



**DEPARTMENT OF TRANSPORTATION  
STATE OF COLORADO**

# **Bridge Ratings, Inspections And Records Manual**

## **(BRIAR MANUAL)**

**STAFF BRIDGE BRANCH  
2012**

# **Bridge Ratings, Inspections and Records Manual (BRIAR MANUAL)**

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- National Bridge Inspection Standards (NBIS) Request for Annual NBIS Program Review Reports  
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- Railroad Guidelines for Design and Construction of Grade Separation Underpass and Overhead Structures  
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• Bridge Load Ratings for the National Bridge Inventory <a href="http://www.fhwa.dot.gov/legsregs/directives/policy/nov5.htm">http://www.fhwa.dot.gov/legsregs/directives/policy/nov5.htm</a>	11/5/1993	2
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# MEMORANDUM

## DEPARTMENT OF TRANSPORTATION

Design / Construction Branch  
4201 E. Arkansas Avenue, Room 107  
Denver, Colorado 80222  
(303) 757-9309 FAX (303) 757-9197



**DATE:** Monday, September 14, 2009  
**TO:** Users of CDOT Electronic Structure Records

Bridge Asset Management  
Records  
Documents  
Structure Folders

**FROM:** Mark A. Nord, P.E. Signature on file  
Bridge Asset Management Engineer

**SUBJECT:** Bridge Asset Management Technical Memorandum  
Bridge Records Email

This memorandum is to document what emails are to be sent to the bridge records email address, how they are to be identified, and how they are filed.

### History

There is correspondence in the hard copy structure folders. The correspondence captured is typically major events during the life of the structure (e.g. essential repair notices, repair details, requests to hang utilities on structures, responses to overlay requests, etc.).

### Policy

Important or significant email on any structure is to be copied to [Bridge.Records@dot.state.co.us](mailto:Bridge.Records@dot.state.co.us) (Microsoft Outlook alias: bridgerec). This only applies to those structures where the Bridge Asset Management unit maintains the records.

Email sent to the bridge records email address will be filed in the referenced electronic structure folder using an automated filing system provided the following information is in the email subject line or within the text of the email:

#### Minimum required information

Full Structure Number

#### Example

E-17-AX, E-17-AY, WALL-E-17-AZ

#### Additional information (if available)

Structure Location

State Highway 007 over a Draw at 3.333

Project Number

BR-0077-121

Subaccount

12345

Project Description

Colorado Bridge Replacement Project

Email without structure identifying information will be returned to the sender.

### Commentary

This method of capturing and filing important correspondence to the electronic structure folders is an important improvement since the evolution from hard copy memorandums to email memorandums.

### Concurrence

Signature on File

Mark A. Leonard, P.E.  
Staff Bridge Engineer

# MEMORANDUM

## DEPARTMENT OF TRANSPORTATION

Staff Bridge Branch  
4201 E. Arkansas Avenue, Room 107  
Denver, Colorado 80222  
(303) 757-9309 FAX (303) 757-9197



**DATE:** November 17, 2011  
**TO:** Users of CDOT Coding Guide for  
Inspection of In-Service Bridges

Bridge Asset Management Manual  
Section 2 - Records  
Subsection Data – Inspection Data

**FROM:** Mark A. Nord  
Bridge Asset Management Engineer

**SUBJECT:** Coding of Item 113, Scour Critical Bridges

***The policy on Item 113, Scour Critical Bridges, was compiled from the following:***

*The Errata Sheet for the FHWA Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges Report No. FHWA-PD-96-001 December 1995*

*The Errata Sheet was produced after the FHWA Memorandum dated April 27, 2001 on the subject: ACTION: Revision of Coding Guide, Item 113 - Scour Critical Bridges*

*Added language prefaced by CDOT Policy – and in italics was added by CDOT Staff Bridge to further clarify the coding definitions and uses.*

### **Item 113, Scour Critical Bridges**

Use a single-digit code as indicated below 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."<sup>1</sup> Detailed engineering guidance is provided in the Hydraulic Engineering Circular 18 titled "Evaluating Scour at Bridges."<sup>2</sup> Whenever a rating factor of 2 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<sup>2</sup> and HEC 23<sup>3</sup>). 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.

#### ***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 Inspection Engineer and the CDOT Bridge Asset Management Engineer. The documentation shall include a memo placed in the structure folder that, with attachments where necessary, identifies the current and new coding for item 113 and provides the basis for the change. The memo will be signed by the CDOT Bridge Inspection Engineer and the CDOT Bridge Asset Management Engineer. 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.*

<u>Code</u>	<u>Description</u>
N	Bridge not over waterway.
U	Bridge with "unknown" foundation that has not been evaluated for scour. Until risk can be determined, a plan of action should be developed and implemented to reduce the risk to users from a bridge failure during and immediately after a flood event (see HEC 23 <sup>3</sup> ).
	<p><i>CDOT Policy –</i></p> <p><i>The code of “U” is only to be used when the foundation is unknown and the scour calculations are not in the bridge record.</i></p> <p><i>Any bridge with a code of “U” will immediately be scheduled to have the foundation determined and the scour calculations completed and placed in the bridge record.</i></p>
T	Bridge over "tidal" waters that has not been evaluated for scour, but considered low risk. Bridge will be monitored with regular inspection cycle and with appropriate underwater inspections until an evaluation is performed ("Unknown" foundations in "tidal" waters should be coded U.)
	<p><i>CDOT Policy –</i></p> <p><i>The code of “T” is not used within Colorado.</i></p>
9	Bridge foundations (including piles) on dry land well above flood water elevations.
8	Bridge foundations determined to be stable for the assessed or calculated scour condition. Scour is determined to be above top of footing (Example A) by assessment (i.e., bridge foundations are on rock formations that have been determined to resist scour within the service life of the bridge <sup>4</sup> ), by calculation or by installation of properly designed countermeasures (see HEC 23 <sup>3</sup> ).
	<p><i>CDOT Policy –</i></p> <p><i>The code of “8” is to be used only for those bridges that have been determined to be stable for the 500-year or controlling storm event based on the scour calculations within the bridge record and where calculated scour is above the footing as shown in Example A.</i></p>
7	Countermeasures have been installed to mitigate an existing problem with scour and to reduce the risk of bridge failure during a flood event. Instructions contained in a plan of action have been implemented to reduce the risk to users from a bridge failure during or immediately after a flood event.
	<p><i>CDOT Policy –</i></p> <p><i>The code of “7” will not be used unless the hydraulic countermeasure has been designed to resist the 500 year or controlling scour storm event on an otherwise scour critical bridge.</i></p> <p><i>Hydraulic countermeasures that reduce the risk of bridge failure during a flood event but do not resist the 500 year or controlling scour storm event will not use the code of “7” but will be recorded in:</i></p> <p><i>Pontis Smart Flag 361 – Scour, and</i></p> <p><i>Colorado Pontis Smart Flag 502 – Channel Protection Material and Condition.</i></p>

- 6 Scour calculation/evaluation has not been made. (Use only to describe case where bridge has not yet been evaluated for scour potential.)

*CDOT Policy –*

*The code of “6” is only to be used when the scour calculations are not in the bridge record.*

*Any bridge with a code of “6” will immediately be scheduled to have the scour calculations completed and placed in the bridge record.*

- 5 Bridge foundations determined to be stable for assessed or calculated scour condition. Scour is determined to be within the limits of footing or piles (Example B) by assessment (i.e., bridge foundations are on rock formations that have been determined to resist scour within the service life of the bridge), by calculations or by installation of properly designed countermeasures (see HEC 23<sup>3</sup>).

*CDOT Policy –*

*The code of “5” is to be used only for those bridges that have been determined to be stable for the 500-year or controlling storm event based on the scour calculations within the bridge record and where calculated scour is within the limits of the footing or piles as shown in Example B.*

- 4 Bridge foundations determined to be stable for assessed or calculated scour conditions; field review indicates action is required to protect exposed foundations (see HEC 23<sup>3</sup>).

*CDOT Policy –*

*The code of “4” is to be used only for those bridges that:*

*Have observed and documented scour that has exposed the piling or footings; and*

*Have been determined to be stable for the 500-year or controlling storm event (Item 113 = “5” or “8”) based on the scour calculations within the bridge record.*

*A code of “4” requires an essential repair finding notice be issued to the applicable region or local agency to address the observed scour.*

*If Item 113 is coded “4”, then Item 60, Substructure, must be coded no greater than “5”, Fair Condition.*

- 3 Bridge is scour critical; bridge foundations determined to be unstable for assessed or calculated scour conditions:

- Scour within limits of footing or piles. (Example B)
- Scour below spread-footing base or pile tips. (Example C)

*CDOT Policy –*

*The code of “3” is to be used only for those bridges that have been determined to be unstable for the 500-year or controlling storm event based on the scour calculations within the bridge record where calculated scour is below the footing or within the limits of the piling as shown in Example B or Example C.*

- 2 Bridge is scour critical; field review indicates that extensive scour has occurred at bridge foundations, which are determined to be unstable by:
- a comparison of calculated scour and observed scour during the bridge inspection, or
  - an engineering evaluation of the observed scour condition reported by the bridge inspector in Item 60.

*CDOT Policy –*

*The code of “2” is to be used only for those bridges that:*

*Have observed and documented scour that has exposed the piling or footings but not enough observed scour to indicate that the bridge failure is imminent; and*

*Have been determined to be unstable for the 500-year or controlling storm event (Item 113 = “3”) based on the scour calculations within the bridge record;*

*A code of “2” requires an essential repair finding notice be issued to the applicable region or local agency to address the observed and documented scour. Although bridges in this category may not be in danger of imminent failure consideration should be given to closing the bridge until repairs are in place to address the observed scour.*

*If Item 113 is coded “2”, then Item 60, Substructure, must be coded no greater than “3”, Serious Condition.*

- 1 Bridge is scour critical; field review indicates that failure of piers/abutments is imminent. Bridge is closed to traffic. Failure is imminent based on:

- a comparison of calculated and observed scour during the bridge inspection, or
- an engineering evaluation of the observed scour condition reported by the bridge inspector in Item 60.

*CDOT Policy –*

*The code of “1” is to be used only for those bridges that:*

*Have observed and documented scour that has exposed the piling or footings enough to indicate that the bridge failure is imminent; and*

*Have been determined to be unstable for the 500-year or controlling storm event (Item 113 = “3”) based on the scour calculations within the bridge record;*

*A code of “1” requires an essential repair finding notice be issued to the applicable region or local agency to address the observed and documented scour. Bridges in this category are in danger of imminent failure and must be closed immediately until repairs are in place to address the observed scour.*

*If Item 113 is coded “1”, then Item 60, Substructure, is to be coded “1”, Imminent Failure Condition.*

- 0 Bridge is scour critical. Bridge has failed and is closed to traffic.

*CDOT Policy –*

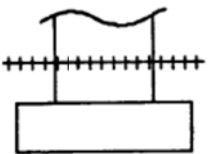
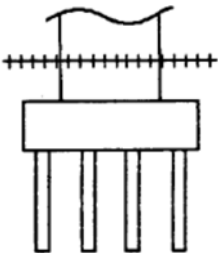
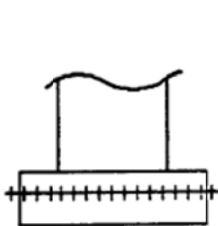
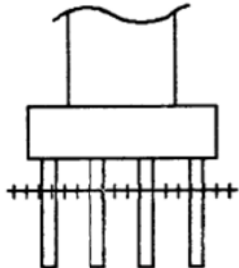
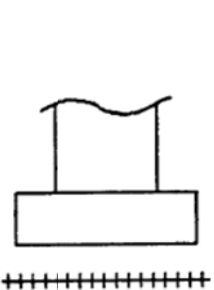
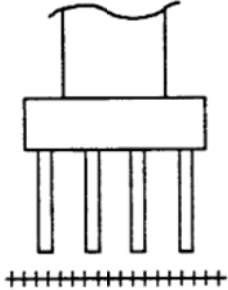
*The code of “0” is to be used only for those bridges that:*

*Have observed scour that has caused the bridge to fail.*

*A code of “0” requires an essential repair finding notice be issued to the applicable region or local agency to address the observed scour. Bridges in this category have failed and must be closed immediately until repairs are in place to address the observed scour.*

*If Item 113 is coded “0”, then Item 60, Substructure, is to be coded “0”, Failed Condition.*

EXAMPLESCALCULATED SCOUR DEPTHACTION NEEDED

A. Above top of footing	 	None - indicate rating of 8 for this item
B. Within limits of footing or piles	 	Conduct foundation structural analysis
C. Below pile tips or spread-footing base	 	Provide for monitoring and scour countermeasures as necessary
SPREAD FOOTING (NOT FOUNDED IN ROCK)		PILE FOOTING

+++++ = Calculated scour depth

<sup>1</sup> FHWA Technical Advisory T 5140.23, Evaluating Scour at Bridges, dated October 28, 1991.

<sup>2</sup> HEC 18, Evaluating Scour at Bridges, Fourth Edition. 2001

<sup>3</sup> HEC 23, Bridge Scour and Stream Instability Countermeasures, Third Edition, 2009

<sup>4</sup> FHWA Memorandum "Scourability of Rock Formations," dated July 19, 1991.

## Concurrence

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Lynn Croswell, P.E.  
Bridge Inspection Engineer

---

Mark A. Leonard, P.E.  
Staff Bridge Engineer

---

Karen Mondragon  
Statewide Bridge Inspection Coordinator

# MEMORANDUM

## DEPARTMENT OF TRANSPORTATION

Staff Bridge Branch  
4201 E. Arkansas Avenue, Room 107  
Denver, Colorado 80222  
(303) 757-9309 FAX (303) 757-9197



**DATE:** Monday March 10, 2014  
**TO:** Users of AASHTOWare Pontis for Colorado DOT

Bridge Asset Management Manual  
Section 2 - Records  
Subsection Data - Load Rating Data

Signature on file

**FROM:** Mark A. Nord, P.E.  
Bridge Asset Management Engineer  
**SUBJECT:** Bridge Asset Management Technical Memorandum  
AASHTOWare Pontis 4.1.1  
Coding of Load Ratings

This memorandum is to document how load ratings are to be coded into AASHTOWare Pontis 4.1.1 and supersedes the memorandum of the same subject dated November 17<sup>th</sup>, 2011.

### Policy

Ratings are to be coded into PONTIS when there is a rater signed load rating summary sheet.

The existing data items that are to be coded and / or verified for each load rating and the new data items used to document the completeness of the load rating are:

- Structure Details:
  - Structure Type
  - Construction Type
  - Design Method – *(new data item)*
  - Design Load
  - Asphalt / Fill Thickness
  - Plans Available – *(new data item)*
  - Replaced with – *(new data item)*
  - Comments – *(new data item)*
- Rating Package Checks:
  - Rating Package Review Date – *(new data item)*
  - Rating Date
  - Raters Initials
  - Checked Date – *(new data item)*
  - Checkers Initials – *(new data item)*
  - Entire Structure Rated – *(new data item)*
  - Rating Calculations Complete – *(new data item)*
  - Rating Input Files Archived – *(new data item)*
  - Rating Output Files Archived – *(new data item)*
  - Rating Package Complete – *(new data item)*
  - Rating Assigned To – *(new data item)*
- Rating Values:
  - Inventory Rating Method
  - Operating Rating Method
  - Inventory Rating
  - Operating Rating
  - Alternate Inventory Rating Method
  - Alternate Operating Rating Method

- Alternate Inventory Load Rating
- Alternate Operating Load Rating
- Girder Operating Rating
- Controlling Inventory Rating Indicator – *(new data item)*
- Controlling Operating Rating Indicator
- Type 3 Truck Operating Rating
- Type 3S2 Truck Operating Rating
- Type 3-2 Truck Operating Rating
- Notional Rating Load (NRL) – *(new data item)*
- Single Unit Bridge Posting Load 4 (SU4) – *(new data item)*
- Single Unit Bridge Posting Load 5 (SU5) – *(new data item)*
- Single Unit Bridge Posting Load 6 (SU6) – *(new data item)*
- Single Unit Bridge Posting Load 7 (SU7) – *(new data item)*
- Bridge Posting
- Overload Color Code
- Overload Color Code Live Load – *(new data item)*
- Permit Truck Operating Rating – *(new data item)*
- Modified Tandem Operating Rating – *(new data item)*
- Overload Critical Structure – *(new data item)*
- VIRTIS Items:
  - Rating Software Used – *(new data item)*
  - VIRTIS BID Number – *(new data item)*
  - VIRTIS Structure Number – *(new data item)*
  - VIRTIS Rating Runs – *(new data item)*
  - VIRTIS Rating Analysis – *(new data item)*
  - VIRTIS Rating System Based – *(new data item)*
  - VIRTIS Rating Linked to PONTIS – *(new data item)*
  - VIRTIS Rating Checkout Privileges – *(new data item)*

Until the new data items can be added to the PONTIS database they will be tracked in a separate Rating Information database by the Rating Group and the Bridge Asset Management Unit.

The data item Load Factor Rating Indicator (Colorado Inventory Item 66L) will no longer be used and will be removed from the Colorado Coding Guide.

Each of the data items identified above is detailed in the appendix attached to this memorandum.

## Concurrence

Signature on file

Mahmood "Mac" Hasan, P.E.  
Project Support Engineer

Signature on file

Joshua Laipply, P.E.  
Staff Bridge Engineer

Signature on file

Lynn Croswell, P.E.  
Bridge Inspection Engineer

Enclosure: Rating Information 2014 03 10

**Rating Information Appendix to memorandum  
Coding of Load Ratings dated 3/10/2014****STRUCTURE DETAILS****STRUCTURE TYPE**

Colorado Inventory Item 120A  
 PONTIS userbrdg.structtype  
 Five (5) Characters

Policy:

Description	Code
Aluminum Arch Culvert.....	AAC
Concrete Arch.....	CA
Concrete Arch Culvert.....	CAC
Concrete Box Culvert.....	CBC
Concrete Box Girder.....	CBG
Concrete Box Girder, Continuous.....	CBGC
Concrete Box Girder, Continuous Prestressed.....	CBGCP
Concrete Box Girder, Prestressed.....	CBGP
Concrete Box Girder, Segmented.....	CBGS
Concrete Double T Prestressed Girder.....	CDTPG
Concrete on I-beam.....	CI
Concrete on I-beam, Continuous.....	CIC
Concrete on I-beam, Continuous and Composite.....	CICK
Concrete on I-beam, Continuous, Composite, Prestressed....	CICKP
Concrete on I-beam, Composite.....	CIK
Concrete on I-beam, Composite, Prestressed.....	CIKP
Corrugated Metal Pipe.....	CMP
Corrugated Plastic Pipe.....	CPP
Concrete Prestressed Girder.....	CPG
Concrete Prestressed Girder, Continuous.....	CPGC
Concrete Rigid Frame.....	CRF
Concrete Slab.....	CS
Concrete Slab, Continuous.....	CSC
Concrete Slab and Girder.....	CSG
Concrete Slab and Girder, Continuous.....	CSGC
Concrete Slab and Girder, Continuous Prestressed.....	CSGCP
Concrete Slab and Girder, Prestressed.....	CSGP
Concrete Slab, Prestressed.....	CSP
Concrete Slab, Prestressed Continuous.....	CSCP
Concrete Tub Girder.....	CTG
Concrete Tub Girder, Prestressed.....	CTGP
Concrete Tub Girder, Continuous.....	CTGC
Concrete Tub Girder, Continuous Prestressed.....	CTGCP
High Mast Light.....	HML
Mast Arm Signal.....	SGNAL
Overhead Pipe.....	OP
Precast Concrete Box Culvert.....	PCBC
Rubble Arch.....	RA
Rubble Arch Culvert.....	RAC
Reinforced Earth.....	RE
Reinforced Concrete Pipe Culvert.....	RCPC
Riveted Girder.....	RG
Riveted Girder Continuous.....	RGC

**Rating Information Appendix to memorandum**  
**Coding of Load Ratings dated 3/10/2014****STRUCTURE TYPE**

Colorado Inventory Item 120A

PONTIS userbrdg.structtype

Five (5) Characters

Policy:

Description	Code
Steel Arch.....	SA
Steel Arch, Culvert/Multiplate Arch Culvert.....	SAC
Steel Box Girder.....	SBG
Steel Box Girder, Continuous.....	SBGC
Steel Box Girder, Prestressed.....	SBGP
Steel Box Girder, Prestressed, Continuous.....	SBGCP
Steel Deck Girder.....	SDG
Steel Deck Girder, Continuous.....	SDGC
Steel Deck Truss.....	SDT
Overhead Sign Bridge.....	SIGN
Overhead Sign, Butterfly.....	SIGNB
Overhead Sign, Cantilever.....	SIGNC
Overhead Sign Bridge with Cantilever.....	SIGND
Steel Low Truss.....	SLT
Steel Stringer, Earth Fill (using 1/2 CMP).....	SSE
Steel Stringer, Earth Fill (using 1/2 CMP) Continuous..	SSEC
Steel Stringer, Metal Plank Floor.....	SSM
Steel Stringer, Continuous/Metal Plank Floor.....	SSMC
Steel Stringer, Timber Floor.....	SSS
Steel Stringer Continuous, Timber Floor.....	SSSC
Steel Thru Arch.....	STA
Steel Thru Girder.....	STG
Steel Thru Truss.....	STT
Suspension Bridge.....	SUSP
Timber w/Concrete Deck.....	TD
Timber Laminated Arch (Gluelam).....	TLA
Timber Laminated Stringer (Gluelam).....	TLS
Timber Low Truss.....	TLT
Timber w/Metal Deck.....	TM
Timber Slab.....	TSLAB
Timber Stringer w/Timber Deck.....	TS
Treated Timber Stringer w/Concrete Deck.....	TTD
Treated Timber Stringer w/Metal Plank Deck.....	TTM
Treated Timber Stringer w/Timber Deck.....	TTS
Timber Thru Truss.....	TTT
Tunnel, Concrete Lined.....	TUNC
Tunnel, Thru Rock - No Lining.....	TUNR
Retaining Wall.....	WALLR
Sound Barrier Wall.....	WALLS
Welded Girder.....	WG
Welded Girder, Continuous.....	WGC
Welded Girder, Continuous and Composite.....	WGCK
Welded Girder, Composite.....	WGK

To be used to identify the Main Span or Superstructure Unit.

**Rating Information Appendix to memorandum**  
**Coding of Load Ratings dated 3/10/2014****CONSTRUCTION TYPE**

Colorado Inventory Item 120B

PONTIS userbrdg.constype

Two (2) Characters TO BE INCREASED TO 30 Characters

Description	Code
Not Applicable or Unknown.....	00
Pre-cast.....	01
Poured in Place.....	02
Pre-tensioned.....	03
Post-tensioned.....	04
Parabolic.....	05
Cantilevered.....	06
Curved.....	10
Concrete 'T' Girder, Prestressed.....	20
Concrete Twin 'T' Girder, Prestressed.....	21
AASHTO Type I, Prestressed.....	25
AASHTO Type II, Prestressed.....	26
AASHTO Type III, Prestressed.....	27
AASHTO Type IV, Prestressed.....	28
Colorado Type G-54, Prestressed, Simple Span.....	30
Colorado Type G-54, Prestressed, Continuous Spans.....	31
Colorado Type G-68, Prestressed, Simple Span.....	32
Colorado Type G-68, Prestressed, Continuous Spans.....	33
Colorado Type G-70, Prestressed, Simple Span.....	34
Colorado Type G-70, Prestressed, Continuous Spans.....	35
Colorado Type G-78, Prestressed, Simple Span.....	36
Colorado Type G-78, Prestressed, Continuous Spans.....	37
Colorado Type G-72, Prestressed, Simple Span.....	38
Colorado Type G-72, Prestressed, Continuous Spans.....	39
BULBT, Simple Span.....	40
BULBT, Continuous Span.....	41
Riveted Plate Girder.....	50
Slant Leg.....	51
Super Span.....	60
Pin & Link, w/Category III UWI (Water depth 4 to 6 ft) ...	80
SI/Pin & Link w/Category II UWI (Water depth 7 to 10 ft) ..	81
SI/Pin & Link w/Category I UWI (Water depth > 10 ft) .....	82
SI/Pin & Link connections.....	83
SI/Category I UWI (Water depth greater than 10 ft.) .....	85
SI/Category II UWI (Water depth 7 ft to 10 ft) .....	86
SI/Category III UWI (Water depth 4 ft to 6 ft) .....	88
Research Required.....	90
Experimental Bridge.....	91
Multi-type Girder System.....	99
Pre-tensioned and Post-tensioned (spliced midspan) .....	PP

Multiple codes are to be separated by commas.

To be used to identify the Main Span or Superstructure Unit.

