW STRUCTURES** – Structures not previously inspected such as newly constructed structures requiring initial inspection or structures found without prior inspections.
- G. **NHS** – National Highway System.
- H. **PEI** – Pontis Element Inspection.
- I. **NBE** – National Bridge Element.
- J. **BME** – Bridge Management Element.
- K. **ADE** – Agency Defined Element.
- L. **SI&A** – Structure Inventory and Appraisal form. An inventory and appraisal form found within the Pontis AASHTOWARE or the AASHTOWare Bridge Management inspection module that contains information about a structure.
- M. **STRAHNET** – Strategic Highway Network.
- N. **TEMPORARY STRUCTURE** – A structure with temporary shoring or temporary repairs or a structure erected to maintain traffic, for the short term, pending permanent repair or replacement.

III. INSPECTION STANDARDS

The Work shall be carried out in accordance with the following documents and revisions thereto:

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- A. CDOT Pontis Bridge Inspection Coding Guide (a)
 - B. Colorado NBI Coding Guide (a)
 - C. Bridge Inspection Reference Manual
 - D. American Welding Society AWS D1.1
 - E. Culvert Inspection Manual (Report No. FHWA-IP-86-2)
 - F. AASHTO Manual for Condition Evaluation
 - G. Underwater Inspection of Bridges (Report No. FHWA-DP-80-1)
 - H. Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Structures (Report No. FHWA-PD-96-0010)
 - I. CDOT Sign and Signal Coding Guide (a)
 - J. Bridge Asset Management and Inspection Manual (BRIAR Manual) (a)
 - K. Other documents as specified by the CDOT Project Manager or his/her designee
- (a) All of the above material will be supplied to the Consultant by CDOT upon request.

IV. STRUCTURE TYPES

Ancillary structure types shall be designated according to the types shown and specified within the CDOT Sign and Signal Coding Guide.

Minor and Non-Qualifying structure types shall be designated according to the types shown and specified within the Colorado NBI Coding Guide.

Miscellaneous structure types shall be designated according to the types shown and specified within the Colorado NBI Coding Guide or as directed by the CDOT Project Manager or his/her designee.

V. STRUCTURE NUMBERING

The CDOT Project Manager or his/her designee shall assign structure numbers for new structures. Signal mast arm structure numbers shall be assigned according to the CDOT Signs and Signals Coding Guide.

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VI. CONSULTANT QUALIFICATIONS

The Consulting firm shall be pre-qualified to conduct structure inspection work for the state of Colorado, Department of Transportation.

The individual in charge of the organizational unit, in charge of the inspection team, and the structure inspectors, shall meet the qualifications as stated in the Code of Federal Regulations, 23 CFR, 650.309. The one exception to this regulation is that the Program Manager shall be a registered professional engineer in the state of Colorado.

Certified Welding Inspectors (CWI) shall be qualified and certified in conformance with the provisions of AWS QC1, Standard for AWS Certification of Welding Inspectors, or shall be an engineer or technician who, by training and experience in metals fabrication, testing and/or in-service inspection, is acceptable to the Owner.

Individuals performing Nondestructive Testing (NDT) shall be qualified in accordance with the current edition of the American Society for Nondestructive Testing Recommended Practice No. SNT-TC-1A. Only individuals qualified for NDT Level II may perform the testing. The testing program shall be administered by an ASNT certified Level III.

VII. PROJECT MANAGEMENT AND COORDINATION

The contract administrator for the work is:

Behrooz Far, P.E.
State Bridge Engineer
Colorado Department of Transportation
4201 East Arkansas Ave., Room 107
Denver, Colorado 80222
(303) 757-9309

The Bridge Inspection Engineer and Program Manager for the work is:

Lynn Croswell, P.E.
Bridge Inspection Engineer
Colorado Department of Transportation
4201 East Arkansas Ave., Room 107
Denver, Colorado 80222
(303) 757-9188

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The Project Manager for the work is:

Mark Stadig
Project Manager
Colorado Department of Transportation
4201 East Arkansas Ave., Room 107
Denver, Colorado 80222
(303) 757-9417

VIII. PROJECT QUANTITIES AND LOCATION

The structures to be inspected will be listed within the individual task orders. It is anticipated that all the overhead signs, signal mast-arms, high-mast lights, minor structures, non-qualifying structures, and culverts will be inspected within the four-year contract period.

