

**Staff Bridge Branch**

Revised October 1998

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# **Pontis Bridge Inspection Coding Guide**

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Colorado Department of Transportation  
Staff Bridge Branch  
4201 East Arkansas Avenue  
Room 330  
Denver, Colorado 80222-3400

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## ***Introduction***

The Pontis Bridge Inspection Coding Guide was developed by the Staff Bridge Branch of the Colorado Department of Transportation. The July 1997 revision was made with input from CDOT bridge inspectors who had been performing bridge inspections using Pontis for approximately four years. The revision includes cross references to the General Comments and Definitions necessary to provide for uniform inspection reports from various bridge inspectors.

This Colorado version is intended to supplement the AASHTO Guide for Commonly Recognized (CoRe) Structural Elements with clarifying information and additional elements unique to Colorado bridges and structures. If conflicts occur between the guides, the AASHTO guide governs.

For comments or questions concerning this coding guide, please contact the Bridge Management Unit at 303/757-9187 or write to:

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Pontis Bridge Inspection Coding Guide**

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- 112 -4- Steel - Stringer - Unpainted
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120 -4- Steel - Bottom chord Through Truss - Unpainted  
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125 -4- Steel - Through Truss excluding Bottom Chord - Unpainted  
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#### **Substructure**

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- 300 -3- Strip Seal Expansion Joint
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- 302 -3- Compression Joint Seal
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### **SmartFlags**

- 355\*-3- Steel Diaphragms
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- 357 -4- Pack Rust (Superstructure)
- 358 -4- Deck Surface Cracking
- 359 -5- Soffit of Concrete Decks and Slabs
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- 362 -3- Traffic Impact (Superstructure)
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- 371\*-3- Traffic Impact (Deck)
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- 373\*-4- Pack Rust (Substructure)
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**Channel/Roadway Alignment/General Remarks**

501\*- Channel Condition  
502\*- Channel Protection Material and Condition  
504\*- Bank Condition  
505\*- Debris  
510\*- Waterway Adequacy  
520\*- Approach Roadway Alignment  
600\*- General Remarks

*The asterisk which follows the Element number or SmartFlag number indicates it was created by CDOT. The bold number indicates the number of condition states.*

## **General Comments and Definitions**

### **Rust Codes (R Codes)**

- R1** = Peeling of the paint, pitting, surface rust, etc., no measurable section loss.  
**R2** = Flaking, minor section loss (< 10% thickness loss).  
**R3** = Flaking, swelling, mod section loss (10% < thickness loss < 30%).  
**R4** = Heavy section loss (> 30% thickness loss), may have holes through base metal.

### **Concrete Scaling Codes (S Codes)**

- S1** = Light scale up to 1/4" deep.  
**S2** = Moderate scale up to 1/2" deep with agg. exposed.  
**S3** = Heavy scale up to 1" deep with some agg. loose or missing.  
**S4** = Critical scale greater than 1" deep with reinforcing bars exposed and general disintegration of the concrete.

GCD01 - **Timber Girders and Stringers:** When reporting quantities in the various condition states, the entire timber girder or stringer length in the worst condition state is to be reported per girder or stringer. For example, if the girder or stringer is 23' long, the reporting quantity is 23' in the worst condition state contained within that girder or stringer.

When timber girders or stringers enter Condition State 3 or 4 and have been repaired, they revert back to Condition State 2. However, **when 25% of the total number of girders or stringers are split, cracked, OR repaired** then all of those girders or stringers shall be listed in Condition State 4 and remain there along with any new split, cracked, or repaired girders or stringers. **When this occurs, a new load rating based on reduced allowable stresses is required - submit the structure folder to the rating unit for evaluation.**

Check - Separation of wood fibers along the grain but not completely through the section.

Split - Separation of wood fibers (can be tight) that extends completely through the section but does not extend to the top or bottom. Usually starts at the ends.

Crack - Separation of wood fibers through the section extending to the top or bottom fibers.

GCD02 - Bridges with **approach slabs** will have a quantity for the type of joint between the abutment backwall and the approach slab. Also, approach slabs that are on "sleeper slabs" at the end away from the bridge will have a quantity for the type of joint over the

"sleeper slab". This joint is between the approach slab and the concrete

roadway pavement. If there is a question about there being a "sleeper slab" you should refer back to the plans, if plans are not available, then treat it as not having a "sleeper slab". The **total quantity** of approach slabs is usually two, however there may be more.

**Approach spans** that cannot be inspected shall be coded and treated as an approach slab. The **total quantity is usually two**, but not greater than four (for parallel bridges with a closed median with one structure number). When approach spans are accessible, the appropriate elements shall be coded and quantities reported. The number of spans for the bridge include approach spans which are accessible.

**Railroad bridges with approach slabs** which are covered with ballast that cannot be inspected should not have the approach slab element coded. Mention the existence of the approach slab in the abutment element comment field. 320 321

GCD03 - **Open Spandrel Concrete and Steel Arches:** Treat as a truss with panels (Refer to GCD16). The caps on top of the spandrels are to be treated as floor beams and the spandrels are to be treated as verticals. 140 141 143 144

GCD04 - When **pulpits or saddles** have been added to restore the bearing area, the condition of the bearing may be restored to Condition State 1, however the damaged portion of the girder will continue to be reported. The pulpit or saddle should be coded as Element 313 Fixed Bearing. Do not count the original bearing if a pulpit or saddle has been placed beneath the girder. 313

GCD05 - Section loss in **steel components** (painted or unpainted) which have been painted or repainted and protected shall be placed in the painted condition state represented by its' active corrosion unless the load capacity rating is affected. An unpainted element with only the ends painted will become the painted element only for the length painted since the paint requires maintenance. A steel component with section loss which has been painted cannot be placed into a higher condition state than Condition State 2 unless the steel section has been restored.

GCD06 - **Pier Columns and Pier Walls:** Vertical substructure units less than 6' wide are considered columns. Vertical substructure units 6' and wider are considered walls (including 6' diameter and wider cylindrical shapes). Variable width walls shall be measured at the widest portion as determined by the plans, excluding the cap. 205 210

GCD07 - **SmartFlags** identify and attempt to quantify and note a deteriorated condition. They are to be used whenever the condition is noted.

GCD08 - The condition of an **overlaid deck** without documentation of the repair shall be coded the same as it was prior to the overlay unless the deterioration was limited only to the asphalt (i.e. rutting or wear). Indicate whether the **asphalt patches are due to deck deterioration or asphalt deterioration**, i.e. rutting, in the deck element comments.

GCD09 - **Rigid frame structures** (which may or may not have girders) shall be considered bridges, not culverts. They shall have abutments and probably a concrete slab element. Some slabs will have fill on them. If the fill has problems, the slab element shouldn't be downgraded. The slab under fill will remain a Condition State 1 and SmartFlag 359 Soffit of Concrete Decks and Slabs will be used to document slab bottom surface deterioration. In general, when the slab bottom surface deterioration enters Condition State 3, the slab element may be lowered to Condition State 2, however it is left to the inspector to add verbiage to indicate why the particular condition state was used.

GCD10 - **Concrete Box Culverts** will always have a bottom slab (floor). 241

GCD11 - A **three sided structure** will be coded as a Concrete Slab (CS) bridge.

GCD12 - **Timber and steel abutments with piles** shall have the piles coded as piles and the caps coded as applicable cap elements. The abutment element is the structural component which retains the approach roadway from the ground line to the roadway.

GCD13 - **New Pontis elements** will not be created unless the new element were to affect more than two percent of the total inventory where the existing elements do not specifically address a particular material or condition.

GCD14 - The "**CDOT SUGGESTED CONDITION STATES FOR PERCENT LOSS OF BEARING AREA**" is coded for the element where the bearing loss has occurred, i.e. superstructure, substructure, or both.

GCD15 - If there are **no comments for Element 510 Waterway Adequacy or Element 520 Approach Roadway Alignment**, remove the elements from the report. 510 520

GCD16 - **One panel length** is the minimum reporting length (**Min Rpt Lgth**) for a **steel through truss, steel deck truss, and timber truss** (Elements 125, 126, 130, 131, and 135). Refer to GCD03 for Elements 140, 141, 143, and 144.

GCD17 - Use Element 205 Concrete Column or Pile Extension for spill-through abutments when **3' of the column is exposed** beneath the bottom of the abutment. Spill-through abutments on columns are to be reported as Element 215 Concrete - Abutment. If sheet piling, backing planks, or other materials have been added to

retain the approach roadway after construction, mention it in the comments for the abutment. 205 215

GCD18 - Count each **culvert longitudinal crack** with efflorescence as 1' in Condition State 2 and those with rust as 1' in Condition State 3. 241

GCD19 - Comments for **culvert aprons** shall be included in Element 502 Channel Protection Material and Condition. 241

GCD20 - **Delineated columns on piers** should be coded as columns unless the delineated column width is greater than 6'. The delineated cap on a pier should be coded as a cap. 205 210 234

GCD21 - The minimum reporting length for damage limited to the joint is the **section length of elastomeric flex-type joint**. For joint anchorage zone damage, the reporting length is the sum of the damage lengths and is a multiple of the section length (say the section length is 6', the damage length reported will be 6', 12', 18'...). 305

GCD22 - For **metal bridge railing with any coated components**, use Element 334 Metal Bridge Railing (Coated). 330 334

GCD23 - Flex beam rail attached to timber posts in fill over a culvert is usually considered to be a roadway railing. **Railing with steel or timber posts in the fill attached to the structure is considered to be bridge railing** (Element 333 Miscellaneous - Bridge Railing (Other) for the timber posts). 330 333 334

GCD24 - The **length of culvert inspected and reported** shall be to the ROW boundary or other known limits of CDOT or entity ownership. 240 241 242 243

GCD25 - **Report the height of fill on bridges and culverts** and write it on the inventory sheet so NBI Item66T can be appropriately coded. 38 52 240 241 242 243

GCD26 - The condition noted on the exterior of **closed web/box girder structures where there is no access for inspection** should be assumed to exist on the interior components, unless the condition is limited only to the exterior.

GCD27 - **Prestressed double-tee** (twin-tee) girders shall be counted as two girders. The reported length shall be per web. 109

GCD28 - **Timber girders or stringers which have been doubled** for repair shall be designated with an apostrophe, e.g. Girders E and E'. The reported length of girder shall not be doubled. 111 117

***Bold lettering** has been added to the Pontis elements to emphasize key words and to ease comparison between the condition states.*

*Ignore the element description language with the **overstrike** font.*

*The **information contained in the tables** for certain Pontis elements*

*provides clarification of the condition states. The information contained in the tables supersedes the condition state language.*



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- 60\*-5- Deck - Railroad

The following SmartFlags may be used in conjunction with Deck elements:

- 358 -4- Deck Surface Cracking
- 359 -5- Soffit of Concrete Decks and Slabs
- 371\*-3- Traffic Impact (Deck)

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## 12 Concrete Deck - Bare

12  
Deck (5)

Units: Each

This element defines those concrete bridge decks with no surface protection of any type and are constructed with uncoated reinforcement. Report the condition state that most nearly represents the condition of the entire deck.

Condition State 1 The surface of the deck has no repaired areas and there are no spalls/delaminations in the deck surface.

- Feasible actions:
- 1) DN
  - 2) Add a protective system

Condition State 2 **Repaired areas and/or spalls/delaminations exist** in the deck surface. The combined **distressed area is 2% or less** of the deck area.

- Feasible actions:
- 1) DN
  - 2) Repair spalled/delam areas
  - 3) Add a protective system

Condition State 3 **Repaired areas and/or spalls/delaminations exist** in the deck surface. The combined area of **distress is 10% or less** of the total deck area.

- Feasible actions:
- 1) DN
  - 2) Repair spalled areas
  - 3) Repair spalled areas and add a protective system on entire deck

Condition State 4 **Repaired areas and/or spalls/delaminations exist** in the deck surface. The combined area of **distress is more than 10% but less than 25%** of the total deck area.

- Feasible actions:
- 1) DN
  - 2) Repair spalled areas
  - 3) Repair spalled areas and add protective system on entire deck

Condition State 5 **Repaired areas and/or spalls/delaminations exist.** The combined area of **distress is more than 25%** of the total deck area.

- Feasible actions:
- 1) DN
  - 2) Repair spalled areas and/or add protective system on entire deck
  - 3) Replace deck

**\_13 Concrete Deck - Unprotected w/AC Overlay**

**13  
Deck(5)**

**Units: Each**

This element defines those bridge decks with no surface protection of any type and are constructed with uncoated reinforcement. The deck is covered with an asphaltic concrete overlay. Report the condition that most nearly represents the condition of the entire deck.

Condition State 1 The surfacing on the deck has no repaired areas and there are no potholes in this surfacing.

Feasible actions: 1) DN

Condition State 2 **Repaired areas and/or potholes or impending potholes exist.** Their combined area is **less than 2%** of the deck area.

Feasible actions: 1) DN  
2) Repair potholes and substrate

Condition State 3 **Repaired areas and/or potholes or impending potholes exist.** Their combined area is **10% or less** of the total deck area.

Feasible actions: 1) DN  
2) Repaired potholes & substrate  
3) Replace overlay & repair substrate

Condition State 4 **Repaired areas and/or potholes or impending potholes exist.** Their combined area is **more than 10% but less than 25%** of the total deck area.

Feasible actions: 1) DN  
2) Replace overlay & repair substrate  
3) Repair substrate & replace overlay

Condition State 5 **Repaired areas and/or potholes or impending potholes exist.** Their combined area is **more than 25%** of the total deck area.

Feasible actions: 1) DN  
2) Repair substrate & replace overlay  
3) Replace deck

**\_14 Concrete Deck - Protected w/AC Overlay**

**14  
Deck(5)**

**Units: Each**

This element defines those bridge decks **protected with a membrane, has uncoated reinforcement and the membrane is protected with an asphaltic concrete overlay.** ~~This deck has had no substrate repairs.~~ Report the condition statement that most nearly represents the entire deck.

Condition State 1 The surfacing on the deck has no repaired areas and there are no potholes in this surfacing.

Feasible actions: 1) DN

Condition State 2 **Repaired areas and/or potholes or impending potholes exist.** Their combined area is **less than 2%** of the deck area.

Feasible actions: 1) DN  
2) Repair potholes

Condition State 3 **Repaired areas and/or potholes or impending potholes exist.** Their combined area is **10% or less** of the total deck area.

Feasible actions: 1) DN  
2) Repair potholes  
3) Replace overlay

Condition State 4 **Repaired areas and/or potholes or impending potholes exist.** Their combined area is **more than 10% but less than 25%** of the total deck area.

Feasible actions: 1) DN  
2) Patch potholes  
3) Replace overlay and protective system

Condition State 5 **Repaired areas and/or potholes exist.** Their combined area is **more than 25%** of the total deck area.

Feasible actions: 1) DN  
2) Replace overlay & protective system  
3) Replace deck

\_18 Concrete Deck - Protected w/Thin Overlay

18  
Deck(5)

Units: Each

This element defines those bridge decks that are protected with a thin (< 1 in.) overlay (e.g. portland cement, epoxy, resin, etc.).  
~~The deck has had no substrate repairs.~~ Report the condition state that most nearly represents the entire deck.

Condition State 1 The surface of the deck has no repaired areas and there are no spalls/delaminations in the deck surface. No wear-out is visible.

Feasible actions: 1) DN

Condition State 2 **Repaired areas and/or spalls/delaminations exist** in the deck surface. The combined **distressed area is 2% or less** of the deck area.

Feasible actions: 1) DN  
2) Repair spalls/delams

Condition State 3 **Repaired areas and/or spalls/delaminations exist** in the deck surface. The combined area of **distress is 10% but less than 25%** of the total deck area.

Feasible actions: 1) DN  
2) Repair spalls/delams

Condition State 4 **Repaired areas and/or spalls/delaminations exist** in the deck surface. The combined area of **distress is more than 10% but less than 25%** of the total deck area.

Feasible actions: 1) DN  
2) Repair spalls/delams  
3) Replace overlay

Condition State 5 **Repaired areas and/or spalls/delaminations exist.** The combined area of **distress is more than 25%** of the total deck area.

Feasible actions: 1) DN  
2) Replace overlay  
3) Replace deck

Units: Each

This element defines those bridge decks that are protected with a rigid overlay (> 1 in.) (e.g. portland cement, epoxy, resin, etc.). ~~The deck has had no substrate repairs.~~ Report the condition state that most nearly represents the entire deck.

Condition State 1 The surface of the deck has no repaired areas and there are no spalls/delaminations in the deck surface. No wear-out is visible.

Feasible actions: 1) DN

Condition State 2 **Repaired areas and/or spalls/delaminations exist** in the deck surface. The combined **distressed area is 2% or less** of the deck area.

Feasible actions: 1) DN  
2) Repair spalls/delams

Condition State 3 **Repaired areas and/or spalls/delaminations exist** in the deck surface. The combined area of **distress is 10% or less** of the total deck area.

Feasible actions: 1) DN  
2) Repair spalls/delams

Condition State 4 **Repaired areas and/or spalls/delaminations exist** in the deck surface. The combined area of **distress is more than 10% but less than 25%** of the total deck area.

Feasible actions: 1) DN  
2) Repair spalls/delams  
3) Replace overlay

Condition State 5 **Repaired areas and/or spalls/delaminations exist.** The combined area of **distress is more than 25%** of the total deck area.

Feasible actions: 1) DN  
2) Replace overlay  
3) Replace deck

23\* Concrete Deck - Bare Protected w/Coated Bars

23\*  
Deck(5)

Units: Each

This element defines those concrete bridge decks with no surface protection of any type and are constructed with coated (epoxy, galvanizing, stainless steel, etc.) reinforcement. Report the condition state that most nearly represents the condition of the entire deck.

Condition State 1 The surface of the deck has no repaired areas and there are no spalls/delaminations in the deck surface.

- Feasible actions:
- 1) DN
  - 2) Add a protective system

Condition State 2 **Repaired areas and/or spalls/delaminations exist** in the deck surface. The combined **distressed area is 2% or less** of the deck area.

- Feasible actions:
- 1) DN
  - 2) Repair spalled/delam areas
  - 3) Add a protective system

Condition State 3 **Repaired areas and/or spalls/delaminations exist** in the deck surface. The combined area of **distress is 10% or less** of the total deck area.

- Feasible actions:
- 1) DN
  - 2) Repair spalled areas
  - 3) Repair spalled areas and add a protective system on entire deck

Condition State 4 **Repaired areas and/or spalls/delaminations exist** in the deck surface. The combined area of **distress is more than 10% but less than 25%** of the total deck area.

- Feasible actions:
- 1) DN
  - 2) Repair spalled areas
  - 3) Repair spalled areas and add protective system on entire deck

Condition State 5 **Repaired areas and/or spalls/delaminations exist.** The combined area of **distress is more than 25%** of the total deck area.

- Feasible actions:
- 1) DN
  - 2) Repair spalled areas and/or add protective system on entire deck
  - 3) Replace deck



24\* Concrete Deck - Thin Overlay Protected w/Coated Bars

24\*  
Deck(5)

Units: Each

This element defines those concrete bridge decks with a thin (< 1 in.) overlay (e.g. portland cement, epoxy, resin, etc.) and are constructed with coated (epoxy, galvanizing, stainless steel, etc.) reinforcement. Report the condition state that most nearly represents the condition of the entire deck.

Condition State 1 The surface of the deck has no repaired areas and there are no spalls/delaminations in the deck surface. No wear-out is visible.

Feasible actions: 1) DN

Condition State 2 **Repaired areas and/or spalls/delaminations exist** in the deck surface. The combined **distressed area is 2% or less** of the deck area.