**Rating Information Appendix to memorandum  
Coding of Load Ratings dated 3/10/2014****DESIGN METHOD - (new data item)**

Non-NBI Item

Colorado Inventory Item 31D

PONTIS userbrdg.designmethod

One (1) Character

Policy:

Code	Description
U	<b>U</b> nknown
W	ASD - Allowable Stress, <b>W</b> orking Stress or Service Load
L	LFD - <b>L</b> oad Factor
R	LRFD - Load and <b>R</b> esistance Factor
X	Railroad
O	<b>O</b> ther Design Method

**Rating Information Appendix to memorandum  
Coding of Load Ratings dated 3/10/2014****DESIGN LOAD**

NBI Item 31  
PONTIS bridge.designload  
One (1) Character

References:

FHWA Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges dated December 1995 as amended by FHWA Memorandum Dated February 2, 2011.

Policy:

Code	Metric Description	English Description
<b>0</b>	<b>Unknown</b>	<b>Unknown</b>
1	M 9	H 10
2	M 13.5	H 15
3	MS 13.5	HS 15
4	M 18	H 20
5	MS 18	HS 20
6	MS 18 + Mod	HS 20 + Mod
7	Pedestrian	Pedestrian
8	Railroad	Railroad
9	MS 22.5 or greater	HS 25 or greater
<b>A</b>	<b>HL 93</b>	<b>HL 93</b>
<b>B</b>	<b>Greater than HL 93</b>	<b>Greater than HL 93</b>
<b>C</b>	<b>Other</b>	<b>Other</b>

**The 0, A, B, or C codes highlighted in bold text are not to be used until after April 1, 2011.**

Code other H, M, HS, or MS design live loads using the nearest equivalent of the numerical portion of the loading.

Code 0 where the design live load is unknown due to the absence of plans, design calculations, or other information.

Code 6 where the military loading is included with MS 18 (HS20). Interstate Alternate is frequently used on plan sheets when HS-20 plus Military was used as the design load.

Code C refers to other situations where the design live load is not based upon AASHTO design live load configurations, such as designs based on specific truck loads (e.g. overhead runways with plane loads, or overhead snow shed loads).

Prior to April 1, 2011

The Zero "0" is used to be used to code an Other Design Load which includes HL-93

LRFD is being placed in Bridge Notes for future retrieval and coding until after April 1, 2011.

**Rating Information Appendix to memorandum  
Coding of Load Ratings dated 3/10/2014****ASPHALT / FILL THICKNESS**

Non-NBI Item  
Colorado Inventory Item 66T  
PONTIS userbrdg.asphaltthickness  
Floating Point Numeric

Policy:

Record the asphalt thickness to the nearest quarter inch.

Determine the depth of fill to the nearest foot and code it to the nearest inch.

**PLANS AVAILABLE - (new data item)**

Non-NBI Item  
Colorado Bridge Inventory Item 500  
PONTIS userbrdg.plans  
One (1) Character

Policy:

Code	Description
0	Plans and / or shop drawings are not available.
1	Plans and / or shop drawings are available that are sufficient for a structural analysis.
N	Plan search not completed.
P	Partial plans available.

**REPLACED WITH - (new data item)**

Non-NBI Item  
Colorado Bridge Inventory Item 8R  
PONTIS userbrdg.replacedwith  
Fifteen (15) Characters

Policy:

Code this field with the structure number of the new structure that will replace or has replaced this structure.

Commentary:

This item is added to identify structures will be or have been removed and replaced with another structure.

This item then will be used to identify structures that do not require a load rating.

There is a corresponding item (userbrdg.replaced\_structure\_id) to identify the structure that this structure replaced.

**Rating Information Appendix to memorandum  
Coding of Load Ratings dated 3/10/2014**

**STRUCTURE COMMENTS - (new data item)**

Non-NBI Item  
Colorado Bridge Inventory Item 8COM  
PONTIS userbrdg.structurecomments  
Two Hundred (200) Characters

Policy:

Code with any comments related to the structure as a whole.

Commentary:

This item is added as a place to add comments that can be used on reports rather than the similar item (bridge.notes) used by inspection.

**RATING PACKAGE CHECKS**

**RATING PACKAGE REVIEW DATE - (new data item)**

Non-NBI Item  
Colorado Inventory Item 66R  
PONTIS userbrdg.ratereview\_date  
Date data

Policy:

This is to be the date the rating package was most recently reviewed by the Bridge Rating Group and the rating item coding updated.

**RATING DATE**

Non-NBI Item  
Colorado Inventory Item 130  
PONTIS bridge.ratingdate  
Date data

Policy:

This is to be the date the rater signed the load rating summary sheet.

Commentary:

The item (userbrdg.rate\_date) with the same purpose as (bridge.ratingdate) is not necessary.

PONTIS userbrdg.rate\_date will be reused as the Checked Date.

**Rating Information Appendix to memorandum  
Coding of Load Ratings dated 3/10/2014**

**RATERS INITIALS**

Non-NBI Item  
Colorado Inventory Item 66I  
PONTIS bridge.rater\_ini  
Three (3) Characters

Policy:

This is to be the initials of the rater that signed the load rating summary sheet.

Code ZZZ if the raters signature is not readable.

Leave blank for no signature.

**CHECKED DATE - (new data item)**

Non-NBI Item  
Colorado Inventory Item 130C  
PONTIS userbrdg.rate\_date TO BE RENAMED TO userbrdg.ratecheck\_date  
Date data

Policy:

This is to be the date the checker signed the load rating summary sheet.

**CHECKERS INITIALS - (new data item)**

Non-NBI Item  
Colorado Inventory Item 66J  
PONTIS userbrdg.ratechecker\_ini  
Three (3) Characters

Policy:

This is to be the initials of the checker that signed the load rating summary sheet.

Code ZZZ if the signature is not readable.

Leave blank for no signature.

**Rating Information Appendix to memorandum  
Coding of Load Ratings dated 3/10/2014****ENTIRE STRUCTURE RATED - (new data item)**

Non-NBI Item  
Colorado Bridge Inventory Item 66ESR  
PONTIS userbrdg.entstrurat  
One (1) Character

Policy:

Code	Description
0	The rating does not represent the entire structure.
1	The rating does represent the entire structure. Also use for Visual Ratings.
N	The rating not checked by the Bridge Rating Group.

**RATING CALCULATIONS COMPLETE - (new data item)**

Non-NBI Item  
Colorado Inventory Item 66CC  
PONTIS userbrdg.calccomp  
One (1) Character

Policy:

Code	Description
0	The rating calculations are not complete per the Bridge Rating Manual.
1	The rating calculations are complete per the Bridge Rating Manual.
N	The rating calculations not checked by the Bridge Rating Group.
V	Visual Rating - Calculations not applicable.

**RATING INPUT FILES ARCHIVED - (new data item)**

Non-NBI Item  
Colorado Inventory Item 66IFA  
PONTIS userbrdg.ratingifa  
One (1) Character

Policy:

Code	Description
0	The rating input files have not been archived.
1	The rating input files have been archived.
N	The rating input files not checked by the Bridge Rating Group.
V	Visual Rating - Input files not applicable

A VIRTIS rating input file is considered archived if it is within the AASHTOWare VIRTIS BridgeWare Database.

**Rating Information Appendix to memorandum  
Coding of Load Ratings dated 3/10/2014****RATING OUTPUT FILES ARCHIVED - (new data item)**

Non-NBI Item  
Colorado Bridge Inventory Item 66OFA  
PONTIS userbrdg.ratingofa  
One (1) Character

Policy:

Code	Description
0	The rating output files have not been archived.
1	The rating output files have been archived.
N	The rating output files not checked by the Bridge Rating Group.
V	Visual Rating - Output files not applicable

**RATING PACKAGE COMPLETE**

Non-NBI Item  
Colorado Bridge Inventory Item 66RPC  
PONTIS userbrdg.rpackcomp  
One (1) Character

Policy:

Code	Description
0	Rating Package is not complete.
1	Rating Package is complete. Also use for Visual Ratings.
N	Rating Package not checked by the Bridge Rating Group.

**RATING ASSIGNED TO**

Non-NBI Item  
Colorado Bridge Inventory Item 66RPC  
PONTIS userbrdg.rating\_assigned  
Seven (7) Characters

Policy: Company or raters initials followed by the fiscal year when  
the rating was assigned.

**Rating Information Appendix to memorandum  
Coding of Load Ratings dated 3/10/2014****RATING VALUES**

<b>INVENTORY RATING METHOD</b>	<b>&amp;</b>	<b>OPERATING RATING METHOD</b>
NBI Item 65		NBI Item 63
PONTIS bridge.irttype		PONTIS bridge.ortype
One (1) Character		One (1) Character

**References:**

FHWA Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges dated December 1995 as amended by FHWA Memorandums Dated February 2, 2011; October 30, 2006; and March 22, 2004.

**Policy:**

Code	Description
<b>0</b>	<b>Field evaluation and documented engineering judgment</b>
1	Load Factor (LF)
2	Allowable Stress (AS)
3	Load and Resistance Factor (LRFR)
4	Load Testing
5	No rating analysis or evaluation performed
6	Load Factor (LF) rating reported by rating factor (RF) method using MS18 loading.
7	Allowable Stress (AS) rating reported by rating factor (RF) method using MS18 loading.
8	Load and Resistance Factor Rating (LRFR) rating reported by rating factor (RF) method using HL-93 loadings.

**The 0 code highlighted in bold text is not to be used until after April 1, 2011.**

Code 0 is to be used when the load rating is determined by field evaluation and documented engineering judgment, typically done when plans are not available or in cases of severe deterioration. Field evaluation and engineering judgment ratings must be documented. See the Bridge Rating Manual for documentation requirements.

Code 3 is to be used for culverts built before 2011 and buried under sufficient fill such that, according to AASHTO design, the live load is insignificant in the structure load capacity.

Code 5 is to be used when the bridge has not been load rated or load rating documentation does not exist in the bridge record. If the bridge has not been load rated then the bridge shall immediately be scheduled to have a load rating completed. The load rating shall be completed before submitting the inspection report for Off-System bridges. The deadline for On-System bridge load ratings will be determined by the Bridge Rating Engineer.

Code 8 is to be used for culverts designed LRFD, built in 2011 or later and buried under sufficient fill such that, according to AASHTO design, the live load is insignificant in the structure load capacity.

**Rating Information Appendix to memorandum  
Coding of Load Ratings dated 3/10/2014****INVENTORY RATING**

NBI Item 66  
PONTIS bridge.irload  
Floating Point Numeric

**OPERATING RATING**

NBI Item 64  
PONTIS bridge.orload  
Floating Point Numeric

Policy:

Code to the nearest tenth of a ton when the Rating Method is coded 0, 1, 2, 3, or 4. Operating must exceed Inventory.

Code 36.0 Inventory and 37.0 Operating when the Rating Method is coded is coded 5.

Code the rating factor to the nearest hundredth when the Rating Method is coded 6, 7, or 8. See commentary for AASHTOWare Pontis 4.1.1 required adjustments.

Code 999 for a structure under sufficient fill such that, according to AASHTO design, the live load is insignificant in the structure load capacity.

Do not code any load rating values or load rating factors that have:

Operating load rating values greater than 90 tons  
Operating rating factors greater than 3.00  
Inventory load rating values greater than 80 tons  
Inventory rating factors greater than 2.00

Code 000 if the bridge is not capable of carrying a 3 Ton live load at the operating level for the Type 3, Type 3-2, or Type 3S2 truck applicable for the route carried on the structure (i.e. Interstate Posting Trucks for Interstate Routes or Colorado Posting Trucks for all other Colorado Routes) and consistent with the direction of the AASHTO Manual for Bridge Evaluation, the bridge shall be closed. The associated 3 Ton Load Rating Factor thresholds are:

Vehicle	Interstate	Colorado
Type 3	3 / 24 = 0.12	3 / 27 = 0.11
Type 3-2	3 / 38 = 0.08	3 / 42.5 = 0.07
Type 3S2	3 / 39 = 0.08	3 / 42.5 = 0.07

The use or presence of a temporary bridge requires special consideration in coding. In such cases, since there is no permanent bridge, code 000 even though the temporary structure is rated for as much as full legal load.

A bridge shored up or repaired on a temporary basis is considered a temporary bridge and the inventory and operating rating shall be coded as if the temporary shoring were not in place. See Temporary Structure Designation (NBI Item 103) for definition of a temporary bridge.

**Rating Information Appendix to memorandum  
Coding of Load Ratings dated 3/10/2014****INVENTORY RATING**

NBI Item 66  
PONTIS bridge.irload  
Floating Point Numeric

**OPERATING RATING**

NBI Item 64  
PONTIS bridge.orload  
Floating Point Numeric

Commentary:

AASHTOWare Pontis 4.1.1 is used to create the NBI Update files that are submitted to FHWA on or before April 1<sup>st</sup> of each year. The following adjustments are needed when using AASHTOWare Pontis 4.1.1:

- Load ratings greater than or equal to 100 tons were discovered to be incorrect in the NBI Update files. Specifically, only the first three digits of the load rating are used to create the NBI Update file. This results in an incorrect value since the load rating values in the NBI Update file includes an assumed decimal place between the 2nd and 3rd digit.
- Rating Factor ratings must be multiplied by 10 in order for the NBI Update file to report the correct rating factor to FHWA.

AASHTOWare Pontis 4.1.1 cannot directly handle Rating Factor ratings. Therefore the rating factor must be converted to equivalent mtons or tons in order to calculate a reasonable Sufficiency Rating. This can be done by multiplying the rating factor by 32.6 mtons if Metric units are selected or by 36 tons if English units are selected. If the rating factor has been multiplied by 10 as indicated in the above comment then the conversion would 3.26 if Metric units are selected or by 3.6 if English units are selected.

FHWA Metric 13, Load Rating, sub-metric M13-3a requires the Operating Rating to be greater than the Inventory Rating.

**Rating Information Appendix to memorandum  
Coding of Load Ratings dated 3/10/2014****ALTERNATE INVENTORY RATING METHOD**

Non-NBI Item  
 Colorado Inventory Item 65ALT  
 PONTIS bridge.altirmeth  
 One (1) Character

**ALTERNATE OPERATING RATING METHOD**

Non-NBI Item  
 Colorado Inventory Item 63ALT  
 PONTIS bridge.altormeth  
 One (1) Character

Policy:

Code	Description
1	Load Factor (LF)
2	Allowable Stress (AS)
3	Load and Resistance Factor (LRFR)
4	Load Testing
6	Load Factor (LF) rating reported by rating factor (RF) method using MS18 loading.
7	Allowable Stress (AS) rating reported by rating factor (RF) method using MS18 loading.
8	Load and Resistance Factor Rating (LRFR) rating reported by rating factor (RF) method using HL-93 loadings.

The Alternate Method fields are used to document load ratings that have:

Operating load rating values that are greater than 90 tons  
 Operating load rating factors that are greater than 3.00  
 Inventory load rating values that are greater than 80 tons  
 Inventory load rating factors that are greater than 2.00

See commentary for AASHTOWare Pontis 4.1.1 required adjustments.

Commentary:

Using the Alternate Method fields is so that actual load rating values and actual load rating factors are still in the database.

AASHTOWare Pontis 4.1.1 cannot directly handle Rating Factor ratings. Therefore, place the actual rating type and rating factors into the alternate rating value field with Metric units selected so that the rating factor is not lost.

**Rating Information Appendix to memorandum  
Coding of Load Ratings dated 3/10/2014****ALTERNATE INVENTORY RATING**

Non-NBI Item  
 Colorado Inventory Item 66ALT  
 PONTIS bridge.altirload  
 Floating Point Numeric

**ALTERNATE OPERATING RATING**

Non-NBI Item  
 Colorado Inventory Item 64ALT  
 PONTIS bridge.altorload  
 Floating Point Numeric

Policy:

Code to the nearest tenth of a ton.

Commentary:

AASHTOWare Pontis 4.1.1 is used to create the NBI Update files that are submitted to FHWA on or before April 1<sup>st</sup> of each year. Load ratings greater than or equal to 100 tons were discovered to be incorrect in the NBI Update files. Specifically, only the first three digits of the load rating are used to create the NBI Update file. This results in an incorrect value since the load rating values in the NBI Update file includes an assumed decimal place between the 2<sup>nd</sup> and 3<sup>rd</sup> digit.

The use of the Alternate Load Ratings fields is so that the actual rating values are still available in the database.

**GIRDER OPERATING RATING**

Non-NBI Item  
 Colorado Inventory Item 66A  
 PONTIS userbrdg.girder\_control  
 Floating Point Numeric

Policy:

Code to the nearest tenth of a ton.

**CONTROLLING INVENTORY RATING INDICATOR**

Non-NBI Item  
 Colorado Inventory Item 66SI  
 PONTIS userbrdg.irate\_control  
 One (1) Character

Policy:

Code	Description
E	Exterior girder rating controlled the inventory rating
I	Interior girder rating controlled the inventory rating
G	Gusset Plate controls the inventory rating
N	Not applicable, railroad, pedestrian loads or tunnel
S	The slab rating controlled the inventory rating
U	The substructure controlled the inventory rating
X	The culvert or other non-slab member controlled the inventory rating.

**Rating Information Appendix to memorandum  
Coding of Load Ratings dated 3/10/2014****CONTROLLING OPERATING RATING INDICATOR**

Non-NBI Item  
Colorado Inventory Item 66S  
PONTIS userbrdg.rate\_control  
One (1) Character

Policy:

Code	Description
E	Exterior girder rating controlled the operating rating
I	Interior girder rating controlled the operating rating
G	Gusset Plate controls the operating rating
N	Not applicable, railroad, pedestrian loads or tunnel
S	The slab rating controlled the operating rating
U	The substructure controlled the operating rating
X	The culvert or other non-slab member controlled the operating rating.

**TYPE 3 TRUCK OPERATING RATING**

Non-NBI Item  
Colorado Inventory Item 129A  
PONTIS bridge.trucklor  
Floating Point Numeric

Policy:

Code to the nearest tenth of a ton.

**TYPE 3S2 TRUCK OPERATING RATING**

Non-NBI Item  
Colorado Inventory Item 129B  
PONTIS bridge.truck2or  
Floating Point Numeric

Policy:

Code to the nearest tenth of a ton.

**TYPE 3-2 TRUCK OPERATING RATING**

Non-NBI Item  
Colorado Inventory Item 129C  
PONTIS bridge.truck3or  
Floating Point Numeric

Policy:

Code to the nearest tenth of a ton.

**NOTIONAL RATING LOAD OPERATING RATING - (new data item)**

Non-NBI Item  
Colorado Inventory Item 129D  
PONTIS bridge.NRLor  
Floating Point Numeric

Policy:

Code to the nearest tenth of a ton.

**Rating Information Appendix to memorandum  
Coding of Load Ratings dated 3/10/2014****SINGLE UNIT BRIDGE POSTING LOAD 4 OPERATING RATING - (new data item)**

Non-NBI Item  
 Colorado Inventory Item 129E  
 PONTIS bridge.SU4or  
 Floating Point Numeric

Policy:

Code to the nearest tenth of a ton.

**SINGLE UNIT BRIDGE POSTING LOAD 5 OPERATING RATING - (new data item)**

Non-NBI Item  
 Colorado Inventory Item 129F  
 PONTIS bridge.SU5or  
 Floating Point Numeric

Policy:

Code to the nearest tenth of a ton.

**SINGLE UNIT BRIDGE POSTING LOAD 6 OPERATING RATING - (new data item)**

Non-NBI Item  
 Colorado Inventory Item 129G  
 PONTIS bridge.SU6or  
 Floating Point Numeric

Policy:

Code to the nearest tenth of a ton.

**SINGLE UNIT BRIDGE POSTING LOAD 7 OPERATING RATING - (new data item)**

Non-NBI Item  
 Colorado Inventory Item 129H  
 PONTIS bridge.SU7or  
 Floating Point Numeric

Policy:

Code to the nearest tenth of a ton.

**BRIDGE POSTING**

NBI Item 70,  
 PONTIS bridge.posting  
 One (1) Character

Reference:

FHWA Recording and Coding Guide for the Structure Inventory and  
 Appraisal of the Nation's Bridges dated December 1995.

Policy:

Code	Description	Colorado	Interstate
		Type 3 Truck	Type 3 Truck
5	≥ legal loads	≥ 27 Tons	≥ 24 Tons
4	0.1 - 9.9% below	24.3 to 26.9 Tons	21.6 to 23.9 Tons
3	10.0 - 19.9% below	21.6 to 24.2 Tons	19.2 to 21.5 Tons
2	20.0 - 29.9% below	18.9 to 21.5 Tons	16.8 to 19.1 Tons
1	30.0 - 39.9% below	16.2 to 18.8 Tons	14.4 to 16.7 Tons
0	> 39.9% below	0 to 16.1 Tons	0 to 14.3 Tons

**Rating Information Appendix to memorandum  
Coding of Load Ratings dated 3/10/2014****OVERLOAD COLOR CODE**

Colorado Inventory Item 139  
PONTIS userbrdg.wgtcolor  
One (1) Character

Policy:

Determination of the Overload Color Code is defined in the Bridge Rating Manual Subsection 1-16

Code	Description
0	White
1	Black
2	Orange
3	Yellow
N	Not Applicable

Overload Color Code only applies to CDOT Major Vehicular Bridges.

**OVERLOAD COLOR CODE LIVE LOAD**

Non-NBI Item  
Colorado Bridge Inventory Item 139OVLDDL  
PONTIS userbrdg.ovldliveload  
One (1) Character

Policy:

Code	Description
0	None - Determined by engineering judgment
1	Modified Tandem
2	Permit Vehicle
3	Permit Vehicle and Modified Tandem

**PERMIT TRUCK OPERATING RATING - (new data item)**

Non-NBI Item  
Colorado Bridge Inventory Item 64pmt  
PONTIS userbrdg.permit  
Floating Point Numeric

Policy:

Code to the nearest tenth of a ton.

**MODIFIED TANDEM OPERATING RATING - (new data item)**

Non-NBI Item  
Colorado Bridge Inventory Item 64mtan  
PONTIS userbrdg.mtan  
Floating Point Numeric

Policy:

Code to the nearest tenth of a ton.

**Rating Information Appendix to memorandum**  
**Coding of Load Ratings dated 3/10/2014****OVERLOAD CRITICAL STRUCTURE - (new data item)**

Non-NBI Item  
Colorado Bridge Inventory Item 139OVLD  
PONTIS userbrdg.ovldcrit  
One (1) Character

**Policy:**

Code	Description
0	The bridge is not overload critical.
1	The bridge is overload critical.
N	Not Applicable

The Overload Critical Structure Code only applies to CDOT Major Vehicular Bridges.

**VIRTIS ITEMS****RATING SOFTWARE USED - (new data item)**

Non-NBI Item  
Colorado Inventory Item 66RS  
PONTIS userbrdg.ratsoft  
One (1) Character

**Policy:**

Code	Description
0	Virtis file does not exist
1	Virtis file exists
2	Hand Load Rating
3	Other Rating Software
N	Rating Software not checked by the Bridge Rating Group.

**VIRTIS BID NUMBER - (new data item)**

Non-NBI Item  
Colorado Inventory Item 66VB  
PONTIS userbrdg.virtisbid  
Five (5) Characters

**Policy:**

Record the BID Number that is associated with the VIRTIS rating.

Leave blank if there isn't a VIRTIS rating.

**VIRTIS STRUCTURE NUMBER - (new data item)**

Non-NBI Item  
Colorado Inventory Item 66VSTR  
PONTIS userbrdg.virtisstr  
Twenty Five (25) Characters

**Policy:**

Code the structure number exactly as it appears in VIRTIS

**Rating Information Appendix to memorandum  
Coding of Load Ratings dated 3/10/2014****VIRTIS RATING RUNS - (new data item)**

Non-NBI Item  
Colorado Inventory Item 66VR  
PONTIS userbrdg.virtisr  
One (1) Character

Policy:

Code	Description
0	Virtis file does not run at the top level
1	Virtis file runs at the top level
N	Virtis file run not checked by the Bridge Rating Group.

Leave blank if there isn't a VIRTIS rating.

**VIRTIS RATING ANALYSIS - (new data item)**

Non-NBI Item  
Colorado Inventory Item 66VA  
PONTIS userbrdg.virtisra  
One (1) Character

Policy:

Code	Description
0	Virtis analysis produces values that do not match the signed Rating Summary Sheet
1	Virtis analysis produces values that match the signed Rating Summary Sheet
N	Virtis analysis not checked by the Bridge Rating Group.

Leave blank if there isn't a VIRTIS rating.

**VIRTIS RATING SYSTEM BASED - (new data item)**

Non-NBI Item  
Colorado Inventory Item 66VSB  
PONTIS userbrdg.virtisb  
One (1) Character

Policy:

Code	Description
0	Virtis rating is not system based
1	Virtis rating is system based
N	Virtis bridge definition not checked by the Bridge Rating Group.

