

SCOPE OF WORK (SOW)
Bridge Inspection and Asset Management Services
Colorado Department of Transportation

I. GENERAL

The goal of this project is to update the National Bridge Inventory (NBI) through inspection of bridges owned by local governments (cities and counties) or the state of Colorado, and to inform the bridge owners and the Colorado Department of Transportation (CDOT) of the conditions of the bridges. The local agencies and state of Colorado will be referred to as the “owner” hereinafter in this Scope.

The National Bridge Inspection Standards (NBIS) require all public bridges to be inspected at least every two years (with the approval of the Federal Highway Administration (FHWA) and the agreement of the owner, some of the bridges that meet specific federal criteria may be inspected every four years).

The purpose of this agreement is to conduct bridge inspections in accordance with the requirements of the National Bridge Inspection Standards (NBIS) and to report the findings to the state and to the owner. The bridge inspections shall be referred to as “the work” henceforth in this scope. The structures to be inspected must meet the NBIS definition of a bridge as follows:

“A structure, including supports, erected over a depression or an obstruction such as water, a highway, or a 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 may include multiple pipes, where the clear distance between openings is less than half of the smaller contiguous opening.”,

The list of bridges to be inspected during each of the agreement periods will be identified prior to the renewal of the agreement for each of the periods. The bridge inspection engineer may also direct the consultant to inspect other bridges as necessary.

The maximum term for this agreement shall be for four years. The term shall be divided into periods as follows:

- | | | | |
|--------------------------------|--------------|---------|---------------|
| 1. Initial period (FY2018): | July 1, 2017 | through | June 30, 2018 |
| 2. First Supplement (FY2019): | July 1, 2018 | through | June 30, 2019 |
| 3. Second Supplement (FY2020): | July 1, 2019 | through | June 30, 2020 |
| 4. Third Supplement (FY2021): | July 1, 2020 | through | June 30, 2021 |
| 5. Fourth Supplement (FY2022): | July 1, 2021 | through | June 30, 2022 |

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II. DEFINITIONS

- A. **AASHTO** – American Association of State Highway and Transportation Officials.
- B. **BRIAR** – Bridge Ratings, Inspections and Records
- C. **ELECTRONIC DATA FILES** - Electronic files containing inventory and inspection data for structures in the bridge inspection engineer specified version of AASHTOWARE BrM, or other database format, specified by the bridge inspection engineer. Electronic sketches in Microstation or compatible format. PDF files of all inspection reports. Electronic files of bridge photographs as described in section IX, paragraph E of this scope. Electronic rating input files. PDF files of the Load Rating Summary Sheets. Streambed Profile Sheets, Tally Sheets, etc. in Microsoft Excel.
- D. **ENGINEER** – CDOT bridge inspection engineer or designee.
- E. **ENTITY BRIDGE MAPS** – County or other entity maps that are used to graphically record bridge locations.
- F. **FCM** – Fracture Critical Member
- G. **FHWA** – Federal Highway Administration.
- H. **FY** – Fiscal Year
- I. **MUTCD** – Manual on Uniform Traffic Control Devices
- J. **NEW STRUCTURES** – Structures not previously inspected such as newly constructed structures requiring initial inspection or structures found to be qualifying and without prior inspections.
- K. **NHS** – National Highway System.
- L. **NDT** – Non-destructive Testing
- M. **OFF-SYSTEM** – Those public bridges which are owned and maintained by local governments and not by the Colorado Department of Transportation.
- N. **EI** – Element Inspection form. A structure inspection form found within the inspection tab of AASHTOWARE BrM, on which the applicable structure element condition states and comments are reported for each structure inspected.