Feasible actions: 1) DN  
2) Repair spalls/delams

Condition State 3 **Repaired areas and/or spalls/delaminations exist** in the deck surface. The combined area of **distress is 10% but less than 25%** of the total deck area.

Feasible actions: 1) DN  
2) Repair spalls/delams

Condition State 4 **Repaired areas and/or spalls/delaminations exist** in the deck surface. The combined area of **distress is more than 10% but less than 25%** of the total deck area.

Feasible actions: 1) DN  
2) Repair spalls/delams  
3) Replace overlay

Condition State 5 **Repaired areas and/or spalls/delaminations exist.** The combined area of **distress is more than 25%** of the total deck area.

Feasible actions: 1) DN  
2) Replace overlay  
3) Replace deck

25\* Concrete Deck - Rigid Overlay Protected w/Coated Bars

25\*  
Deck(5)

Units: Each

This element defines those concrete bridge decks with a rigid (> 1 in.) overlay (e.g. portland cement, epoxy, resin, etc.) and are constructed with coated (epoxy, galvanizing, stainless steel, etc.) reinforcement. Report the condition state that most nearly represents the condition of the entire deck.

Condition State 1 The surface of the deck has no repaired areas and there are no spalls/delaminations in the deck surface. No wear-out is visible.

Feasible actions: 1) DN

Condition State 2 **Repaired areas and/or spalls/delaminations exist** in the deck surface. The combined **distressed area is 2% or less** of the deck area.

Feasible actions: 1) DN  
2) Repair spalls/delams

Condition State 3 **Repaired areas and/or spalls/delaminations exist** in the deck surface. The combined area of **distress is 10% or less** of the total deck area.

Feasible actions: 1) DN  
2) Repair spalls/delams

Condition State 4 **Repaired areas and/or spalls/delaminations exist** in the deck surface. The combined area of **distress is more than 10% but less than 25%** of the total deck area.

Feasible actions: 1) DN  
2) Repair spalls/delams  
3) Replace overlay

Condition State 5 **Repaired areas and/or spalls/delaminations exist.** The combined area of **distress is more than 25%** of the total deck area.

Feasible actions: 1) DN  
2) Replace overlay  
3) Replace deck

Units: Each

This element defines those concrete bridge decks constructed with an asphaltic concrete overlay (waterproof membrane is assumed) and are constructed with coated (epoxy, galvanizing, stainless steel, etc.) reinforcement. Report the condition state that most nearly represents the condition of the entire deck.

Condition State 1 The surfacing on the deck has no repaired areas and there are no potholes in this surfacing.

Feasible actions: 1) DN

Condition State 2 **Repaired areas and/or potholes or impending potholes exist.** Their combined area is **less than 2%** of the deck area.

Feasible actions: 1) DN  
2) Repair potholes

Condition State 3 **Repaired areas and/or potholes or impending potholes exist.** Their combined area is **10% or less** of the total deck area.

Feasible actions: 1) DN  
2) Repair potholes  
3) Replace overlay

Condition State 4 **Repaired areas and/or potholes or impending potholes exist.** Their combined area is **more than 10% but less than 25%** of the total deck area.

Feasible actions: 1) DN  
2) Patch potholes  
3) Replace overlay and protective system

Condition State 5 **Repaired areas and/or potholes exist.** Their combined area is **more than 25%** of the total deck area.

Feasible actions: 1) DN  
2) Replace overlay & protective system  
3) Replace deck

Units: Each

This element defines those concrete slab bridges protected with a cathodic system. The deck may or may not be covered with an overlay. Report the condition state that most nearly represents the entire deck.

Condition State 1 The surface of the deck has no repaired areas and there are no spalls/delaminations in the deck surface.

Feasible actions: 1) DN

Condition State 2 **Repaired areas and/or spalls/delaminations exist** in the deck surface. The combined **distressed area is 2% or less** of the deck area.

Feasible actions: 1) DN  
2) Patch spalls/delams

Condition State 3 **Repaired areas and/or spalls/delaminations exist** in the deck surface. The combined area of **distress is 10% or less** of the total deck area.

Feasible actions: 1) DN  
2) Repair spalled areas  
3) Repair spalled areas and add or replace overlay

Condition State 4 **Repaired areas and/or spalls/delaminations exist** in the deck surface. The combined area of **distress is more than 10% but less than 25%** of the total deck area.

Feasible actions: 1) DN  
2) Repair spalled areas  
3) Repair spalled areas and add or replace overlay

Condition State 5 **Repaired areas and/or spalls/delaminations exist.** The combined area of **distress is more than 25%** of the total deck area.

Feasible actions: 1) DN  
2) Repair spalled areas and add or replace overlay  
3) Replace deck

Units: Each

This element defines those bridge decks that are constructed of steel grids that are open and unfilled. Report the condition state that most nearly represents the condition of the entire deck and its connection devices.

CDOT SUGGESTED CONDITION STATES FOR CORROSION ON PAINTED STEEL ELEMENTS		
	Description	CS
Light	Slight peeling of the paint, pitting, or surface rust, etc. No measurable section loss	2
R1	Peeling of the paint, pitting, surface rust, etc. No measurable section loss	3
R2	Flaking, minor section loss ( $\leq 10\%$ thickness loss)	4
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is not warranted.</b>	4
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is warranted due to location of corrosion on the member.</b>	5
R4	Heavy section loss ( $> 30\%$ thickness loss), may have holes through base metal	5

Condition State 1 There is no corrosion. The paint system, if any, is sound. The connectors (welds, rivets, etc.) are sound.

Feasible actions: 1) DN

Condition State 2 **There is little or no corrosion.** The paint system, if any, may be showing early signs of distress. The connectors are still sound.

Feasible actions: 1) DN  
2) Surface clean

Condition State 3 **Surface or freckled rust has formed.** The paint system is no longer fully effective. There is no loss of section. The connectors may be starting to show signs of distress - cracked welds or broken rivets.

Feasible actions: 1) DN  
2) Surface clean and restore top coat  
3) Rehab connectors

Condition State 4 **Corrosion is moderate. Surface pitting may be present** but any section loss is incidental. Numerous connectors are failing at scattered locations. The strength or serviceability of the section is not yet affected.

Feasible actions: 1) DN  
2) Spot blast, clean & paint  
3) Rehab connectors

Condition State 5 **Corrosion is advanced.** Numerous connectors have failed. **Section loss and/or connectivity is sufficient to warrant analysis** to ascertain the impact on the ultimate strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN  
2) Rehab connectors & replace paint system  
3) Replace unit

Units: Each

This element defines those bridge decks that are constructed of steel grids with either all of the openings or just those in the wheel lines filled with concrete. Report the condition state that most nearly represents the condition of the entire deck and its connection devices.

CDOT SUGGESTED CONDITION STATES FOR CORROSION ON PAINTED STEEL ELEMENTS		
	Description	CS
Light R1	Slight peeling of the paint, pitting, or surface rust, etc. No measurable section loss	2
R1	Peeling of the paint, pitting, surface rust, etc. No measurable section loss	3
R2	Flaking, minor section loss ( $\leq 10\%$ thickness loss)	4
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is not warranted.</b>	4
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is warranted due to location of corrosion on the member.</b>	5
R4	Heavy section loss ( $> 30\%$ thickness loss), may have holes through base metal	5

Condition State 1 There is no corrosion. The paint system, if any, is sound. The connectors (welds, rivets, etc.) are sound. The concrete filler is sound.

Feasible actions: 1) DN

Condition State 2 **There is little or no corrosion.** The paint system, if any, may be showing early signs of distress. The connectors are still sound. The concrete filler is sound.

Feasible actions: 1) DN  
2) Surface clean

Condition State 3 **Surface or freckled rust has formed.** The paint system is no longer fully effective. There is no loss of section. The connectors may be starting to show signs of distress - cracked welds or broken rivets. The concrete filler may have broken out at scattered locations.

Feasible actions: 1) DN  
2) Surface clean and restore top coat  
3) Rehab connectors and concrete filler

Condition State 4 **Surface or freckled rust has formed.** The paint system is no longer fully effective. There is no loss of section. Numerous connectors are failing at scattered locations. Small areas of concrete are missing.

Feasible actions: 1) DN  
2) Spot blast, clean & paint  
3) Rehab connectors and concrete filler

Condition State 5 **Corrosion is advanced.** Numerous connectors have failed. **Section loss and/or connectivity is sufficient to warrant analysis** to ascertain the impact on the ultimate strength and/or serviceability of either the element or the bridge. Much of the concrete filler is missing.

Feasible actions: 1) DN  
2) Rehab connectors & concrete filler & replace paint system

3) Replace unit

Units: Each

This element defines those bridge decks that are constructed of corrugated metal filled with portland cement concrete or asphaltic concrete or an orthotropic steel deck. The orthotropic deck may be covered with an asphaltic or resin concrete. Report the condition state that most nearly represents the entire deck.

CDOT SUGGESTED CONDITION STATES FOR CORROSION ON PAINTED STEEL ELEMENTS		
	Description	CS
Light R1	Slight peeling of the paint, pitting, or surface rust, etc. No measurable section loss	2
R1	Peeling of the paint, pitting, surface rust, etc. No measurable section loss	3
R2	Flaking, minor section loss ( $\leq 10\%$ thickness loss)	4
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is not warranted.</b>	4
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is warranted due to location of corrosion on the member.</b>	5
R4	Heavy section loss ( $> 30\%$ thickness loss), may have holes through base metal	5

Condition State 1 There is no evidence of corrosion and any paint systems are sound and functioning as intended to protect the metal surface. The surfacing, if any, on the deck has no repaired areas and there are no potholes.

Feasible actions: 1) DN

Condition State 2 **There is little or no corrosion.** Any paint systems may be showing early signs of distress. Minor cracking or potholes may exist in the surfacing.

Feasible actions: 1) DN  
2) Surface clean & restore top coat of paint  
3) Repair potholes and cracks

Condition State 3 **Surface or freckle rust has formed.** There is no loss of section. Potholes exist in the surfacing and there may be significant cracking.

Feasible actions: 1) DN  
2) Surface clean & restore top coat of paint  
3) Repair potholes and cracks

Condition State 4 **The paint system has failed. Surface pitting may be present** but any section loss is incidental. Potholes may be large and expose the metal decking.

Feasible actions: 1) DN  
2) Spot blast, clean & paint - repair potholes  
3) Replace paint system and/or replace surfacing

Condition State 5 **Corrosion is advanced. Section loss is sufficient to warrant analysis** to ascertain the impact on the ultimate strength and/or serviceability of either the element or the bridge. The surfacing has failed.

Feasible actions: 1) DN  
2) Rehab., replace paint system, replace



3) surfacing  
Replace unit

Units: Each

This element defines those bridge decks constructed of timber. The decks may be longitudinally or transversely laminated or of planks.

The decks may or may not be constructed with runners of metal or wood. Report the condition state that more nearly represents the entire deck.

CDOT SUGGESTED CONDITION STATES FOR TIMBER DECKS AND SLABS				
CONDITION STATES	CS1	CS2	CS3	CS4
Potholes in asphalt	NONE	< 10% of area	10% to 25% of area	> 25% of area
Deterioration of bare deck	NONE	< 10% of area	10% to 25% of area	> 25% of area

Condition State 1 Investigation indicates **no decay**. There **may be cracks, splits and checks** having no effect on strength or serviceability.

Feasible actions: 1) DN

Condition State 2 **Decay, insect infestation, splitting, cracking or crushing may exist** but none is sufficiently advanced to affect serviceability or strength.

Feasible actions: 1) DN  
2) Rehab and/or protect deck

Condition State 3 **Decay, insect infestation, splitting cracking or crushing has produced loss of strength** of the element but **not of sufficient magnitude to affect the serviceability** of the bridge.

Feasible actions: 1) DN  
2) Rehab deck  
3) Replace deck

Condition State 4 **Advanced deterioration. Decay, insect infestation, splits, cracks or crushing has produced loss of strength that affects the serviceability** of the bridge.

Feasible actions: 1) DN  
2) Replace deck

Units: Each

This element defines those bridge decks constructed of timber. The decks may be longitudinally or transversely laminated or of planks. These decks are over-layed with asphaltic concrete. Report the condition state that most nearly represents the entire deck.

CDOT SUGGESTED CONDITION STATES FOR TIMBER DECKS AND SLABS				
CONDITION STATES	CS1	CS2	CS3	CS4
Potholes in asphalt	NONE	< 10% of area	10% to 25% of area	> 25% of area
Deterioration of bare deck	NONE	< 10% of area	10% to 25% of area	> 25% of area

Condition State 1 Investigation indicates **no decay**. There **may be cracks, splits and checks having no effect** on strength or serviceability. There are no potholes in the surfacing.

Feasible actions: 1) DN

Condition State 2 **Decay, insect infestation, splitting, cracking or crushing may exist** but none is sufficiently advanced to affect serviceability. There may be minor potholes or impending potholes in the surfacing.

Feasible actions: 1) DN  
2) Repair potholes  
3) Rehab and /or protect unit

Condition State 3 **Decay, insect infestation, splitting cracking or crushing has produced loss of strength** of the element but **not of sufficient magnitude to affect the serviceability** of the bridge.

Feasible actions: 1) DN  
2) Rehab deck & repair or replace surfacing  
3) Replace deck and surfacing

Condition State 4 **Advanced deterioration. Decay, insect infestation, splits, cracks or crushing has produced loss of strength that affects the serviceability** of the bridge.

Feasible actions: 1) DN  
2) Replace deck and surfacing

**\_35\* Precast Panel Concrete Deck - Bare**

**35\*  
Deck (5)**

**Units: Each**

This element includes decks with precast, prestressed or precast conventional reinforced panels 3" thick or more with a cast-in-place slab on them. Report the condition state that most nearly represents the entire deck.

This element includes decks with precast prestressed or precast conventional reinforced panels 3" or more thick with a cast-in-place slab above them. The joints between the precast panels are not considered construction joints due to the partial depth of the joint.

Condition State 1 The surface of the deck has no repaired areas and there are no spalls/delaminations in the deck surface.

Feasible actions: 1) DN

Condition State 2 **Repaired areas and/or spalls/delaminations exist** in the deck surface. The combined **distressed area is 2% or less** of the deck area.

Feasible actions: 1) DN  
2) Patch spalls/delams

Condition State 3 **Repaired areas and/or spalls/delaminations exist** in the deck surface. The combined area of **distress is 10% or less** of the total deck area.

Feasible actions: 1) DN  
2) Repair spalled areas  
3) Repair spalled areas and add or replace overlay

Condition State 4 **Repaired areas and/or spalls/delaminations exist** in the deck surface. The combined area of **distress is more than 10% but less than 25%** of the total deck area.

Feasible actions: 1) DN  
2) Repair spalled areas  
3) Repair spalled areas and add or replace overlay

Condition State 5 **Repaired areas and/or spalls/delaminations exist.** The combined area of **distress is more than 25%** of the total deck area.

Feasible actions: 1) DN  
2) Repair spalled areas and add or replace overlay  
3) Replace deck

**\_36\* Precast Panel Concrete Deck - Protected w/AC Overlay**

**36\*  
Deck(5)**

**Units: Each**

This element includes decks with precast, prestressed or precast conventional reinforced panels 3" thick or more with a cast-in-place slab on them. The deck is covered with an asphaltic concrete overlay. Report the condition state that most nearly represents the entire deck.

This element includes decks with precast prestressed or precast conventional reinforced panels 3" or more thick with a cast-in-place slab above them. The joints between the precast panels are not considered construction joints due to the partial depth of the joint.

Condition State 1 The surface of the deck has no repaired areas and there are no spalls/delaminations in the deck surface.

Feasible actions: 1) DN

Condition State 2 **Repaired areas and/or spalls/delaminations exist** in the deck surface. The combined **distressed area is 2% or less** of the deck area.

Feasible actions: 1) DN  
2) Patch spalls/delams

Condition State 3 **Repaired areas and/or spalls/delaminations exist** in the deck surface. The combined area of **distress is 10% or less** of the total deck area.

Feasible actions: 1) DN  
2) Repair spalled areas  
3) Repair spalled areas and add or replace overlay

Condition State 4 **Repaired areas and/or spalls/delaminations exist** in the deck surface. The combined area of **distress is more than 10% but less than 25%** of the total deck area.

Feasible actions: 1) DN  
2) Repair spalled areas  
3) Repair spalled areas and add or replace overlay

Condition State 5 **Repaired areas and/or spalls/delaminations exist.** The combined area of **distress is more than 25%** of the total deck area.

Feasible actions: 1) DN  
2) Repair spalled areas and add or replace overlay  
3) Replace deck

Units: Each

This element defines those concrete slab bridges with no surface protection of any type and are constructed with uncoated reinforcement. Report the condition state that most nearly represents the entire deck.

CDOT Notes: Element 38 Concrete Slab - Bare or Element 52 Concrete Slab - Protected w/Coated Bars may be used in a situation with fill. Use your judgement whether there is fill and code accordingly.

GCD25 - Report the height of fill on bridges and culverts and write it on the inventory sheet so NBI Item66T can be appropriately coded.

Condition State 1 The surface of the deck has no repaired areas and there are no spalls/delaminations in the deck surface.

- Feasible actions:
- 1) DN
  - 2) Add a protective system

Condition State 2 **Repaired areas and/or spalls/delaminations exist** in the deck surface. The combined **distressed area is 2% or less** of the deck area.

- Feasible actions:
- 1) DN
  - 2) Repair spalled/delam areas
  - 3) Add a protective system

Condition State 3 **Repaired areas and/or spalls/delaminations exist** in the deck surface. The combined area of **distress is 10% or less** of the total deck area.

- Feasible actions:
- 1) DN
  - 2) Repair spalled areas
  - 3) Repair spalled areas and add a protective system on entire deck

Condition State 4 **Repaired areas and/or spalls/delaminations exist** in the deck surface. The combined area of **distress is more than 10% but less than 25%** of the total deck area.

- Feasible actions:
- 1) DN
  - 2) Repair spalled areas
  - 3) Repair spalled areas and add protective system on entire deck

Condition State 5 **Repaired areas and/or spalls/delaminations exist.** The combined area of **distress is more than 25%** of the total deck area.

- Feasible actions:
- 1) DN
  - 2) Repair spalled areas and/or add protective system on entire deck
  - 3) Replace deck

Units: Each

This element defines only those concrete slab bridges with no surface protection of any type and are constructed with uncoated reinforcement. The deck is covered with an asphaltic concrete overlay. Report the condition state that most nearly represents the entire deck.

**CDOT Note: Do not use this element in a situation with fill. Use Element 38 Concrete Slab - Bare or Element 52 Concrete Slab - Protected w/Coated Bars.**

Condition State 1 The surfacing on the deck has no repaired areas and there are no potholes in this surfacing.

Feasible actions: 1) DN

Condition State 2 **Repaired areas and/or potholes or impending potholes exist.** Their combined area is **less than 2%** of the deck area.

Feasible actions: 1) DN  
2) Repair potholes and substrate

Condition State 3 **Repaired areas and/or potholes or impending potholes exist.** Their combined area is **10% or less** of the total deck area.

Feasible actions: 1) DN  
2) Repaired potholes & substrate  
3) Replace overlay & repair substrate

Condition State 4 **Repaired areas and/or potholes or impending potholes exist.** Their combined area is **more than 10% but less than 25%** of the total deck area.

Feasible actions: 1) DN  
2) Replace overlay & repair substrate  
3) Repair substrate & replace overlay

Condition State 5 **Repaired areas and/or potholes or impending potholes exist.** Their combined area is **more than 25%** of the total deck area.