Leave blank if there isn't a VIRTIS rating.

**Rating Information Appendix to memorandum  
Coding of Load Ratings dated 3/10/2014****VIRTIS RATING LINKED TO PONTIS - (new data item)**

Non-NBI Item  
Colorado Inventory Item 66VL  
PONTIS userbrdg.virtisl  
One (1) Character

Policy:

Code	Description
0	Virtis rating is not linked to PONTIS record
1	Virtis rating is linked to PONTIS record
N	Virtis rating linked to PONTIS not checked by the Bridge Rating Group.

Leave blank if there isn't a VIRTIS rating.

**VIRTIS RATING CHECKOUT PRIVILEGES - (new data item)**

Non-NBI Item  
Colorado Inventory Item 66VCO  
PONTIS userbrdg.virtisco  
One (1) Character

Policy:

Code	Description
0	Virtis rating checkout privileges have not been removed.
1	Virtis rating checkout privileges have been removed (i.e. Locked)
N	Virtis rating checkout privileges not checked by the Bridge Rating Group.

Leave blank if there isn't a VIRTIS rating.

**DELETED ITEMS****LOAD FACTOR RATING INDICATOR [DELETED]**

Colorado Inventory Item 66L  
PONTIS Not in PONTIS Database  
One (1) Character

This item will no longer be used and will be removed from the Colorado Coding Guide.



**COLORADO**  
**Department of Transportation**  
Division of Engineering Support

Staff Bridge  
4201 E Arkansas Ave, Room 107  
Denver, CO 80222-3406

**MEMORANDUM**

**TO:** BRIAR MANUAL USERS  
**FROM:** CDOT STAFF BRIDGE  
**DATE:** SEPTEMBER 23, 2014  
**SUBJECT:** FILE NAMING CONVENTION FOR INSPECTION SUBMITTALS

This document establishes the electronic file naming convention for structure records. It applies to all structures, i.e., bridges, tunnels, signs, signals, high mast lights, culverts, minors, miscellaneous, walls, etc., unless otherwise noted.

File naming format:

[Structure number] [File type] [Description] [Date]

- [Structure number]: NBI Item 8.
- [File type]: Described below.
- [Description]: Description as needed.
- [Date]: Date of the inspection, correspondence, plans, etc., in the following format YYYY MM DD.

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: \ / : \* ? " < > | # %

For the inch symbol " use two consecutive foot symbols ', or abbreviate or spell out inches or in and feet or ft.

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

File Name Example:

E-17-FX CORRESPONDENCE 2014 09 23.pdf, .doc, or .docx

E-17-FX EMAIL 2014 09 23.pdf

E-17-FX MEMO 2014 09 23.pdf

E-17-FX LTR 2014 09 23.pdf

E-17-FX COST 2014 09 23.xls or .xlsx



- DAMAGE (Damage and Other Photos)

File Name Example:

E-17-FX 20 percent loss of bearing area at Girder 3A Pier 2 2014 09 23.jpg

E-17-FX Impact damage Girder 3A 12'' from Pier 2 2014 09 23.jpg

A-15-A Downstream Channel Left 2014 09 23.jpg

A-15-A Downstream Channel Middle 2014 09 23.jpg

A-15-A Downstream Channel Right 2014 09 23.jpg

A-15-A Load Posting Sign 2014 09 23.jpg

- DGNFILES (Microstation Files) Sketch or Design Files

File Name Example:

E-17-FX DGNFILES Sketch 2014 09 23.dgn

E-17-FX DGNFILES Design 2014 09 23.dgn

- ESSENTIAL REPAIR LETTERS (Essential Repair Findings (ERF) and Letters (ERL), and Inaccessible Findings (IAF) and Letters (IAL))

File Name Example:

E-17-FX ERF Loss of Bearing Area at Girder 3A Pier 2 2014 09 23.pdf

E-17-FX ERL Loss of Bearing Area at Girder 3A Pier 2 - Yellow Priority 2014 09 23.pdf

001A000040BL IAF Grated Inlet and Outlet prevent access 2014 09 23.pdf

001A000040BL IAF Silted in preventing access 2014 09 23.pdf

001A000040BL IAF High Water 2014 09 23.pdf

001A000040BL IAL Grated Inlet and Outlet prevent access - Green Priority 2014 09 23.pdf

- FCMSHEET (Fracture Critical Inspection Sheet)

File Name Example:

E-17-FX FCMSHEET 2014 09 23.pdf

- HISTORICAL STREAMBED PROFILES (Past Streambed Profiles)

File Name Example:

E-17-FX HISTORICAL STREAMBED PROFILE 2014 09 23.pdf, .xls, or .xlsx



- IGA (Inter Governmental Agreements)

File Name Example:

E-17-FX IGA 2014 09 23.pdf

- MISC (Misc. Information)

File Name Example:

E-17-FX MISC 2014 09 23.pdf, .doc, or .docx

- MOVIES (Video Files)

File Name Example:

E-17-FX MOVIES 2013 Flood CR21 and SH114 MP8.253 2014 09 23.avi, .mpg, or .mov

- RATINGS (Rating package)

File Name Example:

E-17-FX RATING 2014 09 23.pdf

- REPAIRSnPROJECTS (Any Information Regarding Repairs)

File Name Example:

E-17-FX REPAIR Corbel Repair at Girder 3A Pier 2 Typical 2014 09 23.pdf

E-17-FX PROJECT Corbel Repair at Girder 3A Pier 2 Typical 2014 09 23.pdf

- STREAMBED PROFILE, formerly Scour Charts

File Name Example:

E-17-FX STREAMBED PROFILE 2014 09 23.xls, .xlsx, or .pdf

- SIA (PDF File of Inspection Report)

File Name Example:

E-17-FX SIA 2014 09 23.pdf

- SKETCHES (Inspection Sketch)

File Name Example:

E-17-FX SKETCH 2014 09 23.pdf



- TALLY SHEETS

File Name Example:

E-17-FX TALLY SHEET Girders 2014 09 23.xls or .xlsx

- TIMBER GIRDER SHEETS

File Name Example:

E-17-FX TIMBER 2014 09 23.pdf

- VCLR (Vertical Clearance Reports)

File Name Example:

E-17-FX VCLR 2014 09 23.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.

		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			
...													
-z													



- File Name Example:

040A032380BL-c2 CMP Widening 2014 09 23.jpg

## Concurrence

Regina Eslary-Buena, EPS Tech II      Date \_\_\_\_\_  
Electronic Files Manager

# MEMORANDUM

## DEPARTMENT OF TRANSPORTATION

Staff Bridge Branch  
4201 E. Arkansas Avenue, Room 107  
Denver, Colorado 80222  
(303) 757-9309 FAX (303) 757-9197



**DATE:** Friday, December 27, 2013  
**TO:** Developers of CDOT Staff Bridge Policy and Standards  
**FROM:** Staff Bridge

BRIAR Manual  
Section 2 - Records

**SUBJECT:** Filing of Final CDOT Staff Bridge Policy and Standards Documents

The purpose of this memorandum is to document the file naming convention and file folder structure for the CDOT Staff Bridge Policy & Standards network share. The documents within the sub folder Branch Administrative are not addressed by this memorandum. The current document file names will be updated when there is an update to any portion of the parent document.

### NAMING CONVENTION

The file naming convention for all electronic files created for CDOT Staff Bridge Policies and Standards shall be:

Document Section Description Year Month

Where:

**Document** is alpha numeric characters to identify the manual or other standard document

DM = Bridge Detail Manual  
EM = Bridge Design Manual  
FI = Fabrication Inspection Manual  
RM = Bridge Rating Manual  
BR = BRIAR Manual  
TM = Technical Memorandum  
Sheet = Worksheet

**Section** is alpha numeric characters to identify the section, subsection, working drawing or chapter number that applies. Where it does not apply it is not used

**Description** is the document, section title, or description that applies

**Year** is four numeric characters for the calendar year the document was issued.

**Month** is two numeric characters for the month the document was issued.

**SIGNED** is added to the end of file name if it is a scan of a document that contains signatures.

Examples:

DM 01 General Instructions 2012 06  
EM 03\_3 Collision Load CT 2009 05  
FI Concrete Products 2012 05  
RM 08 Reinforced Concrete Structures 2011 04  
BR 03 Bridge Inspection QC-QA 2012 05  
TM Detail Manual Revisions 2011 07 SIGNED  
Sheet\_B-206-M2

## FILE FOLDER STRUCTURE

The electronic document files will be placed in [\\public\Bridge Policy & Standards](#)  
Full Access to Bridge Policy & Standards is restricted to the: Staff Bridge Engineer, Bridge Asset Management Engineer, and the leading administrative assistant in the Staff Bridge front office.

The first subfolder shall be an abbreviated version of the document name.

Detail Manual = Bridge Detail Manual  
Design Manual = Bridge Design Manual  
Fabrication Inspection = Fabrication Inspection Manual  
Rating Manual = Bridge Rating Manual  
BRIAR Manual = Bridge Ratings, Inspections and Records Manual  
Technical Memorandums = Technical Memorandums  
Worksheets = Bridge Worksheets (i.e. drawings of standardized bridge details)

The second level subfolders for all documents shall be:

For Distribution  
Previous Versions  
Signed  
Source

**For Distribution** shall contain the PDF versions of the current documents posted on the web.

**Previous Versions** shall contain any PDF or Source or Signed document superseded by a more current version.

**Signed** shall contain scanned versions of any document that is signed.

**Source** shall contain any source documents used to create the current documents. Examples include MS Word Documents, Word Perfect Documents, AutoCAD Drawings, or MicroStation Drawings.

The third level of subfolders should be avoided if possible. However, the third level is used to file superseded worksheets with the folder name based on the year and month they were superseded. In addition, the third level can be used to archive specific subdocuments related to a specific source with the folder name consistent with the document that they support.

## HARD COPIES

The hard copies of signed Bridge Policies and Standards documents will be placed within the binder of the parent document that is kept by the Bridge Asset Management Engineer.

The hard copies of all current Bridge Policies and Standards will be kept by all unit leaders

CONCURRENCE:

Signature on File

---

Joshua R. Laipply, P.E.  
Staff Bridge Engineer

Signature on File

---

Mahmood Hasan, P.E.  
Bridge Standards Engineer

Signature on File

---

Mark A. Nord, P.E.  
Bridge Asset Management Engineer

# MEMORANDUM

## DEPARTMENT OF TRANSPORTATION

Design / Construction Branch  
4201 E. Arkansas Avenue, Room 330  
Denver, Colorado 80222  
(303) 757-9309 FAX (303) 757-9197



**DATE:** Monday, September 14, 2009  
**TO:** Users of Colorado DOT Structure Data

Bridge Asset Management  
Records  
Data  
Inventory Data

**FROM:** Mark A. Nord, P.E. Signature on file  
Bridge Asset Management Engineer

**SUBJECT:** Bridge Asset Management Technical Memorandum  
Structure Number Assignment for Signs

This memorandum is to document how structure numbers will be assigned to signs.

### History

Signs have been assigned structure numbers as Major Structures in accordance with Colorado NBI Coding Guide Appendix E. Specifically, the first five characters describe the grid location of the structure as shown on the Official Colorado State Map and the remaining characters are unique to the structure.

Example:

Full Structure Number	E-06-AB	
Grid Location	E-06-	
Unique Identification	AB	
Character Number	123456789012345	15 Characters Maximum

### Policy

All signs will be assigned structure numbers based on the following:

The first five characters will be SIGN-. The next five characters will describe the grid location of the structure as shown on the Colorado State Map. The remaining characters are unique to the sign structure.

Example:

Full Structure Number	SIGN-E-06-AB	
Sign Designation	SIGN-	
Grid Location	E-06-	
Unique Identification	AB	
Character Number	123456789012345	15 Characters Maximum

All existing signs will have their structure number revised to match the policy.

### Commentary

This change will avoid the occasional confusion that has occurred for users of the Field Log of Structures because the bridge structure numbers are similar to the existing sign structure numbers.

### Concurrence

Signature on File

Mark A. Leonard, P.E.  
Staff Bridge Engineer

# MEMORANDUM

**DEPARTMENT OF TRANSPORTATION**

Staff Bridge Branch  
4201 E. Arkansas Avenue, Room 107  
Denver, Colorado 80222  
(303) 757-9309 FAX (303) 757-9197



**DATE:** Monday March 7<sup>th</sup>, 2011

**TO:** Bridge Asset Management Personnel  
and  
Users of AASHTOWare Pontis data on Oracle

Bridge Asset Management Manual  
Records  
Data  
Databases

**FROM:** Mark A. Nord, P.E.  
Bridge Asset Management Engineer

Signature on file

**SUBJECT:** Update Schedule for AASHTOWare Pontis on Oracle Server

## Policy

The minimum frequency of update to AASHTOWare Pontis database on the Oracle server from local stand-alone Pontis databases will be annual for all structure groups managed by Staff Bridge (Major Bridges, Minor Structures/Culverts, Overhead Signs, Signals, and High Mast Lights).

The annual update times are based on when the best data is available which occurs at different times of the year for each structure group as defined in the following table.

Major Bridges	After the Annual NBI Update to FHWA on or before April 1 <sup>st</sup>	4 <sup>th</sup> quarter of the fiscal year
Minor Structures/Culverts	After the annual inspection task order is completed.	1 <sup>st</sup> or 2 <sup>nd</sup> quarter of the fiscal year
Overhead Signs	After the annual inspection task order is completed.	1 <sup>st</sup> or 2 <sup>nd</sup> quarter of the fiscal year
Mast Arm Signals	After the annual inspection task order is completed.	1 <sup>st</sup> or 2 <sup>nd</sup> quarter of the fiscal year
High Mast Lights	After the annual inspection task order is completed.	1 <sup>st</sup> or 2 <sup>nd</sup> quarter of the fiscal year

## History

AASHTOWare Pontis on the Oracle server is the repository of Pontis structure inventory and inspection data where others within CDOT can access the data. The repository also provides a backup of the Pontis structure inventory and inspection data.

An annual update schedule will serve the backup needs of Staff Bridge and the occasional external users data needs since there are no identified regular users of the Pontis Oracle database outside of Staff Bridge.

### Long Term Goals

The long term goal of Staff Bridge will be to increase the number of users of Pontis Oracle outside of Staff Bridge in order to reduce the dependence on Staff Bridge for Ad Hoc reports and information requests. However, until AASHTOWare Pontis data security concerns can be addressed actively seeking regular external users will be postponed.

The long term goal of Major Bridge updates to Pontis Oracle will be Quarterly to match the Quarterly grouping of On-System and Off-System major vehicular bridge inspections. However, current resources preclude a frequency less than annual.

Concurrence

Signature on file

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Mark A. Leonard, P.E.  
Staff Bridge Engineer

# MEMORANDUM

**DEPARTMENT OF TRANSPORTATION**

Staff Bridge Branch  
4201 E. Arkansas Avenue, Room 107  
Denver, Colorado 80222  
(303) 757-9309 FAX (303) 757-9197



**DATE:** Thursday December 22, 2011  
**TO:** Inspectors of Colorado In-Service Major Vehicular Bridges  
**FROM:** CDOT Staff Bridge

CDOT BRIAR Manual  
Section 3 – Inspections  
Subsection - Major Structure

**SUBJECT:** 48 Month Inspection Frequency Management

This memorandum is to address how CDOT will manage the major vehicular bridges that currently have 48 month inspection frequencies or are eligible for a 48 month inspection frequency.

## MAJOR VEHICULAR BRIDGES THAT CURRENTLY HAVE 48 MONTH INSPECTION FREQUENCIES

The current list of bridges that have 48 month inspection frequencies will be reviewed annually to identify any bridges that no longer qualify for a 48 month inspection frequency or will no longer qualify for a 48 month inspection frequency at or before their next scheduled inspection using the criteria in Attachment A dated January 1997.

The annual review will be scheduled to occur in the first quarter after the annual NBI Update (April through June).

All bridges that no longer qualify for a 48 month inspection or will no longer qualify for a 48 month inspection frequency at or before their next scheduled inspection will be rescheduled for a 24 month inspection frequency. Any of the rescheduled bridges that will appear to have late inspections at the next scheduled NBI Update will be inspected before the next scheduled NBI Update.

Parallel bridges will both have the lowest inspection frequency for which they are eligible.

Prior to the next scheduled inspection all bridges that currently have 48 month inspection frequencies will have the outside of their hard copy structure folders marked with:

### 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 59, Superstructure Condition

Item 60, Substructure Condition

Item 61, Channel and Channel Protection

Item 62, Culverts

Item 67, Structural Evaluation

Item 68, Deck Geometry

Item 69, Under Clearances

Item 71, Waterway Adequacy

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.

**MAJOR VEHICULAR BRIDGES THAT ARE ELIGIBLE FOR A 48 MONTH INSPECTION FREQUENCY**

The bridges that have 24 month inspection frequencies will be reviewed annually to determine if any are eligible for a 48 month inspection frequency using the criteria in Attachment A dated January 1997.

The annual review will be scheduled to occur in the first quarter after the annual NBI Update (April through June).

Bridges that are eligible for a 48 month inspection frequency will be listed and forwarded to the FHWA Colorado Division Bridge Engineer for FHWA concurrence.

Any On-System bridges that receive concurrence from FHWA will immediately be placed on a 48 month inspection frequency.

Any Off-System bridge that receives concurrence from FHWA will be placed on a 48 month inspection frequency if the bridge owner does not respond by the deadline within the notification letter sent to them listing their eligible bridges. The notice to the owner shall be by Certified Mail.

**Concurrence:**

---

Lynn Croswell, PE  
Bridge Inspection Engineer

---

Mark A. Nord, PE  
Bridge Asset Management Engineer

---

Mark A. Leonard, PE  
State Bridge Engineer

---

Karen Mondragon  
Statewide Bridge Inspection Coordinator

Enclosure: Attachment A, CDOT Criteria for Four Year Bridge Inspection Cycle

ATTACHMENT A

**COLORADO DEPARTMENT OF TRANSPORTATION  
CRITERIA FOR FOUR YEAR BRIDGE INSPECTION CYCLE  
January 1997**

In an effort to make the bridge inspection program more efficient, the following extension to the two year inspection cycle is established. This program will apply to State, City , and County structures. Structures that do not meet this criteria will remain on the two year cycle. To assure quality control, the Inspection Team Leader, with the Inspection Engineers concurrence, has the authority to establish a reduced cycle for any bridge based on the structural condition.

1. The structures eligible for this program are listed below as coded in the NBIS code manual, Item 43 & 44, Structure Type:

<u>1st</u> <u>DIGIT</u>	<u>2nd &amp; 3rd</u> <u>DIGIT</u>	<u>DESCRIPTION</u>
1, 2	01	Slabs
1, 2, 3, 4, 5, 6	02	Stringer/Multi beam/Girder
1, 2, 5, 6	04	Tee beams
1, 2, 3, 4, 5, 6	05, 06	Box beams/Box girder
1, 2	19	Culverts

2. The condition of the following items must be rated 6 or greater:

Item 58 Deck	Item 67 Structural Evaluation
Item 59 Superstructure	Item 68 Deck Geometry
Item 60 Substructure	Item 69 Under Clearances V&H
Item 61 Channel & Channel Protection	Item 71 Waterway Adequacy
Item 62 Culverts	Item 72 Approach Roadway Algn

3. The structure must be capable of carrying Colorado legal loads at the inventory stress level. Item 66, Inventory Rating = HS18 and coded 232 or greater for bridges; or HS15 and coded 227 or greater for concrete culverts under fill.

4. Eligible structures must not require any legal load restrictions. Item 41, Structure Open, Posted, or Closed to Traffic is coded 'A'.

5. The longest span may not exceed 100'; Item 48, Length of Maximum Span.

6. Bridges will not be considered for the four year cycle immediately following construction, reconstruction, or rehabilitation. A routine NBIS inspection must be performed before a bridge qualifies for the four year program. This inspection must be performed at least one year after the construction activity.

7. The structures must possess load path redundancy: i.e. no truss, no two girder systems, and no single cell box girder type structures.

8. The structure must not be scour critical. Item 113, Scour Critical Bridges must be coded 5 or greater.

9. The Average Daily Traffic (ADT), Item 29, must not be over 30,000 and the Average Daily Truck Traffic (ADTT), Item 109, must be less than 3,000. This restriction does not apply to culverts with more than 2 feet of cover.

10. Structures of uncommon or unusual design, or designs where there is little performance history, e.g. segmental bridges, are not included.

11. The age of the structure may not exceed 50 years unless it has been reconstructed within the past 30 years.

The frequency and degree of overloads anticipated on the qualifying structures shall be a consideration at the time of NBIS inspections. Discovery of unusual problems shall be cause for that bridge to revert back to the two year inspection. Bridges with repair histories that indicate a strong probability of future problems will not be included as candidates for the four year NBIS inspection interval, e.g. bridges that get hit often by high loads.

The eligibility of each structure will be reviewed following any revision of applicable inventory and inspection data. History in Colorado indicates very slow deterioration rates because of the dry climate, however, any formerly eligible structures which no longer meet the inspection interval extension criteria will revert back to a maximum two year cycle.

The four year inspection interval is optional, representing a maximum and in no way precludes inspections at lesser intervals. Structures that are eligible for the four year program may, at the discretion of the owner, be inspected at more frequent intervals.

# MEMORANDUM

DEPARTMENT OF TRANSPORTATION  
Staff Bridge Branch  
4201 E. Arkansas Avenue, Room 107  
Denver, Colorado 80222  
(303) 757-9309 FAX (303) 757-9197



Date: June 11, 2013  
To: CDOT BRIAR Manual Users  
From: Lynn E. Croswell, CDOT Bridge Inspection Engineer  
Subject: Bridge Closing Criteria and Procedures

CDOT BRIAR Manual  
Section 3 - Inspections

This memorandum is to document bridge closing criteria and procedures and applies to both On-System and Off-System bridges.

## Bridge Closings

The following criteria and procedures will be used when it is determined that a bridge should be closed:

- Criteria:
  - As per rating calculations, a bridge is not capable of carrying a 3 Ton live load at the operating level for the Type 3, Type 3-2, or Type 3S2 truck applicable for the route carried on the structure (i.e. Interstate Posting Trucks for Interstate Routes or Colorado Posting Trucks for all other Colorado Routes)
- Procedures (On-System):
  - When the Bridge Inspection Team Leader in collaboration with the bridge inspector determines that a bridge should be closed, the Bridge Inspection Team Leader will bring it to the attention of CDOT Bridge Inspection Engineer. A review committee consisting of the Bridge Inspection Team Leader, the CDOT Bridge Inspection Engineer, the Staff Bridge PE II responsible for the Region, the Structures Asset Management Engineer and the Project Support, Rating, Standards, & Overloads Engineer will then notify the Staff Bridge Branch Manager of the need to close the bridge. If in the opinion of the Staff Bridge Branch Manager the bridge needs to be closed the CDOT Bridge Inspection Engineer will write an Essential Repair Notification to the Region recommending that the bridge be closed. At 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, and Public Relations Office.

Any additional notifications, i.e. media, Risk Management, etc., will be made by the Regions as per the January 14, 2013 Notification Process For Serious Accidents document.

- Procedures (Off-System):
  - When the Bridge Inspection Team Leader in collaboration with the bridge inspector determines that a bridge should be closed, the Bridge Inspection Team Leader will bring it to the attention of the Consultant's Program Manager. The Consultant's Program Manager will then notify the owner of the bridge and the CDOT Bridge Inspection Engineer. The Consultant's Program Manager will then write an Essential Repair Letter to the owner recommending that the bridge be closed.

These criteria and procedures only apply to issues found during routine or special bridge inspections. Emergency bridge closure procedures for other issues, i.e. damage due to bridge hits, are handled by the regions and/or the bridge owners.

Signature on File

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Lynn E. Croswell, P.E.  
CDOT Bridge Inspection Engineer

Signature on File

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Karen S. Mondragon  
Statewide Bridge Inspection Coordinator

Signature on File

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Joshua R. Laipply, P.E.  
Staff Bridge Engineer

Signature on File

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Mark A. Nord, P.E.  
Structures Asset Management Engineer

# MEMORANDUM

DEPARTMENT OF TRANSPORTATION  
Staff Bridge Branch  
4201 E. Arkansas Avenue, Room 107  
Denver, Colorado 80222  
(303) 757-9309 FAX (303) 757-9197



Date: May 24, 2012

CDOT BRIAR Manual  
Section 3 – Inspection

To: CDOT BRIAR Manual Users

From: Lynn E. Croswell, Bridge Inspection Engineer

Subject: Bridge Inspection Quality Control & Quality Assurance

This document establishes the quality control and assurance procedures for bridge inspections. The Code of Federal Regulations (CFR650.313(g)) states that systematic quality control and quality assurance procedures shall be used to maintain a high degree of accuracy and consistency in the inspections program. The procedures shall include periodic field review of inspections teams, periodic bridge refresher training, and independent reviews of inspection reports and computations. Unless otherwise noted, all of the following procedures apply to both On-System and Off-System bridge inspections.