It is estimated that the following number of inspections will be required over the next four years:

Overhead signs:

1630, includes 30% for un-scheduled and reduced frequency inspections

Signals:

6360, includes 20% for un-scheduled and reduced frequency inspections

High mast lights:

340, includes 10% for un-scheduled and reduced frequency inspections

Minor structures:

7270, includes 20% for un-scheduled and reduced frequency inspections

Miscellaneous structures:

90, includes 20% for un-scheduled and reduced frequency inspections

Non-Qualifying structures:

300, includes 5% un-scheduled and reduced frequency inspections

The project location will be statewide with Consultant teams responsible for separate areas comprised of various CDOT regions. Areas to be inspected will be listed within the individual task orders.

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IX. PROJECT DURATION

- A. The work shall commence on the date specified in the Notice to Proceed. The contract will be terminated upon the completion of the work identified in the specific task orders. The anticipated duration of the contract is four years.
- B. Completion is defined as (1) having submitted all structure reports in the required format to the CDOT Project Manager and his/her designee for review, and (2) the CDOT Project Manager or his/her designee having reviewed and approved the reports.
- C. Task orders will be issued each fiscal year for those structure inspections required in each area for the term of the task order. Included with the task order, CDOT will provide a list of all existing structures deemed critical requiring priority for scheduling. Field inspections shall be completed within the Task Order timeframe specified. Deliverables for all structure evaluations shall be submitted as detailed below.

X. CONSULTANT RESPONSIBILITY

- A. The Consultant shall be responsible for the complete, accurate, and timely inspection and reporting of all structures identified in individual task orders.
- B. The Consultant shall furnish all electronic equipment such as computers, laptops, tablets or other equipment as necessary to complete the work.
- C. The Consultant shall follow the procedures specified in Appendix A of the Scope when a critical structure condition is encountered.
- D. The Consultant shall follow the procedures specified in Appendix B of the Scope for required Maintenance Actions and Minor Repairs.
- E. The Consultant shall submit completed inspection reports to the CDOT Project Manager or his/her designee.
- F. The Consultant shall conduct the work in accordance with all governing safety rules and regulations applicable to the work.
- G. The Consultant shall provide for their own lane closures, working with the appropriate maintenance sections and Region Traffic Engineers to close lanes when required. A list of contacts will be provided to the Consultant upon request.
- H. The Consultant will provide all necessary inspection and testing equipment, personal protective equipment (PPE), vehicles for transport, and access equipment to properly and adequately perform the work described herein.

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XI. INSPECTION REQUIREMENTS

Inspections and structure evaluations will be performed via normal and customary visual means as defined by the following references and will include evaluation of all accessible structure components within reason unless noted otherwise to identify changes from previously recorded conditions, and to determine their physical and functional condition. All structure coding items shall be completed per the requirements of the NBIS and CDOT in accordance with the documents listed in Section III.

Suspected cracks, not open to the surface, in steel members on Sign Structures, Signal Poles, and High Mast Light Poles shall be verified by applicable NDT methods.

The Consultant shall meet with each maintenance coordinator prior to beginning work in the maintenance section. This meeting is to identify themselves to the coordinator, to learn of problem structures identified by maintenance, to present their plan of action to the coordinator, to determine any traffic control needs, and to obtain information pertinent to the inspection such as plans, maps, etc. Traffic control will be required for all inspections over live traffic lanes. Inspection over live traffic via rope access or structure climbing may be allowed with prior approval of CDOT Project Manager and his/her designee. Rope access or structure climbing will be restricted to the same hours as traffic control set by the maintenance coordinator or Regional Traffic Engineer. Structural components over shoulders may not require traffic control (to be determined in conjunction with CDOT Project Manager or his/her designee and/or maintenance coordinator). Contact information for the maintenance coordinator and Regional Traffic Engineer will be supplied to the Consultant by CDOT upon request.