Feasible actions: 1) DN  
2) Repair substrate & replace overlay  
3) Replace deck

Units: Each

This element defines those concrete slab bridges with the deck protected by a membrane, has uncoated reinforcement and the membrane is protected with an asphaltic concrete overlay. Report the condition statement that most nearly represents the entire deck.

**CDOT Note: Do not use this element in a situation with fill. Use Element 38 Concrete Slab - Bare or Element 52 Concrete Slab - Protected w/Coated Bars.**

Condition State 1 The surfacing on the deck has no repaired areas and there are no potholes in this surfacing.

Feasible actions: 1) DN

Condition State 2 **Repaired areas and/or potholes or impending potholes exist.** Their combined area is less than 2% of the deck area.

Feasible actions: 1) DN  
2) Repair potholes

Condition State 3 **Repaired areas and/or potholes or impending potholes exist.** Their combined area is 10% or less of the total deck area.

Feasible actions: 1) DN  
2) Repair potholes  
3) Replace overlay

Condition State 4 **Repaired areas and/or potholes or impending potholes exist.** Their combined area is more than 10% but less than 25% of the total deck area.

Feasible actions: 1) DN  
2) Patch potholes  
3) Replace overlay and protective system

Condition State 5 **Repaired areas and/or potholes exist.** Their combined area is more than 25% of the total deck area.

Feasible actions: 1) DN  
2) Replace overlay & protective system  
3) Replace deck



Units: Each

This element defines those concrete slab bridges where the deck surface is protected with a thin (< 1 in.) overlay (e.g. portland cement, epoxy, resin, etc.) Report the condition statement that most nearly represents the condition of the entire deck.

**CDOT Note: Do not use this element in a situation with fill. Use Element 38 Concrete Slab - Bare or Element 52 Concrete Slab - Protected w/Coated Bars.**

Condition State 1 The surface of the deck has no repaired areas and there are no spalls/delaminations in the deck surface. No wear-out is visible.

Feasible actions: 1) DN

Condition State 2 **Repaired areas and/or spalls/delaminations exist** in the deck surface. The combined **distressed area is 2% or less** of the deck area.

Feasible actions: 1) DN  
2) Repair spalls/delams

Condition State 3 **Repaired areas and/or spalls/delaminations exist** in the deck surface. The combined area of **distress is 10% but less than 25%** of the total deck area.

Feasible actions: 1) DN  
2) Repair spalls/delams

Condition State 4 **Repaired areas and/or spalls/delaminations exist** in the deck surface. The combined area of **distress is more than 10% but less than 25%** of the total deck area.

Feasible actions: 1) DN  
2) Repair spalls/delams  
3) Replace overlay

Condition State 5 **Repaired areas and/or spalls/delaminations exist.** The combined area of **distress is more than 25%** of the total deck area.

Feasible actions: 1) DN  
2) Replace overlay  
3) Replace deck

Units: Each

This element defines those concrete slab bridges where the deck surface is protected with a rigid overlay (> 1 in.)(e.g. portland cement, epoxy, resin, etc.) Report the condition state that most nearly represents the condition of the entire deck.

**CDOT Note: Do not use this element in a situation with fill. Use Element 38 Concrete Slab - Bare or Element 52 Concrete Slab - Protected w/Coated Bars.**

Condition State 1 The surface of the deck has no repaired areas and there are no spalls/delaminations in the deck surface. No wear-out is visible.

Feasible actions: 1) DN

Condition State 2 **Repaired areas and/or spalls/delaminations exist** in the deck surface. The combined **distressed area is 2% or less** of the deck area.

Feasible actions: 1) DN  
2) Repair spalls/delams

Condition State 3 **Repaired areas and/or spalls/delaminations exist** in the deck surface. The combined area of **distress is 10% or less** of the total deck area.

Feasible actions: 1) DN  
2) Repair spalls/delams

Condition State 4 **Repaired areas and/or spalls/delaminations exist** in the deck surface. The combined area of **distress is more than 10% but less than 25%** of the total deck area.

Feasible actions: 1) DN  
2) Repair spalls/delams  
3) Replace overlay

Condition State 5 **Repaired areas and/or spalls/delaminations exist.** The combined area of **distress is more than 25%** of the total deck area.

Feasible actions: 1) DN  
2) Replace overlay  
3) Replace deck

Units: Each

This element defines those concrete slab bridges with the superstructure **constructed with coated reinforcement**. The **deck may be covered with some type of overlay**. Report the condition state that most nearly represents the entire deck.

CDOT Notes: Element 38 Concrete Slab - Bare or Element 52 Concrete Slab - Protected w/Coated Bars may be used in a situation with fill. Use your judgement whether there is fill and code accordingly.

Use this element in situations with or without asphalt.

GCD25 - Report the height of fill on bridges and culverts and write it on the inventory sheet so NBI Item66T can be appropriately coded.

Condition State 1 The surface of the deck has no repaired areas and there are no spalls/delaminations in the deck surface.

Feasible actions: 1) DN

Condition State 2 **Repaired areas and/or spalls/delaminations exist** in the deck surface. The combined **distressed area is 2% or less** of the deck area.

Feasible actions: 1) DN  
2) Patch spalls/delams

Condition State 3 **Repaired areas and/or spalls/delaminations exist** in the deck surface. The combined area of **distress is 10% or less** of the total deck area.

Feasible actions: 1) DN  
2) Repair spalled areas  
3) Repair spalled areas and add or replace overlay

Condition State 4 **Repaired areas and/or spalls/delaminations exist** in the deck surface. The combined area of **distress is more than 10% but less than 25%** of the total deck area.

Feasible actions: 1) DN  
2) Repair spalled areas  
3) Repair spalled areas and add or replace overlay

Condition State 5 **Repaired areas and/or spalls/delaminations exist**. The combined area of **distress is more than 25%** of the total deck area.

Feasible actions: 1) DN  
2) Repair spalled areas and add or replace overlay  
3) Replace deck

Units: Each

This element defines those concrete slab bridges protected with a cathodic system. The deck may or may not be covered with an overlay. Report the condition state that most nearly represents the entire deck.

Condition State 1 The surface of the deck has no repaired areas and there are no spalls/delaminations in the deck surface.

Feasible actions: 1) DN

Condition State 2 **Repaired areas and/or spalls/delaminations exist** in the deck surface. The combined **distressed area is 2% or less** of the deck area.

Feasible actions: 1) DN  
2) Patch spalls/delams

Condition State 3 **Repaired areas and/or spalls/delaminations exist** in the deck surface. The combined area of **distress is 10% or less** of the total deck area.

Feasible actions: 1) DN  
2) Repair spalled areas  
3) Repair spalled areas and add or replace overlay

Condition State 4 **Repaired areas and/or spalls/delaminations exist** in the deck surface. The combined area of **distress is more than 10% but less than 25%** of the total deck area.

Feasible actions: 1) DN  
2) Repair spalled areas  
3) Repair spalled areas and add or replace overlay

Condition State 5 **Repaired areas and/or spalls/delaminations exist.** The combined area of **distress is more than 25%** of the total deck area.

Feasible actions: 1) DN  
2) Repair spalled areas and add or replace overlay  
3) Replace deck

Units: Each

This element defines those timber bridge slabs with no surface protection of any type. Report the condition state that most nearly represents the condition of the entire deck.

CDOT SUGGESTED CONDITION STATES FOR TIMBER DECKS AND SLABS				
CONDITION STATES	CS1	CS2	CS3	CS4
Potholes in asphalt	NONE	< 10% of area	10% to 25% of area	> 25% of area
Deterioration of bare deck	NONE	< 10% of area	10% to 25% of area	> 25% of area

**CDOT Note: Do not use SmartFlag 359 Soffit of Concrete Decks or Slabs in conjunction with this element.**

Condition State 1 Investigation indicates **no decay**. There **may be cracks, splits and checks having no effect** on strength or serviceability.

Feasible actions: 1) DN

Condition State 2 **Decay, insect infestation, splitting, cracking or crushing may exist but none is sufficiently advanced to affect** serviceability or strength.

Feasible actions: 1) DN  
2) Rehab and/or protect deck

Condition State 3 **Decay, insect infestation, splitting cracking or crushing has produced loss of strength** of the element but **not of sufficient magnitude to affect** the serviceability of the bridge.

Feasible actions: 1) DN  
2) Rehab deck  
3) Replace deck

Condition State 4 **Advanced deterioration. Decay, insect infestation, splits, cracks or crushing** has produced loss of strength that **affects the serviceability of the bridge**.

Feasible actions: 1) DN  
2) Replace deck

Units: Each

This element defines those bridge slabs constructed of timber. These slabs are over-layed with asphaltic concrete. Report the condition state slabs that most nearly represents the entire deck.

CDOT SUGGESTED CONDITION STATES FOR TIMBER DECKS AND SLABS				
CONDITION STATES	CS1	CS2	CS3	CS4
Potholes in asphalt	NONE	< 10% of area	10% to 25% of area	> 25% of area
Deterioration of bare deck	NONE	< 10% of area	10% to 25% of area	> 25% of area

**CDOT Note: Do not use SmartFlag 359 Soffit of Concrete Decks or Slabs in conjunction with this element.**

Condition State 1 Investigation indicates no decay. There may be cracks, splits and checks having no effect on strength or serviceability. **There are no potholes in the surfacing.**

Feasible actions: 1) DN

Condition State 2 **Decay, insect infestation, splitting, cracking or crushing may exist but none is sufficiently advanced to affect serviceability.** There may be minor potholes or impending potholes in the surfacing.

Feasible actions: 1) DN  
2) Repair potholes  
3) Rehab and /or protect unit

Condition State 3 **Decay, insect infestation, splitting cracking or crushing has produced loss of strength** of the element but **not of sufficient magnitude to affect** the serviceability of the bridge.

Feasible actions: 1) DN  
2) Rehab deck & repair or replace surfacing  
3) Replace deck and surfacing

Condition State 4 **Advanced deterioration.** **Decay, insect infestation, splits, cracks or crushing has produced loss of strength** that affects the serviceability of the bridge.

Feasible actions: 1) DN  
2) Replace deck and surfacing

**\_60\* Deck - Railroad**

**60\*  
Deck (5)**

**Units: Each**

This element defines those bridges decks that carry a railroad over a highway, county road, or city street. They can be constructed of steel, concrete, timber or a combination of materials. They may or may not have a membrane, covered with rock or cinder ballast, or railroad ties and no ballast.

Due to the type of service used in this element, the **condition states will be based on the bottom condition of the deck** as the top surface is very seldom visible for inspection. The **feasible actions will consist of rehabilitation or replacement.**

**CDOT Notes: Describe what type of material is utilized for the deck in the comments for this element.**

**Do not use SmartFlag 359 Soffit of Concrete Decks or Slabs in conjunction with this element.**

Condition State 1 The element shows no evidence of distress or deterioration. There may be **very minor water leakage at the joints.** Timber may have **minor checks.**

Condition State 2 The is **light transverse cracks** in the concrete and **may or may not have water leakage;** the steel decks have **R1 other than at the joints,** the paint system is still intact and there is **no bare metal;** timber has **minor water stain, minor checks,** but no other signs of deterioration.

Condition State 3 The concrete shows **cracking with efflorescence and water leakage;** steel decks have **R1 other than at the joints,** the **paint system has failed;** timber has **moderate water stain, checking, minor splits,** but no other signs of deterioration.

Condition State 4 The concrete has **heavy efflorescence, may have stalactites but no delaminations** on the bottom; steel decks have **R2 other than at the joints;** timber has **checking, minor splits, minor rot.** All signs of **distress are not sufficient magnitude to affect serviceability** of the bridge.

Condition State 5 The concrete has **heavy efflorescence, may have stalactites, delaminations** on the bottom; steel decks have **R3/R4 other than at the joints;** timber has **checking, splitting, rot, or cracking.** All signs of **distress are of sufficient magnitude to affect serviceability** of the bridge.

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## ***Superstructure Element Index***

101 -4- Steel - Closed Web/Box Girder - Unpainted  
102 -5- Steel - Closed Web/Box Girder - Painted  
104 -4- P/S Concrete - Closed Web/Box Girder  
105 -4- Concrete - Closed Webs/Box Girder  
106 -4- Steel - Open Girder - Unpainted  
107 -5- Steel - Open Girder - Painted  
109 -4- P/S Concrete - Open Girder  
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115 -4- P/S Concrete - Stringer  
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117 -4- Timber - Stringer  
120 -4- Steel - Bottom chord Through Truss - Unpainted  
121 -5- Steel - Bottom chord Through Truss - Painted  
125 -4- Steel - Through Truss excluding Bottom Chord - Unpainted  
126 -5- Steel - Through Truss excluding Bottom Chord - Painted  
130 -4- Steel - Deck Truss - Unpainted  
131 -5- Steel - Deck Truss - Painted  
135 -4- Timber - Truss/Arch  
140 -4- Steel - Arch - Unpainted  
141 -5- Steel - Arch - Painted  
143 -4- P/S Concrete - Arch  
144 -4- Concrete - Arch  
145 -4- Arch - Other/Stone Masonry  
146 -4- Steel - Cable not embedded in concrete (Uncoated)  
147 -5- Steel - Cable not embedded in concrete (Coated)  
151 -4- Steel - Floor Beam - Unpainted  
152 -5- Steel - Floor Beam - Painted  
154\*-4- P/S Concrete - Floor Beam  
155 -4- Concrete - Floor Beam  
156 -4- Timber - Floor Beam  
160 -4- Steel - Pin and Hanger Assembly - Unpainted  
161 -5- Steel - Pin and Hanger Assembly - Painted

The following SmartFlags may be used in conjunction with Superstructure elements:

355\*-3- Steel Diaphragms  
356 -3- Steel - Fatigue  
357 -4- Pack Rust (Superstructure)  
362 -3- Traffic Impact (Superstructure)

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Units: LF of Girder

This element defines only those steel closed web/box girder units that are not painted or are constructed of weathering steel. Report the estimated lineal feet in each of Condition States 2 through 4. The number of units in Condition State 1 will be the remainder of the units after deducting those reported in Condition States 2 through 4.

CDOT SUGGESTED CONDITION STATES FOR CORROSION ON UNPAINTED STEEL ELEMENTS		
	Description	CS
R1	Pitting or surface rust, etc. No measurable section loss	2
R2	Flaking, minor section loss (≤ 10% thickness loss)	3
R3	Flaking, swelling, mod. section loss (10% < thickness loss ≤ 30%) <b>structural analysis is not warranted.</b>	3
R3	Flaking, swelling, mod. section loss (10% < thickness loss ≤ 30%) <b>structural analysis is warranted due to location of corrosion on the member.</b>	4
R4	Heavy section loss (> 30% thickness loss), may have holes through base metal.	4

Condition State 1 **There is little or no corrosion** of the unpainted steel. The weathering steel is coating uniformly and remains in excellent condition.

Feasible actions: 1) DN

Condition State 2 **Surface rust, surface pitting, has formed or is forming** on the unpainted steel. The weathering steel has not corroded beyond design limits. Weathering steel color is yellow orange to light brown.

Feasible actions: 1) DN  
2) Clean & paint

Condition State 3 **Steel has measurable section loss due to corrosion but does not warrant structural analysis.** Weathering steel is dark brown or black.

Feasible actions: 1) DN  
2) Clean & paint

Condition State 4 **Corrosion is advanced. Section loss is sufficient to warrant structural analysis** to ascertain the impact on the ultimate strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit

Units: LF of Girder

This element defines only those steel closed web/box girder units that are painted. Report the estimated lineal feet in each of Condition States 2 through 5. The number of units in Condition State 1 will be the remainder of the units after deducting those reported in Condition States 2 through 5.

CDOT SUGGESTED CONDITION STATES FOR CORROSION ON PAINTED STEEL ELEMENTS		
	Description	CS
Light R1	Slight peeling of the paint, pitting, or surface rust, etc. No measurable section loss	2
R1	Peeling of the paint, pitting, surface rust, etc. No measurable section loss	3
R2	Flaking, minor section loss ( $\leq 10\%$ thickness loss)	4
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is not warranted.</b>	4
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is warranted due to location of corrosion on the member.</b>	5
R4	Heavy section loss ( $> 30\%$ thickness loss), may have holes through base metal	5

Condition State 1 There is no evidence of active corrosion and the paint system is sound and functioning as intended to protect the metal surface.

Feasible actions: 1) DN  
2) Surface clean

Condition State 2 **There is little or no active corrosion.** Surface or freckled rust has formed or is forming. The paint system may be chalking, peeling, curling or showing other early evidence of paint system distress but **there is no exposure of metal.**

Feasible actions: 1) DN  
2) Surface clean  
3) Surface clean & restore top coat

Condition State 3 **Surface or freckled rust is prevalent.** The paint system is no longer effective. **There may be exposed metal** but there is no active corrosion which is causing loss of section.

Feasible actions: 1) DN  
2) Spot blast, clean & paint

Condition State 4 The **paint system has failed.** **Surface pitting may be present** but any section loss due to active corrosion does not yet warrant structural analysis of either the element or the bridge.

Feasible actions: 1) DN  
2) Spot blast, clean & paint  
3) Replace paint system

Condition State 5 **Corrosion has caused section loss and is sufficient to warrant structural analysis** to ascertain the impact on the ultimate strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN  
2) Major rehab unit

3) Replace unit

Units: LF of Girder

This element defines only those closed web/box girder units constructed of prestressed concrete. Report the estimated lineal feet in each of Condition States 2 through 4. The number of units in Condition State 1 will be the remainder of the units after deducting those reported in Condition States 2 through 4.

CDOT SUGGESTED CONDITION STATES FOR CRACKS IN PRESTRESSED CONCRETE GIRDERS			
CS1	CS2	CS3	CS4
≤ 0.10 mm (≤ 0.004 in)	0.10 < W ≤ 0.25 (0.004 in) (0.009 in)	0.25 < W ≤ 0.76 (0.009 in) (0.030 in)	W > 0.76 mm (> 0.030 in)

CDOT SUGGESTED CONDITION STATES FOR PERCENT LOSS OF BEARING AREA			
LOSS OF BEARING AREA(%)			
PERCENT LOSS	≤ 10%	10 < % ≤ 20	> 20%
CONDITION STATES	2	3	4

CDOT Note: The total quantity for this element is the product of the length times the number of cells.

Condition State 1 The element shows no deterioration. There may be discoloration, efflorescence, and/or superficial cracking but without effect on strength and/or serviceability.

Feasible actions: 1) DN

Condition State 2 Minor cracks and spalls may be present and there may be exposed reinforcing with no evidence of corrosion. There is no exposure of the prestress system.

Feasible actions: 1) DN  
2) Seal cracks minor patch

Condition State 3 Some delaminations and/or spalls may be present. There may be minor exposure but no deterioration of the prestress system. Corrosion of non-prestressed reinforcement may be present but loss of section is incidental and does not significantly affect the strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN  
2) Clean steel & patch, (&/or seal)

Condition State 4 Delaminations, spalls and corrosion on non-prestressed reinforcement are prevalent. There may also be exposure and deterioration of the prestress system (manifested by loss of bond, broken strands or wire, failed anchorages, etc). There is sufficient concern to warrant an analysis to ascertain the impact on the strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit

Units: LF of Girder

This element defines only those closed web/box girder units constructed of reinforced concrete. Report the estimated lineal feet in each of Condition States 2 through 4. The number of units in Condition State 1 will be the remainder of the units after deducting those reported in Condition States 2 through 4.