## **Quality Control by Team Leaders**

Inspection teams shall be rotated so that a given bridge is inspected by different team leaders. This provides review and checking of one team leader by another. For On-System bridges any two consecutive regular inspections of a given bridge will be made by different team leaders. For Off-System bridges the regional assignments to contract inspectors shall be rotated every four years.

## **Field Reviews by Bridge Inspection Engineer**

The CDOT Bridge Inspection Engineer shall audit the work of each CDOT inspection team and each inspection contractor annually. The audits shall include field inspection of bridges within six months of a regular inspection to check the coding, comments, and overall inspection report quality. At least one bridge shall be reviewed annually for each CDOT inspection team and inspection contractor. The bridges will be selected randomly and at least one bridge containing a fracture critical member will be included. The Bridge Inspection Engineer will review the results of the audit with the team or contractor and 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 Pontis Table & Field [userinsp.one time note]. The following format will be used: Field Review - <month and year of the review>. Quarterly, a list showing which structures were reviewed will be provided to the FHWA Colorado Division Bridge Engineer. In addition, any reviews that the FHWA representative would like to see will be provided upon request.

The audit will generally be conducted by the Bridge Inspection Engineer with a senior bridge inspector. The Bridge Inspection Engineer may on occasion delegate the audit to two senior bridge inspectors, but will participate in the review of the audit with the inspection team or contractor.

The Bridge Inspection Engineer will participate in annual field reviews with the FHWA Division Bridge Engineer as part of the annual NBI review process. The Bridge Inspection Engineer will review the audit results as applicable with any inspection teams.

## **Inspection Report Quality Control by Team Leader**

The bridge inspection team leader shall check all bridge inspection reports before making the final submittal. Any apparent discrepancies in entries from other team members shall be reviewed with that team member and corrected as needed. All items in the report and all supporting documentation shall be reviewed. In signing the report the team leader is certifying that they have checked the full report and all entries are accurate.

## **Inspection Report Quality Assurance**

The Bridge Inspection Engineer shall assign a senior bridge inspector to perform selective independent reviews of inspection reports.

Inspection reports shall be reviewed and checked if any of the following occurs.

- A change of 2 or more for the following Items:
  - Item 58, Deck
  - Item 59, Superstructure
  - Item 60, Substructure
  - Item 62, Culverts
- Any change to the following Items:
  - Item 41, Structure Open, Posted, or Closed to Traffic
  - Item 66, Inventory Rating
  - Item 66A, Girder Operating Rating
  - Item 66S, Controlling Operating Rating
  - Item 70, Bridge Posting
  - Item 130, Date of Structure Rating
  - Item 113, Scour Critical Bridges
- Sufficiency Rating changes from less than 50 to greater than 50, or from greater than 50 to less than 50.
- Any change of 10 or more to the Sufficiency Rating not caused by the following Items:
  - Item 58, Deck
  - Item 59, Superstructure
  - Item 60, Substructure
  - Item 62, Culverts
- Changes in the Structurally Deficient or Functionally Obsolete classifications.
- Any change to Item 68, Deck Geometry, except when new ADT's are done because this can trigger changes to Item 68. In this case only check if Item 68 is 4 or less, or there is a change of 2 or more in Item 68, or 68 code goes up; e.g., from 4 to 6.
- A change in Item 67, Structural Condition, when it is the only change.
- Item 72, Approach Roadway Alignment, changes from high to low.

The checking process shall include the following items.

- Check the Structure Inventory and Appraisal (SI&A) sheet for correct NBI coding.
- Check the Element Inspection Report for correct Pontis element coding. Make sure all the required elements are correctly listed, verify quantities and verify coding into condition states.
- Make sure each folder contains an Inspection Report (which includes a SI&A sheet, an Element Inspection Report, a Maintenance Activity Summary), a load rating summary sheet, structure sketch, channel section, superstructure (under side of the bridge), elevation and roadway photos, and photos showing upstream and downstream views.

- Check the entire structure folder for any supporting documentation provided as part of the inspection. Review the supporting documentation for completeness, clarity, accuracy, and appropriate content.
- Check any changes impacting Sufficiency Rating; i.e., Item 58, Deck, going from a 6 to a 5 or 5 to 4. The following are other Items that impact Sufficiency Rating:
  - Item 58, Deck
  - Item 59, Superstructure
  - Item 60, Substructure
  - Item 62, Culverts
  - Item 67, Structural Condition
  - Item 68, Deck Geometry
  - Item 71, Waterway Adequacy
  - Item 72, Approach Roadway Alignment
- Check any changes to Item 113, Scour Critical Bridges, to ensure that protocol has been followed (as per new guidelines initially established November 2011) and necessary documentation has been provided.
- If the load rating codes are the only changes that would cause you to check the structure folder, then just check to see that the related items were coded correctly on the SI&A sheets.

The results of the Quality Assurance review will be documented upon completion of the review. The review documentation, including the team leader or consultants response, will be archived on \\Public\Briar. The date of the Quality Assurance review will be documented in the Pontis Table & Field [userinsp.one time note]. The following format will be used: QA Review - <month and year of the review and by whom>. Quarterly, a list showing which structure reports were reviewed will be provided to the FHWA Colorado Division Bridge Engineer. In addition, any reviews that the FHWA representative would like to see will be provided upon request.

### Bridge Inspector Training

As required by the CFR, all team leaders shall have successfully completed an FHWA approved comprehensive bridge inspection training course. At least every five years Staff Bridge shall sponsor an FHWA comprehensive bridge inspection training course or FHWA approved bridge inspector refresher course. These classes, when offered, will be required training for any bridge inspector doing full time bridge inspection work for the Department. Bridge Inspector Training will be tracked by the Bridge Inspection Engineer.

Every year the Staff Bridge Branch will sponsor at least one training event relevant to bridge inspectors and with the intention of improving the quality of bridge inspections. At least every five years the Staff Bridge Branch shall sponsor a Pontis related training class and make it available to all bridge inspectors.

Signature on File

Lynn E. Croswell, P.E.  
Bridge Inspection Engineer

Signature on File

Karen S. Mondragon  
Statewide Bridge Inspection Coordinator

Signature on File

Mark A. Leonard, P.E.  
Staff Bridge Engineer

Signature on File

Mark A. Nord, P.E.  
Bridge Asset Management Engineer

## Nord, Mark

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**From:** Anderson, Jeffrey  
**Sent:** Monday, July 20, 2009 4:30 PM  
**To:** Leonard, Mark  
**Cc:** Nord, Mark; Mondragon, Karen; White, Steven  
**Subject:** Bridge Inspection Sequences

# MEMORANDUM

DEPARTMENT OF TRANSPORTATION  
Staff Bridge Branch  
4201 E. Arkansas Avenue, Room 107  
Denver, Colorado 80222  
(303) 757-9309 FAX (303) 757-9197

**DATE:** July 20, 2009  
**To:** Mark Leonard – Staff Bridge Branch Director

*Jeff Anderson*

**FROM:** Jeff Anderson – Staff Bridge  
**SUBJECT:** Bridge Inspection Sequences

Last year I mapped out the extra inspection work to be done by the off-system consultants. I made an error at that time by placing the underwater inspections in fiscal year 2010. The extra work that should have been designated for fiscal year 2010 was the south area ADT's. The change to the extra work results in the following:

Last year's sequence documentation:

FY 08: North Area ADT's (all counties including orphan ADT's)  
FY 09: Pin Inspections and Central Area ADT's (all counties including orphan ADT's)  
FY 10: Underwater Inspections – performed by underwater inspections consultant  
FY 11: South Area ADT's (all counties including orphans)

Changed to:

FY 08: North Area ADT's (all counties including orphan ADT's)  
FY 09: Pin Inspections and Central Area ADT's (all counties including orphan ADT's)  
FY 10: South Area ADT's (all counties including orphans)  
FY 11: Underwater Inspections – performed by underwater inspections consultant  
FY 12: North Area ADT's (all counties including orphan ADT's)  
FY 13: Pin Inspections and Central Area ADT's (all counties including orphan ADT's)  
FY 14: South Area ADT's (all counties including orphans)  
FY 15: Underwater Inspections – performed by underwater inspections consultant  
FY 16: North Area ADT's (all counties including orphan ADT's)

FY 17: Pin Inspections and Central Area ADT's (all counties including orphan ADT's)  
FY 18: South Area ADT's (all counties including orphans)  
FY 19: Underwater Inspections – performed by underwater inspections consultant

The on-system inspections will follow the same sequence as the off-system work as follows:

FY 10: Pin Inspections: these were supposed to be done in fiscal year 2009 but will be picked up by consultant forces early in FY 2010.  
FY 10: South Area ADT's for orphan structures – consultant forces  
FY 11: Underwater Inspections – performed by underwater inspections consultant  
FY 12: North Area ADT's for orphan structures – consultant forces  
FY 13: Pin Inspections and Central Area ADT's for orphan structures – consultant forces  
FY 14: South Area ADT's for orphan structures – consultant forces  
FY 15: Underwater Inspections – performed by underwater inspections consultant  
FY 16: North Area ADT's for orphan structures – consultant forces  
FY 17: Pin Inspections and Central Area ADT's for orphan structures – consultant forces  
FY 18: South Area ADT's for orphan structures – consultant forces  
FY 19: Underwater Inspections – performed by underwater inspections consultant

Please let me know if you have any questions or if I'm missing anything. Thank you!

Cc: Mark Nord  
Karen Mondragon  
Steve White

# MEMORANDUM

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**DEPARTMENT OF TRANSPORTATION**

Design / Construction Branch  
4201 E. Arkansas Avenue, Room 330  
Denver, Colorado 80222  
(303) 757-9309 FAX (303) 757-9197



**DATE:** March 23, 2011  
**TO:** Bridge Inspectors

CDOT BRIAR Manual  
Section 3 -- Inspection  
Inspection Procedures

**FROM:** Mark A. Leonard

**SUBJECT:** Bridge Rail Anchorages

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 all bridge rails shall be inspected and reported as per standard inspection procedures, but additional consideration should 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 notice should be issued or if additional inspection or testing is warranted.

## Discussion

On January 27, 2011 the Colorado FHWA Division Office submitted an information notice to CDOT. This submittal from FHWA was in response to NTSB's request for FHWA to inform DOT's of the risks with steel reinforcement corrosion and concrete voids in bridge rail attachment points and the nondestructive evaluation methods used by the Maryland DOT to identify internal corrosion problems.

The NTSB's information request was in response to a fatality in Maryland where a segmented concrete bridge rail failed to contain an 80,000 pound truck which impacted the barrier at 40 degree angle and a speed exceeding 40 mph. These conditions exceed the minimum requirements (TL-4) for bridge rails. The current minimum requirements for bridge rails on highways with speeds greater than 45 mph are containment of a 22,000 pound truck, at 15 degrees, and 55 mph.

Corrosion at bridge rail anchorages is a concern and is evaluated and reported on by our bridge inspectors with each inspection. As with the Maryland bridge rail, we have experienced bridge rail corrosion due to moisture and anti-icing chemicals. These conditions are reported and essential repair notices are issued where applicable.

The details of CDOT's current standard bridge rails are such that they are not especially vulnerable to localized deterioration in the anchorage zones. This is not true for bridge rails that lack longitudinal continuity. What is of greatest interest from the NTSB report is the demonstration of poor performance from a concrete bridge rail where one inch wide control joints separated the barrier into segments across the bridge.

Current bridge rail standards require longitudinal continuity from the roadway guardrails to the bridge rails and across the bridge. The longitudinal continuity is provided by current standard guardrail to bridge rail transitions, by the continuous tubes on steel bridge rails, and by the continuous reinforcing steel on concrete bridge rails. Current standards for concrete bridge rails employ dowels to help provide continuity across expansion joints.

CDOT continues to upgrade bridge rails to current standards as funding allows, however many bridges have older bridge rails that lack longitudinal continuity. It is especially common in older steel bridge rails to have details where the longitudinal elements are interrupted, or placed in segments, across the bridge.

#### References

- January 27, 2011 letter from John Cater, FHWA Division Administrator, to Pam Hutton, CDOT Chief Engineer. Subject: Information – NTSB Recommendation on Corrosion and Voids in Concrete Railing.
- January 10, 2011 memorandum from King G. Gee, FHWA Associate Administrator for Infrastructure, to FHWA Division Administrators. Subject: Information – NTSB Recommendation on Corrosion and Voids in Concrete Bridge Railings.
- November 23, 2010 letter from Deborah Hersman, NTSB Chairperson, to Victor Mendez, FHWA Administrator. Subject: NTSB's recommendations to FHWA regarding the 8/10/2008 bridge rail accident on the William Preston Lane Memorial Bridge near Annapolis, Maryland.

#### Concurrence

Signature on File

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Jeffrey A. Anderson, P.E.  
Bridge Inspection Engineer

Signature on File

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Mark A. Leonard, P.E.  
Staff Bridge Engineer

E-mail distribution with copies of references:

Bridge Inspection Personnel  
Scott McDaniel  
Matt Greer, FHWA  
Staff Bridge design & construction engineers

# MEMORANDUM

DEPARTMENT OF TRANSPORTATION  
Staff Bridge Branch  
4201 E. Arkansas Avenue, Room 107  
Denver, Colorado 80222  
(303) 757-9309 FAX (303) 757-9197



Date: May 25, 2012  
To: CDOT BRIAR Manual Users  
From: Lynn E. Croswell, Bridge Inspection Engineer  
Subject: Inspection of Complex Bridges

CDOT BRIAR Manual  
Section 3 – Inspection

This document establishes the identification of and procedures for complex bridges. The following applies to both On-System and Off-System bridges. The Code of Federal Regulations (CFR 650.305) defines complex bridges as movable, suspension, cable stayed, and other bridges with unusual characteristics.

At this time there are no complex major vehicular bridges identified as part of the CDOT On-System bridge inspection program and one complex major vehicular bridge (MOF83-02.90) identified as part of the CDOT Off-System bridge inspection program. MOF83-02.90 is a 300 foot suspension bridge, located in Moffat County, carrying County Road 83 over the Green River. Complex bridges, and the associated bridge inspection procedures, are adequately described in the FHWA manual for the Safety Inspection of In-Service Bridges, the FHWA Bridge Inspector's Reference Manual, and CDOT's BRIAR Manual.

For MOF83-02.90 and in the future whenever a complex bridge is added to the system, the following will be include in the structure folder.

- Identify any special procedures for the bridge.
- Identify any additional inspector training and experience required for the bridge.
- Mark the hard copy structure folder as "Complex" on the front cover.
- List any special procedures and inspector qualifications on the inside left cover of the hard copy structure folder.

Although segmental concrete bridges are not considered complex it may be appropriate to develop procedures for the inspection of anchorages and external post tensioning.

Signature on file.

Lynn E. Croswell, P.E.  
Bridge Inspection Engineer

Signature on file.

Karen S. Mondragon  
Statewide Bridge Inspection Coordinator

Signature on file.

Mark A. Leonard, P.E.  
Staff Bridge Engineer

Signature on file.

Mark A. Nord, P.E.  
Bridge Asset Management Engineer

# MEMORANDUM

DEPARTMENT OF TRANSPORTATION  
Staff Bridge Branch  
4201 E. Arkansas Avenue, Room 107  
Denver, Colorado 80222  
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CDOT BRIAR Manual  
Section 3 – Inspections  
Essential Repairs

Date: November 18, 2010

To: Chief Engineer, Director of Staff Services, Region Transportation Directors, Region Maintenance Superintendents, Region Program Engineers, Staff Maintenance Branch Manager, FHWA Division Bridge Engineer, Staff Bridge Personnel

From: Jeffrey A. Anderson, CDOT Bridge Inspection Program Manager

Subject: Essential Structure Repairs

This memorandum provides the department's policy and procedures for essential structure repairs. It updates and supersedes the July 11, 2001 Staff Bridge technical memorandum addressing the same topic and will be maintained and made available in Section 3 of the CDOT Bridge Asset Management & Inspection Manual (BRIAR) Manual.

This policy and procedure is established to maintain the safe and continued service of the department's structures and to satisfy the requirements of the Code of Federal Regulations (CFR) 23-650-subpart C and the AASHTO Manual for Bridge Evaluation section 4.8.1.4. The CFR and AASHTO specifications require DOT's to establish notification and tracking procedures to assure that critical bridge inspection findings are addressed within an appropriate timeframe.

## **Definition of Essential Repairs**

Essential repairs are the repairs necessary to ensure the safe and continued service of the department's structures. Examples of essential repair needs include: a girder severely damaged by an over-height vehicle; a bridge foundation undermined by scour; and advanced deterioration of a primary structure member that has undermined its load-carrying capacity. They also include less time sensitive items such as a bridge rail damaged by an errant vehicle; a plugged drain resulting in embankment erosion; and active corrosion that could undermine a bridge's load-carrying capacity before the next inspection.

## **Identification of Essential Repairs**

Problems with structures are typically discovered by the department's bridge inspectors and maintenance employees. Occasionally other CDOT employees and non-CDOT personnel observe and report problems. Immediate and potentially critical problems with structures should be reported to region maintenance or the State Patrol as appropriate. The region 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 will be made by the CDOT Bridge Inspection Program Manager, or his or her designee, and will be made as a follow-up to inspection program findings or evaluations requested by the region.

The bridge inspection program typically inspects major bridges on a two-year frequency. Some newer structures are on a four-year frequency while those with noted problems may be inspected more frequently, such as yearly or on a six-month basis. The process of documenting and processing essential inspection 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 essential repair finding is categorized using maintenance activity numbers as described in Appendix C of the Colorado Pontis Coding Guide.
3. The bridge inspector assigns a double asterisk to the essential repair finding. Example: \*\*354.01 is an essential repair finding due to collision damage sustained by the bridge's girders or truss members.
4. Structure folders with inspection reports containing a double asterisk repair finding are delivered to the Bridge Inspection Program Manager for evaluation.
5. If the Bridge Inspection Program Manager determines that the identified finding is not essential, the program manager documents why in writing on the report. The program manager then signs and dates the report before returning the structure folder to the files.
6. If the Bridge Inspection Program Manager determines the repair is essential, the manager classifies the repair and notifies the applicable region.

### **Classification and Prioritization**

When identifying a needed repair as essential, the Bridge Inspection Program Manager will classify the repair based on the appropriate time frame for addressing the problem as follows:

Orange	Accomplish repairs within the timeframe specified by the memo or within 30 days maximum.
Yellow	Recommend accomplishing repairs within the next 90 days.
Green	Recommend accomplishing repairs within the next year or as funding allows.
Blue	Monitoring by maintenance in lieu of repairs. The type and frequency of monitoring as specified by the repair notice.
C	Potentially critical condition discovered by the first round of minor culvert inspections. Funding has been insufficient to address all findings from the first round of inspections and therefore these need to be addressed as soon as funding allows.

Structure numbers highlighted in **red** indicate bridges that have been turned over to the Colorado Bridge Enterprise.

### **Process for Notification and Tracking**

The CDOT Bridge Inspection Program Manager will notify the regions of essential repair needs. The process for notification and tracking of essential repairs is as follows.

1. 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 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 Staff Bridge Quality Assurance Inspector. 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.

2. Tracking spreadsheets, one for each region, are maintained by the Bridge Inspection Program Manager.
  - 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 designee, with each essential repair memo submittal, and is updated by the Maintenance Superintendent, or designee, whenever any follow-up action is taken.
3. When the regions complete the repairs they update the applicable tracking spreadsheet by filling in the date the finding was repaired.
4. 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.
5. The bridge inspectors will document, in their inspection report, whether or not any essential repairs 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.

### **Staff Bridge Design and Construction Unit Leaders' Responsibilities**

The Staff Bridge PE II assigned to the applicable region shall provide any engineering needed for essential repairs. 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 repairs.

### **Structures Other than Major Bridges**

In addition to the department's bridge inspection program, the policy and procedures in this memorandum also apply to the department's culvert and sign/signal/HML (high-mast-lights) inspection programs, and to any essential findings related 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 less than 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) and miscellaneous structures
- Tunnels

### **Off-System Bridges**

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 essential repairs by the program. This program applies only to major vehicular bridges owned by the cities and counties. The following procedure only applies to essential repair needs discovered by the off-system inspection program.

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 Inspection Program Manager is also the manager for the off-system bridge inspection program. The Staff Bridge Quality Assurance Inspector is currently the project manager for the bridge inspection consultant contracts.

The process for identification, notification, and tracking of off-system essential bridge repairs is as follows:

1. An essential repair need is discovered by the bridge inspector during bridge inspection.
2. The essential repair finding is categorized using maintenance activity numbers as described in Appendix C of the Colorado Pontis Coding Guide.
3. The bridge inspector assigns a double asterisk to the essential repair finding. Example: \*\*354.01 is an essential repair finding due to collision damage sustained by the bridge's girders or truss members.
4. The essential repair finding is evaluated by the consultant's senior inspection engineer.
5. If the consultant's senior inspection engineer determines that the identified finding is not essential, that engineer documents why in writing on the report. The engineer then signs and dates the report before returning the structure folder back to the inspector.

6. 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 above is used for classification. Notifications are sent by e-mail to the local agencies' public works or road and bridge departments. Those copied on the notification include other local agency contacts as determined by the consulting firm, the FHWA Division Bridge Engineer, the Staff Bridge Branch Manager, the Staff Bridge Asset Management Engineer, the Staff Bridge Inspection Program Manager and the Staff Bridge Quality Assurance Inspector.
7. The Staff Bridge Quality Assurance Inspector 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 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, and the date the consultant's senior inspection engineer confirmed the repair had been completed.
8. 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 Staff Bridge Quality Assurance Inspector to be used in updating the tracking spreadsheet by filling in the date the finding was reported as repaired.
9. Essential repair findings reported to be completed are confirmed by bridge inspectors during regularly-scheduled inspections. The Quality Assurance Inspector 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. Any special inspections paid for with off-system inspection project funds must be pre-approved by the Staff Bridge Quality Assurance Inspector.
10. The bridge inspectors will document in their inspection report whether or not any essential repairs 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 notifies the Quality Assurance Inspector who then updates the tracking spreadsheet accordingly. If the inspection engineer determines that the repair has not been addressed, the engineer will issue a follow-up repair notice to the local agency.

## Concurrence

### *Signature on File*

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Jeffrey A. Anderson  
Bridge Inspection Program Manager

### *Signature on File*

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Mark A. Nord  
Bridge Asset Management Program  
Manager

### *Signature on File*

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Mark A. Leonard  
Staff Bridge Branch Manager

### *Signature on File*

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Richard J. Gabel  
Director of Staff Services

# MEMORANDUM

DEPARTMENT OF TRANSPORTATION  
Staff Bridge Branch  
4201 E. Arkansas Avenue, Room 107  
Denver, Colorado 80222  
(303) 757-9309 FAX (303) 757-9197



Date: May 24, 2012  
To: CDOT BRIAR Manual Users  
From: Lynn E. Croswell, Bridge Inspection Engineer  
Subject: Inspection of Bridge Fracture Critical Members

CDOT BRIAR Manual  
Section 3 – Inspection

This document establishes the requirements and procedures for fracture critical members in accordance with the Code of Federal Regulations (CFR 650 Subpart C). The following applies to both On-System and Off-System bridges unless otherwise noted.

## General Requirements

The inspection of fracture critical members requires a hands-on inspection of fracture critical members and member components. A hands-on inspection is a close-up inspection, within arm's length, of the fracture critical member or components to identify any deficiencies not readily detectable using routine inspection procedures. Where required by the condition of the member or component, or where required by the inspection procedure established for the bridge, the visual techniques shall be supplemented by other applicable nondestructive testing (NDT).

The inspection of Fracture Critical Members (FCM) is a hands-on vs. routine visual inspection. All bridges with fracture critical members or components shall receive a fracture critical inspection at the same time as the regular bridge inspection. All bridges with fracture critical members or components will be inspected on a 24 month basis or less.

When a significant defect is found with a fracture critical member or component, the inspection frequency will generally be reduced to 12 months or less until the defect can be repaired. The inspection frequency and mitigation strategy will be at the discretion of the Bridge Inspection Engineer for On-System bridges and the consultant's Senior Bridge Inspection Engineer for Off-System bridges.

## Pre-Inspection Documentation

Bridges with fracture critical members or components shall be identified by the structure folder and the fracture critical members or components, and any special inspection procedures, shall be identified in the folders.

Structure folders for Fracture Critical Bridges are marked with a stamp on the front (see Figure 1) so that they can receive the extra effort involved in their inspection. The FCMs will be determined by an engineer and identified on the sketches using the following symbol:



Beneath the FCM symbol shall be the member description (e.g. Bottom Chord, Floor Beam, etc.)