Structures which are deemed inaccessible for evaluation by the Consultant due to debris such as silt, tumbleweeds, etc. are to be identified to the CDOT Project Manager and his/her designee via email (including photographs where possible) within 15 days of the original site visit. Return trips and inspections are required provided the CDOT Project Manager and his/her designee notifies the Consultant of corrective actions taken within 45 days of notice by Consultant. In the event of a site visit, inspection dates and reports are to be created within Pontis noting the site visit and conditions encountered in "Inspection Notes".

Digital color photographs are required for each structure per the BRIAR Manual or as directed by the CDOT Project Manager or his/her designee. Photographs are required for new structures, structures with missing photographs and if there has been a change in the surroundings.

Digital cameras shall be a minimum of 2 megapixel resolution capabilities. Photos shall be submitted in the Joint Photographic Experts Group (jpg) format and have a size from 500 kilobytes to 1 megabyte. The photos shall be submitted on a compact disk (CD), DVD, or submitted via Google Drive.

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Supplemental photographs and sketches shall be taken and/or developed as necessary to give a clear understanding and documentation of distressed structure conditions.

The SI&A items, PEI, NBE, BME and ADE condition states and associated inspection comments shall be reported with the inspection report approved by the CDOT Project Manager or his/her designee. The SI&A items, PEI, NBE, BME and ADE information shall be revised, if necessary, to reflect the actual elements, quantities, comments and items found in the structure.

Maintenance recommendations, including photographs, shall be developed for all Element Level Condition states of 4.

Completed inspection reports shall be submitted to the CDOT Project Manager and his/her designee at the end of the month following each quarter or at the end of the Task Order period whichever is earlier. For example, a submittal would be required on April 30th for field work completed between January 1 and March 31. Due to the yearly schedule, submittals may consist of an email stating that zero field work was completed during the quarter prior.

XII. STRUCTURAL ANALYSIS REQUIREMENTS

The following applies to minor structures only:

- A. All required structural analysis, including load rating, will be reported to the CDOT Project Manager and his/her designee and documented in the bridge notes for the structure.

The following applies to minor culverts only:

- A. Culverts shall be assigned visual load rating values of 36 Ton inventory rating and 40 Ton operating rating.
- B. Culvert ratings shall be reduced to 27 Ton inventory rating and a 36 Ton operating rating (or lower as deemed by the Team Leader) when evidence of damage is caused by live load or will be effected by live load.

XIII. FRACTURE CRITICAL STEEL STRUCTURES

Fracture critical members are those defined by the FHWA in their manual titled *Inspection of Fracture Critical Structure Members* and shall be identified and inspected in accordance with that document. Since the signs and signals are supported by fracture critical details, they are by nature fracture critical structures. Fracture Critical Members (FCM), or member components, are non-redundant tension members or tension components of members whose failure would be expected to result in collapse of the structure.

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XIV. UNDERWATER INSPECTIONS

Inspection of underwater bridge or structure elements shall be limited to visual, tactile, and probing tasks in water depths less than or equal to 3-feet which can be accomplished safely without the aid of diving equipment. Structures with elements which are deemed inaccessible by the Consultant due to depth and/or other conditions and have the probability or likelihood of scour condition are to be identified to the CDOT Project Manager and his/her designee via email (including photographs where possible) within 15 days of the original site visit. Conditions warranting underwater inspection shall be documented in appropriate element (such as 221-submerged pile cap/footing in Pontis or 9221 in AASHTOWare BrM) and request documented in Inspection Notes. Underwater inspection frequency (NBI Item 92B) shall be updated to 48 months.