SUGGESTED CONDITION STATES FOR CRACKS IN MILDLY REINFORCED CONCRETE GIRDERS						
WIDTH (W) in millimeters (inches)						
TYPE OF CRACK	NONE	≤ 0.8 mm (≤ 1/32 in)	0.8 < W ≤ 2 (1/32) (1/16)	2 < W ≤ 2.5 (1/16) (3/32)	2.5 < W ≤ 3 (3/32) (1/8)	W > 3 mm (> 1/8 in)
SHEAR	1	2	2	3	4	4
FLEXURE	1	1	2	3	4	4
DIAGONAL	1	2	2	3	3	4

CDOT SUGGESTED CONDITION STATES FOR PERCENT LOSS OF BEARING AREA			
LOSS OF BEARING AREA (%)			
PERCENT LOSS	≤ 10%	10 < % ≤ 20	> 20%
CONDITION STATES	2	3	4

**CDOT Note:** The total quantity for this element is the product of the length times the number of cells.

Condition State 1 The element shows no deterioration. There may be discoloration, efflorescence, and/or superficial cracking but without effect on strength and/or serviceability.

Feasible actions: 1) DN

Condition State 2 Minor cracks & spalls may be present but there is no exposed reinforcing or surface evidence of rebar corrosion.

Feasible actions: 1) DN  
2) Seal cracks minor patch

Condition State 3 Some delaminations and/or spalls may be present and some reinforcing may be exposed. Corrosion of rebar may be present but loss of section is incidental and does not significantly affect the strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN  
2) Clean rebar & patch, (and/or seal)

Condition State 4 Advanced deterioration. Corrosion of reinforcement and/or loss of concrete section is sufficient to warrant analysis to ascertain the impact on the strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit

Units: LF of Girder

This element defines only those steel open girders/units that are not painted or are constructed of weathering steel. Report the estimated lineal feet in each of Condition States 2 through 4. The number of units in Condition State 1 will be the remainder of the units after deducting those reported in Condition States 2 through 4.

CDOT SUGGESTED CONDITION STATES FOR CORROSION ON UNPAINTED STEEL ELEMENTS		
	Description	CS
R1	Pitting or surface rust, etc. No measurable section loss	2
R2	Flaking, minor section loss ( $\leq 10\%$ thickness loss)	3
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is not warranted.</b>	3
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is warranted due to location of corrosion on the member.</b>	4
R4	Heavy section loss ( $> 30\%$ thickness loss), may have holes through base metal.	4

Condition State 1 **There is little or no corrosion** of the unpainted steel. The weathering steel is coating uniformly and remains in excellent condition.

Feasible actions: 1) DN

Condition State 2 **Surface rust, surface pitting, has formed or is forming** on the unpainted steel. The weathering steel has not corroded beyond design limits. Weathering steel color is yellow orange to light brown.

Feasible actions: 1) DN  
2) Clean & paint

Condition State 3 **Steel has measurable section loss due to corrosion but does not warrant structural analysis.** Weathering steel is dark brown or black.

Feasible actions: 1) DN  
2) Clean & paint

Condition State 4 Corrosion is advanced. **Section loss is sufficient to warrant structural analysis** to ascertain the impact on the ultimate strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit



Units: LF of Girder

This element defines only those steel open girders/units that are painted. Report the estimated lineal feet in each of Condition States 2 through 5. The number of units in Condition State 1 will be the remainder of the units after deducting those reported in Condition States 2 through 5.

CDOT SUGGESTED CONDITION STATES FOR CORROSION ON PAINTED STEEL ELEMENTS		
	Description	CS
Light R1	Slight peeling of the paint, pitting, or surface rust, etc. No measurable section loss	2
R1	Peeling of the paint, pitting, surface rust, etc. No measurable section loss	3
R2	Flaking, minor section loss ( $\leq 10\%$ thickness loss)	4
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is not warranted.</b>	4
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is warranted due to location of corrosion on the member.</b>	5
R4	Heavy section loss ( $> 30\%$ thickness loss), may have holes through base metal	5

Condition State 1 There is no evidence of active corrosion and the paint system is sound and functioning as intended to protect the metal surface.

- Feasible actions: 1) DN  
2) Surface clean

Condition State 2 **There is little or no active corrosion.** Surface or freckled rust has formed or is forming. The paint system may be chalking, peeling, curling or showing other early evidence of paint system distress but **there is no exposure of metal.**

- Feasible actions: 1) DN  
2) Surface clean  
3) Surface clean & restore top coat

Condition State 3 **Surface or freckled rust is prevalent.** The paint system is no longer effective. **There may be exposed metal** but there is no active corrosion which is causing loss of section.

- Feasible actions: 1) DN  
2) Spot blast, clean & paint

Condition State 4 The **paint system has failed.** **Surface pitting may be present** but any section loss due to active corrosion does not yet warrant structural analysis of either the element or the bridge.

- Feasible actions: 1) DN  
2) Spot blast, clean & paint  
3) Replace paint system

Condition State 5 **Corrosion has caused section loss and is sufficient to warrant structural analysis** to ascertain the impact on the ultimate strength and/or serviceability of either the element or the bridge.

- Feasible actions: 1) DN  
2) Major rehab unit

3) Replace unit

Units: LF of Girder

This element defines open girders constructed of prestressed concrete. Report the estimated lineal feet in each of Condition States 2 through 4 for each girder. The number of units in Condition State 1 will be the remainder of the units after deducting those reported in Condition States 2 through 4.

CDOT SUGGESTED CONDITION STATES FOR CRACKS IN PRESTRESSED CONCRETE GIRDERS			
CS1	CS2	CS3	CS4
≤ 0.10 mm (≤ 0.004 in)	0.10 < W ≤ 0.25 (0.004 in) (0.009 in)	0.25 < W ≤ 0.76 (0.009 in) (0.030 in)	W > 0.76 mm (> 0.030 in)

CDOT SUGGESTED CONDITION STATES FOR PERCENT LOSS OF BEARING AREA			
LOSS OF BEARING AREA(%)			
PERCENT LOSS	≤ 10%	10 < % ≤ 20	> 20%
CONDITION STATES	2	3	4

**CDOT Note: GCD27 - Prestressed double-tee (twin-tee) girders shall be counted as two girders. The reported length shall be per web.**

Condition State 1 The element show no deterioration. There may be discoloration, efflorescence, and/or superficial cracking but without effect on strength and/or serviceability.

Feasible actions: 1) DN

Condition State 2 Minor cracks and spalls may be present and there may be exposed reinforcing with no evidence of corrosion. There is no exposure of the prestress system.

Feasible actions: 1) DN  
2) Seal cracks minor patch

Condition State 3 Some delaminations and/or spalls may be present. There may be minor exposure but no deterioration of the prestress system. Corrosion of non-prestressed reinforcement may be present but loss of section is incidental and does not significantly affect the strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN  
2) Clean steel & patch, (&/or seal)

Condition State 4 Delaminations, spalls and corrosion on non-prestressed reinforcement are prevalent. There may also be exposure and deterioration of the prestress system (manifested by loss of bond, broken strands or wire, failed anchorages, etc). There is sufficient concern to warrant an analysis to ascertain the impact on the strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit

Units: LF of Girder

This element defines only those open girders/units constructed of reinforced concrete. Report the estimated lineal feet in each of Condition States 2 through 4. The number of units in Condition State 1 will be the remainder of the units after deducting those reported in Condition States 2 through 4.

SUGGESTED CONDITION STATES FOR CRACKS IN MILDLY REINFORCED CONCRETE GIRDERS						
WIDTH (W) in millimeters (inches)						
TYPE OF CRACK	NONE	≤ 0.8 mm (≤ 1/32 in)	0.8 < W ≤ 2 (1/32) (1/16)	2 < W ≤ 2.5 (1/16) (3/32)	2.5 < W ≤ 3 (3/32) (1/8)	W > 3 mm (> 1/8 in)
SHEAR	1	2	2	3	4	4
FLEXURE	1	1	2	3	4	4
DIAGONAL	1	2	2	3	3	4

CDOT SUGGESTED CONDITION STATES FOR PERCENT LOSS OF BEARING AREA			
LOSS OF BEARING AREA (%)			
PERCENT LOSS	≤ 10%	10 < % ≤ 20	> 20%
CONDITION STATES	2	3	4

Condition State 1 The element shows no deterioration. There may be discoloration, efflorescence, and/or superficial cracking but without effect on strength and/or serviceability.

Feasible actions: 1) DN

Condition State 2 Minor cracks & spalls may be present but there is no exposed reinforcing or surface evidence of rebar corrosion.

Feasible actions: 1) DN  
2) Seal cracks minor patch

Condition State 3 Some delaminations and/or spalls may be present and some reinforcing may be exposed. Corrosion of rebar may be present but loss of section is incidental and does not significantly affect the strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN  
2) Clean rebar & patch, (and/or seal)

Condition State 4 Advanced deterioration. Corrosion of reinforcement and/or loss of concrete section is sufficient to warrant analysis to ascertain the impact on the strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit

Units: LF of Girder

This element defines only those open girders of timber construction. Report the number of girders in each of Condition States 2 through 4. The number of units in Condition State 1 will be the remainder of units after deducting those reported in Condition States 2 through 4.

CDOT SUGGESTED CONDITION STATES FOR TIMBER GIRDERS, STRINGERS, CAPS AND FLOORBEAMS		
Splits < 3 ft long or checks > 1" deep = CS 2	Splits ≥ 3 ft long = CS 4	Any stress related full width crack (thickness of the section) = CS 4

CDOT SUGGESTED CONDITION STATES FOR PERCENT LOSS OF BEARING AREA			
LOSS OF BEARING AREA(%)			
PERCENT LOSS	≤ 10%	10 < % ≤ 20	> 20%
CONDITION STATES	2	3	4

CDOT Note: GCD28 - Timber girders or stringers which have been doubled for repair shall be designated with an apostrophe, e.g. Girders E and E'. The reported length of girder shall not be doubled.

Condition State 1 Investigation indicates **no decay**. There may be **superficial cracks, splits and checks** having no effect on strength or serviceability.  
Feasible actions: 1) DN

Condition State 2 **Decay, insect infestation/marine borer infestation, abrasion, splitting, cracking, checking or crushing may exist** but none is sufficiently advanced to affect serviceability of the element.  
Feasible actions: 1) DN  
2) Rehab &/or protect unit

Condition State 3 **Decay, insect infestation, abrasion, splitting, cracking or crushing** has produced **loss of strength of the element but not of a sufficient magnitude** to affect the serviceability of the bridge.  
Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit

Condition State 4 Advanced deterioration. **Decay, insect infestation, abrasion, splits, cracks or crushing** has produced **loss of strength** that affects the serviceability of the bridge.  
Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit

Units: LF of Stringer

A stringer is defined as those elements which support the deck in a stringer/floor beam/girder (or truss) system. Report the estimated lineal feet in each Condition States 2 through 4. The number of units in Condition State 1 will be the remainder of the units after deducting those reported in Condition States 2 through 4.

CDOT SUGGESTED CONDITION STATES FOR CORROSION ON UNPAINTED STEEL ELEMENTS		
	Description	CS
R1	Pitting or surface rust, etc. No measurable section loss	2
R2	Flaking, minor section loss ( $\leq 10\%$ thickness loss)	3
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is not warranted.</b>	3
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is warranted due to location of corrosion on the member.</b>	4
R4	Heavy section loss ( $> 30\%$ thickness loss), may have holes through base metal.	4

Condition State 1 **There is little or no corrosion** of the unpainted steel. The weathering steel is coating uniformly and remains in excellent condition.

Feasible actions: 1) DN

Condition State 2 **Surface rust, surface pitting, has formed or is forming** on the unpainted steel. The weathering steel has not corroded beyond design limits. Weathering steel color is yellow orange to light brown.

Feasible actions: 1) DN  
2) Clean & paint

Condition State 3 **Steel has measurable section loss due to corrosion but does not warrant structural analysis.** Weathering steel is dark brown or black.

Feasible actions: 1) DN  
2) Clean & paint

Condition State 4 Corrosion is advanced. **Section loss is sufficient to warrant structural analysis** to ascertain the impact on the ultimate strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit

Units: LF of Stringer

A stringer is defined as those elements which support the deck in a stringer/floor beam/girder (or truss) system. Report the estimated lineal feet in each Condition States 2 through 4. The number of units in Condition State 1 will be the remainder of the units after deducting those reported in Condition States 2 through 4.

CDOT SUGGESTED CONDITION STATES FOR CORROSION ON PAINTED STEEL ELEMENTS		
	Description	CS
Light R1	Slight peeling of the paint, pitting, or surface rust, etc. No measurable section loss	2
R1	Peeling of the paint, pitting, surface rust, etc. No measurable section loss	3
R2	Flaking, minor section loss ( $\leq 10\%$ thickness loss)	4
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is not warranted.</b>	4
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is warranted due to location of corrosion on the member.</b>	5
R4	Heavy section loss ( $> 30\%$ thickness loss), may have holes through base metal	5

Condition State 1 There is no evidence of active corrosion and the paint system is sound and functioning as intended to protect the metal surface.

- Feasible actions:
- 1) DN
  - 2) Surface clean

Condition State 2 **There is little or no active corrosion.** Surface or freckled rust has formed or is forming. The paint system may be chalking, peeling, curling or showing other early evidence of paint system distress but **there is no exposure of metal.**

- Feasible actions:
- 1) DN
  - 2) Surface clean
  - 3) Surface clean & restore top coat

Condition State 3 **Surface or freckled rust is prevalent.** The paint system is no longer effective. **There may be exposed metal** but there is no active corrosion which is causing loss of section.

- Feasible actions:
- 1) DN
  - 2) Spot blast, clean & paint

Condition State 4 The **paint system has failed.** **Surface pitting may be present** but any section loss due to active corrosion does not yet warrant structural analysis of either the element or the bridge.

- Feasible actions:
- 1) DN
  - 2) Spot blast, clean & paint
  - 3) Replace paint system

Condition State 5 **Corrosion has caused section loss and is sufficient to warrant structural analysis** to ascertain the impact on the ultimate strength and/or serviceability of either the element or the bridge.

- Feasible actions:
- 1) DN
  - 2) Major rehab unit

3) Replace unit



Units: LF of Stringer

A stringer is defined as those elements which support the deck in a stringer/floor beam/girder (or truss) system. Report the estimated lineal feet in each Condition States 2 through 4. The number of units in Condition State 1 will be the remainder of the units after deducting those reported in Condition States 2 through 4.

CDOT SUGGESTED CONDITION STATES FOR CRACKS IN PRESTRESSED CONCRETE GIRDERS			
CS1	CS2	CS3	CS4
$\leq 0.10$ mm ( $\leq 0.004$ in)	$0.10 < W \leq 0.25$ (0.004 in) (0.009 in)	$0.25 < W \leq 0.76$ (0.009 in) (0.030 in)	$W > 0.76$ mm ( $> 0.030$ in)

CDOT SUGGESTED CONDITION STATES FOR PERCENT LOSS OF BEARING AREA			
LOSS OF BEARING AREA(%)			
PERCENT LOSS	$\leq 10\%$	$10 < \% \leq 20$	$> 20\%$
CONDITION STATES	2	3	4

Condition State 1 The element **show no deterioration**. There **may be discoloration, efflorescence, and/or superficial cracking** but without effect on strength and/or serviceability.

Feasible actions: 1) DN

Condition State 2 **Minor cracks and spalls** may be present and there **may be exposed reinforcing with no evidence of corrosion**. There is no exposure of the prestress system.

Feasible actions: 1) DN  
2) Seal cracks minor patch

Condition State 3 Some **delaminations and/or spalls** may be present. There may be **minor exposure but no deterioration of the prestress system**. **Corrosion of non-prestressed reinforcement may be present** but loss of section is incidental and does not significantly affect the strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN  
2) Clean steel & patch, (&/or seal)

Condition State 4 **Delaminations, spalls and corrosion on non-prestressed reinforcement** are prevalent. There may also be **exposure and deterioration of the prestress system** (manifested by **loss of bond, broken strands or wire, failed anchorages, etc**). There is sufficient concern to warrant an analysis to ascertain the impact on the strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit

Units: LF of Stringer

A stringer is defined as those elements which support the deck in a stringer/floor beam/girder (or truss) system. Report the estimated lineal feet in each Condition States 2 through 4. The number of units in Condition State 1 will be the remainder of the units after deducting those reported in Condition States 2 through 4.

SUGGESTED CONDITION STATES FOR CRACKS IN MILDLY REINFORCED CONCRETE GIRDERS						
WIDTH (W) in millimeters (inches)						
TYPE OF CRACK	NONE	≤ 0.8 mm (≤ 1/32 in)	0.8 < W ≤ 2 (1/32) (1/16)	2 < W ≤ 2.5 (1/16) (3/32)	2.5 < W ≤ 3 (3/32) (1/8)	W > 3 mm (> 1/8 in)
SHEAR	1	2	2	3	4	4
FLEXURE	1	1	2	3	4	4
DIAGONAL	1	2	2	3	3	4

CDOT SUGGESTED CONDITION STATES FOR PERCENT LOSS OF BEARING AREA			
LOSS OF BEARING AREA (%)			
PERCENT LOSS	≤ 10%	10 < % ≤ 20	> 20%
CONDITION STATES	2	3	4

Condition State 1 The element shows no deterioration. There **may be discoloration, efflorescence, and/or superficial cracking** but without effect on strength and/or serviceability.

Feasible actions: 1) DN

Condition State 2 **Minor cracks & spalls may be present** but there is **no exposed reinforcing or surface evidence of rebar corrosion**.

Feasible actions: 1) DN  
2) Seal cracks minor patch

Condition State 3 **Some delaminations and/or spalls may be present** and **some reinforcing may be exposed**. **Corrosion of rebar may be present but loss of section is incidental** and does not significantly affect the strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN  
2) Clean rebar & patch, (and/or seal)

Condition State 4 Advanced deterioration. **Corrosion of reinforcement and/or loss of concrete section is sufficient to warrant analysis** to ascertain the impact on the strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit

Units: LF of Stringer

A stringer is defined as those elements which support the deck in a stringer/floor beam/girder (or truss) system. Report the estimated lineal feet in each Condition States 2 through 4. The number of units in Condition State 1 will be the remainder of the units after deducting those reported in Condition States 2 through 4.

CDOT SUGGESTED CONDITION STATES FOR TIMBER GIRDERS, STRINGERS, CAPS AND FLOORBEAMS		
Splits < 3 ft long or checks > 1" deep = CS 2	Splits ≥ 3 ft long = CS 4	Any stress related full width crack (thickness of the section) = CS 4

CDOT SUGGESTED CONDITION STATES FOR PERCENT LOSS OF BEARING AREA			
LOSS OF BEARING AREA(%)			
PERCENT LOSS	≤ 10%	10 < % ≤ 20	> 20%
CONDITION STATES	2	3	4

CDOT Note: GCD28 - Timber girders or stringers which have been doubled for repair shall be designated with an apostrophe, e.g. Girders E and E'. The reported length of girder shall not be doubled.

Condition State 1 Investigation indicates **no decay**. There may be **superficial cracks, splits and checks** having no effect on strength or serviceability.

- Feasible actions: 1) DN

Condition State 2 **Decay, insect infestation/marine borer infestation, abrasion, splitting, cracking, checking or crushing may exist** but none is sufficiently advanced to affect serviceability of the element.

- Feasible actions: 1) DN
- 2) Rehab &/or protect unit

Condition State 3 **Decay, insect infestation, abrasion, splitting, cracking or crushing** has produced **loss of strength of the element but not of a sufficient magnitude** to affect the serviceability of the bridge.