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- O. **SI&A** – Structure Inventory and Appraisal form. An inventory and appraisal form found within the AASHTOWARE BrM program that contains information about a structure.
- P. **STRAHNET** – Strategic Highway Network
- Q. **TEMPORARY BRIDGE** – 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:

- A. Pontis Bridge Inspection Coding Guide
- B. Colorado NBI Coding Guide
- C. Manual for Bridge Element Inspection
- D. AASHTO Manual for Bridge Evaluation
- E. Bridge Inspection Reference Manual
- F. Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges (Report No. FHWA-PD-96-001)
- G. Underwater Inspection of Bridges (Report No. FHWA-DP-80-1)
- H. Inspection of Fracture Critical Bridge Members (Report No. FHWA-IP-86-26)
- I. Culvert Inspection Manual, (Report No. FHWA-IP-86-2)
- J. Hydraulic Engineering Circular No. 18 (HEC-18, Publication No. FHWA-IP-90-017),
- K. Hydraulic Engineering Circular No. 20 (HEC-20, Publication No. FHWA-IP-90-014)
- L. Bridge Asset Management and Inspection Manual (BRIAR Manual)
- M. Other documents as specified by the CDOT Project Manager or his/her designee

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IV. CONSULTANT QUALIFICATIONS

The consulting firm shall be pre-qualified to conduct bridge inspection work for the State of Colorado, Department of Transportation.

The project manager, the inspection team leader, and the bridge inspectors, shall meet the qualifications as stated in the Code of Federal Regulations, 23 CFR, 650.309.

V. PROJECT MANAGEMENT AND COORDINATION

The Contract Administrator for the work is:

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

The bridge inspection engineer for the work is:

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

Project management activities will be coordinated by:

Anthony Macias, CEPM I
Colorado Department of Transportation
4201 East Arkansas Ave.
Room 107
Denver, Colorado 80222
(303) 757-9226

VI. PROJECT LOCATION

For off-system structures, the state is divided into three horizontal bands with one consultant contracted to do each band. It is anticipated that the consultants

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inspecting these areas will finish the four-year cycle in the regions that they are currently inspecting. Consultants will rotate to another section of the state after two years and every four years thereafter. The department reserves the right to combine or otherwise modify any, or all, of the bands and to select the consultant(s) to perform the work in accordance with these modifications at the conclusion of the consultant selection process. The bridge inspection engineer may revise these alignments of counties in the odd and even years.

See Exhibit E for the counties, which include the cities within these counties, currently in each of the three bands.

A. STATEWIDE ON-SYSTEM

Inspection services for on-system, state-owned bridges shall be provided as identified by individual contract task orders.

B. UNSCHEDULED INSPECTIONS

- A. Unscheduled inspection of bridges will be required from time to time. These inspections are typically for newly constructed bridges that require a post-construction inspection. At times, a local entity will request an inspection for bridges that the local entity has discovered to have an apparently critical problem.
- B. Newly constructed bridges must be inspected and rated within thirty days of notification from the bridge inspection engineer.
- C. Special inspections shall be conducted at the request of the bridge inspection engineer for non-NBI qualifying and CDOT-owned structures. The inspection requirements and standards outlined within this scope of work shall apply to these structures.

VII. PROJECT DURATION

- A. The work shall commence on the date specified in the notice to proceed and shall be completed as specified in the individual task orders, "Notice to Proceed".
- B. Completion is defined as (1) having submitted all bridge reports in the required format to the bridge inspection engineer for review, (2) the bridge inspection engineer having reviewed and approved the reports for distribution to the owners, and (3) the presentation of the final reports to the owners in a meeting held at a location specified by the owner.

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VIII. CONSULTANT RESPONSIBILITY