XV. SCOUR ANALYSIS/REPORT

For new and existing minor structures and culverts, no scour analysis shall be performed for this inspection project other than probing to determine scour limits. If significant scour potentially creating a stability concern or a continued scouring trend is noted during the inspection, the problem shall be noted and described in the Inspection Report (Pontis Element 361 – Scour Smart-flag in Pontis or Scour Defect for the element in AASHTOWare BrM).

XVI. REPORTING

- A. The Consultant shall use Pontis or AASHTOWare BrM Inspection Module for reporting element inspection and NBIS inventory information. The Consultant shall provide final reports to the CDOT Project Manager or his/her designee in a PDF format. The electronic data files shall be provided in the format specified by the CDOT Project Manager or his/her designee.
- B. Signatures of the Team Leader for all of the inspected structures shall be included in pdf submittal of each inspection report and an electronic copy the signature page kept on file.
- C. As necessary, supplemental sketches, photos, plans, etc. shall be prepared and included as part of the final report and submitted via original format (MicroStation, jpg, etc.) and pdf to document structure condition.
- D. Final PDF's, PDI's, XML's and photos shall be supplied to the CDOT Project Manager or his/her designee on CD's, DVD's, or via the Google Drive shared folder.

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XVII. SERVICES AND MATERIALS AVAILABLE FROM CDOT

The following services and materials will be available to the Consultant from CDOT:

- A. Assistance in setting up the Pontis or AASHTOWare BrM software and database.
- B. PDF of Pontis AASHTOWare BrM user manual, CDOT Sign and Signal Coding Guide
- C. CDOT Staff will be available for reference on coding, computer use, or other related concerns.
- D. Most current designated STRAHNET and NHS routes (identified in the database).

XVIII. FINAL REVIEW

Each report will be reviewed by the CDOT Project Manager or his/her designee for completeness and consistency as resources allow. Each incomplete or inconsistent report will be returned to the Consultant for review and for corrections within 3 months of the submittal date or the end of the associated task order whichever is earlier.

XIX. METHOD OF PAYMENT

These contracts will be paid for on a cost plus fixed fee basis. The consulting firms will bill for their actual costs, using the negotiated rates, incurred while performing the work. Consultants will bill monthly and include a project status update with each billing.

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APPENDIX A
IDENTIFICATION OF CRITICAL STRUCTURE CONDITIONS

- A. **PURPOSE:** This appendix establishes the procedures of the Colorado Department of Transportation, Staff Bridge, regarding the general subject of critical structure inspection findings. The term “critical” as contained within these procedures is intended to mean a condition involving grave uncertainty,; i.e., a hazardous or precarious condition.

Deficiencies that are such as to compromise the ability of the structure to safely remain in place are deemed to be Essential Repair Findings (ERF) requiring immediate identification, notification, correction, and follow-up.

- B. **TYPICAL CONDITIONS:** The following represents typical but not all inclusive inspection findings which are considered to be a ERF:
1. **Tension Members** (overhead signs, signal mast-arms, high-mast lights)
Tension members identified as fracture critical members within the Structure File Data and which are damaged by natural or impact forces.
 2. **Steel Structures** (overhead signs, signal mast-arms, high-mast lights)
 - a. Trusses with misalignment of a top chord member in an amount that exceeds half the width of the member.
 - b. One element of a two element bottom chord truss member being fractured.
 - c. Bottom chord truss members with over 30% section loss.
 - d. Cracks in tension members and welds that are normal to primary tensile stresses, resulting from fatigue loading.
 - e. Impact damage.
 - f. Loose or missing bolts in any connection.
 3. **Concrete Structures** (minor structures and culverts)
 - a. Concrete slabs with over 30% loss in primary moment steel.
 - b. Slabs sheared at the ends to the extent that displacement has occurred.
 - c. Collapsed joints or severe invert deterioration.
 4. **Steel Structures** (minor structures and culverts)
 - a. Corrosion in floors resulting in perforations of the metal.
 - b. Displacements in tops.
 - c. Collapsed seams or joints.
 5. **General** (minor structures and culverts)
 - a. Scour which has caused vertical or horizontal displacement, or has the potential to cause such displacement.