- Feasible actions: 1) DN
- 2) Rehab unit
- 3) Replace unit

Condition State 4 **Advanced deterioration. Decay, insect infestation, abrasion, splits, cracks or crushing** has produced **loss of strength** that affects the serviceability of the bridge.

- Feasible actions: 1) DN
- 2) Rehab unit
- 3) Replace unit

Units: LF of Truss

This element defines the bottom chord of unpainted steel trusses or are constructed of weathering steel. Report the estimated lineal feet in each of Condition States 2 through 4. The number of units in Condition State 1 will be the remainder of the units after deducting those reported in Condition States 2 through 4. Only report lengths along the span. Do not add web member lengths.

CDOT SUGGESTED CONDITION STATES FOR CORROSION ON UNPAINTED STEEL ELEMENTS		
	Description	CS
R1	Pitting or surface rust, etc. No measurable section loss	2
R2	Flaking, minor section loss ( $\leq 10\%$ thickness loss)	3
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is not warranted.</b>	3
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is warranted due to location of corrosion on the member.</b>	4
R4	Heavy section loss ( $> 30\%$ thickness loss), may have holes through base metal.	4

Condition State 1 **There is little or no corrosion** of the unpainted steel. The weathering steel is coating uniformly and remains in excellent condition.

Feasible actions: 1) DN

Condition State 2 **Surface rust, surface pitting, has formed or is forming** on the unpainted steel. The weathering steel has not corroded beyond design limits. Weathering steel color is yellow orange to light brown.

Feasible actions: 1) DN  
2) Clean & paint

Condition State 3 **Steel has measurable section loss due to corrosion but does not warrant structural analysis.** Weathering steel is dark brown or black.

Feasible actions: 1) DN  
2) Clean & paint

Condition State 4 Corrosion is advanced. **Section loss is sufficient to warrant structural analysis** to ascertain the impact on the ultimate strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit

Units: LF of Truss

This element defines the bottom chord of painted steel trusses. Report the estimated lineal feet in each of Condition States 3 through 5. The number of units in Condition State 1 will be the remainder of the units after deducting those reported in Condition States 2 through 5. Only report lengths along the span. Do not add web member lengths.

CDOT SUGGESTED CONDITION STATES FOR CORROSION ON PAINTED STEEL ELEMENTS		
	Description	CS
Light R1	Slight peeling of the paint, pitting, or surface rust, etc. No measurable section loss	2
R1	Peeling of the paint, pitting, surface rust, etc. No measurable section loss	3
R2	Flaking, minor section loss ( $\leq 10\%$ thickness loss)	4
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is not warranted.</b>	4
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is warranted due to location of corrosion on the member.</b>	5
R4	Heavy section loss ( $> 30\%$ thickness loss), may have holes through base metal	5

Condition State 1 There is no evidence of active corrosion and the paint system is sound and functioning as intended to protect the metal surface.

- Feasible actions:
- 1) DN
  - 2) Surface clean

Condition State 2 **There is little or no active corrosion.** Surface or freckled rust has formed or is forming. The paint system may be chalking, peeling, curling or showing other early evidence of paint system distress but **there is no exposure of metal.**

- Feasible actions:
- 1) DN
  - 2) Surface clean
  - 3) Surface clean & restore top coat

Condition State 3 **Surface or freckled rust is prevalent.** The paint system is no longer effective. **There may be exposed metal** but there is no active corrosion which is causing loss of section.

- Feasible actions:
- 1) DN
  - 2) Spot blast, clean & paint

Condition State 4 The **paint system has failed. Surface pitting may be present** but any section loss due to active corrosion does not yet warrant structural analysis of either the element or the bridge.

- Feasible actions:
- 1) DN
  - 2) Spot blast, clean & paint
  - 3) Replace paint system

Condition State 5 **Corrosion has caused section loss and is sufficient to warrant structural analysis** to ascertain the impact on the ultimate strength and/or serviceability of either the element or the bridge.

- Feasible actions:
- 1) DN
  - 2) Major rehab unit

3) Replace unit

125 Steel - Through Truss excluding Bottom Chord - Unpainted 125 Superstructure(10)

Units: LF of Truss Min Rpt Lgth = One Panel GCD16

This element defines all truss elements except the bottom chord of unpainted steel trusses or those constructed of weathering steel.

Report the estimated lineal feet in each of Condition States 2 through 4. The number of units in Condition State 1 will be the remainder of the units after deducting those reported in Condition States 2 through 4. Only report lengths along the span. Do not add web member lengths.

CDOT SUGGESTED CONDITION STATES FOR CORROSION ON UNPAINTED STEEL ELEMENTS		
	Description	CS
R1	Pitting or surface rust, etc. No measurable section loss	2
R2	Flaking, minor section loss ( $\leq 10\%$ thickness loss)	3
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is not warranted.</b>	3
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is warranted due to location of corrosion on the member.</b>	4
R4	Heavy section loss ( $> 30\%$ thickness loss), may have holes through base metal.	4

Condition State 1 **There is little or no corrosion** of the unpainted steel. The weathering steel is coating uniformly and remains in excellent condition.

Feasible actions: 1) DN

Condition State 2 **Surface rust, surface pitting, has formed or is forming** on the unpainted steel. The weathering steel has not corroded beyond design limits. Weathering steel color is yellow orange to light brown.

Feasible actions: 1) DN  
2) Clean & paint

Condition State 3 **Steel has measurable section loss due to corrosion but does not warrant structural analysis.** Weathering steel is dark brown or black.

Feasible actions: 1) DN  
2) Clean & paint

Condition State 4 Corrosion is advanced. **Section loss is sufficient to warrant structural analysis** to ascertain the impact on the ultimate strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit

126 Steel - Through Truss excluding Bottom Chord - Painted 126  
**Superstructure(10)**

**Units: LF of Truss Min Rpt Lgth = One Panel GCD16**

This element defines all truss elements except the bottom chord of painted steel trusses. Report the estimated lineal feet in each of Condition States 2 through 5. The number of units in Condition State 1 will be the remainder of the units after deducting those reported in Condition States 2 through 5. Only report lengths along the span. Do not add web member lengths.

CDOT SUGGESTED CONDITION STATES FOR CORROSION ON PAINTED STEEL ELEMENTS		
	Description	CS
Light R1	Slight peeling of the paint, pitting, or surface rust, etc. No measurable section loss	2
R1	Peeling of the paint, pitting, surface rust, etc. No measurable section loss	3
R2	Flaking, minor section loss ( $\leq 10\%$ thickness loss)	4
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is not warranted.</b>	4
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is warranted due to location of corrosion on the member.</b>	5
R4	Heavy section loss ( $> 30\%$ thickness loss), may have holes through base metal	5

Condition State 1 There is no evidence of active corrosion and the paint system is sound and functioning as intended to protect the metal surface.

- Feasible actions: 1) DN  
 2) Surface clean

Condition State 2 **There is little or no active corrosion.** Surface or freckled rust has formed or is forming. The paint system may be chalking, peeling, curling or showing other early evidence of paint system distress but **there is no exposure of metal.**

- Feasible actions: 1) DN  
 2) Surface clean  
 3) Surface clean & restore top coat

Condition State 3 **Surface or freckled rust is prevalent.** The paint system is no longer effective. **There may be exposed metal** but there is no active corrosion which is causing loss of section.

- Feasible actions: 1) DN  
 2) Spot blast, clean & paint

Condition State 4 The **paint system has failed.** **Surface pitting may be present** but any section loss due to active corrosion does not yet warrant structural analysis of either the element or the bridge.

- Feasible actions: 1) DN  
 2) Spot blast, clean & paint  
 3) Replace paint system

Condition State 5 **Corrosion has caused section loss and is sufficient to warrant structural analysis** to ascertain the impact on the ultimate strength and/or serviceability of either the element or the bridge.

- Feasible actions: 1) DN  
 2) Major rehab unit



3) Replace unit

Units: LF of Truss Min Rpt Lgth = One Panel GCD16

This element defines all members of unpainted steel deck trusses or those constructed with weathering steel. Report the estimated lineal feet in each of Condition States 2 through 4. The number of units in Condition State 1 will be the remainder of the units after deducting those reported in Condition States 2 through 4. Only the report lengths along the span. Do not add web member lengths.

CDOT SUGGESTED CONDITION STATES FOR CORROSION ON UNPAINTED STEEL ELEMENTS		
	Description	CS
R1	Pitting or surface rust, etc. No measurable section loss	2
R2	Flaking, minor section loss ( $\leq 10\%$ thickness loss)	3
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is not warranted.</b>	3
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is warranted due to location of corrosion on the member.</b>	4
R4	Heavy section loss ( $> 30\%$ thickness loss), may have holes through base metal.	4

Condition State 1 **There is little or no corrosion** of the unpainted steel. The weathering steel is coating uniformly and remains in excellent condition.

Feasible actions: 1) DN

Condition State 2 **Surface rust, surface pitting, has formed or is forming** on the unpainted steel. The weathering steel has not corroded beyond design limits. Weathering steel color is yellow orange to light brown.

Feasible actions: 1) DN  
2) Clean & paint

Condition State 3 **Steel has measurable section loss due to corrosion but does not warrant structural analysis.** Weathering steel is dark brown or black.

Feasible actions: 1) DN  
2) Clean & paint

Condition State 4 Corrosion is advanced. **Section loss is sufficient to warrant structural analysis** to ascertain the impact on the ultimate strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit

Units: LF of Truss Min Rpt Lgth = One Panel GCD16

This element defines all members of painted steel deck trusses. Report the estimated lineal feet in each of Condition States 2 through 5 for each truss. The number of units in Condition State 1 will be the remainder of the units after deducting those reported in Condition States 2 through 5. Only report lengths along the span. Do not add web member lengths.

CDOT SUGGESTED CONDITION STATES FOR CORROSION ON PAINTED STEEL ELEMENTS		
	Description	CS
Light R1	Slight peeling of the paint, pitting, or surface rust, etc. No measurable section loss	2
R1	Peeling of the paint, pitting, surface rust, etc. No measurable section loss	3
R2	Flaking, minor section loss ( $\leq 10\%$ thickness loss)	4
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is not warranted.</b>	4
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is warranted due to location of corrosion on the member.</b>	5
R4	Heavy section loss ( $> 30\%$ thickness loss), may have holes through base metal	5

Condition State 1 There is no evidence of active corrosion and the paint system is sound and functioning as intended to protect the metal surface.

- Feasible actions:
- 1) DN
  - 2) Surface clean

Condition State 2 **There is little or no active corrosion.** Surface or freckled rust has formed or is forming. The paint system may be chalking, peeling, curling or showing other early evidence of paint system distress but **there is no exposure of metal.**

- Feasible actions:
- 1) DN
  - 2) Surface clean
  - 3) Surface clean & restore top coat

Condition State 3 **Surface or freckled rust is prevalent.** The paint system is no longer effective. **There may be exposed metal** but there is no active corrosion which is causing loss of section.

- Feasible actions:
- 1) DN
  - 2) Spot blast, clean & paint

Condition State 4 The **paint system has failed.** **Surface pitting may be present** but any section loss due to active corrosion does not yet warrant structural analysis of either the element or the bridge.

- Feasible actions:
- 1) DN
  - 2) Spot blast, clean & paint
  - 3) Replace paint system

Condition State 5 **Corrosion has caused section loss and is sufficient to warrant structural analysis** to ascertain the impact on the ultimate strength and/or serviceability of either the element or the bridge.

- Feasible actions:
- 1) DN
  - 2) Major rehab unit

3) Replace unit

Units: LF of Truss Min Rpt Lgth = One Panel GCD16  
LF of Arch

This element defines all members of trusses and arches that are constructed of timber. Report the estimated number of lineal feet in each of Condition States 2 through 4. The number of units in Condition State 1 will be the remainder of the units after deducting those reported in Condition States 2 through 4.

CDOT SUGGESTED CONDITION STATES FOR TIMBER GIRDERS, STRINGERS, CAPS AND FLOORBEAMS		
Splits < 3 ft long or checks > 1" deep = CS 2	Splits ≥ 3 ft long = CS 4	Any stress related full width crack (thickness of the section) = CS 4

Condition State 1 Investigation indicates **no decay**. There may be **superficial cracks, splits and checks** having no effect on strength or serviceability.  
Feasible actions: 1) DN

Condition State 2 **Decay, insect infestation/marine borer infestation, abrasion, splitting, cracking, checking or crushing may exist** but none is sufficiently advanced to affect serviceability of the element.  
Feasible actions: 1) DN  
2) Rehab &/or protect unit

Condition State 3 **Decay, insect infestation, abrasion, splitting, cracking or crushing** has produced **loss of strength of the element but not of a sufficient magnitude** to affect the serviceability of the bridge.  
Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit

Condition State 4 Advanced deterioration. **Decay, insect infestation, abrasion, splits, cracks or crushing** has produced **loss of strength** that affects the serviceability of the bridge.  
Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit

Units: LF of Arch Min Rpt Lgth = One Panel GCD03 GCD16

This element defines all members of only those steel arches that are not painted or are constructed of weathering steel. Report the estimated number of lineal feet in each of Condition States 2 through 4. The number of units in Condition State 1 will be the remainder of the units after deducting those reported in Condition States 2 through 4. Only report lengths along the span. Do not add web member lengths.

CDOT SUGGESTED CONDITION STATES FOR CORROSION ON UNPAINTED STEEL ELEMENTS		
	Description	CS
R1	Pitting or surface rust, etc. No measurable section loss	2
R2	Flaking, minor section loss (≤ 10% thickness loss)	3
R3	Flaking, swelling, mod. section loss (10% < thickness loss ≤ 30%) <b>structural analysis is not warranted.</b>	3
R3	Flaking, swelling, mod. section loss (10% < thickness loss ≤ 30%) <b>structural analysis is warranted due to location of corrosion on the member.</b>	4
R4	Heavy section loss (> 30% thickness loss), may have holes through base metal.	4

Condition State 1 **There is little or no corrosion** of the unpainted steel. The weathering steel is coating uniformly and remains in excellent condition.

Feasible actions: 1) DN

Condition State 2 **Surface rust, surface pitting, has formed or is forming** on the unpainted steel. The weathering steel has not corroded beyond design limits. Weathering steel color is yellow orange to light brown.

Feasible actions: 1) DN  
2) Clean & paint

Condition State 3 **Steel has measurable section loss due to corrosion but does not warrant structural analysis.** Weathering steel is dark brown or black.

Feasible actions: 1) DN  
2) Clean & paint

Condition State 4 Corrosion is advanced. **Section loss is sufficient to warrant structural analysis** to ascertain the impact on the ultimate strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit

Units: LF of Arch Min Rpt Lgth = One Panel GCD03 GCD16

This element defines all members of only those steel arches that are painted. Report the estimated number of lineal feet in each of Condition States 2 through 5. The number of units in Condition State 1 will be the remainder of the units after deducting those reported in Condition States 2 through 5. Only report lengths along the span. Do not add web member lengths.

CDOT SUGGESTED CONDITION STATES FOR CORROSION ON PAINTED STEEL ELEMENTS		
	Description	CS
Light R1	Slight peeling of the paint, pitting, or surface rust, etc. No measurable section loss	2
R1	Peeling of the paint, pitting, surface rust, etc. No measurable section loss	3
R2	Flaking, minor section loss ( $\leq 10\%$ thickness loss)	4
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is not warranted.</b>	4
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is warranted due to location of corrosion on the member.</b>	5
R4	Heavy section loss ( $> 30\%$ thickness loss), may have holes through base metal	5

Condition State 1 There is no evidence of active corrosion and the paint system is sound and functioning as intended to protect the metal surface.

- Feasible actions:
- 1) DN
  - 2) Surface clean

Condition State 2 **There is little or no active corrosion.** Surface or freckled rust has formed or is forming. The paint system may be chalking, peeling, curling or showing other early evidence of paint system distress but **there is no exposure of metal.**

- Feasible actions:
- 1) DN
  - 2) Surface clean
  - 3) Surface clean & restore top coat

Condition State 3 **Surface or freckled rust is prevalent.** The paint system is no longer effective. **There may be exposed metal** but there is no active corrosion which is causing loss of section.

- Feasible actions:
- 1) DN
  - 2) Spot blast, clean & paint

Condition State 4 The **paint system has failed.** **Surface pitting may be present** but any section loss due to active corrosion does not yet warrant structural analysis of either the element or the bridge.

- Feasible actions:
- 1) DN
  - 2) Spot blast, clean & paint
  - 3) Replace paint system

Condition State 5 **Corrosion has caused section loss and is sufficient to warrant structural analysis** to ascertain the impact on the ultimate strength and/or serviceability of either the element or the bridge.

- Feasible actions:
- 1) DN
  - 2) Major rehab unit

3) Replace unit



Units: LF of Arch Min Rpt Lgth = One Panel GCD03 GCD16

This element defines only those arches constructed of prestressed concrete. Report the estimated number of lineal feet in each of Condition States 2 through 4. The number of units in Condition State 1 will be the remainder of the units after deducting those reported in Condition States 2 through 4.

CDOT SUGGESTED CONDITION STATES FOR CRACKS IN PRESTRESSED CONCRETE GIRDERS			
CS1	CS2	CS3	CS4
≤ 0.10 mm (≤ 0.004 in)	0.10 < W ≤ 0.25 (0.004 in)(0.009 in)	0.25 < W ≤ 0.76 (0.009 in) (0.030 in)	W > 0.76 mm (> 0.030 in)

Condition State 1 The element **show no deterioration**. There **may be discoloration, efflorescence, and/or superficial cracking** but without effect on strength and/or serviceability.

Feasible actions: 1) DN

Condition State 2 **Minor cracks and spalls** may be present and there **may be exposed reinforcing with no evidence of corrosion**. There is no exposure of the prestress system.

Feasible actions: 1) DN  
2) Seal cracks minor patch

Condition State 3 Some **delaminations and/or spalls may be present**. There may be **minor exposure but no deterioration of the prestress system**. **Corrosion of non-prestressed reinforcement may be present** but loss of section is incidental and does not significantly affect the strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN  
2) Clean steel & patch, (&/or seal)

Condition State 4 **Delaminations, spalls and corrosion on non-prestressed reinforcement are prevalent**. There may also be **exposure and deterioration of the prestress system** (manifested by **loss of bond, broken strands or wire, failed anchorages, etc**). There is sufficient concern to warrant an analysis to ascertain the impact on the strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit

Units: LF of Arch Min Rpt Lgth = One Panel GCD03 GCD16

This element defines only those arches (open/closed spandrel, earth filled, bowstring, etc.) constructed of reinforced concrete. Report the estimated number of lineal feet in each of Condition States 2 through 4. The number of units in Condition State 1 will be the remainder of the units after deducting those reported in Condition States 2 through 4.

SUGGESTED CONDITION STATES FOR CRACKS IN MILDLY REINFORCED CONCRETE GIRDERS						
WIDTH (W) in millimeters (inches)						
TYPE OF CRACK	NONE	≤ 0.8 mm (≤ 1/32 in)	0.8 < W ≤ 2 (1/32) (1/16)	2 < W ≤ 2.5 (1/16) (3/32)	2.5 < W ≤ 3 (3/32) (1/8)	W > 3 mm (> 1/8 in)
SHEAR	1	2	2	3	4	4
FLEXURE	1	1	2	3	4	4
DIAGONAL	1	2	2	3	3	4

Condition State 1 The element shows no deterioration. There may be discoloration, efflorescence, and/or superficial cracking but without effect on strength and/or serviceability.

Feasible actions: 1) DN

Condition State 2 Minor cracks & spalls may be present but there is no exposed reinforcing or surface evidence of rebar corrosion.