- A. The consultant shall be responsible for the complete inspection, rating, and reporting of qualifying off-system bridges in their areas. NBI bridge inspections shall be conducted at regular intervals not to exceed the specified inspection frequency from the time the structures were last inspected. When this timing requirement cannot be met, written notification shall be given to the bridge inspection engineer and documented in the Inspection Notes for that inspection in the bridge inspection report.
- B. The consultant shall stay informed of changes in the bridge inventory in their areas due to annexations, replacements, or newly constructed bridges. The consultant shall inform the bridge inspection engineer of these changes in a format approved by the bridge inspection engineer or his/her designee.
- C. The consultant shall follow the procedures specified in Appendix A of the scope when an Essential Repair Finding (ERF) is encountered.
- D. The consultant shall insure that bridges are properly posted and signed. Photo documentation of the posting signs shall be included with each inspection report. If a bridge is found not to be properly posted, the consultant shall follow the procedures specified in Appendix A of the scope to report an ERF to the bridge owner.
- E. The consultant shall verify that any vertical clearance signs or markings on bridges are accurate. This information should be noted in the bridge notes section of the inspection report. The consultant shall notify the owner immediately, via an ERF letter, when the actual measured vertical clearance is less than what is denoted on the sign/markings. Vertical clearances are to be measured per the guideline defined in Section 601.1.2 and Appendix D of the CDOT Construction Manual.
- F. The consultant shall submit completed inspection reports to the bridge inspection engineer for review prior to submitting the reports to the owner.
- G. The consultant shall conduct the work in accordance with all governing safety rules and regulations applicable to the work.
- H. The consultant shall provide annual verification of Consultant Qualifications to the bridge inspection engineer or his/her designee.
- I. The consultant shall contact each bridge owner prior to beginning work in the owner's area. The consultant shall meet with the bridge owner at the owner's request. The purpose of this contact or meeting is to identify themselves to the owner, to learn of changes in the inventory, to present their plan of action

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to the owner, and to obtain information pertinent to the inspection such as plans, maps, etc.

J. Additional task orders will be written as follows:

- FY2018: South Area ADT's (all counties including On-system orphans)
- FY2019: Underwater Inspections, performed by underwater inspections consultant under a separate contract
- FY2020: North Area ADT's (all counties including On-system orphan)
- FY2021: Pin Inspections and Central Area ADT's (all counties including On-system orphan)

K. Additional Task Orders may be written for Scour Plan of Action (POA) and Load Rating Updates

IX. INSPECTION REQUIREMENTS

- A. All bridge coding items shall be completed per the requirements of the NBIS and CDOT in accordance with the following:
 - 1. The FHWA manual Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges, December 1995 (Federal Coding Guide), except that English Units shall be recorded
 - 2. The Colorado NBI Coding Guide
 - 3. Manual for Bridge Element Inspection
 - 4. The CDOT Pontis Bridge Inspection Coding Guide (only numeric values are necessary on the EI form for Items 58, 59, 60, 61, 62, 71, and 72. Comments for those items are not necessary. The condition states and comments for the inspection elements applicable to a structure shall be reported on the EI forms according to the CDOT Pontis Bridge Inspection Coding Guide.
- B. The consultant shall meet with the bridge inspection engineer each quarter to present a progress report for the previous quarter and a project schedule for the next quarter. The progress report shall list the entities inspected and the number of bridges and types inspected in each entity. The schedule for the next quarter shall include the entities to be inspected, the number of bridges and types in each of the entities, the personnel assigned to do the work, and the approximate dates that the inspections will commence in each entity.
- C. A minimum of three 3 ½" by 5" color reproductions combined in a PDF document from digital cameras are required for each bridge. One photograph

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shall show the complete bridge in an elevation view and the other photograph shall show the entire roadway surface of the bridge looking in the direction of inventory. The roadway photo may be taken looking in the opposite direction the next inspection cycle and alternate between the two, there after. The elevation view, if at all possible, shall be taken from the upstream side where roadways cross waterways. The elevation view may be taken from the downstream side if that view of the bridge is less obstructed by vegetation. One photograph shall be taken at the bottom of the superstructure or culvert, showing the girders if applicable and oriented to look down the center of the roadway from beneath the structure. In all cases the description of the photo shall identify the direction in which the photo is taken. Digital cameras shall be a minimum of 5 megapixel resolution capabilities. Individual photo sizes shall be limited to less than 500 kilobytes where possible. The pictures shall be submitted to CDOT both as a combined PDF document and as individual JPG files and submitted on a compact disk or USB storage device. Additional photographs will be taken of installed load-posting signs where applicable.