The structure folder will also have a Fractural Critical Inspection sheet (see Figure 2) identifying the FCM's and their inspection requirements.

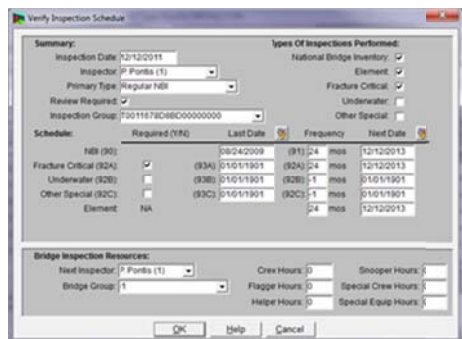
A Fracture Critical bridge contains one or more Fracture Critical Members or components. A FCM, is a steel member, or part of a member, in **tension** whose failure would probably cause a portion of or the entire bridge to collapse. This generally includes lower cords of trusses, two-girder simple span bridges, and steel pier caps. It may not include diagonals or verticals of trusses because their failure may not cause a collapse. Continuous span two steel box girder bridges are usually not fracture critical, although the spans adjacent to expansion devices need to be investigated by an engineer to determine whether or not they are Fracture Critical.

## Inspection Documentation

When the Pontis Inspection report is being edited the New Inspection Setup Mode, should have the Fracture Critical box at the Inspection Types Performed checked.



The Verify Inspection Schedule screen should have the Types of Inspections Performed, Fracture Critical box checked and the Fracture Critical (92A) should be checked down in the schedule area. The 24 months may need to be toggled on or off, or reduced for a shorter frequency.



The correct coding in Pontis is very important to maintain accurate records.

The reporting of FCM inspections will be part of the monthly inspection status report so it is essential that it be coded correctly in the Pontis database.

## Inspection Procedures

FCM inspections are done no further than arm's length away. This may entail walking along the lower cord of trusses or close inspection by other means. The inspector needs to follow safety protocol by using Fracture Critical Memorandum 2012-05-23.docx

Version: 5/24/2012

a harness and lanyard(s). The inspector will move dirt and debris sufficiently to observe and measure the remaining section on the lower cord, gusset plates, and ends of floor beams. The inspector needs to observe the coped sections of floor beam connections to the truss.

The inspection of steel pier caps requires the Below Bridge Access Vehicle or a ladder or a bucket truck to get close enough to the connections to clean and measure corrosion and/or cracks. The connections near the top of the steel pier caps will be the main focal point over columns and the connections near the bottom of the steel pier caps will be the main focal point between the supporting columns, i.e. members in tension.

Some bridges may require special techniques to accurately assess the FCM. For example, the Truss structure K-18-R in Pueblo over the Arkansas River has had Rope Access to get below it due to the walks at the cords; scaffolding was used prior to rope access.

Inspectors shall follow any special inspection procedures on the green sheet. For most bridges special procedures are not needed, for example the detection of fatigue cracks in most steel girders is adequately addressed in the FHWA manual for the Safety Inspection of In-Service Bridges and the FHWA Bridge Inspector's Reference Manual.

If fatigue cracks are suspected the bridge inspectors will clean the area, remove any applied coatings if necessary and perform grinding, dye penetrant, and/or magnetic particle testing as necessary to determine if there is cracking and the extent of any cracking. If these methods are inadequate or impractical for the particular situation, the Bridge Inspection Engineer or the consultant's Senior Bridge Inspection Engineer shall be consulted and additional personnel shall be employed to complete the fracture critical inspection using ultrasound or other applicable NDT methods. The locations, dates and type of test shall be documented in the Inspection Report. In addition to documenting the test in the Inspection Report, the inspector will enter the information in an electronic FCM-NDT Tracking spreadsheet provided by the Bridge Inspection Engineer.

Significant defects, such as fatigue crack, tear, impact damage, significant corrosion, etc. will be brought to the attention the Bridge Inspection Engineer or consultant senior inspection engineer. These defects will be treated as an Essential Repair and the procedures outlined in the Essential Structure Repairs memorandum will be used to notify the owner and track the repairs. The Bridge Inspection Engineer or the consultant's Senior Bridge Inspection Engineer shall reduce the inspection frequency to 12 months or less until the defect can be repaired. The structure may be load restricted or closed until the deficiency is repaired. The Bridge Inspection Engineer will determine the course of action.

Signature on File

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Lynn E. Crowell, P.E.  
Bridge Inspection Engineer

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Karen S. Mondragon  
Statewide Bridge Inspection Coordinator

Signature on File

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Mark A. Leonard, P.E.  
Staff Bridge Engineer

Signature on File

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Mark A. Nord, P.E.  
Bridge Asset Management Engineer

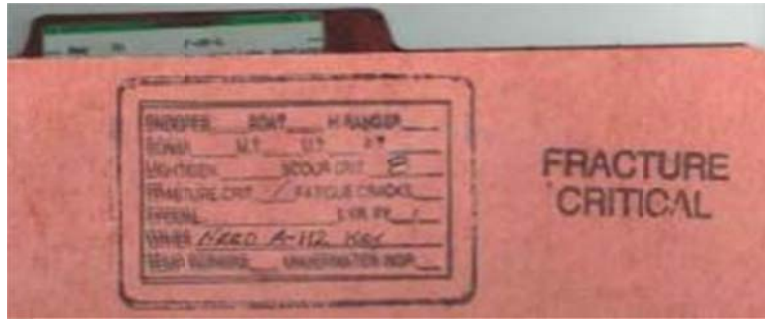


Figure 1

**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

# MEMORANDUM

DEPARTMENT OF TRANSPORTATION  
Staff Bridge Branch  
4201 E. Arkansas Avenue, Room 107  
Denver, Colorado 80222  
(303) 757-9309 FAX (303) 757-9197



Date: June 11, 2013  
To: CDOT BRIAR Manual Users  
From: Lynn E. Crowell, CDOT Bridge Inspection Engineer  
Subject: Inspection Frequency Criteria

CDOT BRIAR Manual  
Section 3 - Inspections

This document establishes the level of inspection, and frequency for all of the following inspection types where appropriate:

- Routine inspections – less than 24-month intervals
- Fracture Critical Member (FCM) inspections – less than 24-month intervals
- Underwater inspections– less than 60-month intervals
- Damage inspections
- In-depth inspections
- Special inspections

The following applies to both On-System and Off-System bridges unless otherwise noted.

## **Routine inspections – less than 24-month intervals**

Bridges meeting the following criteria will be inspected on a 12-month maximum frequency. Lesser frequencies may be required as determined by the Bridge Inspection Engineer or the Consultants Program Manager:

- Bridges with Items 58, 59, 60, or 62 with NBI ratings of 3 or less.
- Bridges with active fatigue cracks that have not been arrested.
- Timber bridges with split stringers, defined in the CDOT Bridge Rating Manual, Section 13-3-III, that have not been repaired.
- Timber piling with advanced rot that reduces the structural capacity of the member.
- Bridges needing corbels (bearing repairs) that have not been repaired that have greater than a 50% bearing loss.

The level of inspection will be as per the FHWA manual for the Safety Inspection of In-Service Bridges and the FHWA Bridge Inspector's Reference Manual. If additional inspection procedures are required, they will be documented in the structure folder.

## **Fracture Critical Member (FCM) inspections – less than 24-month intervals**

Fracture Critical Bridges meeting the following criteria will be inspected on a 12-month maximum frequency. Lesser frequencies may be required as determined by the Bridge Inspection Engineer or the Consultants Program Manager:

- Fracture Critical Bridges with visual indications of active fatigue cracks in the FCM.
- Once deficiencies are noted and repaired, the inspection frequency will return to the routine inspections frequency.

The level of inspection will be as per the FHWA manual for the Safety Inspection of In-Service Bridges and the FHWA Bridge Inspector's Reference Manual. If additional inspection procedures are required, they will be documented in the structure folder. See BRIAR Manual, Section 3, Inspection of Bridge Fracture Critical Members for FCM inspection requirements.

## **Underwater inspections – less than 60-month intervals**

No underwater inspection will exceed sixty months within the state of Colorado. Any foundation that is under four feet of water or greater will be included in the underwater inspection cycle. The inspection level and frequency of bridges requiring less than 60-month frequencies, as determined by the Bridge Inspection Engineer or Consultants Program Manager, regarding underwater inspections will be based on the following:

- Bridges with known scour issues. Inspection intervals shall be left to the Bridge Inspection Engineer or Consultants Program Manager, considering such factors as the severity of the scour, the potential for additional scour, and the type of foundation that the individual bridges are founded upon.
- Noted scour that is to within six inches of the bottoms of spread footings.
- Piling that is exposed more than four feet.

Channel profiles shall be checked and noted during every routine inspection. The previous five inspection cycles will be shown on the cross-sections in order to track changes in the channel profiles.

### **Underwater Inspection Procedures**

Bridges requiring underwater inspections are currently and will continue to be identified in Colorado's database. Underwater elements on these bridges shall continue to be inspected by divers on a 60-month frequency. Locations of underwater elements shall continue to be identified and recorded. Though inspection procedures should not differ from routine underwater inspections, inspection procedures will be documented within the underwater inspection report.

## **Damage inspections**

Damage inspections shall be conducted as requested by Maintenance personnel or the Owner of the bridge. These inspections typically occur after an incident involving a bridge, i.e. impact by a vehicle. Inspect and document all damage caused by the incident. Note, often not all of the damage is at the point of impact. Connections to adjacent girders, bearings, etc. may also be effected.

## **In-depth inspections**

In-depth inspections shall be conducted for segmental bridges during their routine inspection, paying special attention to anchorage zones where they are accessible and not permanently buried in concrete.

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

## **Special inspections**

Special inspections shall be performed on pins every 48-months when they are tested with ultrasonic equipment. Hands-on inspections of pins shall be conducted during the routine inspections.

Signature on File

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Lynn E. Croswell, P.E.  
CDOT Bridge Inspection Engineer

Signature on File

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Karen S. Mondragon  
Statewide Bridge Inspection Coordinator

Signature on File

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Joshua R. Laipply, P.E.  
Staff Bridge Engineer

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Mark A. Nord, P.E.  
Structures Asset Management Engineer

# MEMORANDUM

**DEPARTMENT OF TRANSPORTATION**

Staff Bridge Branch  
4201 E. Arkansas Avenue, Room 107  
Denver, Colorado 80222  
(303) 757-9309 FAX (303) 757-9197



**DATE:** Thursday May 24, 2012

**TO:** Colorado Bridge Inspectors

**FROM:** CDOT Staff Bridge

Bridge Asset Management Manual  
Section 3 – Inspection  
Major Structure

**SUBJECT:** Inspection Scheduling – Major Vehicular Bridges

Since the early 1970's Colorado DOT scheduled inspections of major vehicular bridges to occur within a required quarter (3 month period). In order to achieve better compliance with the FHWA performance metrics related to inspection frequency CDOT will schedule inspections to occur within a required month. A required inspection month will assigned for National Bridge Inventory (NBI); Element; Fracture Critical; Underwater; and Other Special (i.e. Pin) inspections prior to July 2012. Required inspection months will be determined based on the historical inspection month and the historical assigned inspection quarter. The inspection within the required inspection month will begin July 1, 2012.

**NBI; Element; and Fracture Critical Inspections**

NBI; Element; and Fracture Critical scheduled required month information will be placed in Pontis Table & Field [bridge.bridgegroup]. This field was selected because it is already in Pontis and is intended for use in grouping together bridges for inspection purposes. The field is in Pontis on the SCHEDULE tab under Bridge Inspection Resources and is labeled [Bridge Group:]. The definition of how to code [bridge.bridgegroup] is defined in the appendix to this memorandum. The field will be coded for all major vehicular bridges prior to July 2012.

The schedule information currently in Colorado Items 122a through 122f will be maintained.

**Pin Inspections**

Other Special (i.e. Pin) inspection schedule required month information will be placed in Pontis Table & Field [bridge.userkey3] also known as [Bridge User Key 3]. This field was selected because it: exists in Pontis; is intended for agency defined use and is not currently being used. The field is in Pontis on the INVENTORY tab Classification sub tab under [Agency Bridge Items:] and labeled [3:]. The definition of how to code [bridge.userkey3] is defined in the appendix to this memorandum. The field will be coded for all major vehicular bridges prior to July 2012.

**Underwater Inspections**

Underwater inspection schedule required month information will be placed in Pontis Table & Field [bridge.userkey4] also known as [Bridge User Key 4]. This field was selected because it: exists in Pontis; is intended for agency defined use and is not currently being used. The field is in Pontis on the INVENTORY tab Classification sub tab under [Agency Bridge Items:] and labeled [4:]. The definition of how to code [bridge.userkey4] is defined in the appendix to this memorandum. The field will be coded for all major vehicular bridges prior to July 2012.

Inspection within the required month has two additional requirements. The first added requirement is a monthly inspection schedule report to identify bridges that will be inspected after their scheduled month but before they become more than a month late. The second added requirement is the submittal of preliminary PDI's (Pontis Data Interchange File) before the end of the month immediately following the month of inspection.

The monthly inspection schedule report is a tabulation of bridges scheduled for inspection with a location for the field inspection date that is to be populated by the bridge inspectors as the bridges are inspected. Bridges without field inspection dates in the month they are scheduled for inspection will immediately be scheduled for inspection before they become more than a month late. Any bridges identified to be more than month late or at risk of being more than a month late will be inspected as soon as possible using available resources that are qualified to perform the needed inspection. The first monthly inspection schedule report will be on or before the first working day in July of 2012. The subsequent monthly reports will also be produced on or before the first working day of the month.

The submittal of preliminary PDI's before the end of the month following the month of inspection is to get the inspection data into the preliminary database as soon as is practical. The final PDI's are to be submitted once the preliminary PDI and hard copy submittals have been reviewed and accepted by the Statewide Bridge Inspection Coordinator or the Bridge Inspection Engineer. The final PDI's will be imported into the master database.

### Concurrence

Signature on File

Lynn Croswell, P.E.  
Bridge Inspection Engineer

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Mark A. Leonard, P.E.  
Staff Bridge Engineer

Signature on File

Mark A. Nord, P.E.  
Bridge Asset Management Engineer

Signature on File

Karen S. Mondragon  
Statewide Bridge Inspection Coordinator

Attachment

## Scheduled Month for NBI, Element and Fracture Critical Inspections

Pontis Table &amp; Column Name: .....bridge.bridgegroup

Data Type: .....CHAR

Width: .....20

<b>24 month Inspection Frequencies</b>	<b>48 month Inspection Frequencies</b>
<b>Fiscal Year Characters 1 – 3</b>	<b>Fiscal Year Characters 1 – 3</b>
ODD = Odd fiscal year EVN = Even fiscal year  Fiscal year number is based on the calendar year when the fiscal year ends.	LP0 = Leap Year LP1 = Leap Year + 1 LP2 = Leap Year + 2 LP3 = Leap Year + 3
<b>Blank Character 4</b>	<b>Blank Character 4</b>
<b>Month Characters 5 – 7</b>	<b>Month Characters 5 – 7</b>
JAN = January FEB = February MAR = March APR = April MAY = May JUN = June JUL = July AUG = August SEP = September OCT = October NOV = November DEC = December	JAN = January FEB = February MAR = March APR = April MAY = May JUN = June JUL = July AUG = August SEP = September OCT = October NOV = November DEC = December
<b>Blank Character 8</b>	<b>Blank Character 8</b>
<b>Trip Characters 9 – 11</b>	<b>Trip Characters 9 – 11</b>
T_0 = Trip not assigned  Q##  Where: Q equals Quarter A - H ## = Trip number _1 - 99	T_0 = Trip not assigned  Q##  Where: Q equals Quarter A - H ## = Trip number _1 - 99
<b>Blank Characters 12 - 20</b>	<b>Blank Characters 12 - 20</b>

NOTE - Changes to this code must be approved by the Bridge Inspection Engineer or the Statewide Bridge Inspection Coordinator.

## Scheduled Month for NBI, Element and Fracture Critical Inspections

Pontis Table &amp; Column Name: .....bridge.bridgegroup

Data Type: .....CHAR

Width: .....20

<b>12 month Inspection Frequencies</b>	
<b>Fiscal Year</b> Characters 1 – 3	
12M	
<b>Blank Character 4</b>	
<b>Month</b> Characters 5 – 7	
JAN = January FEB = February MAR = March APR = April MAY = May JUN = June JUL = July AUG = August SEP = September OCT = October NOV = November DEC = December = Blank for Non-Qualifying	
<b>Blank Character 8</b>	
<b>Trip – Even Fiscal Year</b> Characters 9 – 11	<b>Trip – Odd Fiscal Year</b> Characters 13 – 15
T_0 = Trip not assigned  Q##  Where: Q equals Quarter A - H ## = Trip number _1 - 99	T_0 = Trip not assigned  Q##  Where: Q equals Quarter A - H ## = Trip number _1 - 99
<b>Blank Character 12</b>	<b>Blank Character 16 - 20</b>

NOTE - Changes to this code must be approved by the Bridge Inspection Engineer or the Statewide Bridge Inspection Coordinator.

## Scheduled Month for NBI, Element and Fracture Critical Inspections

Pontis Table &amp; Column Name: .....bridge.bridgegroup

Data Type: .....CHAR

Width: .....20

<b>6 month Inspection Frequencies</b>	
<b>Fiscal Year</b> Characters 1 – 3	
06M	
<b>Blank Character 4</b>	
<b>Month</b> Characters 5 – 7	<b>Month</b> Characters 9 – 11
JAN = January FEB = February MAR = March APR = April MAY = May JUN = June JUL = July AUG = August SEP = September OCT = October NOV = November DEC = December = Blank for Non-Qualifying	JAN = January FEB = February MAR = March APR = April MAY = May JUN = June JUL = July AUG = August SEP = September OCT = October NOV = November DEC = December = Blank for Non-Qualifying
<b>Blank Character 8</b>	<b>Blank Character 12</b>
<b>Trip</b> Characters 13 – 15	<b>Trip</b> Characters 17 – 19
T_0 = Trip not assigned  Q##  Where: Q equals Quarter A - H ## = Trip number _1 - 99  Trips are not typically assigned for 6 month inspection frequencies.	T_0 = Trip not assigned  Q##  Where: Q equals Quarter A - H ## = Trip number _1 - 99  Trips are not typically assigned for 6 month inspection frequencies.
<b>Blank Character 16</b>	<b>Blank Character 20</b>

Changes to this code must be approved by the Bridge Inspection Engineer or the Statewide Bridge Inspection Coordinator.

## Scheduled Month for NBI, Element and Fracture Critical Inspections

Pontis Table & Column Name: .....bridge.bridgegroup  
 Data Type: .....CHAR  
 Width:.....20

NOTE - Changes to this code must be approved by the Bridge Inspection Engineer or the Statewide Bridge Inspection Coordinator.

### Coding Examples:

Columns  
 111111111112  
 12345678901234567890

### 24 Month Inspection Frequency

**ODD JAN E\_1** January inspection in every odd Fiscal Year  
 E Quarter Trip 1

### 48 Month Inspection Frequency

**LP1 AUG C22** August inspection in every Leap Year plus 1  
 B Quarter Trip 22

### 12 Month Inspection Frequency

**12M OCT H\_5 F\_6** October inspection every year  
 H Quarter Trip five in even fiscal years  
 F Quarter Trip six in odd fiscal years

### 6 Month Inspection Frequency

**06M MAY NOV T\_0 T\_0** May inspection every year Trip not assigned  
 November inspection every year Trip not assigned

## Scheduled Month for Underwater Inspections

Pontis Table &amp; Column Name: .....bridge.userkey4

Data Type: .....CHAR

Width: .....30

48 month Inspection Frequencies	
Fiscal Year Characters 1 – 3	
LP0 = Leap Year LP1 = Leap Year + 1 LP2 = Leap Year + 2 LP3 = Leap Year + 3	
Blank Character 4	
Month Characters 5 – 7	
JAN = January FEB = February MAR = March APR = April MAY = May JUN = June JUL = July AUG = August SEP = September OCT = October NOV = November DEC = December = Blank for Non-Qualifying	
Blank Character 8 -20	

NOTE - Changes to this code must be approved by the Bridge Inspection Engineer or the Statewide Bridge Inspection Coordinator.

### Coding Example:

Columns  
                   11111111112  
 12345678901234567890

### 48 Month Inspection Frequency

**LP1 SEP**                                      September Underwater inspection in every Leap Year plus 1

### **Notes:**

Underwater Inspection Frequency to be coded with 60 months.

NBI Item 92B last two digits

Pontis Table & Column Name: inspevnt.uwinspfreq

For frequencies less than 48 months use coding defined for NBI, Element and Fracture Critical Inspections except for trip.

```
Pontis Table & Column Name: .....bridge.userkey3
Data Type: .....CHAR
Width:.....30
```

<b>48 month Inspection Frequencies</b>	
<b>Fiscal Year</b> Characters 1 – 3	
LP0	= Leap Year
LP1	= Leap Year + 1
LP2	= Leap Year + 2
LP3	= Leap Year + 3
<b>Blank Character 4</b>	
<b>Month</b> Characters 5 – 7	
JAN	= January
FEB	= February
MAR	= March
APR	= April
MAY	= May
JUN	= June
JUL	= July
AUG	= August
SEP	= September
OCT	= October
NOV	= November
DEC	= December
	= Blank for Non-Qualifying
<b>Blank Character 8 -20</b>	

### Coding Example:

Columns																			
11111111112																			
1	2	3	4	5	6	7	8	9	0	1	2	3	4	5	6	7	8	9	0

### 48 Month Inspection Frequency

LP0 OCT	October Pin inspection in every Leap Year
---------	---

**Notes:**

Other Special Inspection Frequency to be coded with 60 months.  
 NBI Item 92C last two digits  
 Pontis Table & Column Name: inspevnt.osinspfreq

For frequencies less than 48 months use coding defined for NBI, Element and Fracture Critical Inspections except for trip

**ITEM122A, Assigned Quarter for 12 Month Inspection Frequency**

Pontis Table &amp; Column Name: .....userbrdg.month\_12

Data Type: ..... VARCHAR

Width: .....3

NOTE - Changes to this code must be approved by the Statewide Bridge Inspection Coordinator or the Bridge Inspection Engineer.

This is a one character code to identify the assigned quarter for structures to be inspected on a 12 month inspection frequency. Code with a letter indicating the inspection quarter that is 12 months from the assigned quarter in Item 122C. Choose the code for the appropriate quarter in the listing under Item122C.

Example: If a structure has a regular inspection quarter of "A" in Item122C then the corresponding Item122A code would be "E", the quarter 12 months from "A". For all other structures, leave Item122A blank.

**ITEM122AA, Assigned Trip for 12 Month Inspection Frequency**

Pontis Table &amp; Column Name: .....userbrdg.trip\_12

Data Type: ..... VARCHAR

Width: .....3

NOTE - Changes to this code must be approved by the Statewide Bridge Inspection Coordinator or the Bridge Inspection Engineer.

This is a two digit code to identify the assigned trip number for structures to be inspected on a 12 month inspection frequency. Use codes listed under Item122CC.

**ITEM122B, Special Inspection Requirements**

Pontis Table &amp; Column Name: .....userbrdg.spec\_insp

Data Type: ..... VARCHAR

Width: .....3

This is a one character code used to identify those structures which are of special interest when scheduling inspections. Code the structure according to the specific category affecting it and/or the scheduling problems encountered. The following codes are used for On-System and Off-System inspected bridges. However, only On-System inspected bridges use the temporary M designation for new structures. It is removed once a structure has been inspected.

<b>Description</b>	<b>Code</b>
Not Applicable .....	0
Timber Structures over Canal .....	2
Other Structures over Canal .....	3
New Structure not inspected .....	M
Revisit, (still under construction, can not inspect due to high water, etc.) .....	R
Under construction (to be replaced) .....	U
Inspect on a less than 12 month cycle, (i.e. every quarter or every six months) .....	X

**ITEM122C, Assigned Quarter for 24 Month Inspection Frequency**

Pontis Table &amp; Column Name: .....userbrdg.month\_24

Data Type: ..... VARCHAR

Width: .....3

NOTE - Changes to this code must be approved by the Statewide Bridge Inspection Coordinator or the Bridge Inspection Engineer.

This is a one character code to identify the assigned quarter for structures to be inspected on a 24 month inspection frequency.