Feasible actions: 1) DN  
2) Seal cracks minor patch

Condition State 3 Some delaminations and/or spalls may be present and some reinforcing may be exposed. Corrosion of rebar may be present but loss of section is incidental and does not significantly affect the strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN  
2) Clean rebar & patch, (and/or seal)

Condition State 4 Advanced deterioration. Corrosion of reinforcement and/or loss of concrete section is sufficient to warrant analysis to ascertain the impact on the strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit

Units: LF

This element defines arches made of masonry or any other material except steel, concrete, or timber.

Condition State 1 There is **little or no deterioration**. Surface defects only are in evidence.

Feasible actions: 1) DN

Condition State 2 There may be **minor deterioration, cracking and weathering**. **Mortar in joints** may show **minor deterioration**.

Feasible actions: 1) DN  
2) Rehab unit

Condition State 3 **Moderate to major** deterioration and cracking. **Major** deterioration of joints.

Feasible actions: 1) DN  
2) Rehab unit

Condition State 4 **Major deterioration, splitting, or cracking** of materials may be **affecting the structural capacity** of the element.

Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit

146 Steel - Cable not embedded in concrete (Uncoated) 146  
Superstructure (10)

Units: Each

This element defines only those steel cables not embedded in concrete. Report the number of individual cables in each of Condition States 2 through 4. The number of cables in Condition State 1 will be the total number of cables on the bridge less those reported in Condition States 2 through 4.

CDOT SUGGESTED CONDITION STATES FOR CORROSION ON UNPAINTED STEEL ELEMENTS		
	Description	CS
R1	Pitting or surface rust, etc. No measurable section loss	2
R2	Flaking, minor section loss ( $\leq 10\%$ thickness loss)	3
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is not warranted.</b>	3
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is warranted due to location of corrosion on the member.</b>	4
R4	Heavy section loss ( $> 30\%$ thickness loss), may have holes through base metal.	4

Condition State 1 There is **little or no corrosion of unpainted steel**. Strand and anchor sockets show no signs of distress.  
 Feasible actions: 1) DN

Condition State 2 **Surface rust has formed or is forming**. Strand and anchor sockets show no signs of distress.  
 Feasible actions: 1) DN  
 2) Clean & paint

Condition State 3 **Surface pitting may be present but any section loss is incidental** and does not affect the strength or serviceability of either the element or the bridge. **Cable banding, if any, may show some loosening or slipping**. Cable anchor devices may be loosening.  
 Feasible actions: 1) DN  
 2) Clean & paint

Condition State 4 Corrosion is advanced. **Cable strands or wires may be broken or severely abraded**. Anchors may show signs of slippage. **Section loss or other deterioration is sufficient to warrant analysis** for strength and/or serviceability of both the element and the bridge.  
 Feasible actions: 1) DN  
 2) Rehab unit  
 3) Replace unit

Units: Each

This element defines only those steel cables not embedded in concrete. Report the number of individual cables in each of Condition States 2 through 4. The number of cables in Condition State 1 will be the total number of cables on the bridge less those reported in Condition States 2 through 4.

CDOT SUGGESTED CONDITION STATES FOR CORROSION ON PAINTED STEEL ELEMENTS		
	Description	CS
Light R1	Slight peeling of the paint, pitting, or surface rust, etc. No measurable section loss	2
R1	Peeling of the paint, pitting, surface rust, etc. No measurable section loss	3
R2	Flaking, minor section loss ( $\leq 10\%$ thickness loss)	4
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is not warranted.</b>	4
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is warranted due to location of corrosion on the member.</b>	5
R4	Heavy section loss ( $> 30\%$ thickness loss), may have holes through base metal	5

Condition State 1 There is little or no evidence of active corrosion. Protective coating is sound and functioning as intended to protect the metal surface. Strand and anchor sockets show no signs of distress.

Feasible actions: 1) DN

Condition State 2 There is little or no evidence of active corrosion. Surface or freckled rust has formed or is forming. The protective coating may be peeling, chalking, curling, or showing other early evidence of distress but there is no exposure of metal. Stand and anchor sockets show no signs of distress.

Feasible actions: 1) DN  
 2) Clean and restore coating

Condition State 3 Surface or freckled rust is prevalent. There may be exposed metal but there is no active corrosion which is causing loss of section. Protective system is no longer effective. Strand and anchor sockets show no signs of distress.

Feasible actions: 1) DN  
 2) Clean and restore coating

Condition State 4 Corrosion may be present but any section loss is incidental and does not affect the strength or serviceability of either the element or the bridge. Cable banding, if any, may show some loosening or slippage. Cable anchor devices may be loosening.

Feasible actions: 1) DN  
 2) Rehab unit and replace coating system  
 3) Replace unit

Condition State 5 Corrosion is advanced. Cable strands or wires may be broken or severely abraded. Anchors may show signs of slippage. Section loss or other deterioration is sufficient to warrant analysis for strength and/or serviceability of both the element and the bridge.

- Feasible actions:
- 1) DN
  - 2) Rehab unit and replace coating system
  - 3) Replace unit

Units: LF of Floor Beam

This element defines only those steel floor beams that are not painted or are constructed with weathering steel. Report the estimated lineal feet in each of Condition States 2 through 4. The number of units in Condition State 1 will be the remainder of the units after deducting those reported in Condition States 2 through 4.

CDOT SUGGESTED CONDITION STATES FOR CORROSION ON UNPAINTED STEEL ELEMENTS		
	Description	CS
R1	Pitting or surface rust, etc. No measurable section loss	2
R2	Flaking, minor section loss ( $\leq 10\%$ thickness loss)	3
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is not warranted.</b>	3
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is warranted due to location of corrosion on the member.</b>	4
R4	Heavy section loss ( $> 30\%$ thickness loss), may have holes through base metal.	4

Condition State 1 **There is little or no corrosion** of the unpainted steel. The weathering steel is coating uniformly and remains in excellent condition.

Feasible actions: 1) DN

Condition State 2 **Surface rust, surface pitting, has formed or is forming** on the unpainted steel. The weathering steel has not corroded beyond design limits. Weathering steel color is yellow orange to light brown.

Feasible actions: 1) DN  
2) Clean & paint

Condition State 3 **Steel has measurable section loss due to corrosion but does not warrant structural analysis.** Weathering steel is dark brown or black.

Feasible actions: 1) DN  
2) Clean & paint

Condition State 4 Corrosion is advanced. **Section loss is sufficient to warrant structural analysis** to ascertain the impact on the ultimate strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit

Units: LF of Floor Beam

This element defines only those steel floor beams that are painted. Report the estimated lineal feet in each of Condition States 2 through 5. The number of units in Condition State 1 will be the remainder of the units after deducting those reported in Condition States 2 through 5.

CDOT SUGGESTED CONDITION STATES FOR CORROSION ON PAINTED STEEL ELEMENTS		
	Description	CS
Light R1	Slight peeling of the paint, pitting, or surface rust, etc. No measurable section loss	2
R1	Peeling of the paint, pitting, surface rust, etc. No measurable section loss	3
R2	Flaking, minor section loss ( $\leq 10\%$ thickness loss)	4
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is not warranted.</b>	4
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is warranted due to location of corrosion on the member.</b>	5
R4	Heavy section loss ( $> 30\%$ thickness loss), may have holes through base metal	5

Condition State 1 There is no evidence of active corrosion and the paint system is sound and functioning as intended to protect the metal surface.

- Feasible actions:
- 1) DN
  - 2) Surface clean

Condition State 2 **There is little or no active corrosion.** Surface or freckled rust has formed or is forming. The paint system may be chalking, peeling, curling or showing other early evidence of paint system distress but **there is no exposure of metal.**

- Feasible actions:
- 1) DN
  - 2) Surface clean
  - 3) Surface clean & restore top coat

Condition State 3 **Surface or freckled rust is prevalent.** The paint system is no longer effective. **There may be exposed metal** but there is no active corrosion which is causing loss of section.

- Feasible actions:
- 1) DN
  - 2) Spot blast, clean & paint

Condition State 4 The **paint system has failed.** **Surface pitting may be present** but any section loss due to active corrosion does not yet warrant structural analysis of either the element or the bridge.

- Feasible actions:
- 1) DN
  - 2) Spot blast, clean & paint
  - 3) Replace paint system

Condition State 5 **Corrosion has caused section loss and is sufficient to warrant structural analysis** to ascertain the impact on the ultimate strength and/or serviceability of either the element or the bridge.

- Feasible actions:
- 1) DN
  - 2) Major rehab unit



3) Replace unit

Units: LF of Floor Beam

This element defines only those floor beams constructed of prestressed concrete. Report the estimated lineal feet in each of Condition States 2 through 4 for each floor beam. The number of units in Condition State 1 will be the remainder of the units after deducting those reported in Condition States 2 through 4.

CDOT SUGGESTED CONDITION STATES FOR CRACKS IN PRESTRESSED CONCRETE GIRDERS			
CS1	CS2	CS3	CS4
≤ 0.10 mm (≤ 0.004 in)	0.10 < W ≤ 0.25 (0.004 in)(0.009 in)	0.25 < W ≤ 0.76 (0.009 in) (0.030 in)	W > 0.76 mm (> 0.030 in)

Condition State 1 The element **show no deterioration**. There may be **discoloration, efflorescence, and/or superficial cracking** but without effect on strength and/or serviceability.

Feasible actions: 1) DN

Condition State 2 **Minor cracks and spalls** may be present and there may be **exposed reinforcing with no evidence of corrosion**. There is no exposure of the prestress system.

Feasible actions: 1) DN  
2) Seal cracks minor patch

Condition State 3 Some **delaminations and/or spalls** may be present. There may be **minor exposure but no deterioration of the prestress system**. **Corrosion of non-prestressed reinforcement may be present** but loss of section is incidental and does not significantly affect the strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN  
2) Clean steel & patch, (&/or seal)

Condition State 4 **Delaminations, spalls and corrosion on non-prestressed reinforcement** are prevalent. There may also be **exposure and deterioration of the prestress system** (manifested by **loss of bond, broken strands or wire, failed anchorages, etc**). There is sufficient concern to warrant an analysis to ascertain the impact on the strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit

Units: LF of Floor Beam

This element defines only those floor beams constructed of reinforced concrete. Report the estimated lineal feet in each of Condition States 2 through 4. The number of units in Condition State 1 will be the remainder of the units after deducting those reported in Condition States 2 through 4.

SUGGESTED CONDITION STATES FOR CRACKS IN MILDLY REINFORCED CONCRETE GIRDERS						
WIDTH (W) in millimeters (inches)						
TYPE OF CRACK	NONE	≤ 0.8 mm (≤ 1/32 in)	0.8 < W ≤ 2 (1/32) (1/16)	2 < W ≤ 2.5 (1/16) (3/32)	2.5 < W ≤ 3 (3/32) (1/8)	W > 3 mm (> 1/8 in)
SHEAR	1	2	2	3	4	4
FLEXURE	1	1	2	3	4	4
DIAGONAL	1	2	2	3	3	4

Condition State 1 The element shows no deterioration. There may be **discoloration, efflorescence, and/or superficial cracking** but without effect on strength and/or serviceability.

Feasible actions: 1) DN

Condition State 2 **Minor cracks & spalls may be present** but there is **no exposed reinforcing or surface evidence of rebar corrosion**.

Feasible actions: 1) DN  
2) Seal cracks minor patch

Condition State 3 **Some delaminations and/or spalls may be present** and **some reinforcing may be exposed**. **Corrosion of rebar may be present but loss of section is incidental** and does not significantly affect the strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN  
2) Clean rebar & patch, (and/or seal)

Condition State 4 Advanced deterioration. **Corrosion of reinforcement and/or loss of concrete section is sufficient to warrant analysis** to ascertain the impact on the strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit

Units: LF of Floor Beam

This element defines only those floor beams of timber construction. Report the number of floor beams in each of Condition States 2 through 4. The number of units in Condition State 1 will be the remainder of the units after deducting those reported in Condition States 2 through 4.

CDOT SUGGESTED CONDITION STATES FOR TIMBER GIRDERS, STRINGERS, CAPS AND FLOORBEAMS		
Splits < 3 ft long or checks > 1" deep = CS 2	Splits ≥ 3 ft long = CS 4	Any stress related full width crack (thickness of the section) = CS 4

Condition State 1 Investigation indicates **no decay**. There may be **superficial cracks, splits and checks** having no effect on strength or serviceability.

Feasible actions: 1) DN

Condition State 2 **Decay, insect infestation/marine borer infestation, abrasion, splitting, cracking, checking or crushing may exist** but none is sufficiently advanced to affect serviceability of the element.

Feasible actions: 1) DN  
2) Rehab &/or protect unit

Condition State 3 **Decay, insect infestation, abrasion, splitting, cracking or crushing** has produced **loss of strength of the element but not of a sufficient magnitude** to affect the serviceability of the bridge.

Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit

Condition State 4 Advanced deterioration. **Decay, insect infestation, abrasion, splits, cracks or crushing** has produced **loss of strength** that affects their serviceability of the bridge.

Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit

Units: Each Pin & Hanger Set

This element defines only those steel pin and hanger assemblies that are either not painted or are constructed of weathering steel.

Report the number of pin and hanger sets in Condition States 2 through 4. The number of pin and hanger sets in Condition State 1 will be the total number of pin and hanger sets in the bridge less those reported in Condition States 2 through 4.

Note: Any deformation or restriction of the pin and hanger should be identified with an on/off flag. A uniform flag number should be identified for consistent use by all states.

CDOT SUGGESTED CONDITION STATES FOR CORROSION ON UNPAINTED STEEL ELEMENTS		
	Description	CS
R1	Pitting or surface rust, etc. No measurable section loss	2
R2	Flaking, minor section loss ( $\leq 10\%$ thickness loss)	3
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is not warranted.</b>	3
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is warranted due to location of corrosion on the member.</b>	4
R4	Heavy section loss ( $> 30\%$ thickness loss), may have holes through base metal.	4

**CDOT Note: Use this element for all pin connections.**

Condition State 1 **There is little or no corrosion** of the unpainted steel. The weathering steel is coating uniformly and remains in excellent condition.

Feasible actions: 1) DN

Condition State 2 **Surface rust, surface pitting, has formed or is forming** on the unpainted steel. The weathering steel has not corroded beyond design limits.

Feasible actions: 1) DN  
2) Clean & paint

Condition State 3 **Steel has measurable section loss due to corrosion but does not warrant structural analysis.**

Feasible actions: 1) DN  
2) Clean & paint

Condition State 4 Corrosion is advanced. **Section loss is sufficient to warrant structural analysis** to ascertain the impact on the ultimate strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit

Units: Each Pin & Hanger Set

This element defines only those pin and hanger assemblies that are painted.

Report the number of pin and hanger sets in Condition States 2 through 5. The number of pin and hanger sets in Condition State 1 will be the total number of pin and hanger sets in the bridge less those reported in Condition States 2 through 5.

Note: Any deformation or restriction of the pin and hanger should be identified with an on/off flag. A uniform flag number should be identified for consistent use by all states.

CDOT SUGGESTED CONDITION STATES FOR CORROSION ON PAINTED STEEL ELEMENTS		
	Description	CS
Light R1	Slight peeling of the paint, pitting, or surface rust, etc. No measurable section loss	2
R1	Peeling of the paint, pitting, surface rust, etc. No measurable section loss	3
R2	Flaking, minor section loss ( $\leq 10\%$ thickness loss)	4
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is not warranted.</b>	4
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is warranted due to location of corrosion on the member.</b>	5
R4	Heavy section loss ( $> 30\%$ thickness loss), may have holes through base metal	5

CDOT Note: Use this element for all pin connections.

Condition State 1 There is no evidence of active corrosion and the paint system is sound and functioning as intended to protect the metal surface.

Feasible actions: 1) DN

Condition State 2 **There is little or no active corrosion.** Surface or freckled rust has formed or is forming. The paint system may be chalking, peeling, curling or showing other early evidence of paint system distress but **there is no exposure of metal.**

Feasible actions: 1) DN  
2) Surface clean

Condition State 3 **Surface or freckled rust is prevalent.** The paint system is no longer effective. **There may be exposed metal** but there is no loss of section.

Feasible actions: 1) DN  
2) Spot blast, clean & paint

Condition State 4 The **paint system has failed.** **Surface pitting may be present** but any section loss due to active corrosion does not yet warrant structural analysis of either the element of the bridge.

Feasible actions: 1) DN  
2) Spot blast, clean & paint  
3) Replace paint system

Condition State 5 Corrosion is advanced. **Section loss is sufficient to warrant structural analysis** to ascertain the impact on the ultimate strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN

- 2) Major rehab unit
- 3) Replace unit

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## ***Substructure Element Index***

201 -4- Steel - Column or Pile Extension - Unpainted  
202 -5- Steel - Column or Pile Extension - Painted  
204 -4- P/S Concrete - Column or Pile Extension  
205 -4- Concrete - Column or Pile Extension  
206 -4- Timber - Column or Pile Extension  
210 -4- Concrete - Pier Wall  
211 -4- Other - Pier Wall  
215 -4- Concrete - Abutment  
216 -4- Timber - Abutment  
217 -4- Other - Abutment  
220 -4- Concrete - Submerged Pile Cap/Footing  
221\*-4- Concrete - Pile Cap/Footing  
225 -4- Steel - Submerged Pile - Unpainted  
226 -4- P/S Concrete - Submerged Pile  
227 -4- Concrete - Submerged Pile  
228 -4- Timber - Submerged Pile  
230 -4- Steel - Cap - Unpainted  
231 -5- Steel - Cap - Painted  
233 -4- P/S Concrete - Cap  
234 -4- Concrete - Cap  
235 -4- Timber - Cap

The following SmartFlags may be used in conjunction with Substructure elements:

360 -3- Settlement  
361 -3- Scour  
370\*-3- Traffic Impact (Substructure)  
372\*-3- False Bent/Temporary Support  
373\*-4- Pack Rust (Substructure)  
399\*-5- Alkali-Silica Reactivity (ASR)

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Units: Each

This element defines only those columns or pile extensions that are unpainted or are constructed of weathering steel. ~~and are exposed to variable conditions (these elements are either partially submerged or are seasonally submerged).~~ Report the number of columns or pile extensions in each of Condition States 2 through 4.

The number of columns/pile extensions in Condition State 1 will be the total number of columns/pile extensions in the bridge less those reported in Condition States 2 through 4.

CDOT SUGGESTED CONDITION STATES FOR CORROSION ON UNPAINTED STEEL ELEMENTS		
	Description	CS
R1	Pitting or surface rust, etc. No measurable section loss	2
R2	Flaking, minor section loss ( $\leq 10\%$ thickness loss)	3
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is not warranted.</b>	3
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is warranted due to location of corrosion on the member.</b>	4
R4	Heavy section loss ( $> 30\%$ thickness loss), may have holes through base metal.	4

Condition State 1 **There is little or no corrosion** of the unpainted steel. The weathering steel is coating uniformly and remains in excellent condition.

Feasible actions: 1) DN

Condition State 2 **Surface rust, surface pitting, has formed or is forming** on the unpainted steel. The weathering steel has not corroded beyond design limits. Weathering steel color is yellow orange to light brown.

Feasible actions: 1) DN  
2) Clean & paint

Condition State 3 **Steel has measurable section loss due to corrosion but does not warrant structural analysis.** Weathering steel is dark brown or black.