- D. Supplemental photographs and sketches shall be completed to give a clear understanding and documentation of distressed bridge conditions.
- E. A separate set of photographs, taken in a panoramic view, is required for those bridges that are over waterways. These photos shall be taken every six years unless changes merit a more frequent interval. The procedures for taking the scour photographs are defined further in this scope of work.
- F. The Element condition states and comments and the SI&A items shall be reported using the report format as directed by the CDOT Project Manager or his/her designee in each task order. The EI and SI&A information shall be revised, if necessary, to reflect the actual elements, quantities, comments and items found in the structure. For re-inspections, many of the items listed on the form will remain the same as in previous reports and need not be changed unless found to be in error or changed since the last inspection report.
- G. A cross-section shall be provided with each inspection for structures that span across waterways, dry streambeds, gullies, or other potential waterways. The format for the cross-section shall be the approved Excel spreadsheet developed under the previous contracts. The cross-section shall be plotted on the structure sketches and made a part of the report. The cross-section shall be measured to the upstream underside of the girders or other structural members and taken at each pier, abutment midpoint of each span, and intermediate locations as appropriate. Additional measurements shall be taken at areas of localized scour not occurring on the upstream side of the structures. Their location shall be documented on the cross-section. The new cross-sections shall be plotted over previous cross-sections to determine if scour or degradation is occurring. The consultant shall initial the cross section sheet. The consultant shall inform the

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entity in writing, either by e-mail or letter, with a copy to the bridge inspection engineer, whenever the following conditions are found:

1. A general channel degradation, as determined by the cross-sections, of 1' or more, and/or
2. Local pier and/or abutment scour of 2 feet, and/or
3. Footings or pilings that have become exposed.

The letter shall specifically identify the problem being reported, the location of the problem, and recommended action for the entity to take. The recommended action may include, but is not limited to monitoring, load restrictions, closure, a brief description of a repair, or a recommendation for a hydraulic evaluation and structural analysis of the bridge that is beyond the services to be provided under this agreement.

- K. Completed inspection reports shall be submitted to the bridge inspection engineer within 180 days of the date of the inspection for Off-System bridges or within 90 days of the date of the inspection for state owned bridges or at the end of the contract period whichever is earlier.
- L. If cracks or other flaws are suspected in steel members, non-destructive testing (NDT) (dye-penetrant, magnetic particle, or ultrasonic) shall be performed on the suspected portion to accurately determine if cracks or other flaws are present. Consultants shall have the appropriate NDT equipment present at each steel structure inspection site.
- M. Each inspected bridge shall be located using GPS equipment or web based mapping, i.e. Google Maps, Google Earth, etc., to obtain longitudes and latitudes at the center of the bridge.

X. STRUCTURAL ANALYSIS REQUIREMENTS

- A. Each new structure, and any previously inspected and rated structure for which the rating may have changed because of structural reasons (subject to paragraph E in this section) since the last inspection, shall be rated in accordance with the current AASHTO Manual for Bridge Evaluation, AASHTO Standard Specifications for Highway Bridges, and CDOT Staff Bridge Load Factor Rating Manual. The load rating capacity shall be reported on the Load Rating Summary Sheet.
- B. The consultant shall employ the computer programs currently used by CDOT bridge rating unit unless otherwise approved to evaluate the load carrying capacity. Any re-rates or new ratings shall be performed using AASHTOWare BrR or other industry software approved by CDOT as applicable. Ratings shall be complete and independent of any previous analysis.

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- C. If the current physical condition of the structure and present loadings (subject to paragraph E in this section) accurately reflect those assumed in an existing load rating, the structure need not be re-rated.
- D. Special Rating Conditions:
1. Normally, substructures are not analyzed in establishing the load ratings. However, if the consultant finds deteriorated conditions in the substructure that affect the load carrying capacity of the bridge, the consultant shall conduct a substructure analysis and load-rate the bridge based on the controlling rating. The ratings of the superstructure and substructure shall both be noted on the load rating summary sheet when the substructure is the controlling unit.
 2. Concrete structures for which details of reinforcement are not known, and for which a reasonable search cannot locate plans, must be assigned an Engineering Judgment rating in accordance with the CDOT Bridge Rating Manual.
 3. Bridges shall be re-rated when:
 - a. The change in asphalt or gravel thickness from the previous rating amounts to 3” or more.
 - b. Structural conditions change. For example when one or more timber stringers have deteriorated, broken, split, or otherwise lost section capacity since the previous rating.
 - c. The structure was widened or rehabilitated and not re-rated at that time.
 - d. Other conditions exist that suggest re-rating is needed. The condition must be documented with the new rating.