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- C. RESPONSIBILITY OF THE INSPECTION TEAM LEADER: It shall be the responsibility of the inspection team leader performing an inspection to be alert for conditions other than identified above which may also be considered an ERF. Such a finding shall be reported to the CDOT Project Manager or his/her designee upon return from the inspection or, if deemed necessary, immediately by e-mail or by telephone. ERFs shall be reported via the approved ERF Memo and tracked within the CDOT ERF Tracking Spreadsheet.
- D. CRITICALITY OF THE DEFICIENCY: The criticality of the deficiency will result in one or more of the following actions with an importance described as follow:
1. Immediate removal (overhead signs, signal mast-arms, high-mast lights).
 2. Immediate closure of the roadway (minor structures and culverts).
 3. Restricted traffic usage (minor structures and culverts).
 4. Urgent repairs to be accomplished within a time period as determined by the CDOT Project Manager or his/her designee (all structures).

The Consultant shall propose repairs or remedial actions to be taken, to the CDOT Project Manager or his/her designee.

- E. SPECIAL ACTIONS REQUIRED OF THE INSPECTION TEAM LEADER:
1. The team leader shall notify the CDOT Project Manager or his/her designee by phone or by e-mail when the actions identified as 1 through 3 above are appropriate. They should describe the unsafe condition and recommend immediate steps to be taken to insure safety to the traveling public.
 2. The team leader shall provide written confirmation to the CDOT Project Manager or his/her designee for any action required by 1 or 2 above.
 3. The Consultant shall notify the CDOT Project Manager or his/her designee in writing for any action required by 4 above within one week. This notice should include comments relative to an appropriate repair. This does not mean that the Consultant must provide a design for the repair.

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APPENDIX B
MAINTENANCE ACTIONS AND MINOR REPAIRS

- A. **PURPOSE:** This appendix establishes the procedures of the Colorado Department of Transportation, Staff Bridge, regarding Maintenance Actions and Minor Repairs.

The consultant shall perform the following:

1. Maintenance Actions:

- a. Structure number identification labeling. The Consultant shall label overhead sign and high-mast light structures that are not labeled with a structure identification number. The label shall consist of a painted stencil with three (3") inch letters applied vertically or as directed by the CDOT Project Manager or his/her designee.
- b. Other maintenance actions as identified in individual task orders and as directed by the CDOT Project Manager or his/her designee.

2. Minor Repairs:

- a. An Essential Repair Finding (see Appendix A) shall be submitted for any loose nuts that cannot be tightened by using the following listed procedures.
 - i. Anchor bolt nuts found to be loose during the inspection shall be tightened using the turn-of-nut method by first tightening the nuts to snug tight which is defined as the tightness that exists when the upper and lower nuts are in firm contact with the base plate. Then the upper and lower nuts shall each be rotated an additional 1/12 turn (30 degrees \pm 5 degrees) with a slugging, hydraulic, or air impact wrench. If the leveling nut cannot be accessed, the upper nut shall tighten to snug tight and then rotated an additional 1/6 turn (60 degrees \pm 5 degrees) with a slugging, hydraulic, or air impact wrench.
 - ii. Upper connection U-Bolt nuts (Types 051 and 103 only, does not include high strength bolts) found to be loose during the inspection shall be tightened using the turn-of-nut method by first tightening the nut to snug tight which is defined as the tightness that exists when the nut is in firm contact with the face plate. Then each nut shall be rotated an additional 1/12 turn (30 degrees \pm 5 degrees) with a slugging, hydraulic or air impact wrench. The exposed threads of the U-bolt shall be marred to prevent the nuts from loosening.
- b. Other minor repairs as identified in individual task orders and as directed by the CDOT Project Manager or his/her designee.