Feasible actions: 1) DN  
2) Clean & paint

Condition State 4 Corrosion is advanced. **Section loss is sufficient to warrant structural analysis** to ascertain the impact on the ultimate strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit

Units: Each

This element defines only those columns or pile extensions that are painted. ~~and are exposed to variable conditions (these elements are either partially submerged or are seasonally submerged).~~ Report the number of columns or pile extensions in each of Condition States 2 through 5. The number of columns/pile extensions in Condition State 1 will be the total number of columns/pile extensions in the bridge less those reported in Condition States 2 through 5.

CDOT SUGGESTED CONDITION STATES FOR CORROSION ON PAINTED STEEL ELEMENTS		
	Description	CS
Light R1	Slight peeling of the paint, pitting, or surface rust, etc. No measurable section loss	2
R1	Peeling of the paint, pitting, surface rust, etc. No measurable section loss	3
R2	Flaking, minor section loss ( $\leq 10\%$ thickness loss)	4
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is not warranted.</b>	4
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is warranted due to location of corrosion on the member.</b>	5
R4	Heavy section loss ( $> 30\%$ thickness loss), may have holes through base metal	5

Condition State 1 There is no evidence of active corrosion and the paint system is sound and functioning as intended to protect the metal surface.

- Feasible actions:
- 1) DN
  - 2) Surface clean

Condition State 2 **There is little or no active corrosion.** Surface or freckled rust has formed or is forming. The paint system may be chalking, peeling, curling or showing other early evidence of paint system distress but **there is no exposure of metal.**

- Feasible actions:
- 1) DN
  - 2) Surface clean
  - 3) Surface clean & restore top coat

Condition State 3 **Surface or freckled rust is prevalent.** The paint system is no longer effective. **There may be exposed metal** but there is no active corrosion which is causing loss of section.

- Feasible actions:
- 1) DN
  - 2) Spot blast, clean & paint

Condition State 4 **The paint system has failed. Surface pitting may be present** but any section loss due to active corrosion does not yet warrant structural analysis of either the element or the bridge.

- Feasible actions:
- 1) DN
  - 2) Spot blast, clean & paint
  - 3) Replace paint system

Condition State 5 **Corrosion has caused section loss and is**

**sufficient to warrant structural analysis** to ascertain the impact on the ultimate strength and/or serviceability of either the element or the bridge.

Feasible actions:

- 1) DN
- 2) Major rehab unit
- 3) Replace unit

Units: Each

This element defines prestressed concrete columns or pile extensions. Report the number of columns or pile extensions in each of Condition States 2 through 4. The number of columns/pile extensions in Condition State 1 will be the total number of columns/pile extensions at the bridge less those reported in Condition States 2 through 4.

Condition State 1 The element **show no deterioration**. There **may be discoloration, efflorescence, and/or superficial cracking** but without effect on strength and/or serviceability.

Feasible actions: 1) DN

Condition State 2 **Minor cracks and spalls** may be present and there **may be exposed reinforcing with no evidence of corrosion**. There is no exposure of the prestress system.

Feasible actions: 1) DN  
2) Seal cracks minor patch

Condition State 3 Some **delaminations and/or spalls may be present**. There may be **minor exposure but no deterioration of the prestress system**. **Corrosion of non-prestressed reinforcement may be present** but loss of section is incidental and does not significantly affect the strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN  
2) Clean steel & patch, (&/or seal)

Condition State 4 **Delaminations, spalls and corrosion on non-prestressed reinforcement are prevalent**. There may also be **exposure and deterioration of the prestress system** (manifested by **loss of bond, broken strands or wire, failed anchorages, etc**). There is sufficient concern to warrant an analysis to ascertain the impact on the strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit

Units: Each

This element defines reinforced concrete columns or pile extensions. Report the number of columns or pile extensions in each of Condition States 2 through 5. The number of columns/pile extensions in Condition State 1 will be the total number of columns/pile extension at the bridge less those reported in Condition States 2 through 4.

CDOT Notes: Comments concerning debris walls and crash walls should be included with this element.

GCD06 - Pier Columns and Pier Walls: Vertical substructure units less than 6' wide are considered columns. Vertical substructure units 6' and wider are considered walls (including 6' diameter and wider cylindrical shapes). Variable width walls shall be measured at the widest portion as determined by the plans, excluding the cap.

GCD17 - Use Element 205 Concrete Column or Pile Extension for spill-through abutments when 3' of the column is exposed beneath the bottom of the abutment. Spill-through abutments on columns are to be reported as Element 215 Concrete - Abutment. If sheet piling, backing planks, or other materials have been added to retain the approach roadway after construction, mention it in the comments for the abutment.

GCD20 - Delineated columns on piers should be coded as columns unless the delineated column width is greater than 6'. The delineated cap on a pier should be coded as a cap.

For exposed footings/pile caps, see Element 220 Concrete - Submerged Pile Cap/Footing or Element 221 Concrete Pile Cap/Footing.

Condition State 1 The element shows no deterioration. There may be discoloration, efflorescence, and/or superficial cracking but without effect on strength and/or serviceability.

Feasible actions: 1) DN

Condition State 2 Minor cracks & spalls may be present but there is no exposed reinforcing or surface evidence of rebar corrosion.

Feasible actions: 1) DN  
2) Seal cracks minor patch

Condition State 3 Some delaminations and/or spalls may be present and some reinforcing may be exposed. Corrosion of rebar may be present but loss of section is incidental and does not significantly affect the strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN  
2) Clean rebar & patch, (and/or seal)





Units: Each

This element defines columns or pile extensions of timber construction. Report the number of columns or pile extensions in each of Condition States 2 through 4. The number of columns/pile extensions in Condition State 1 will be the total number of columns/pile extensions at the bridge less those reported in Condition States 2 through 4.

CDOT SUGGESTED CONDITION STATES FOR TIMBER PILES ONLY		
Splits < 3 ft long or checks (1/2" < check depth < 1") = CS 2	Splits ≥ 3 ft long = CS 4	Any stress related cracked or broken pile = CS 4
Checks > 1" deep = CS 3		
Checks > 1" deep and/or core rot = CS 4		

CDOT Note: Includes timber abutment piles but not wingwall or sub-abutment piles.

Condition State 1 Investigation indicates **no decay**. There may be **superficial cracks, splits and checks** having no effect on strength or serviceability.

Feasible actions: 1) DN

Condition State 2 **Decay, insect infestation/marine borer infestation, abrasion, splitting, cracking, checking or crushing may exist** but none is sufficiently advanced to affect serviceability of the element.

Feasible actions: 1) DN  
2) Rehab &/or protect unit

Condition State 3 **Decay, insect infestation, abrasion, splitting, cracking or crushing** has produced **loss of strength of the element but not of a sufficient magnitude** to affect the serviceability of the bridge.

Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit

Condition State 4 Advanced deterioration. **Decay, insect infestation, abrasion, splits, cracks or crushing** has produced **loss of strength** that affects the serviceability of the bridge.

Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit

Units: LF

This element defines reinforced concrete pier walls. Report the estimated lineal feet of pier walls in each of Condition States 2 through 4. The number of units in Condition State 1 will be the remainder of the units after deducting those reported in Condition States 2 through 4.

CDOT SUGGESTED CONDITION STATES FOR PERCENT LOSS OF BEARING AREA			
LOSS OF BEARING AREA(%)			
PERCENT LOSS	≤ 10%	10 < % ≤ 20	> 20%
CONDITION STATES	2	3	4

CDOT Notes: GCD06 - Pier Columns and Pier Walls: Vertical substructure units less than 6' wide are considered columns. Vertical substructure units 6' and wider are considered walls (including 6' diameter and wider cylindrical shapes). Variable width walls shall be measured at the widest portion as determined by the plans, excluding the cap.

GCD20 - Delineated columns on piers should be coded as columns unless the delineated column width is greater than 6'. The delineated cap on a pier should be coded as a cap.

If piles are exposed greater than 3' under a concrete footing or pier wall, see Elements 201, 204, 205, 206, 225, 226, 227, or 228. Document piles which are exposed less than 3' in the comments for this element.

For exposed footings/pile caps, see Element 220 Concrete - Submerged Pile Cap/Footing or Element 221 Concrete Pile Cap/Footing.

Condition State 1 The element shows no deterioration. There may be discoloration, efflorescence, and/or superficial cracking but without effect on strength and/or serviceability.

Feasible actions: 1) DN

Condition State 2 Minor cracks & spalls may be present but there is no exposed reinforcing or surface evidence of rebar corrosion.

Feasible actions: 1) DN  
2) Seal cracks minor patch

Condition State 3 Some delaminations and/or spalls may be present and some reinforcing may be exposed. Corrosion of rebar may be present but loss of section is incidental and does not significantly affect the strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN  
2) Clean rebar & patch (and/or seal)

Condition State 4    Advanced    deterioration.    **Corrosion of reinforcement and/or loss of concrete section is sufficient to warrant analysis** to ascertain the impact on the strength and/or serviceability of either the element or the bridge.

Feasible actions:                    1)    DN  
    2)    Rehab unit  
    3)    Replace unit

Units: LF

This element defines only those pier walls constructed of material other than reinforced concrete. This includes masonry pier walls.

CDOT SUGGESTED CONDITION STATES FOR PERCENT LOSS OF BEARING AREA			
LOSS OF BEARING AREA (%)			
PERCENT LOSS	≤ 10%	10 < % ≤ 20	> 20%
CONDITION STATES	2	3	4

Condition State 1 There is **little or no deterioration**. Surface defects only are in evidence.

Feasible actions: 1) DN

Condition State 2 There may be **minor deterioration, cracking and weathering**. **Mortar** in the **joints** may show **minor deterioration**.

Feasible actions: 1) DN  
2) Rehab unit

Condition State 3 **Moderate to major** deterioration and cracking. **Major** deterioration of the joints.

Feasible actions: 1) DN  
2) Rehab unit

Condition State 4 **Major deterioration, splitting, or cracking** of materials may be **affecting the structural capacity** of the element.

Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit

Units: LF

This element defines reinforced concrete abutments. Report the estimated lineal feet of abutments in each of Condition States 1 through 4.

CDOT SUGGESTED CONDITION STATES FOR PERCENT LOSS OF BEARING AREA			
LOSS OF BEARING AREA(%)			
PERCENT LOSS	≤ 10%	10 < % ≤ 20	> 20%
CONDITION STATES	2	3	4

CDOT Notes: Abutment length is to be measured to the out-to-out of the deck and along the abutment skew. I-70 bridges located on Vail Pass and in Glenwood Canyon have had the abutment lengths calculated from the plans.

GCD17 - Use Element 205 Concrete Column or Pile Extension for spill-through abutments when 3' of the column is exposed beneath the bottom of the abutment. Spill-through abutments on columns are to be reported as Element 215 Concrete - Abutment. If sheet piling, backing planks, or other materials have been added to retain the approach roadway after construction, mention it in the comments for the abutment.

If the concrete footing is exposed, see Element 220 Concrete - Submerged Pile Cap/Footing or Element 221 Concrete - Pile Cap/Footing.

If piles are exposed under concrete footing, see Elements 201, 204, 205, 206, 225, 226, 227, or 228.

Condition State 1 The element shows no deterioration. There may be discoloration, efflorescence, and/or superficial cracking but without effect on strength and/or serviceability.

Feasible actions: 1) DN

Condition State 2 Minor cracks & spalls may be present but there is no exposed reinforcing or surface evidence of rebar corrosion.

Feasible actions: 1) DN  
2) Seal cracks minor patch

Condition State 3 Some delaminations and/or spalls may be present and some reinforcing may be exposed. Corrosion of rebar may be present but loss of section is incidental and does not significantly affect the strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN  
2) Clean rebar & patch, (and/or seal)

Condition State 4 Advanced deterioration. Corrosion of reinforcement and/or loss of concrete section is sufficient to warrant analysis to ascertain the impact on the strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit

Units: LF

This element defines abutments of timber construction. Report the estimated lineal feet of abutments in each of Condition States 1 through 4.

**CDOT Notes:** Abutment length is to be measured to the out-to-out of the deck along the abutment skew.

**Include timber piling or caps with their respective elements. The timber abutment element includes only the backing planks.**

Condition State 1 Investigation indicates **no decay**. There may be **superficial cracks, splits and checks** having no effect on strength or serviceability.

Feasible actions: 1) DN

Condition State 2 **Decay, insect infestation/marine borer infestation, abrasion, splitting, cracking, checking or crushing may exist** but none is sufficiently advanced to affect serviceability of the element.

Feasible actions: 1) DN  
2) Rehab &/or protect unit

Condition State 3 **Decay, insect infestation, abrasion, splitting, cracking or crushing** has produced **loss of strength of the element but not of a sufficient magnitude** to affect the serviceability of the bridge.

Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit

Condition State 4 Advanced deterioration. **Decay, insect infestation, abrasion, splits, cracks or crushing** has produced **loss of strength** that affects their serviceability of the bridge.

Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit

Units: LF

This element defines only those abutments constructed of material other than reinforced concrete or timber. This includes masonry abutments.

CDOT SUGGESTED CONDITION STATES FOR PERCENT LOSS OF BEARING AREA			
LOSS OF BEARING AREA (%)			
PERCENT LOSS	≤ 10%	10 < % ≤ 20	> 20%
CONDITION STATES	2	3	4

CDOT SUGGESTED CONDITION STATES FOR CORROSION ON UNPAINTED STEEL ELEMENTS		
	Description	CS
R1	Pitting or surface rust, etc. No measurable section loss	2
R2	Flaking, minor section loss (≤ 10% thickness loss)	3
R3	Flaking, swelling, mod. section loss (10% < thickness loss ≤ 30%) <b>structural analysis is not warranted.</b>	3
R3	Flaking, swelling, mod. section loss (10% < thickness loss ≤ 30%) <b>structural analysis is warranted due to location of corrosion on the member.</b>	4
R4	Heavy section loss (> 30% thickness loss), may have holes through base metal.	4

CDOT Note: Abutment length is to be measured to the out-to-out of the deck and along the abutment skew.

For steel abutments, use the "CDOT SUGGESTED CONDITION STATES FOR CORROSION ON UNPAINTED STEEL ELEMENTS". Use these guidelines whether the steel abutment is painted or unpainted.

Condition State 1 There is **little or no deterioration**. Surface defects only are in evidence.

Feasible actions: 1) DN

Condition State 2 There may be **minor deterioration, cracking and weathering**. **Mortar in joints** may show **minor deterioration**.

Feasible actions: 1) DN  
2) Rehab unit

Condition State 3 **Moderate to major** deterioration and cracking. **Major** deterioration of joints.

Feasible actions: 1) DN  
2) Rehab unit

Condition State 4 **Major deterioration, splitting, or cracking** of materials may be **affecting the structural capacity** of the element.

Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit

Units: Each

This element defines only those reinforced concrete pile caps and/or footings that are **continuously submerged and are visible for inspection**. The exposure may be intentional or caused by scour. **This element is not to be confused with elements in a variable wet situation**. Report the number of submerged pile caps and/or footings in each of Condition States 2 through 4. The number of submerged pile cap/footings in condition state 1 will be the total number of submerged pile cap/footings at the bridge less those reported in Condition States 2 through 4.

SUGGESTED CONDITION STATES FOR CRACKS IN MILDLY REINFORCED CONCRETE GIRDERS						
WIDTH (W) in millimeters (inches)						
TYPE OF CRACK	NONE	≤ 0.8 mm (≤ 1/32 in)	0.8 < W ≤ 2 (1/32) (1/16)	2 < W ≤ 2.5 (1/16) (3/32)	2.5 < W ≤ 3 (3/32) (1/8)	W > 3 mm (> 1/8 in)
SHEAR	1	2	2	3	4	4
FLEXURE	1	1	2	3	4	4
DIAGONAL	1	2	2	3	3	4

Condition State 1 The element shows no deterioration. There **may be discoloration, efflorescence, and/or superficial cracking** but without effect on strength and/or serviceability.

Feasible actions: 1) DN

Condition State 2 **Minor cracks & spalls may be present** but there is **no exposed reinforcing or surface evidence of rebar corrosion**.

Feasible actions: 1) DN  
2) Seal cracks minor patch

Condition State 3 **Some delaminations and/or spalls may be present** and **some reinforcing may be exposed**. **Corrosion of rebar may be present but loss of section is incidental** and does not significantly affect the strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN  
2) Clean rebar & patch, (and/or seal)

Condition State 4 Advanced deterioration. **Corrosion of reinforcement and/or loss of concrete section is sufficient to warrant analysis** to ascertain the impact on the strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit



Units: Each

This element defines only those reinforced concrete pile caps and/or footings that are visible for inspection. The exposure may be intentional or caused by scour. Report the number of pile caps and/or footings in each of Condition States 2 through 4. The number of pile cap/footings in Condition State 1 will be the total number of pile cap/footings at the bridge less those reported in Condition States 2 through 4.

SUGGESTED CONDITION STATES FOR CRACKS IN MILDLY REINFORCED CONCRETE GIRDERS						
WIDTH (W) in millimeters (inches)						
TYPE OF CRACK	NONE	≤ 0.8 mm (≤ 1/32 in)	0.8 < W ≤ 2 (1/32) (1/16)	2 < W ≤ 2.5 (1/16) (3/32)	2.5 < W ≤ 3 (3/32) (1/8)	W > 3 mm (> 1/8 in)
SHEAR	1	2	2	3	4	4
FLEXURE	1	1	2	3	4	4
DIAGONAL	1	2	2	3	3	4

Condition State 1 The element shows no deterioration. There may be **discoloration, efflorescence, and/or superficial cracking** but without effect on strength and/or serviceability.

Feasible actions: 1) DN

Condition State 2 **Minor cracks & spalls may be present** but there is **no exposed reinforcing or surface evidence of rebar corrosion**.

Feasible actions: 1) DN  
2) Seal cracks minor patch

Condition State 3 **Some delaminations and/or spalls may be present** and **some reinforcing may be exposed**. **Corrosion of rebar may be present but loss of section is incidental** and does not significantly affect the strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN  
2) Clean rebar & patch, (and/or seal)

Condition State 4 Advanced deterioration. **Corrosion of reinforcement and/or loss of concrete section is sufficient to warrant analysis** to ascertain the impact on the strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit

Units: Each

This element defines only those unpainted steel piles that are **continuously and totally submerged and are visible for inspection.**

The exposure may be intentional or caused by scour. **This element is not to be confused with piles in a variable wet situation.** Report the number of submerged piles in each of Condition States 2 through 4. The number of submerged piles in Condition State 1 will be the total number of submerged piles at the bridge less those reported in Condition States 2 through 4.

CDOT SUGGESTED CONDITION STATES FOR CORROSION ON UNPAINTED STEEL ELEMENTS		
	Description	CS
R1	Pitting or surface rust, etc. No section measurable loss	2
R2	Flaking, minor section loss ( $\leq 10\%$ thickness loss)	3
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is not warranted.</b>	3
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is warranted due to location of corrosion on the member.</b>	4
R4	Heavy section loss ( $> 30\%$ thickness loss), may have holes through base metal.	4

Condition State 1 **There is little or no corrosion** of the unpainted steel. The weathering steel is coating uniformly and remains in excellent condition.

Feasible actions: 1) DN

Condition State 2 **Surface rust, surface pitting, has formed or is forming** on the unpainted steel. The weathering steel has not corroded beyond design limits. Weathering steel color is yellow orange to light brown.

Feasible actions: 1) DN  
2) Clean & paint

Condition State 3 **Steel has measurable section loss due to corrosion but does not warrant structural analysis.** Weathering steel is dark brown or black.