XI. FRACTURE CRITICAL STEEL BRIDGES

Fracture critical members are those defined by the FHWA in their manual titled *Inspection of Fracture Critical Bridge Members* and shall be identified and inspected in accordance with that document and shall comply with the memorandum titled *Inspection of Bridge Fracture Critical Members* in the BRIAR Manual.

- A. A Fracture Critical Member (FCM), is a steel member, or part of a member, in tension whose failure would probably cause a portion of or the entire bridge to collapse.
- B. Some examples of fracture critical bridges are two-girder systems, two-girder steel box sections, two-truss systems, tied arches, suspension spans, simply

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supported cross girders and pier caps, and two-girder systems using pin and hanger supports.

- C. The consultant shall provide a list of the fracture critical bridges to the bridge inspection engineer with each submittal of the inspection reports.
- D. The consultant must prepare forms and sketches that identified Fracture Critical members prior to the inspection. It is important that the inspection of fracture critical bridge members be documented thoroughly and accurately.
- E. Ultrasonic testing shall be conducted on the pins of pin-connected trusses and the pins and hanger straps of the connected girders in FY 2017. A list of the bridges tested in FY 2013 will be provided by CDOT. Pins and hanger straps that the consultant has special concern about may be inspected on a more frequent interval as agreed to, or directed, by the bridge inspection engineer.
- F. Ultrasonic testing shall be done in accordance with the requirements specified Pin Inspections task order scope of work. Use of dye penetrant and/or magnetic particle NDT methods are considered part of the regular inspection work and not paid for separately.

XII. UNDERWATER INSPECTIONS

- A. Underwater inspections shall consist of any appropriate method, short of employing diving or remote submersibles, to evaluate the structure below the waterline. For water depths up to 3 feet, the consultant shall investigate the foundation conditions by probing and/or feeling for undercutting of the foundation or other problems such as deterioration of foundation elements.
- B. All bridges with piers and/or abutments with typical water depths in excess of 3' throughout the year shall be recorded in the reports and a list of the submerged substructure units provided to the bridge inspection engineer. The substructure units below the waterline will be inspected under a separate contract in fiscal year 2020 and at 4-year intervals thereafter.

XIII. SITE REVIEW

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- A. A site review will be required for all bridges recommended for closure to verify that they are closed. Inspect bridges closed to highway traffic to assure that the physical barriers are maintained and that the public safety is not jeopardized. Assess the physical integrity of the structure and any potential hazards to the public on or beneath the structure, especially if pedestrian use is to be allowed. Photographs shall be taken to record the visit and, if appropriate, notes shall be made and included in the structure folder.
- B. Bridges that have been removed and replaced with non-qualifying structures shall be photographed and a short narrative shall be provided describing the replacement structure. These bridges shall be removed from the bridge inventory.

XIV. SCOUR ANALYSIS/REPORT

- A. The scour analysis report shall be sealed by the professional engineer performing the analysis.
- B. Scour depth shall be determined per the guidelines documented in the HEC-18 manual.
- C. If a local scour analysis has not previously been conducted for structures over a watercourse, a depth of scour prediction shall be made in accordance with HEC-18. A reasonable effort shall be made to determine the foundation type, e.g. spread footing, piling, caisson, etc, so that a risk factor may be determined. Canal crossings and shale stream bottoms are examples of conditions where scour analysis may not be necessary. The bridge inspection engineer shall approve the scour analysis prior to it being performed for structures with a low scour potential (i.e., structures over lined channels, canals, or other controlled waterways).
- D. For each bridge analyzed for scour, the consultant shall submit a table showing structure number; feature crossed; calculated scour depth for a 500-year flood; distance to bottom of bridge footing, piles or other foundation type referenced to the bottom of the upstream girder (bridge foundation type may be unknown); type of streambed foundation material; velocity of stream; pier dimensions; pier type, slope of the streambed, depth of flow. The procedure for conducting this work is as follows:
 - 1. Make visual observation of bridge site relative to the drainage basin.
 - 2. Probe at abutments and piers to identify and record scour and undercutting.
 - 3. Measure and record pier width, length, and pier nosing. Determine angle of flood flow to pier centerline.