<b>Description</b>	<b>Code</b>
First Quarter, Even Calendar Year (Jan-Feb-Mar) .....	A
Second Quarter, Even Calendar Year (Apr-May-Jun) .....	B
Third Quarter, Even Calendar Year (Jul-Aug-Sep) .....	C
Fourth Quarter, Even Calendar Year (Oct-Nov-Dec) .....	D
First Quarter, Odd Calendar Year (Jan-Feb-Mar) .....	E
Second Quarter, Odd Calendar Year (Apr-May-Jun) .....	F
Third Quarter, Odd Calendar Year (Jul-Aug-Sep) .....	G
Fourth Quarter, Odd Calendar Year (Oct-Nov-Dec) .....	H
Tunnels monitored 24 hours (not inspected) .....	X
Not Applicable or No Assigned Quarter (used for Non-Qualifying structures) .....	Blank

**ITEM122CC, Assigned Trip for 24 Month Inspection Frequency**

Table &amp; Column Name: .....userbrdg.trip\_24

Datatype: ..... VARCHAR

Width: .....3

NOTE - Changes to this code must be approved by the Statewide Bridge Inspection Coordinator or the Bridge Inspection Engineer.

This is a two digit code to identify the assigned trip number for structures to be inspected on a 24 month inspection frequency.

<b>Description</b>	<b>Code</b>
No Assigned Trip (used for Off-System and Non-Qualifying structures) .....	0
Trip 1 .....	1
Trip 2 .....	2
.....	...
Trip 99 .....	99

**ITEM122D, Assigned Quarter for 48 Month Inspection Frequency**

Pontis Table &amp; Column Name: .....userbrdg.month\_48d

Datatype: ..... VARCHAR

Width: .....3

NOTE - Changes to this code must be approved by the Statewide Bridge Inspection Coordinator or the Bridge Inspection Engineer.

This is a one character code to identify the assigned quarter for structures to be inspected on a 48 month inspection frequency. This is for inspections occurring in Leap Year and Leap Year plus one year. Use codes listed under Item122C.

**ITEM122DD, Assigned Trip for 48 Month Inspection Frequency**

Table &amp; Column Name: .....userbrdg.trip\_48d

Datatype: ..... VARCHAR

Width: .....3

NOTE - Changes to this code must be approved by the Statewide Bridge Inspection Coordinator or the Bridge Inspection Engineer.

This is a two digit code to identify the assigned trip number for structures to be inspected on a 48 month inspection frequency. Use codes listed under Item122CC.

#### **ITEM122E, Assigned Quarter for 48 Month Inspection Frequency**

Table & Column Name: .....userbrdg.month\_48e

Datatype: ..... VARCHAR

Width: .....3

NOTE - Changes to this code must be approved by the Statewide Bridge Inspection Coordinator or the Bridge Inspection Engineer.

This is a one character code to identify the assigned quarter for structures to be inspected on a 48 month inspection frequency. This is for inspections occurring in Leap Year plus 2 years and Leap Year plus three years. Use codes listed under Item122C.

#### **ITEM122EE, Assigned Trip for 48 Month Inspection Frequency**

Pontis Table & Column Name: .....userbrdg.trip\_48e

Datatype: ..... VARCHAR

Width: .....3

NOTE - Changes to this code must be approved by the Statewide Bridge Inspection Coordinator or the Bridge Inspection Engineer.

This is a two digit code to identify the assigned trip number for structures to be inspected on a 48 month inspection frequency. Use codes listed under Item122CC.

#### **ITEM122F, Schedule Note**

Pontis Table & Column Name: .....userbrdg.sched\_note

Datatype: ..... VARCHAR

Width: .....30

#### **DESCRIPTION:**

A thirty character code related to Item122B which describes the reason for a revisit.

#### **PROCEDURE:**

This character is used when an "R" is coded for Item122B. Describe why the bridge could not be inspected and when the inspection might be possible. This item will be put in the database by the BMS unit based on information provided by the Bridge Inspectors, Bridge Inspection Engineer, or Statewide Bridge Inspection Coordinator.

#### **CODING EXAMPLES:**

<b>Description</b>	<b>Code</b>
New bridge D-17-DI is under construction .....	In construction 01/98
Water too high to inspect concrete on rolled I-beam bridge C-16-AE .....	High water 10/98

# MEMORANDUM

DEPARTMENT OF TRANSPORTATION  
Staff Bridge Branch  
4201 E. Arkansas Avenue, Room 107  
Denver, Colorado 80222  
(303) 757-9309 FAX (303) 757-9197



Date: June 11, 2013  
To: CDOT BRIAR Manual Users  
From: Lynn E. Crowell, CDOT Bridge Inspection Engineer  
Subject: New Bridge Inspections

CDOT BRIAR Manual  
Section 3 - Inspections

This memorandum is to document inspection of new bridge and applies to both On-System and Off-System bridges.

## New Bridges

Because of the following, an initial inventory and condition assessment will be performed within 90 days of the official opening of the structure to traffic:

- New bridges, including phase construction, are designed and design checked by a Professional Engineer registered in the state of Colorado.
- The CDOT performs construction inspection of new bridges.

## On-System

Construction Bulletin 2009 Number 13, Bridge Construction Reviews, Dated July 16, 2009 states that "Staff Bridge [Staff Bridge PE II assigned to the Region] shall conduct a final inspection for acceptance of all major structures before project final acceptance is granted." The Staff Bridge PE II assigned to the Region will notify the CDOT Bridge Inspection Engineer and the Structures 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.

## Off-System

The Consultant shall contact all bridge owners in their assigned area a minimum of twice a year (approximately every six months) to learn of changes in the inventory.

Official opening is defined as the completion of the bridge construction project.

Signature on File

Lynn E. Crowell, P.E.  
CDOT Bridge Inspection Engineer

Signature on File

Joshua R. Laipply, P.E.  
Staff Bridge Engineer

Signature on File

Karen S. Mondragon  
Statewide Bridge Inspection Coordinator

Signature on File

Mark A. Nord, P.E.  
Structures Asset Management Engineer

# MEMORANDUM

DEPARTMENT OF TRANSPORTATION  
Staff Bridge Branch  
4201 E. Arkansas Avenue, Room 107  
Denver, Colorado 80222  
(303) 757-9309 FAX (303) 757-9197



Date: June 11, 2013  
To: CDOT BRIAR Manual Users  
From: Lynn E. Crowell, CDOT Bridge Inspection Engineer  
Subject: Re-rating of Advanced and Critically Deteriorated Bridge Components

CDOT BRIAR Manual  
Section 3 - Inspections

This memorandum is to address how the Colorado Department of Transportation will manage the re-rating of advanced and critically deteriorated bridge components. The following applies to both On-System and Off-System bridges.

## **On-System:**

When the Bridge Inspection Team Leader in collaboration with the bridge inspector confirms the presence of advanced deterioration (i.e. NBI condition rating of 3 or lower) for a structural component, the Bridge Inspection Team Leader will bring their findings to the attention of the CDOT Bridge Inspection Engineer. Upon verification of their findings, the CDOT Bridge Inspection Engineer will request the Staff Bridge PE II responsible for the Region re-rate the structure. With the new rating in hand, the CDOT Bridge Inspection Engineer will discuss the findings with the Staff Bridge Branch Manager, the Staff Bridge PE II responsible for the Region, the Structures Asset Management Engineer, Project Support, Rating, Standards, & Overloads Engineer, the Bridge Inspection Team Leader and the Staff Bridge Quality Assurance Inspector. Depending on the rating results, the CDOT Bridge Inspection Engineer may issue an Essential Repair Notification to the Region requiring repairs and posting to be performed for the designated structure(s).

All recommended repairs shall be completed within the timeframe noted in the Essential Repair Notification.

Communication and collaboration between all parties (Region Program Engineer, Resident Engineer, Region Maintenance personnel, Staff Bridge PE II responsible for the Region, CDOT Bridge Inspection Engineer, Project Support, Rating, Standards, & Overloads Engineer, Structures Asset Management Engineer) are highly encouraged between the time the structure is found deficient and recommended repairs are completed.

When load restrictions are required, the Structures Asset Management Engineer will issue an official memorandum for all required load restrictions to the Permit office, Project Support, Rating, Standards, & Overloads Engineer, Region Maintenance Personnel, Chief Engineer, Director of Staff Services and the Region Transportation Director.

Any additional notifications, i.e. Public Relations, media, Risk Management, etc., will be made by the Regions.

## Off-System:

When the Bridge Inspection Team Leader in collaboration with the bridge inspector confirms advanced deterioration (i.e. NBI condition rating of 3 or lower) for a structural component, the Bridge Inspection Team Leader will bring their findings to the attention of Consultant's Program Manager. Upon verification of their findings, the Consultant's Program Manager will discuss the findings with the Owner and the CDOT Bridge Inspection Engineer. If it is determined that a re-rating is required, the Consultant will re-rate the structure. When load restrictions are required, the Consultant's Program Manager will issue an Essential Repair Notification to the Owner requiring repairs and posting to be performed for the designated structure(s).

All recommended repairs shall be completed within the time frame noted in the Essential Repair Notification.

Signature on File

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Lynn E. Croswell, P.E.  
CDOT Bridge Inspection Engineer

Signature on File

---

Karen S. Mondragon  
Statewide Bridge Inspection Coordinator

Signature on File

---

M. Mac Hasan, P.E., S.E.  
Project Support, Rating, Standards, &  
Overloads Engineer

Signature on File

---

Mark A. Nord, P.E.  
Staff Bridge Asset Management Engineer

Signature on File

---

Joshua Laipply, P.E.  
Staff Bridge Engineer

# MEMORANDUM

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**DEPARTMENT OF TRANSPORTATION**

Design / Construction Branch  
4201 E. Arkansas Avenue, Room 330  
Denver, Colorado 80222  
(303) 757-9309 FAX (303) 757-9197



**DATE:** March 31, 2009

Bridge Asset Management  
Reports

**TO:** Producers of Bridge Asset Management Unit Reports

**FROM:** Mark A. Nord, P.E.  
Bridge Asset Management Engineer

**SUBJECT:** Bridge Asset Management Technical Memorandum  
Standard Headers and Footers for Reports

This memorandum is to document what information should be included in the headers and footers of reports produced by the Bridge Asset Management Unit.

## History

The Bridge Asset Management Unit produces multiple reports each year and has not uniformly defined the data source used to produce the reports in the past.

## Policy

The minimum information required in the report header and footer is:

- Report file name;
- Printed date and time;
- Data source;
- Page [page no.] of [total pages];
- Date prepared; and
- Prepared by: CDOT Staff Bridge.

The optional information in the report header and footer is:

- Spreadsheet tab;
- Report title; and
- Preparers initials.

The attached shows the layout of the required and optional items.

## Commentary

Standardizing the reports should improve presentation and future reference.

## Concurrence

---

Mark A. Leonard, P.E.  
Staff Bridge Engineer

*File Name*  
*Excel Worksheet Tab (if applicable)*

*Report Title (optional)*

Printed: *Print Date*  
*Print Time*

# Bridge Asset Management Unit

## Standard Headers and Footers for Reports

Effective: March 31<sup>st</sup>, 2009

Data Source: *Description*

Page *Page* of *Total Pages*

Prepared: *Date Prepared*  
By: CDOT Staff Bridge  
*Preparer Initials (optional)*

# MEMORANDUM

## DEPARTMENT OF TRANSPORTATION

Design / Construction Branch  
4201 E. Arkansas Avenue, Room 107  
Denver, Colorado 80222  
(303) 757-9309 FAX (303) 757-9197



**DATE:** May 9, 2014

**TO:** BRIAR Manual

Bridge Asset Management Manual  
Section 8 – Asset Management

**FROM:** CDOT Staff Bridge

**SUBJECT:** Safety Management of Bridges with Fracture Critical Members

### Existing In-Service Bridges

Existing bridges with fracture critical members are to be inspected per the National Bridge Inspection Standards.

Inspections of fracture critical members are to be documented as defined in the CDOT BRIAR manual and CDOT Colorado Coding Guide.

Essential Structure Repair findings on fracture critical members are to be addressed as defined in the CDOT BRIAR manual.

Collections of debris and failed protective systems on fracture critical members are to be treated as Essential Structure Repair findings.

Essential Structure Repair findings on fracture critical members are to be assigned a higher priority than a similar finding on a bridge without fracture critical members.

### New or Planned Bridges

New bridges with fracture critical members are to be designed per the latest AASHTO bridge design code, any applicable FHWA guidance, and any applicable CDOT guidance at the time of design.

### Concurrence



Joshua Laipply, P.E.  
Staff Bridge Engineer



Mahmood "Mac" Hasan, P.E.  
Project Support Engineer



Lynn Croswell, P.E.  
Bridge Inspection Engineer



Mark A. Nord, P.E.  
Bridge Asset Management Engineer

### CDOT Bridge Good Fair Poor Criteria

Rating	Criteria
Poor	<p>Sufficiency rating less than 50 and status of structurally deficient or functionally obsolete.</p> <ul style="list-style-type: none"> <li>Bridges in Poor condition do not meet all safety and geometry standards and require reactive maintenance to ensure their safe service. For the purpose of determining bridge-funding needs it is assumed that bridges in poor condition have exceeded their economically viable service life and require replacement or major rehabilitation.</li> </ul>
Fair	<p>Sufficiency rating from 50 and 80 and status of structurally deficient or functionally obsolete.</p> <ul style="list-style-type: none"> <li>Bridges in Fair condition marginally satisfy safety and geometry standards and either require preventative maintenance or rehabilitation.</li> </ul>
Good	<p>All remaining major bridges that do not meet the criteria for Poor or Fair.</p> <ul style="list-style-type: none"> <li>Bridges in good condition generally meet all safety and geometry standards and typically only require preventative maintenance.</li> </ul>

The following narrative is a summary of CDOT's bridge classification and was prepared for use in reports. The *Structurally Deficient and Functionally Obsolete Definition* document on the CDOT Staff Bridge web page provides a more complete definition of these two terms.

CDOT reports major vehicular bridge condition by the percent of bridge deck area statewide in good or fair condition. The National Bridge Inventory standards established by the Federal Highway Administration are used to inventory and classify the condition of the major vehicular bridges. The classification is based on a sufficiency rating of 0-100 and a status of not deficient, functionally obsolete, or structurally deficient.

Major vehicular bridges in poor condition have a sufficiency rating less than 50 and status of structurally deficient or functionally obsolete. Bridges in Poor condition do not meet all safety and geometry standards and require reactive maintenance to ensure their safe service. For the purpose of determining bridge-funding needs it is assumed that bridges in poor condition have exceeded their economically viable service life and require replacement or major rehabilitation.

Major vehicular bridges in fair condition have a sufficiency rating from 50 to 80 and a status of structurally deficient or functionally obsolete. Bridges in Fair condition marginally satisfy safety and geometry standards and either require preventative maintenance or rehabilitation.

Major vehicular bridges in good condition are all remaining major bridges that do not meet the criteria for Poor or Fair. Bridges in good condition generally meet all safety and geometry standards and typically only require preventative maintenance.

A bridge is structurally deficient if it does not meet minimum standards for condition or capacity. A structurally deficient bridge often has one or more members in poor condition due to

deterioration or other damage. Having only a small portion of a bridge in poor condition can result in the entire bridge being classified as structurally deficient. Structurally deficient bridges require monitoring, maintenance, or repair to ensure their safe use and continued service.

A bridge is functionally obsolete if it does not meet current minimum geometric requirements. Bridges classified as functionally obsolete often have inadequate roadway shoulders, insufficient number of lanes to handle current traffic volumes, overhead clearances less than minimums, or inadequate widths for roadways or streams passing underneath. Functional obsolete bridges may need signage (e.g. vertical clearance signs), reduced speeds, or traffic control devices (e.g. additional guardrails) to ensure safety.

Within this document there are four different definitions for Structurally Deficient and Functionally Obsolete.

- Narrative definitions used by Colorado DOT
- Quoted definitions from two separate AASHTO sources
- Quoted technical definition from FHWA
- Flow charts of technical definition used by Colorado DOT

### **Narrative definitions used by Colorado DOT**

#### **Structurally Deficient (SD)**

Structurally deficient is a term used by the National Bridge Inventory to classify bridges where the structural condition or capacity is less than fully adequate.

In Colorado a structurally deficient bridge is typically one where corrosion or deterioration has resulted in a portion of the bridge being in poor condition; for example, where water leaking through an expansion joint has caused the end of a steel girder to rust. Depending on the degree of deterioration bridges that are structurally deficient require additional monitoring, maintenance, or repair to ensure safety and continued service.

Having only a small portion of a bridge in poor condition can result in the entire bridge being classified as structurally deficient. When there are many locations and factors contributing to a bridge being classified as structurally deficient, or both structurally deficient and functionally obsolete, it can be more economical in the long term to replace the bridge rather than providing the increased monitoring, maintenance and repairs.

#### **Functionally Obsolete (FO)**

Functionally obsolete is a term use by the National Bridge Inventory to classify bridges where the size or geometric clearances of the bridges is less than fully adequate.

In Colorado bridges classified as functionally obsolete often have inadequate roadway shoulders, the number lanes are insufficient to handle current traffic volumes, the vertical clearance beneath the bridge is less than the legal clearances of 13.5' or 14.5', or the opening beneath the bridge is not wide enough – e.g., bridge foundations are located too close to roadways passing underneath, or flood waters are backed up when there is a stream passing underneath.

Bridges classified as functionally obsolete often require signage (e.g. vertical clearance signs), reduced speeds, or traffic control devices (e.g. additional guardrails) to ensure safety. It is not uncommon for replacement to be the most economical solution for bridges with inadequate geometry.

**Quoted definitions from the AASHTO source:**

National Bridges - AASHTO Subcommittee on Public Affairs  
<http://www.dot.state.ia.us/subcommittee/default.aspx>

**Structurally Deficient and Sufficiency Rating**

A bridge sufficiency rating includes a multitude of factors: inspection results of the structural condition of the bridge, traffic volumes, number of lanes, road widths, clearances, and importance for national security and public use, to name just a few.

The sufficiency rating is calculated per a formula defined in Federal Highway Administration's Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges. This rating is indicative of a bridge's sufficiency to remain in service. The formula places 55 percent value on the structural condition of the bridge, 30 percent on its serviceability and obsolescence, and 15 percent on its essentiality to public use.

The point calculation is based on a 0-100 scale and it compares the existing bridge to a new bridge designed to current engineering standards.

The bridge's sufficiency rating provides an overall measure of the bridge's condition and is used to determine eligibility for federal funds. Bridges are considered structurally deficient if significant load carrying elements are found to be in poor condition due to deterioration or the adequacy of the waterway opening provided by the bridge is determined to be extremely insufficient to point of causing intolerable traffic interruptions.

Every bridge constructed goes through a natural deterioration or aging process, although each bridge is unique in the way it ages.

The fact that a bridge is classified under the federal definition as "structurally deficient" does not imply that it is unsafe. A structurally deficient bridge, when left open to traffic, typically requires significant maintenance and repair to remain in service and eventual rehabilitation or replacement to address deficiencies. To remain in service, structurally deficient bridges are often posted with weight limits to restrict the gross weight of vehicles using the bridges to less than the maximum weight typically allowed by statute.

To be eligible for federal aid the following is necessary (a local match is required):

Replacement: bridge must have a sufficiency rating of less than 50 and be either functionally obsolete or structurally deficient.

Repair: bridge must have a sufficiency rating of less than [or equal to] 80 and the jurisdiction is prevented from using any additional federal aid for 10 years.

**Functionally Obsolete**

A functionally obsolete bridge is one that was built to standards that are not used today. These bridges are not automatically rated as structurally deficient, nor are they inherently unsafe. Functionally obsolete bridges are those that do not have adequate lane widths, shoulder widths, or vertical clearances to serve current traffic demand, or those that may be occasionally flooded.

A functionally obsolete bridge is similar to an older house. A house built in 1950 might be perfectly acceptable to live in, but it does not meet all of today's building codes. Yet, when it comes time to consider upgrading that house or making improvements, the owner must look at ways to bring the structure up to current standards.

**Quoted definitions from the AASHTO source:**

AASHTO -- Bridging the Gap  
<http://www.transportation1.org/bridgereport/struggle.html>

**Bridge Sufficiency Rating**

A bridge sufficiency rating includes a multitude of factors: inspection results of the structural condition of the bridge, traffic volumes, number of lanes, road widths, clearances, and importance for national security and public use, as examples.

The sufficiency rating is calculated by using a formula defined by the Federal Highway Administration. This rating indicates a bridge's sufficiency to remain in service. The formula places 55 percent of its value on the structural condition of the bridge, 30 percent on its serviceability and obsolescence, and 15 percent on whether it is essential to public use.

The point calculation is based on a 0–100 scale and compares the existing bridge to a new bridge designed to current engineering standards.

The bridge's sufficiency rating provides an overall measure of the bridge's condition and is used to determine eligibility for federal funds.

**Functionally Obsolete**

Of the nation's 590,000 bridges, a total of 73,000, about 12 percent, are rated as functionally obsolete.

A functionally obsolete bridge is one that was built to standards that are not used today. These bridges are not automatically rated as structurally deficient, nor are they unsafe. Functionally obsolete bridges are those that do not have adequate lane widths, shoulder widths, or vertical clearances to serve current traffic demand, or those that may be occasionally flooded.

A functionally obsolete bridge is similar to an older house. A house built in 1950 might be perfectly acceptable to live in, but it does not meet all of today's building codes. Yet, when it comes time to consider upgrading that house or making improvements, the owner must look at ways to bring the structure up to current standards.

**Structurally Deficient**

Of the nation's 590,000 bridges, some 80,000 are rated as structurally deficient, about 13 percent.

Bridges are considered structurally deficient if:

Significant load-carrying elements are found to be in poor condition due to deterioration, or  
The adequacy of the waterway opening provided by the bridge is determined to be extremely insufficient to the point of causing intolerable traffic interruptions.

Every bridge constructed goes through a natural deterioration or aging process, although each bridge is unique in the way it ages.

The fact that a bridge is classified under the federal definition as "structurally deficient" does not imply that it is unsafe. A structurally deficient bridge, when left open to traffic, typically requires significant maintenance and repair to remain in service and eventual rehabilitation or replacement to address deficiencies. To remain in service, structurally deficient bridges are often posted with weight limits to restrict the gross weight of vehicles using the bridges.

**Quoted technical definition from FHWA**

The technical Structurally Deficient and Functionally Obsolete definitions are not defined in the FHWA Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges (FHWA-PD-001). Instead the technical definitions are in the non-regulatory supplement for Part 650 Subpart D.

**Extract from Non-regulatory Supplement for Part 650, Subpart D of 23 CFR 650**

**HIGHWAY BRIDGE REPLACEMENT AND REHABILITATION PROGRAM (23 CFR 650.409).**

The National Bridge Inventory will be used for preparing the selection list of bridges both on and off of Federal-aid highways. Highway bridges considered structurally deficient or functionally obsolete and with a sufficiency rating of 80 or less will be used for the selection list. Those bridges appearing on the list with a sufficiency rating of less than 50.0 will be eligible for replacement or rehabilitation while those with a sufficiency rating of 80.0 or less will be eligible for rehabilitation. To be considered for the classification of deficient bridge, a structure must be of bridge length, and had not been constructed or had major reconstruction within the past 10 years.

a. **General Qualifications:** In order to be considered for either the structurally deficient or functionally obsolete classification a highway bridge must meet the following:

**Structurally Deficient -**

1. A condition rating of 4 or less for
  - \_ Item 58 - Deck; or
  - \_ Item 59 - Superstructures; or
  - \_ Item 60 - Substructures; or
  - \_ Item 62 - Culvert and Retaining Walls. orItem 62 applies only if the last digit of Item 43 is coded 19.
2. An appraisal rating of 2 or less for
  - \_ Item 67 - Structural Condition; or
  - \_ Item 71 - Waterway Adequacy.Item 71 applies only if the last digit of Item 42 is coded 0, 5, 6, 7, 8 or 9.

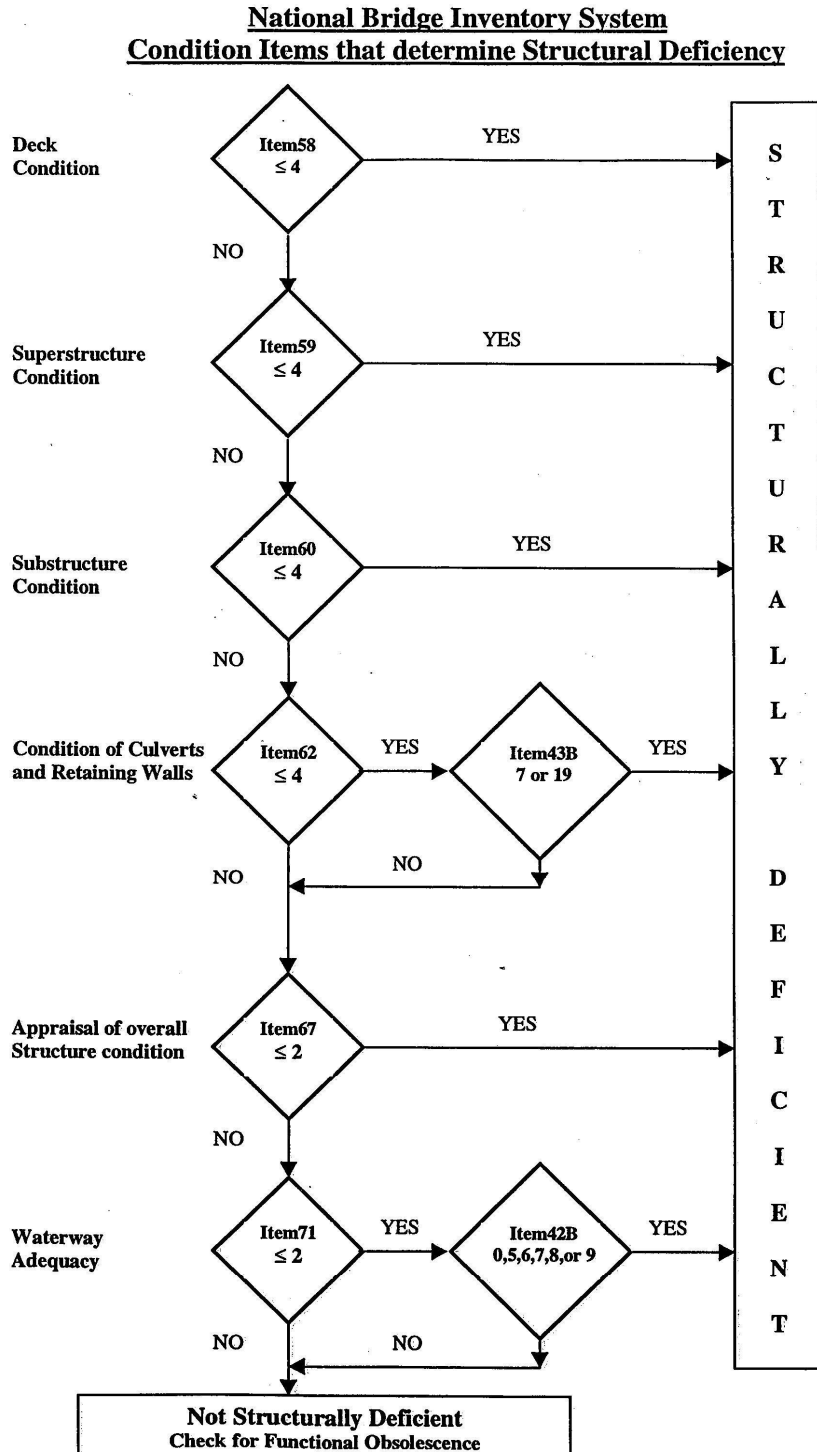
**Functionally Obsolete -**

1. An appraisal rating of 3 or less for
  - \_ Item 68 - Deck Geometry; or
  - \_ Item 69 - Underclearances; orItem 69 applies only if the last digit of Item 42 is coded 0, 1, 2, 4, 6, 7 or 8.
- \_ Item 72 - Approach Roadway Alignment. or
2. An appraisal rating of 3 for
  - \_ Item 67 - Structural Condition; or
  - \_ Item 71 - Waterway Adequacy.Item 71 applies only if the last digit of Item 42 is coded 0, 5, 6, 7, 8 or 9.

b. **Any bridge classified** as structurally deficient is excluded from the functionally obsolete category.

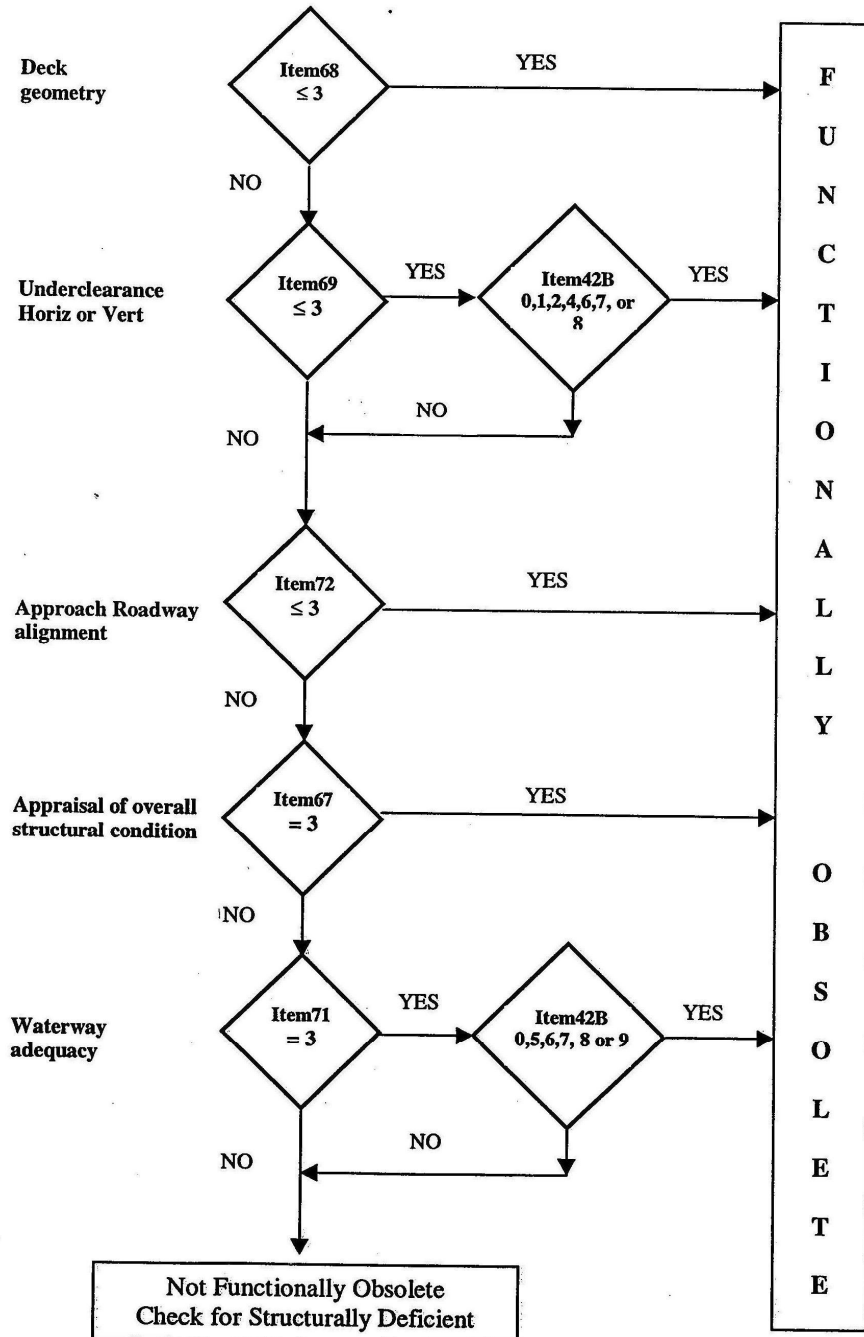
Flow charts of technical definition used by Colorado DOT

BMU 02/03/99



BMU 02/03/99

**National Bridge Inventory System**  
**Condition Items that determine Functional Obsolescence**



Note: A structure designated as Structurally Deficient cannot also be designated as Functionally Obsolete.

# STRUCTURE SUFFICIENCY RATING

**STRUCTURAL  
ADEQUACY  
AND  
SAFETY**  
**S1 = 55% Max.**

59 Superstructure Condition  
60 Substructure Condition  
62 Culvert Condition  
66 Inventory Rating

**SERVICEABILITY  
AND  
FUNCTIONAL  
OBsolescence**  
**S2 = 30% Max.**

28 Lanes on Structure  
29 Average Daily Traffic  
32 Approach Roadway Width  
43 Structure Type Main  
51 Bridge Roadway Width  
53 Vertical Clear Over Deck  
58 Deck Condition  
67 Structural Evaluation  
68 Deck Geometry  
69 Under clearances  
71 Waterway Adequacy  
72 Approach Roadway Alignment  
100 STRAHNET Hwy. Designation

19 Detour Length  
29 Average Daily Traffic  
100 STRAHNET Hwy. Designation

**ESSENTIALITY FOR  
PUBLIC USE**  
**S3 = 15% Max.**

## SPECIAL REDUCTIONS

**S4 = 13% Max.**

19 Detour Length  
36 Traffic Safety Features  
43 Structure Type, Main

**SUFFICIENCY RATING = S1 + S2 + S3 - S4**

**Sufficiency Rating shall not be  
less than 0% nor greater than 100%**

## **Bridge Program Description**

### **July 2010**

The CDOT bridge program originated with the FHWA Highway Bridge Replacement and Rehabilitation Program in 1972. Eligible work consisted of bridge inspection, appraisal and inventory; and, bridge replacement and major rehabilitation (rehabilitation added in 1978) for bridges on the FHWA Bridge Select List. At its inception the program consisted primarily of federal funds and the State's 20% match. Over the years the percentage of state funds in the program has grown.

In 1998 federal participation was broadened to include scour countermeasures, and in 2002, to include bridge preventative maintenance. Starting with fiscal year 2008 CDOT increased the scope of the program to include essential bridge and culvert repairs, bridge planned preventative maintenance, and culvert, overhead sign, signal, and high mast light inspection and inventory.

Culvert, overhead sign, signal, and high mast light inspections, as well as culvert and bridge essential repairs are not eligible for federal participation and should be coded as non-participating.. Some essential bridge repairs do meet the requirements for federal participation, but for simplicity and uniformity CDOT will code all essential repair work as non-participating.

The allocation of funds to the Regions is based on the area of bridges in each Region on the select list (i.e. the areas of bridges in poor and fair condition) and the linear feet of culverts with essential inspection findings. The funds are then further earmarked for each Region for the following subprograms.

- Bridge Replacement & Major Rehabilitation
- Bridge Preventative Maintenance
- Essential Bridge Repairs
- Essential Culvert Repairs

Each Region has only one control total from OFMB for their bridge program funds. The exact percentage of the Region's bridge program funds that are expended for each of the four subprograms in a given year is at the discretion of the Region. However, over several years the average dollar amount spent per year for each subprogram should approach the recommended subprogram allocation.

### **Bridge Enterprise**

The intent of this subprogram is to repair, reconstruct, replace, or maintain bridges on the state highway system that were identified poor as of January 1, 2009 or subsequently identified as poor. Bridges in poor condition have a Sufficiency Rating less than 50 and are either Structurally Deficient or Functionally Obsolete. The poor bridges on the bridge select list provide the initial prioritization of bridges eligible for the Bridge Enterprise.

The meaning of reconstruct is equivalent to major rehabilitation which means the project must bring the bridge up to current standards with the intent of obtaining an extended remaining service life – 75 years for new bridges, and preferably this long for major rehabilitation, but not

less than 10 years. The determination of whether to perform replacement or major rehabilitation is formally made through the bridge selection report process.

### **Bridge Replacement and Major Rehabilitation**

The intent of this subprogram is to remove poor and fair bridges from the select list; especially bridges in poor condition (i.e. Sufficiency Rating less than 50 and either Structurally Deficient or Functionally Obsolete). Eligible work is the replacement and major rehabilitation of bridges on the select list. The project must bring the bridge up to current standards. The meaning of “major” in major rehabilitation is, like replacement, the project must bring the bridge up to current standards with the intent of obtaining an extended remaining service life – 75 years for new bridges, and preferably this long for major rehabilitation, but not less than 10 years.

The determination of whether to perform replacement or major rehabilitation is formally made through the bridge selection report process. For bridges in fair condition (i.e. Sufficiency Rating from 50 to less than 80 and either Structurally Deficient or Functionally Obsolete) federal participation for replacement requires documentation that replacement is overall more cost effective than major rehabilitation – this is also accomplished, when needed, by the structure selection report process.

To maximize the efficiency of this program in removing bridges from the select list it is expected that the costs of nonstructural items will be minimized. FHWA’s goal nationally is to have the cost of nonstructural items not exceed 10% of the total project costs on bridge program projects, and to limit any additional costs for aesthetic treatment to items mandated by the project’s environmental documents. The cost for any project work that is not related to replacing or rehabilitating the bridge is not eligible.

The bridge select list provides the initial prioritization of bridges eligible for replacement or major rehabilitation. The Regions provide the final project selection. The Staff Bridge Asset Management Engineer will issue the select list annually in May.

### **Bridge Planned Preventative Maintenance**

The intent of this program is to help preserve the remaining service life of existing bridges, especially those in good and fair condition. The Department provides funds for bridge maintenance through the MLOS program. This subprogram provides additional funds for specific preservation activities – repairing leaking joints in bridge decks, waterproofing bridge decks, waterproofing exposed structural member surfaces, and washing of bridges.

The primary causes of reduced bridge service life are leaking joints in bridge decks, bridge deck deterioration, and deterioration of exposed concrete and structural steel surfaces. The Staff Bridge Asset Management Engineer will provide each Region with a prioritized list of bridges for joint repair and waterproofing bridges with asphalt riding surfaces. Staff Bridge is in the process of determining the best methods and materials for waterproofing bare concrete bridge decks and other exposed surfaces, and in the future will provide prioritized lists of bridges that would benefit from bridge preventative maintenance. In the meantime, these funds should focus on repairing leaking joints and waterproofing bridge decks with asphalt riding surfaces.

The lists from Staff Bridge provide the initial prioritization of bridges for preventative maintenance actions. The Region's make the final selection of projects. Generally it is recommended to use these funds in tandem with other project work to maximize their efficiency; e.g., waterproofing bridge decks and fixing expansion joints on resurfacing projects makes the most efficient use of traffic control expenditures and contributes to the long term durability of the new riding surface at the bridges.

### **Essential Bridge Repairs**

The intent of this program is to help ensure essential repair notices are addressed. Eligible work is as identified by essential repair notices issued by the Staff Bridge Inspection Engineer. To ensure safety and/or the continued use of the structure, essential repairs should be performed as soon as practical considering the priority identified in the notice. There are three possible priorities that can be assigned. First priority (orange) is as specified in the notice or at most 30 days. Second priority (yellow) is repair within 90 days. Third priority (green) is repair within one year or as funding allows. The Staff Bridge Inspection Engineer maintains a list of pending essential repairs in each Region and submits this list with each essential repair notice. In addition, the lists are maintained on a network share accessible to all within CDOT.

In most cases essential bridge repairs are not considered eligible for federal participating. However, scour remediation is eligible for federal participation.

The amount budgeted within this subprogram is not adequate to handle all essential repairs. The cost of some repairs requires funding from other sources. The Hanging Lake Tunnel repair is an extreme example of this. For collision damage, occasionally the hauling companies insurance pays for the repairs.

### **Essential Culvert and Minor Bridge Repairs**

The previous discussion regarding essential bridge repairs also applies to culverts and minor structures. This subprogram is for minor bridges and culverts that are less than 20' long measured along the centerline of roadway. Culverts longer than 20' are major structures and have the same eligibility in the bridge program as bridges longer than 20'. Structures less than four feet in length are currently not inspected by this subprogram.

The amount budgeted for this subprogram is significantly less than the backlog of essential repair notices for minor bridges and culverts. There is a large backlog because the minor bridge and culvert inspection subprogram did not start until FY04. In FY08 the Department completed the first round of inspections for all minor bridges and culverts, four feet to twenty feet in length.

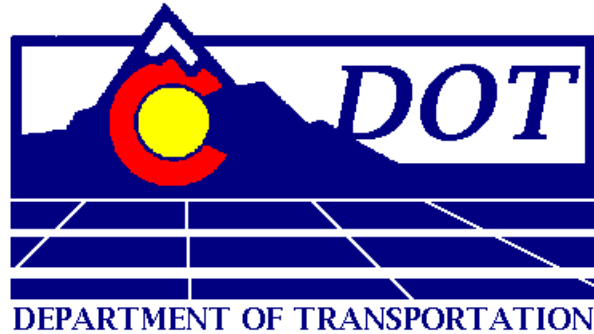
**Bridge Inspection and Asset Management****Culvert and Minor Bridge Inspection and Asset Management****Overhead Sign, Signal, and High-Mast-Light Inspection and Asset Management**

These three subprograms provide for the inspection, inventory, appraisal, and reporting of the named structures. These programs are managed by the Staff Bridge Branch. On-system bridges are inspected by CDOT employees. All other inspections are accomplished via consultant contracts.

**Off-System Bridge Inspection, Appraisal, and Inventory****Off-System Bridge Replacement and Major Rehabilitation**

These are the federally mandated counterparts to the on-system subprograms. Federal regulation requires that at least 15% of the federal bridge funds that DOT's receive be allocated to local agencies for these two subprograms. These subprograms are managed by the Staff Bridge Branch. The off-system bridge inspections are performed by consultant contract.

As with CDOT's bridges, there is a select list for off-system bridges in Colorado. This select list defines eligible replacement and major rehabilitation projects, and provides the initial prioritization of bridges. The final project selection is performed by the Special Highway Committee (SHC). The SHC is administered by the Colorado Municipal League (CML) and Colorado Counties Incorporated (CCI) and is composed of representatives from the cities and counties. The SHC receives applications from local agencies for bridge funds and reviews and ranks these for the final project selection. Staff Bridge has encouraged the SHC to maintain a three to five year prioritized listing of future projects. The Staff Bridge Inspection Engineer maintains a list of active projects and planned future projects.



# **Colorado Off-System Bridge Program Business Processes**

## **Project Selection, Programming and Budgeting**

**Staff Bridge Branch  
January 4, 2011**

## **Colorado Off-System Bridge Program Business Processes**

### **Project Selection, Programming and Budgeting**

August 12, 2010 revisions shown in blue font

January 4, 2011 updated links

#### **Project Selection**

- By the end of the first quarter of each fiscal year the Staff Bridge Off-System program will submit to the Special Highway Committee (SHC) the current select list of off-system bridges (the list of bridges eligible for off-system funding) and an updated Off-System Bridge Program Summary Report. The summary report will provide the SHC with the expected availability of off-system bridge program funds. The Staff Branches Business Office, region business offices, and region local agency coordinators will be copied on this submittal.
- Before the end of the 1<sup>st</sup> quarter of each fiscal year the Special Highway Committee (SHC) will solicit requests from the cities and counties for bridge program project funding.
- The SHC will meet before the end of the 2<sup>nd</sup> quarter of the fiscal year to select and approve bridge program projects for the next fiscal year.
- At this meeting the SHC will also prioritize the next three years of project requests received. This provides the local agencies with an indication of when their projects could possibly be funded, and provides the SHC and CDOT with a list of projects that could possibly be advanced if additional funds become available for the next fiscal year; e.g., if an authorized project for the next fiscal year is later withdrawn by the local agency. The project funding amounts for the 2<sup>nd</sup> through 4<sup>th</sup> year projects are tentative and for planning purposes. The final funding amounts will be finalized and approved when the project is authorized by the SHC for the current or next fiscal year.
- For a complete description of the off-system bridge program see the Colorado Off-System Bridge Program Description & Guidelines for Bridge Selection at the following location.  
<http://internal/StaffBridge/BridgeProgram/BridgeProgramIndex.htm>

#### **Initial Project Programming & Budgeting**

- During the 3<sup>rd</sup> quarter of the fiscal year the CDOT Off-System Program Manager will issue an e-mail notice of the projects authorized for the next fiscal year and of the amounts of program funds (FABZFST) that need to be transferred from the Statewide Off-System Bridge Pool to the Region Off-System Bridge Pools for these projects. The notice shall be accompanied by the Off-System Program Summary Report and sent to the SHC (via the Colorado Municipal League and Colorado Counties Incorporated), Staff Branches Business Office, region business offices, and region local agency project coordinators. [The notice will include for each bridge authorized the structure number, bridge location, and the local agency.](#)
- Acting on this notice from the program manager, the Staff Branches Business Office and OFMB will transfer the requested program funds from the statewide pool to the region pools. OFMB will typically include the additional 20% match of local funds (FAB00000). When the regions are ready to budget their projects they can request OFMB to add any local agency overmatch and tell OFMB who the overmatch is from. The statewide pool is normally funded with only 20% of FAB00000 funds.

- The region business offices will STIP the funds into the individual projects located in their region authorized by the SHC.
- The region budget offices will submit a budget action for approval by OFMB using the STIP Regional WBS number.
- Requests by the Staff Bridge Off-System Bridge Program Manager for transfers from the statewide to region pools will only be for the current or next fiscal year. In the past transfers were also occasionally made for subsequent years. The practice of transferring funds for subsequent years has been discontinued because it has led to complications when the scheduled year for a project changes (e.g. when a local agency asks to go in a later year or funds become available for the project to go in an earlier year), or the project budget has changed (e.g. due to inflation of construction costs).

### **Programming & Budget Modifications**

- Requests for funding changes shall be submitted to the Staff Bridge Off-System Bridge Program Manager by way of e-mail.
- The program manager will submit a recommendation for funding changes to the SHC for their approval. Approvals outside of the SHC's annual meeting will be processed by e-mail.
- On receiving approval from the SHC, the program manager will issue an e-mail notice of authorized funding changes and the amounts of program funds that need to be transferred between statewide and region off-system bridge pools. The notice shall be accompanied by an updated Off-System Program Summary Report and sent to the SHC, Staff Branches Business Office, region business offices, and region local agency coordinators.
- Acting on this notice the Staff Branches Business Office and OFMB will transfer funds between the statewide and region off-system bridge pools as requested.
- The region business offices will modify project STIP amounts and budget their updated projects from the region off-system bridge pool.

### **Project Closures**

- The Region Business Office will deSTIP any remaining funds due to project closures and move the funds to the region off-system bridge pool.
- The Region Business Office will inform OFMB of the project closure funds that need to be moved from the region pool to the statewide pool.
- OFMB will move the surplus region pool funds to the statewide off-system bridge pool. OFMB will identify the related project in the text of, or attachment to, the budget action in SAP. Identifying the project helps Staff Bridge maintain the separate totals of city and county funds available.

### **Reporting**

- The current Off-System Bridge Program Summary Report can be accessed by CDOT personnel at any time at the following location.  
<http://internal/StaffBridge/BridgeProgram/BridgeProgramIndex.htm>
- The report provides an accounting of the statewide off-system bridge pool, the amount of funds available for authorization by the SHC, a listing of current project authorizations, and a summary

of transfers between the statewide and region pools. Only program funds (FABZFST) are tracked by Staff Bridge and the summary report. Local agency matching funds are not reflected.

- The program summary report will be updated whenever there are any changes to project authorizations by the SHC, and whenever the Staff Bridge Program Manager requests a transfer of funds from the statewide pool and region pools.
- In the program summary report any remaining funds due to project closures are not shown until the funds are returned to the statewide pool. It is important that the region business offices have OFMB return any unused funds to the statewide pool as described above.
- To keep city and county balances of available funds correct in the summary report, we need to:
  - Return unused funds from closed projects to the statewide pool and identify the project they are from as part of the transfer. [Return unused funds to the statewide pool for any projects where the final amount budgeted was less than the amount transferred from the statewide pool. Identify the project as part of the transfer.](#)
  - Do not use funds for unauthorized projects. Send requests for authorizations to the Staff Bridge Off-System Program Manager.
  - Do not use more funds for a project than is authorized. Send requests for supplemental authorizations to the Staff Bridge program manager.
  - Let the Staff Bridge program manager know of any projects that are withdrawn. The list of authorized projects needs to reflect any terminated projects.
  - The current region “BRO” pools were established in 2007. If any funds from the region pools have been used for projects that were authorized before 7/1/2007, the regions need to let the Staff Bridge program manager know and the list of project authorizations will be updated accordingly. If not updated the spreadsheet will show these funds as still available for additional authorization.

# MEMORANDUM

DEPARTMENT OF TRANSPORTATION  
Staff Bridge Branch  
4201 E. Arkansas Avenue, Room 107  
Denver, Colorado 80222  
(303) 757-9309 FAX (303) 757-9197



CDOT BRIAR Manual  
Section 11 – Off-System  
Bridge Program

Date: August 26, 2010  
To: CDOT BRIAR Manual Users  
From: Mark A. Leonard, Staff Bridge Branch Manager  
Subject: Off-System Bridge Program  
Staff Bridge Internal Policy  
Roles, Responsibilities, & Reports

## Program Reports & Documents

The Staff Bridge Branch will maintain the following off-system bridge program reports and documents.

- Colorado Off-System Bridge Program Description & Guidelines for Bridge Selection
- Colorado Off-System Bridge Program Business Processes – Project Selection, Programming and Budgeting
- Off-System Bridge Program Summary Report
- Off-System Bridge Project Tracking Report
- BRO FMEDDW Report
- Off-System Bridge Select List
- Program Correspondence File

The Colorado Off-System Bridge Program Description & Guidelines for Bridge Selection document shall provide the necessary description of the program to CDOT and non-CDOT individuals that are interested in the program. In addition to providing an understanding of the program, it will provide the information needed by local agencies to submit applications for program grants.