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4. Determine streambed top of water elevation or bottom of dry channel elevation 500' upstream and 500' downstream, as site features will allow.
5. Identify streambed material types e.g. boulders, cobbles, gravel, sand, silt, etc.
6. Take a minimum of two photographs looking upstream and two photographs looking downstream in a panoramic manner to get as much of a view of the contributing area as possible.
7. When practical, discuss stream flow history with local people.
8. Estimate the depth of maximum flow considering one of the following:
 - a. Depth of flow equal to the vertical distance from flow line to bottom of girder.
 - b. Depth of flow equal to the vertical distance from flow line to top of channel banks where visual inspection indicates water will flow away from the bridge.
 - c. Depth of flow equal to the vertical distance from flow line to 3 ft. above the channel banks when visual inspection does not indicate where water will flow away from the bridge.
9. Where bridges are determined to be scour critical or have unknown foundations, report the water surface level at one foot below the low bottom chord (one foot of freeboard). This is the water elevation at which the bridge should be recommended for closure.
10. If the depth of scour is below the foundation, then the bridge is considered to be scour-critical. If there is calculable scour, but not below the bottom of the foundation, perform a structural analysis to determine whether or not the bridge is unstable. The scour analysis shall be included in the report and shall be used for coding Item 113.

XV. REPORTING

- A. The consultant shall use a CDOT-provided computer program for reporting Structure Inventory, Appraisal, and Element inspection data. The consultant shall provide final reports, with original signatures, to the owner and to the bridge inspection engineer. Final reports shall be submitted either hard copy or electronic copy to the owner and electronic copy only to CDOT. The electronic data files, as described in Section II, paragraph B, shall be provided to the bridge inspection engineer. They also shall be provided to the bridge owners at their request.

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- B. Each inspected structure shall be located on the entity maps. If a structure has been permanently removed, the entity map shall be modified accordingly. Maps that have become illegible shall be redone.
- C. Completed inspection reports containing EI and SI&A information, ratings, sketches, and other pertinent documentation shall be included in an electronic structure folder and one shall be submitted to the bridge inspection engineer and one copy to the owner.
- D. All forms shall include the inspector's and/or rater's original signature and the appropriate date.
- E. Overwriting of previous reports is not acceptable.
- F. As necessary, supplemental sketches, photos, plans, etc. shall be prepared and included as part of the final report to document bridge condition.
- G. If a bridge is rated or re-rated, all rating calculations and a new load rating summary sheet shall be submitted as part of the final report. An electronic copy of the input file and a PDF file of the load rating summary sheet shall be submitted to the bridge inspection engineer as directed by the CDOT Project Manager or his/her designee. If the structure is not re-rated, the consultant shall sign and date the current load rating summary sheet and state that the bridge was inspected but not rated by the consultant.
- H. An electronic inspection report with all electronic data files shall be submitted to the bridge inspection engineer as directed by the CDOT Project Manager or his/her designee.

XVI. SERVICES AND MATERIALS AVAILABLE FROM CDOT

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

- A. All forms required to be completed for each inspection.
- B. Load Rating Summary Sheets
- C. Bridge Asset Management and Inspection Manual (BRIAR Manual), CDOT Structure Inventory Coding Guide, CDOT Pontis Bridge Inspection Manual, AASHTOWare BrM User's Manual, and the CDOT Staff Bridge Rating Manual.
- D. CDOT Staff will be available for reference on coding, rating, computer use, or other related concerns. CDOT Staff will provide the current version of

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AASHTOWare BrM for use on the consultant computers. Licensing for this software is covered under the CDOT annual licensing agreement with AASHTO. The consultant will be responsible for obtaining their own version of AASHTOWare BrR for rating bridges.

- E. Most current designated STRAHNET and NHS routes (identified in the database).
- F. ADT adjustment tables.
- G. Electronic files on computer disks in the version of AASHTOWare BrM specified by the bridge inspection engineer, compatible with IBM PC microcomputers. These will be provided on an entity basis and will reflect the current inventory. Edit features within AASHTOWare BrM will be used for adding structures to the database, editing data on existing structures, and printing the appropriate forms.
- H. AASHTOWare BrM installation software.