The Colorado Off-System Bridge Program Business Processes – Project Selection, Programming and Budgeting document shall describe the interdepartmental business processes concerning the off-system program. The intended audience for this report is the Special Highway Committee (SHC), and CDOT personnel that work with the bridge program: Staff Branches and regional business offices, OFMB personnel, local agency coordinators, and Staff Bridge personnel.

The Off-System Bridge Program Summary Report is to provide an accounting of the previous and current available funds in the statewide off-system bridge pool, project authorizations, and transfers between the statewide pool and region pools. The timeframe for the report shall be from July 1, 2007 to the date of the current report. The information in the report shall be based SAP documented budget actions and identification of project authorizations by the Program Manager. The purpose of this report is to provide the Department's official identification of project authorizations, and program funding available for

authorization by the SHC. The current status of program authorizations and statewide pool balances shall be tracked and reported.

The Off-System Bridge Project Tracking Report shall provide the history bridge off-system project budget actions. The timeframe for the report shall be from July 1, 2007 to the date of the current report. The information shall be based on SAP documented budget actions and SAP project information. This report is maintained to ensure project budget actions are consistent with the SHC project authorizations, and help the Program Manager facilitate the return of unused project funds to the statewide pool. The status of project actions shall be tracked and reported on.

The BRO FMEDDW report is a working document used by Staff Bridge to provide help provide the SAP budget action needed to maintain the program summary and project tracking reports. The report consists of the history of program budget actions from SAP with annotations to facilitate the identification of projects and pools associated with the transfers. The timeframe of the report is from July 1, 2006 through the date of the current report.

The Off-System Select List is the Department's official list of off-system bridge currently eligible for bridge program funding.

The Program Correspondence File shall contain all correspondence and meeting minutes related to the following. The file shall be kept in chronological order, made available on request for reference by others, and maintained for use by the current and subsequent Program Managers. As a minimum the file shall be complete starting from July 1, 2006.

- Recommendations made by Staff Bridge to the SHC
- Approved project authorizations by the SHC
- Program fund transfer requests made by Staff Bridge

## **Reports & Documents – Archiving & Access**

With the exception of the Bridge Select List and Program Correspondence file, the most recent approved and submitted versions of the foregoing reports and documents shall be archived in the Branch document archive. [\\Public\bridge policy & standards\Branch Administrative\BRO Tracking Reports](#)

Staff Bridge will maintain an internal web page for the Off-System Bridge Program to provide the current approved versions of the following documents. <http://internal/StaffBridge/Reports/ReportIndex.htm>

- Colorado Off-System Bridge Program Business Process – Project Selection, Programming and Budgeting
- Off-System Bridge Program Summary Report
- Off-System Bridge Project Tracking Report
- Colorado Off-System Bridge Program Description & Guidelines for Bridge Selection
- Off-System Bridge Select List
- Off-System Bridge Program Internal Policy Memo

## **Position Responsibilities**

### **Staff Bridge Off-System Bridge Program Manager:**

- Department's liaison with the SHC.
- Provides information from the Department needed by the SHC.
- Technical and program advisor to SHC, CDOT regional personnel, and local agencies.

- Formulates recommended new project authorizations for the SHC based on available funding and the grant requests the SHC committee has received from local agencies.
- Makes recommendations to the SHC for project fiscal year schedule modifications as needed to optimize the employment of available program funds. Conducts periodic reviews of available funding and current project authorizations to identify opportunities to reschedule projects to optimize the use of available program funds. Makes associated inquiries and recommendations to local agencies as needed.
- Receives requests for project authorizations, or authorization modifications, from local agencies and CDOT personnel. Formulates these requests and advances them to the SHC with recommendations for SHC action.
- Responsible for maintaining all program reports and documents, itemized above, with the exception of the program summary report and select list.
- Responsible for ensuring providing the bridge and budgetary information the SHC and Branch need for making decisions and on which they base their approvals, and ensuring this information is accurate and complete.
- Ensuring all bridges recommended to the SHC for funding are eligible for program funds.

#### **Staff Bridge Branch Manager:**

- Shall approve all requests by Staff Bridge for transferring program funds from the statewide pool.
- As part of the Branch's front office budget tracking processes, shall be responsible for maintaining the program summary report based on budget action information from SAP and project authorization information from the program manager.
- Shall approve all subsequent versions of the following reports and documents.
  - Colorado Off-System Bridge Program Description & Guidelines for Bridge Selection
  - Colorado Off-System Bridge Program Business Processes – Project Selection, Programming and Budgeting
  - Off-System Bridge Program Summary Report

#### **Staff Bridge Structure Asset Management Engineer**

- Shall be responsible for maintaining the off-system select list and ensuring its availability at least by July 1<sup>st</sup> of each year.
- Shall be responsible for maintaining the off-system bridge program web page, as part of the asset management unit's duties to provide the Department's bridge related information to outside parties.

#### **Internal Budgeting Processes & Approvals**

Interdepartmental roles and procedures shall be as defined by the Colorado Off-System Bridge Program Business Process – Project Selection, Programming and Budgeting document.

All new program project authorizations and modifications to existing project authorizations shall be approved by the SHC.

All requests by Staff Bridge for transferring funds from the statewide pool shall be made by the Program Manager and be approved by the Branch Manager. These requests shall be accompanied by a current version of the Program Summary Report. The Branch Manager's approval is with regard to the availability of funds based on the information in the Program Summary Report.

The Program Manger shall be responsible for tracking project budget actions and issuing notices to the applicable business offices for any incidents of budget actions that are not consistent with the SHC project authorizations as reported in the Program Summary Report.

All recommendations to the SHC by Staff Bridge shall be made by the Program Manager. An updated copy of the summary report shall accompany all Staff Bridges requests and recommendations to the SHC for action.

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Jeffery A. Anderson  
Off-System Bridge Program Manager

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Mark A. Nord  
Bridge Asset Management Program  
Manager

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Mark A. Leonard  
Staff Bridge Branch Manager

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Richard J. Gabel  
Director of Staff Services



# Colorado Off-System Bridge Program Description and Guidelines for Selecting Bridges for Rehabilitation or Replacement Funding

These guidelines are intended to provide assistance in selecting OFF-SYSTEM bridge projects and estimating funding eligibility and participation in accordance with the requirements of the Federal Highway Bridge Program and CDOT established criteria.

For more information, contact:

Colorado Department of Transportation  
Staff Bridge Branch  
Structure Asset Management Unit, or  
Structure Inspection Unit  
(303) 757-9309

September 9, 2011

## Program Description

What is a bridge? The Federal definition of a bridge as defined in the National Bridge Inspection Standards (NBIS) published in the Code of Federal Regulations (23 CFR 650.3) is as follows:

“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 (6.1 meters) between undercopings of abutments or spring lines of arches, or extreme ends of openings for multiple boxes; it may also include multiple pipes, where the clear distance between openings is less than half of the smaller contiguous opening.”

Public bridges meeting this definition fall under the provisions of the National Bridge Inventory Standards (NBIS) and must be inspected on a regular basis. The results of the inspections become a part of the National Bridge Inventory (NBI).

The federal government, through the federal bridge program, provides funding to the Colorado Department of Transportation (CDOT), as well as the other states, for financing a portion of the replacement or rehabilitation costs of bridges which are on the Select List. These funds are also used for bridge inspection, inventory, and asset management purposes.

CDOT's bridge program consists of the federal bridge program funds allocated to the state plus state funds. In recent years state funds have made up 40% to 50% of the total program. Per Federal requirements at least 15% of the federal bridge program funds must be used for off-system bridges. In recent years CDOT has allocated 30% to 35% of the total CDOT bridge program funds to off-system bridges.

The terms on-system and off-system refer to the Federal Functional Classification description of the route carried by the bridge. Generally CDOT owned bridges are on-system and city and county owned bridges are off-system. More specifically,

- On-System bridges are those where Item 26 of the NBI = one of the following:
  - 01 (Rural, Principal Arterial - Interstate),
  - 02 (Rural, Principal Arterial - Other),
  - 06 (Rural, Minor Arterial),
  - 07 (Rural, Major Collector),
  - 11 (Urban, Principal Arterial - Interstate),
  - 12 (Urban, Principal Arterial - Other Freeways or Expressways) ,
  - 14 (Urban, Other Principal Arterial), or
  - 16 (Urban, Minor Arterial).
- Off-System bridges are those where Item 26 of the NBI = one of the following:
  - 08 (Rural, Minor Collector),
  - 09 (Rural, Local),
  - 17 (Urban Collector), or
  - 19 (Urban, Local).

## Definition of Terms

### National Bridge Inventory (NBI)

The aggregation of structure inventory and appraisal data collected to fulfill the requirement of the National Bridge Inspection Standards that each State shall prepare and maintain an inventory of all bridges subject to the NBIS.

### National Bridge Inspection Standards (NBIS)

Federal regulations establishing requirements for inspection procedures, frequency of inspections, qualifications of personnel, inspection reports, and preparation and maintenance of a State bridge inventory. The NBIS apply to all structures defined as bridges on all public roads.

### Public Road

Any road under the jurisdiction of and maintained by a public authority and open to public travel.

### Sufficiency Rating

The sufficiency rating formula is a method of evaluating data by calculating four separate factors to obtain a numeric value which is indicative of a bridge's sufficiency to remain in service. The result of this method is a percentage in which 100 percent would represent an entirely sufficient bridge and zero would represent an entirely insufficient or deficient bridge. The sufficiency rating shall not be less than 0% nor greater than 100%.

The factors considered in determining a sufficiency rating are: S1 - Structural Adequacy and Safety (55% maximum), S2 - Serviceability and Functional Obsolescence (30% maximum), S3 - Essentiality for Public Use (15% maximum), and S4 - Special Reductions (detour length, traffic safety features, and structure type - 13% maximum).

$$\text{Sufficiency Rating} = S1 + S2 + S3 - S4.$$

Bridges which have a sufficiency rating less than 80.0 qualify for the Federal Select List.

### Federal Select List of Bridges

The Federal Select List of Bridges, commonly known as "the Select List", is a subset of the National Bridge Inventory (NBI). The bridges on the Select List have a Sufficiency Rating less than, or equal to, 80.0 AND are either Structurally Deficient or Functionally Obsolete. Bridge program funds can be expended only on bridges which meet these Select List criteria.

To further refine the use of bridge program funds, those bridges on the Select List that have a sufficiency rating from 50.0 through 80.0 qualify only for rehabilitation unless it can be shown that replacement is more economical or feasible. Bridges on the Select List which have a sufficiency rating less than 50.0 qualify for replacement.

## Selecting Bridges for Rehabilitation or Replacement Funding

The following procedures and requirements are used for bridge replacement and rehabilitation projects utilizing bridge program funds.

1. Projects are selected for funding by the Special Highway Committee (SHC). The SHC is administered through the Colorado Municipal League and Colorado Counties Incorporated and is composed of four representatives each from counties and municipalities.

On years where bridge program funding is available for authorizing additional projects, the SHC will solicit the counties and municipalities for bridge applications. Projects are then selected based on priority, typically determined by sufficiency rating and available funds.

Off-System bridge program projects are administered by the CDOT regional offices through the Region Local Agency Project Coordinator. When a county or municipality is notified by the SHC that their bridge application has been successful, the county or municipality then works with the CDOT Region Local Agency Project Coordinator to deliver the project.

The SHC will typically maintain a four year plan of projects. Funding is typically not made available until July and is only made available for budgeting projects scheduled in that fiscal year. The state fiscal year starts on July 1<sup>st</sup>.

2. Before submitting an application for bridge program funding to the SHC, verify that the structure is on, or currently qualifies for, the Federal Select List of Bridges. A copy of the select list can be obtained from the CDOT Staff Bridge Branch, Structure Asset Management Unit. In order to qualify for the Select List, two conditions must be satisfied:
  - a) The structure must have a Sufficiency Rating of 80.0 or less and
  - b) The structure must be either Structurally Deficient (SD) or Functionally Obsolete (FO). Whether a structure is SD or FO is determined by applying specific Federal criteria. If a structure is both SD and FO, then the SD designation controls.

Changes of bridge inspection coding may cause the bridge to fall off the current Select List. Bridges are generally considered eligible if the bridge has appeared on the Select List sometime in the last ten years. Any request to use bridge program funds for a bridge not on the Select List should be fully documented and justified to indicate that additional deficiencies have developed through some natural or unforeseen phenomenon or that the bridge was dropped from the Select List because of changes in the Federal Coding Guide. Contact the Bridge Management Unit for clarification in these cases.

2. Determine if the structure qualifies for replacement or rehabilitation funding:
  - a) Replacement: Structures on the Select List with a Sufficiency Rating LESS THAN 50 qualify for replacement. However, rehabilitation of a structure should always be considered.

Project eligibility includes total replacement of a structurally deficient or functionally obsolete bridge with a new facility constructed in the same general traffic corridor.

- b) Rehabilitation: Structures on the select list with a Sufficiency Rating less than or equal to 80.0 qualify for rehabilitation.

Project eligibility includes the work required to restore the structural integrity of a bridge, as well as work necessary to correct major safety defects, except as noted under ineligible work.

3. Bridge program requirements which must be addressed:

- a) Design Requirements: The project design for replacement or rehabilitation must follow the criteria set by the following design documents: CDOT Project Development Manual, CDOT Bridge Design Manual, CDOT Bridge Detailing Manual, CDOT Bridge Rating Manual, CDOT Drainage Manual, the AASHTO LRFD Bridge Design Specifications, the AASHTO Policy on Geometric Design of Highways and Streets, and other requirements as identified by the CDOT Region Local Agency Project Coordinator.

A structural selection report shall address alternative and economic solutions for the replacement or rehabilitation of the existing bridge.

On a case-by-case basis, under certain conditions a structure apparently only eligible for rehabilitation may still be replaced if:

1. the existing structure type makes rehabilitation impossible, or
2. the existing conditions would be sacrificed by rehabilitation, or
3. the cost of rehabilitation would exceed the cost of replacement.

Applicable hydraulic and environmental issues shall also be included in the report. This report should be submitted in the early stages of the design process to CDOT Staff Bridge Design and Management through the Special Highway Committee. CDOT Staff Bridge Design and Management will forward the report to the appropriate Region Local Agency Program Manager for review and concurrence.

b) Ineligible work:

- 1) Roadwork: The costs of long approach fills, causeways, connecting roadways, interchanges, ramps, and other extensive earth structures, when constructed beyond the attainable touchdown point, are not eligible under the bridge program.

A nominal amount of approach work, sufficient to connect the new facility to the existing roadway or to return the gradeline to an attainable touchdown point in accordance with good design practice is eligible. This roadway work should generally be no more than 15% of the cost for replacing the bridge and shall not be more than the minimum necessary to meet current geometric design requirements.

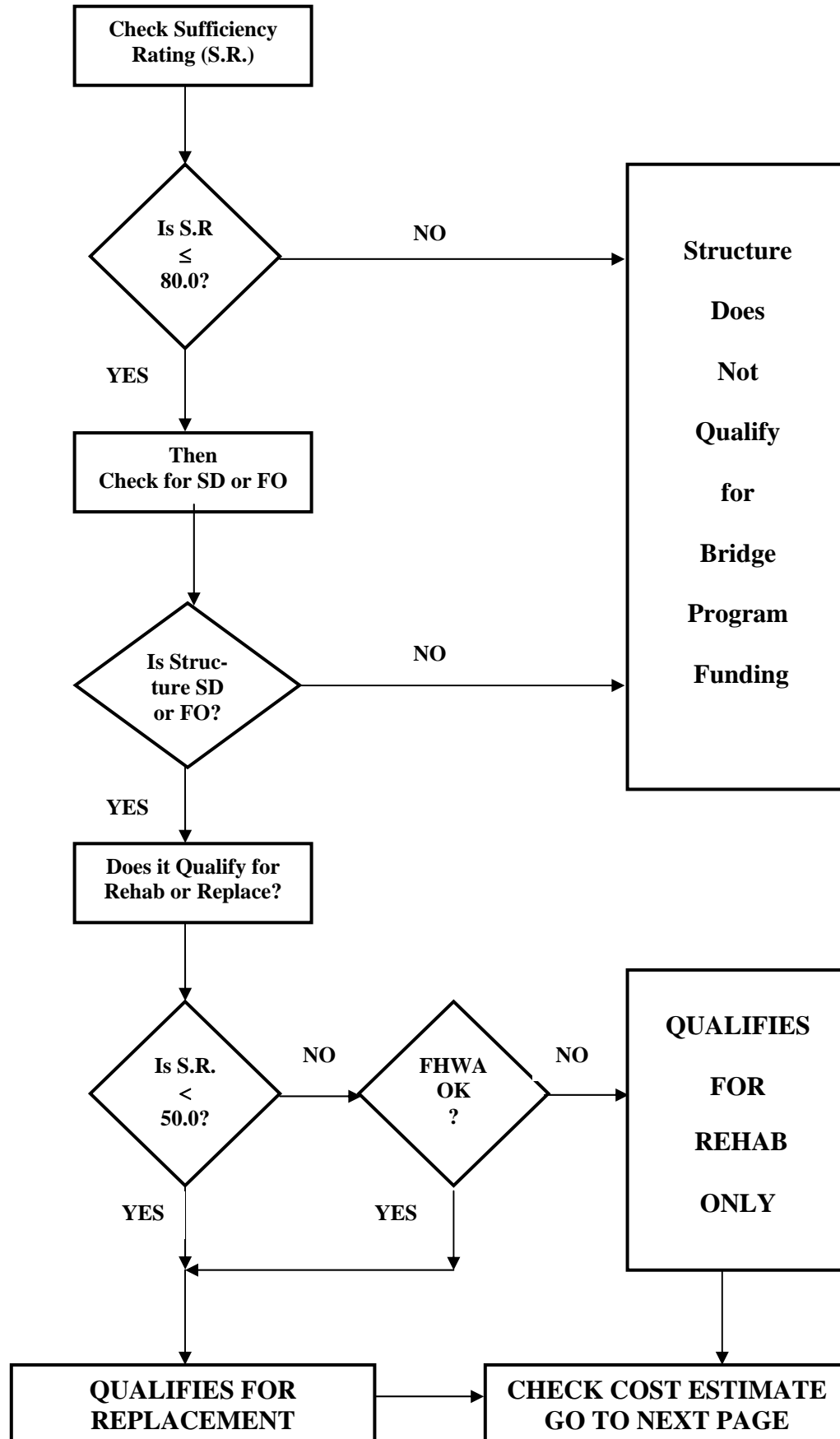
Roadwork costs exceeding 15% of the bridge replacement or rehabilitation costs, or the minimum necessary to meet current geometric design requirements, shall utilize other funding sources.

- 2) Aesthetic features: Special architectural features on bridges required by the environmental document may be eligible for bridge program funds. Otherwise, other funding sources shall be utilized.
- 3) Ten-Year Rule: A bridge will not appear on the Select List nor qualify for bridge program funding within 10 years of the date of its construction, reconstruction or major rehabilitation. This policy applies no matter what funds were used for the construction, reconstruction or rehabilitation: Federal, State, local, private, or any combination thereof.

Bridges removed from the Select List because of the 10-year rule criteria but with Federal-aid funds obligated for construction work prior to their removal will continue to be eligible for bridge program funds.

- 4) Examples of work which are not considered reconstruction or major rehabilitation and are not eligible for bridge program funding:
  - A. Safety feature replacement or upgrading (for example, bridge rail, approach guardrail or impact attenuators).
  - B. Overlay of bridge deck as part of a larger highway surfacing project (for example, overlay carried across bridge deck for surface uniformity without additional bridge work).
  - C. Utility work.
  - D. Emergency repair to restore structural integrity to the previous status following an accident. Federal ER program funding may be available for a declared disaster exceeding \$700,000 roadway/bridge damage.
  - E. Retrofitting to correct a deficiency which does not substantially alter the physical geometry or increase the load-carrying capacity.
  - F. Work performed to keep a bridge operational while plans for complete rehabilitation or replacement are under preparation (for example, adding a substructure element or extra girder).

## Eligibility Flow Chart



## Estimating Reasonable Costs for Bridge Replacement

The following method is provided to estimate bridge replacement cost prior to any engineering and is for planning purposes and to establish an initial reasonable project cost. A detailed engineering cost estimates will be needed before starting either the design or construction phases of projects using bridge program funds. Actual costs will be significantly different than this estimate.

The SHC or CDOT may require a detailed engineering estimate before approving an application for funding or a request to supplement previously approved funds. If the funding requested exceeds the amount obtained by using this method, a detailed engineering cost estimate should be performed to help justify the request.

This method only applies to bridge replacements. Bridge rehabilitation projects vary widely in scope and therefore require a bridge engineer's estimate.

The "total project cost factor" accounts for the roadway work, traffic control, utilities, environmental work, ROW, and other non-bridge items that relate to the bridge replacement project.

The larger "engineering cost factor" includes both design and construction engineering. If the application is for construction funds only, use the smaller factor.

If the "new bridge deck area" is not known, a method for estimating the new area based on the area of the old bridge is given below.

### Estimating Total Project Cost

New bridge deck area	_____	Sq. Ft.
Times the bridge only unit cost,	_____	x \$134/Sq. Ft.
Times the total project cost factor,	_____	x 2.73
Times engineering cost factor,	_____	x 1.31 or 1.15
Estimated reasonable total project cost =	\$ _____	

### Estimating New Bridge Deck Area

Calculate the deck area of the existing bridge to the nearest Square Foot:

Structure Length (NBI Item49):	_____	Ft.
Times the width out-to-out (NBI Item52):	_____	Ft.
Existing Deck Area =	_____	Sq. Ft.

Estimate the area of the new bridge deck:

Existing Deck Area from above	_____	Sq. Ft.
Multiply by size factor	_____	x 2.11
Estimated new deck area =	_____	Sq. Ft.

# MEMORANDUM

DEPARTMENT OF TRANSPORTATION  
Staff Bridge Design  
4201 E. Arkansas Avenue, Room 330  
Denver, Colorado 80222  
(303) 757-9309 FAX (303) 757-9197



**DATE:** June 11, 2013  
**TO:** Off-System Bridge Inspection Consultants  
**FROM:** Karen S. Mondragon  
**SUBJECT:** Policy for Updating NBI Item 41, Operational Status (Load Posting Code) for Off-System Bridges

CDOT BRIAR Manual  
Section 11 – Off-System Bridge Program

This memorandum supersedes the memorandum of the same subject dated May 24<sup>th</sup>, 2012.

This document establishes the policy for updating the operational status code for NBI Item 41 Structure Open, Posted or Closed to Traffic in the Master Off-System Pontis/NBI Database.

Per the recommendation of the FHWA, we will update our current database by changing all B's to P's where bridge owners have turned in a signed and dated load posting certificate. However, beginning with Fiscal Year 12 bridge inspections, CDOT will use the following procedure for changing B's to P's.

During the regular inspection of structures requiring load posting, the inspector shall take photos of the posting signs at all approaches to the bridge. Those photos are to be included as part of the inspection report. Also, the inspector shall note the status of the posting in the inspection report in the comments for Pontis Element 600, General Remarks.

Following the inspection of structures that require load posting, the bridge inspection consultant shall notify the bridge owner within 3 business days when bridges are not posted as required and change Item 41 to a B. The consultant shall notify the bridge owner by sending an essential repair notice, preferably by email, or by hard copy in the event the owner does not have access to email. The notice shall inform the owner of the reason that the structure is not properly posted. The notice shall include the recommended posted values. The notice shall also inform the owners about the MUTCD load posting sign requirements. The notice shall direct the owner to send in photos of the corrected load posting signs to the consultant. When the consultant receives the photos of the corrected load posting the consultant will change the NBI Item 41 to a P for the structure. The consultant shall include the owners posting sign photos in the inspection report.

The bridge owner shall have all posting signs in place within 90 days from the date of the essential repair notification.

During the final presentation of inspection reports to the bridge owners, the bridge inspection consultant shall give the owner a copy of the load posting certificate, which lists all of their structures that require posting. The consultant shall remind the owner about any remaining posting deficiencies, i.e. any remaining B's for Item 41, those structures where posting is required but still not legally implemented. The structures with B's shall be posted with the values shown on the certificate and on the load rating summary sheet for the structure. Once the owner has accurately posted those structures, they shall document the posting with photographs of the posting signs at the bridges. They shall send a copy of the photos along with the signed and dated certificate back to the CDOT Off-System Inspections Project Manager. Upon receiving the signed certificate and photos, CDOT will change Item 41 from a B to a P in the master Off-System Pontis/NBI database.

Signature on File

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Lynn E. Croswell, P.E.  
CDOT Bridge Inspections Engineer

Signature on File

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Joshua R. Laipply, P.E.  
Staff Bridge Engineer

Signature on File

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Karen S. Mondragon  
Statewide Bridge Inspections Coordinator  
Off-System Inspections Project Manager

Signature on File

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