XVII. FINAL REVIEW

- A. Each inspection report will be reviewed by the project manager for completeness and consistency. Each incomplete or inconsistent report will be returned to the consultant for review and for corrections
- B. The consultant shall hold a final report presentation meeting with each owner when all inspection work is completed and reports have been accepted by the project manager. This presentation shall occur no later than 60 days from the date that the final reports are accepted by the project manager. This will be a joint review with the proper city/county officials and the consultant to discuss the inspection reports. This review will be held at a mutually agreed upon location. An e-mail documenting this meeting shall be submitted to the project manager. If an owner chooses not to have the presentation, the e-mail will state that the owner declined the presentation. Prior to the meeting, the consultant shall notify the project manager of the time, date and location of the meeting by e-mail and extend an invitation for the project manager to attend.
- C. The bridge inspection engineer or his designee may accompany the consultant during field inspections or visit the office of the consultant to review procedures and inspection reports and to verify billings.

XVIII. METHOD OF PAYMENT

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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 ESSENTIAL REPAIR FINDINGS

- A. **PURPOSE:** This appendix establishes the procedures of the Colorado Department of Transportation, Staff Bridge Branch regarding the general subject of Essential Repair Findings. The term “essential repair” as contained within these procedures is intended to mean a structural or safety related deficiency that requires immediate follow-up inspection or action.

Bridge postings and/or closings may result in short term adverse effects on the delivery of public and private service locally. However, they do not necessarily constitute an essential repair. Rather, deficiencies that compromise the ability of the structure to safely convey traffic are deemed to be essential repair findings 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**
Tension members identified as fracture critical members within the Structure File Data and which are damaged by natural or impact forces.
 2. **Load Capacity**
A condition which results in a restriction of the maximum acceptable load carrying capacity of a structure to some value less than 27 Tons on the Type III, 3-axle truck at the Operating Rating level.
 3. **Timber Structures**
 - a. Three adjacent crushed stringers
 - b. Three broken stringers in one span, two of which are adjacent to one another.
 - c. Stringers with rot at the ends, which may cause the stringer to fall off the timber cap.
 - d. “Mushrooming” for a depth of 2” on three adjacent stringers.
 - e. Rot in the top of 80% of all stringers in one span, which reduces the effective depth by 25%.
 - f. Rot in timber piles that affect the carrying-capacity of the structure.
 4. **Concrete Structures**
 - a. Concrete girders with over 30% of the primary moment steel severed.
 - b. Loss of section in beam ends and/or spalls in concrete girder supports where girders have less than 80% bearing area remaining.
 - c. Girders sheared at the ends to the extent that displacement has occurred.

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5. Steel Structures
 - 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 severed.
 - c. The bottom flange of a steel girder being severed.
 - d. Bottom chord truss members with over 30% section loss.
 - e. Steel or aluminum culverts including super spans with unusual section displacement and/or gaps at the point of overlap and cracks in bolt lines.

6. General – All Structures
 - a. Scour which has caused vertical or horizontal displacement.
 - b. Scour under a spread footing, which has caused a loss of 15% of the bearing area.
 - c. Substructure problems that threaten the structural integrity of the bridge.
 - d. Corrosion in steel piling that affects the carrying-capacity of the structure.

- C. It shall be the responsibility of the bridge inspection team leader performing an inspection to be alert for conditions other than identified above which may also be considered a ERF. Such a finding shall be reported to the owner upon return from the inspection or, if deemed necessary, immediately by telephone or in person.

- D. The criticality of the deficiency will result in one or more of the following actions with an importance described as follow:
 1. Immediate closure.
 2. Posting load limits.
 3. Restricted traffic usage.
 4. Urgent repairs.

- E. SPECIAL ACTIONS REQUIRED OF THE INSPECTION TEAM LEADER:
 1. The team leader shall notify the owner by phone, or in person, when the actions identified as 1 through 3 above are appropriate. He or she 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 owner for any action required by 1 above. Copies of the confirmation with supporting documentation shall be sent to the bridge inspection engineer with “cc” to project manager on all critical inspection finding correspondence.
 3. Within ten working days after an owner has been informed of a type 1, 2, or 3 deficiency, the consultant shall contact the owner by phone to determine what

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- action was taken. The consultant shall send a follow-up letter to the bridge inspection engineer describing what action was taken by the owner.
4. The consultant shall notify the owner in writing of Type 4 deficiencies 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. A copy of the notification shall be sent to the bridge inspection engineer for any essential repair finding. The bridge inspection engineer will notify the FHWA division administrator when a critical deficiency, 1 through 4 is reported. The bridge inspection engineer will forward documentation, as describe in paragraph E.2 above, to the FHWA division administrator.
- F. The bridge inspection engineer will follow-up with the owner as to any items brought to his attention per paragraph E.4 above and which are indicated to be unresolved.

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APPENDIX B
BRIDGE CLOSURE REQUIREMENTS

- A. A bridge **MUST BE CLOSED** if it is not capable of carrying 3 Tons at the operating level.
- B. Bridges with an Inventory Rating of 3 Tons must be posted with a gross load of 3 Tons and must be closed to trucks.
- C. Bridges that require closure must be closed per the MUTCD signing and barricading specifications. The “ROAD CLOSED” sign shall be placed at the point of physical closure. If the jurisdiction desires, the message may be changed to “BRIDGE CLOSED”. This sign is to be accompanied by a permanent Type III barricade installation that completely closes the roadway to the passage of vehicles.
- D. Due to the tendency for the public to move and/or drive around barricades, particular effort should be made to insure that a substantial installation is used.

Exhibit E

NORTH AREA

Approximately 1600 Bridges
4,157,000 SF Deck Area

ODD FY	EVEN FY
800 bridges	800 bridges
2,315,000 SF	1,842,000 SF

BOULDER	GARFIELD
BROOMFIELD	GRAND
JACKSON	LOGAN
LARIMER	MOFFAT
MORGAN	PHILLIPS
RIO BLANCO	SEDGWICK
ROUTT	WASHINGTON
YUMA	WELD

CENTRAL AREA

Approximately 1700 Bridges
9,821,000 SF Deck Area

ODD FY	EVEN FY
800 bridges	900 bridges
5,122,000 SF	4,699,000 SF

CLEAR CREEK	ADAMS
DENVER	ARAPAHOE
DOUGLAS	EAGLE
ELBERT	EL PASO
GILPIN	TELLER
JEFFERSON	
LINCOLN	
PARK	
SUMMIT	

SOUTH AREA

Approximately 1550 Bridges
3,555,000 SF Deck Area

ODD FY	EVEN FY
725 bridges	825 bridges
1,741,000 SF	1,814,000 SF

ALAMOSA	BACA
ARCHULETA	BENT
CONEJOS	CHAFFEE
COSTILLA	CHEYENNE
CROWLEY	DELTA
CUSTER	DOLORES
FREMONT	GUNNISON
HINSDALE	KIT CARSON
HUERFANO	LAKE
KIOWA	MESA
LA PLATA	MONTROSE
LAS ANIMAS	OTERO
MINERAL	OURAY
MONTEZUMA	PITKIN
PROWERS	SAN JUAN
PUEBLO	SAN MIGUEL
RIO GRANDE	
SAGUACHE	

FY2017 is an ODD Fiscal Year and runs from July 1, 2016 to June 30, 2017
 FY2018 is an EVEN Fiscal Year and runs from July 1, 2017 to June 30, 2018
 FY2019 is an ODD Fiscal Year and runs from July 1, 2018 to June 30, 2019
 FY2020 is an EVEN Fiscal Year and runs from July 1, 2019 to June 30, 2020
 FY2021 is an ODD Fiscal Year and runs from July 1, 2020 to June 30, 2021
 FY2022 is an EVEN Fiscal Year and runs from July 1, 2021 to June 30, 2022

EVEN
Fiscal Year
i.e. 2017-2018

ODD
Fiscal Year
i.e. 2016-2017

State of Colorado