Feasible actions: 1) DN  
2) Clean & paint

Condition State 4 Corrosion is advanced. **Section loss is sufficient to warrant structural analysis** to ascertain the impact on the ultimate strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit

Units: Each

This element defines only those prestressed concrete piles that are **continuously submerged and are visible for inspection**. The exposure may be intentional or caused by scour. **This element is not to be confused with piles in a variable wet situation**. Report the number of piles in each of Condition States 2 through 4. The number of submerged piles in Condition State 1 will be the total number of submerged piles at the bridge less those reported in Condition States 2 through 4.

Condition State 1 The element **show no deterioration**. There **may be discoloration, efflorescence, and/or superficial cracking** but without effect on strength and/or serviceability.

Feasible actions: 1) DN

Condition State 2 **Minor cracks and spalls** may be present and there **may be exposed reinforcing with no evidence of corrosion**. There is no exposure of the prestress system.

Feasible actions: 1) DN  
2) Seal cracks minor patch

Condition State 3 Some **delaminations and/or spalls may be present**. There may be **minor exposure but no deterioration of the prestress system**. **Corrosion of non-prestressed reinforcement may be present** but loss of section is incidental and does not significantly affect the strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN  
2) Clean steel & patch, (&/or seal)

Condition State 4 **Delaminations, spalls and corrosion or non-prestressed reinforcement are prevalent**. There may also be **exposure and deterioration of the prestress system** (manifested by **loss of bond, broken strands or wire, failed anchorages, etc**). There is sufficient concern to warrant an analysis to ascertain the impact on the strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit

Units: Each

This element defines only those reinforced concrete piles that are **continuously submerged and are visible for inspection**. The exposure may be intentional or caused by scour. **This element is not to be confused with piles in a variable wet situation**. Report the number of submerged piles in each of Condition States 2 through 4. The number of submerged piles in Condition State 1 will be the total number of submerged piles at the bridge less those reported in Condition States 2 through 4.

Condition State 1 The element shows no deterioration. There **may be discoloration, efflorescence, and/or superficial cracking** but without effect on strength and/or serviceability.

Feasible actions: 1) DN

Condition State 2 **Minor cracks & spalls may be present** but there is **no exposed reinforcing or surface evidence of rebar corrosion**.

Feasible actions: 1) DN  
2) Seal cracks minor patch

Condition State 3 **Some delaminations and/or spalls may be present** and **some reinforcing may be exposed**. **Corrosion of rebar may be present but loss of section is incidental** and does not significantly affect the strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN  
2) Clean rebar & patch, (and/or seal)

Condition State 4 Advanced deterioration. **Corrosion of reinforcement and/or loss of concrete section is sufficient to warrant analysis** to ascertain the impact on the strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit

Units: Each

This element defines only timber piles that are continuously submerged and are visible for inspection. The exposure may be intentional or caused by scour. This element is not to be confused with piles in a variable wet situation. Report the number of piles in each of Condition States 2 through 4. The number of submerged piles in Condition State 1 will be the total number of submerged piles at the bridge less those reported in Condition States 2 through 4.

CDOT SUGGESTED CONDITION STATES FOR TIMBER PILES ONLY		
Splits < 3 ft long or checks (1/2" < check depth < 1") = CS 2	Splits ≥ 3 ft long = CS 4	Any stress related cracked or broken pile = CS 4
Checks > 1" deep = CS 3		
Checks > 1" deep and/or core rot = CS 4		

Condition State 1 Investigation indicates no decay. There may be superficial cracks, splits and checks having no effect on strength or serviceability.

Feasible actions: 1) DN

Condition State 2 Decay, insect infestation/marine borer infestation, abrasion, splitting, cracking, checking or crushing may exist but none is sufficiently advanced to affect serviceability of the element.

Feasible actions: 1) DN  
2) Rehab &/or protect unit

Condition State 3 Decay, insect infestation, abrasion, splitting, cracking or crushing has produced loss of strength of the element but not of a sufficient magnitude to affect the serviceability of the bridge.

Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit

Condition State 4 Advanced deterioration. Decay, insect infestation, abrasion, splits, cracks or crushing has produced loss of strength that affects the serviceability of the bridge.

Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit

Units: LF

This element defines all unpainted steel caps or those constructed of weathering steel. Report the estimated lineal feet Condition States 2 through 4. The number of units in Condition State 1 will be the remainder of the units after deducting those reported in Condition States 2 through 4.

CDOT SUGGESTED CONDITION STATES FOR CORROSION ON UNPAINTED STEEL ELEMENTS		
	Description	CS
R1	Pitting or surface rust, etc. No measurable section loss	2
R2	Flaking, minor section loss ( $\leq 10\%$ thickness loss)	3
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is not warranted.</b>	3
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is warranted due to location of corrosion on the member.</b>	4
R4	Heavy section loss ( $> 30\%$ thickness loss), may have holes through base metal.	4

**CDOT Note: This element may include abutment caps.**

Condition State 1 There is little or no corrosion of the unpainted steel. The weathering steel is coating uniformly and remains in excellent condition.

Feasible actions: 1) DN

Condition State 2 Surface rust, surface pitting, has formed or is forming on the unpainted steel. The weathering steel has not corroded beyond design limits. Weathering steel color is yellow orange to light brown.

Feasible actions: 1) DN  
2) Clean & paint

Condition State 3 Steel has measurable section loss due to corrosion but does not warrant structural analysis. Weathering steel is dark brown or black.

Feasible actions: 1) DN  
2) Clean & paint

Condition State 4 Corrosion is advanced. Section loss is sufficient to warrant structural analysis to ascertain the impact on the ultimate strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit

Units: LF

This element defines all steel caps that are painted. Report the estimated lineal feet in each of Condition States 2 through 5. The number of units in Condition State 1 will be remainder of the units after deducting those reported in Condition States 2 through 4.

CDOT SUGGESTED CONDITION STATES FOR CORROSION ON PAINTED STEEL ELEMENTS		
	Description	CS
Light R1	Slight peeling of the paint, pitting, or surface rust, etc. No measurable section loss	2
R1	Peeling of the paint, pitting, surface rust, etc. No measurable section loss	3
R2	Flaking, minor section loss ( $\leq 10\%$ thickness loss)	4
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is not warranted.</b>	4
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is warranted due to location of corrosion on the member.</b>	5
R4	Heavy section loss ( $> 30\%$ thickness loss), may have holes through base metal	5

CDOT Note: This element may include abutment caps.

Condition State 1 There is no evidence of active corrosion and the paint system is sound and functioning as intended to protect the metal surface.

- Feasible actions:
- 1) DN
  - 2) Surface clean

Condition State 2 **There is little or no active corrosion.** Surface or freckled rust has formed or is forming. The paint system may be chalking, peeling, curling or showing other early evidence of paint system distress but **there is no exposure of metal.**

- Feasible actions:
- 1) DN
  - 2) Surface clean
  - 3) Surface clean & restore top coat

Condition State 3 **Surface or freckled rust is prevalent.** The paint system is no longer effective. **There may be exposed metal** but there is no active corrosion which is causing loss of section.

- Feasible actions:
- 1) DN
  - 2) Spot blast, clean & paint

Condition State 4 The **paint system has failed.** **Surface pitting may be present** but any section loss due to active corrosion does not yet warrant structural analysis of either the element or the bridge.

- Feasible actions:
- 1) DN
  - 2) Spot blast, clean & paint
  - 3) Replace paint system

Condition State 5 **Corrosion has caused section loss and is sufficient to warrant structural analysis** to ascertain the impact on the ultimate strength and/or serviceability of either the element or the bridge.

- Feasible actions:
- 1) DN

- 2) Major rehab unit
- 3) Replace unit



Units: LF

This element defines only those caps constructed of prestressed concrete. Report the estimated lineal feet in each of Condition States 2 through 4. The number of units in Condition State 1 will be the remainder of the units after deducting those reported in Condition States 2 through 4.

CDOT SUGGESTED CONDITION STATES FOR CRACKS IN PRESTRESSED CONCRETE GIRDERS			
CS1	CS2	CS3	CS4
$\leq 0.10$ mm ( $\leq 0.004$ in)	$0.10 < W \leq 0.25$ (0.004 in) (0.009 in)	$0.25 < W \leq 0.76$ (0.009 in) (0.030 in)	$W > 0.76$ mm ( $> 0.030$ in)

CDOT SUGGESTED CONDITION STATES FOR PERCENT LOSS OF BEARING AREA			
LOSS OF BEARING AREA (%)			
PERCENT LOSS	$\leq 10\%$	$10 < \% \leq 20$	$> 20\%$
CONDITION STATES	2	3	4

Condition State 1 The element **show no deterioration**. There **may be discoloration, efflorescence, and/or superficial cracking** but without effect on strength and/or serviceability.

Feasible actions: 1) DN

Condition State 2 **Minor cracks and spalls** may be present and there **may be exposed reinforcing with no evidence of corrosion**. There is no exposure of the prestress system.

Feasible actions: 1) DN  
2) Seal cracks minor patch

Condition State 3 Some **delaminations and/or spalls** may be **present**. There may be **minor exposure but no deterioration of the prestress system**. **Corrosion of non-prestressed reinforcement may be present** but loss of section is incidental and does not significantly affect the strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN  
2) Clean steel & patch, (&/or seal)

Condition State 4 **Delaminations, spalls and corrosion on non-prestressed reinforcement** are prevalent. There may also be **exposure and deterioration of the prestress system** (manifested by **loss of bond, broken strands or wire, failed anchorages, etc**). There is sufficient concern to warrant an analysis to ascertain the impact on the strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit

Units: LF

This element defines only those caps constructed of reinforced concrete. Report the estimated lineal feet in each of Condition States 2 through 4. The number of units in Condition State 1 will be the remainder of the units after deducting those reported in Condition States 2 through 4.

SUGGESTED CONDITION STATES FOR CRACKS IN MILDLY REINFORCED CONCRETE GIRDERS						
WIDTH (W) in millimeters (inches)						
TYPE OF CRACK	NONE	≤ 0.8 mm (≤ 1/32 in)	0.8 < W ≤ 2 (1/32) (1/16)	2 < W ≤ 2.5 (1/16) (3/32)	2.5 < W ≤ 3 (3/32) (1/8)	W > 3 mm (> 1/8 in)
SHEAR	1	2	2	3	4	4
FLEXURE	1	1	2	3	4	4
DIAGONAL	1	2	2	3	3	4

CDOT SUGGESTED CONDITION STATES FOR PERCENT LOSS OF BEARING AREA			
LOSS OF BEARING AREA (%)			
PERCENT LOSS	≤ 10%	10 < % ≤ 20	> 20%
CONDITION STATES	2	3	4

**CDOT Note:** GCD20 - Delineated columns on piers should be coded as columns unless the delineated column width is greater than 6'. The delineated cap on a pier should be coded as a cap.

Condition State 1 The element shows no deterioration. There **may be discoloration, efflorescence, and/or superficial cracking** but without effect on strength and/or serviceability.

Feasible actions: 1) DN

Condition State 2 **Minor cracks & spalls may be present** but there is **no exposed reinforcing or surface evidence of rebar corrosion**.

Feasible actions: 1) DN  
2) Seal cracks minor patch

Condition State 3 **Some delaminations and/or spalls may be present** and **some reinforcing may be exposed**. **Corrosion of rebar may be present** but **loss of section is incidental** and does not significantly affect the strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN  
2) Clean rebar & patch, (and/or seal)

Condition State 4 Advanced deterioration. **Corrosion of reinforcement and/or loss of concrete section is sufficient to warrant analysis** to ascertain the impact on the strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit

Units: LF

This element defines only those caps of timber construction. Report the estimated lineal feet in each of Condition States 2 through 4. The number of units in Condition State 1 will be the remainder of the units after deducting those reported in Condition States 2 through 4.

CDOT SUGGESTED CONDITION STATES FOR TIMBER GIRDERS, STRINGERS, CAPS AND FLOORBEAMS		
Splits < 3 ft long or checks > 1" deep = CS 2	Splits ≥ 3 ft long = CS 4	Any stress related full width crack (thickness of the section) = CS 4

CDOT Notes: This element may include abutment caps.

Do not report the entire cap length in the worst condition state.

Condition State 1 Investigation indicates **no decay**. There may be **superficial cracks, splits and checks** having no effect on strength or serviceability.

Feasible actions: 1) DN

Condition State 2 **Decay, insect infestation/marine borer infestation, abrasion, splitting, cracking, checking or crushing may exist** but none is sufficiently advanced to affect serviceability of the element.

Feasible actions: 1) DN  
2) Rehab &/or protect unit

Condition State 3 **Decay, insect infestation, abrasion, splitting, cracking or crushing** has produced **loss of strength of the element but not of a sufficient magnitude** to affect the serviceability of the bridge.

Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit

Condition State 4 **Advanced deterioration. Decay, insect infestation, abrasion, splits, cracks or crushing** has produced **loss of strength** that affects the serviceability of the bridge.

Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit

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## ***Culvert Element Index***

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241 -4- Concrete - Culvert  
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243 -4- Other - Culvert

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Units: LF of Culvert

This element defines all metal (steel, aluminum, **galvanized**, etc.) culverts, including arches, round or elliptical pipes, etc. Report the estimated number of linear feet in each of Condition States 2 through 4. The number of units in Condition State 1 will be the remainder of the units after deducting those in Condition States 2 through 4.

CDOT SUGGESTED CONDITION STATES FOR CORROSION ON UNPAINTED STEEL ELEMENTS		
	Description	CS
R1	Pitting or surface rust, etc. No measurable section loss	2
R2	Flaking, minor section loss (≤ 10% thickness loss)	3
R3	Flaking, swelling, mod. section loss (10% < thickness loss ≤ 30%) <b>structural analysis is not warranted.</b>	3
R3	Flaking, swelling, mod. section loss (10% < thickness loss ≤ 30%) <b>structural analysis is warranted due to location of corrosion on the member.</b>	4
R4	Heavy section loss (> 30% thickness loss), may have holes through base metal.	4

**CDOT Notes:** All measurements are linear feet along the length of each cell of a CBC, pipe, or arch, not along the center line of the roadway. The length of pipes shall include end sections.

**GCD24** - The length of culvert inspected and reported shall be to the ROW boundary or other known limits of CDOT or entity ownership.

**GCD25** - Report the height of fill on bridges and culverts and write it on the inventory sheet so NBI Item66T can be appropriately coded.

Condition State 1 The element show little or no deterioration. **Some discoloration or surface corrosion may exist** but there is no metal pitting.

Feasible actions: 1) DN

Condition State 2 There may be **minor to moderate corrosion and pitting**, especially at the barrel invert. **Little or no distortion** exists.

Feasible actions: 1) DN  
2) Rehab unit

Condition State 3 **Significant corrosion, deep pitting or some holes in the invert** may exist. Significant scour or erosion may be affecting structural integrity. **Minor to moderate distortion and deflection** may exist. There is little or no roadway settlement.

Feasible actions: 1) DN  
2) Rehab unit

Condition State 4 **Major corrosion, extreme pitting or holes** in the barrel may exist. **Major distortion, deflection, or settlement** may be evident. **Minor to major roadway settlement** may be evident.

Feasible actions: 1) DN

- 2) Rehab unit
- 3) Replace unit



Units: LF of Culvert

This element defines all precast and cast-in-place (conventional or prestressed) concrete arch, pipe and box culverts. Report the estimated number of linear feet in each of Condition States 2 through 4. If a joint determines the controlling element, report the number of linear feet of one culvert section at the appropriate condition state. The number of units in Condition State 1 will be the remainder of the units after deducting those in Condition States 2 through 4.

**CDOT Notes:** All measurements are linear feet along the length of each cell of a CBC, pipe, or arch, not along the center line of the roadway.

GCD10 - Concrete Box Culverts will always have a bottom slab (floor).

GCD18 - Count each culvert longitudinal crack with efflorescence as 1' in Condition State 2 and those with rust as 1' in Condition State 3.

GCD19 - Comments for culvert aprons shall be included in Element 502 Channel Protection Material and Condition.

GCD24 - The length of culvert inspected and reported shall be to the ROW boundary or other known limits of CDOT or entity ownership.

GCD25 - Report the height of fill on bridges and culverts and write it on the inventory sheet so NBI Item66T can be appropriately coded.

Comments concerning scour should be included in SmartFlag 361 Scour.

Condition State 1 Superficial cracks & spalls may be present, but there is no exposed reinforcing or evidence of rebar corrosion. There is little or no deterioration or separation of joints.

Feasible actions: 1) DN

Condition State 2 Deterioration, minor chloride contamination, minor cracking and/or leaching may have begun. There may be deterioration and separation of joints.

Feasible actions: 1) DN  
2) Rehab unit

Condition State 3 There may be moderate to major deterioration, extensive cracking and/or leaching and large areas of spalls. Minor to moderate distortion, settlement, or misalignment may have occurred. There may be considerable deterioration and separation of joints and/or minor roadway settlement.

Feasible actions: 1) DN  
2) Rehab unit

Condition State 4 Major deterioration, spalling, cracking, major distortion, deflection settlement, or misalignment of the barrel may be in evidence. Major separation of joints may have occurred. Holes may exist in floors and walls. Settlement of roadway may have occurred.

Feasible actions: 1) DN  
2) Rehab unit

3) Replace unit

Units: LF of Culvert

This element defines all timber box culverts. Report the estimated number of linear feet in each of Condition States 2 through 4. If fasteners are the controlling element, estimate the percentage of connections in each condition state and use the corresponding percentage of total linear feet for measurement. The number of units in Condition State 1 will be the remainder of the units after deducting those in Condition States 2 through 4.

**CDOT Notes:** All measurements are linear feet along the length of each cell of a CBC, pipe, or arch, not along the center line of the roadway.

**GCD24** - The length of culvert inspected and reported shall be to the ROW boundary or other known limits of CDOT or entity ownership.

**GCD25** - Report the height of fill on bridges and culverts and write it on the inventory sheet so NBI Item66T can be appropriately coded.

Condition State 1 The timber and fasteners are in sound condition.

Feasible actions: 1) DN

Condition State 2 There may be **minor decay and weathering. Corrosion at fasteners and connections may have begun.** There is little or no distortion and/or deflection.

Feasible actions: 1) DN  
2) Rehab unit

Condition State 3 There may be **significant decay, weathering and warped or broken timbers. Significant decay and corrosion at fasteners and connections may be evident. Minor to moderate distortion** of the culvert may exist. There is little or no roadway settlement.

Feasible actions: 1) DN  
2) Rehab unit

Condition State 4 There may be **major decay and many warped, broken or missing timbers.** There is **major decay and corrosion at fasteners and connections. Major distortion or deflection** of the culvert may exist. There may be minor to major roadway settlement.

Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit

Units: LF of Culvert

This element defines all culverts not included under the metal, concrete or timber culvert elements. It will include masonry construction and combinations of other materials. Report the estimated number of linear feet in each of Condition States 2 through 4. The number of units in Condition State 1 will be the remainder of the units after deducting those in Condition States 2 through 4.

**CDOT Notes:** All measurements are linear feet along the length of each cell of a CBC, pipe, or arch, not along the center line of the roadway.

**GCD24** - The length of culvert inspected and reported shall be to the ROW boundary or other known limits of CDOT or entity ownership.

**GCD25** - Report the height of fill on bridges and culverts and write it on the inventory sheet so NBI Item66T can be appropriately coded.

Condition State 1 There is little or no deterioration. **Surface defects only** are in evidence. There are no scour or misalignment problems.

Feasible actions: 1) DN

Condition State 2 There may be **minor deterioration, cracking and misalignment**.

Feasible actions: 1) DN  
2) Rehab unit

Condition State 3 **Moderate to major deterioration and cracking and/or minor to moderate distortion** or deflection has occurred. There is little or no roadway settlement.

Feasible actions: 1) DN  
2) Rehab unit

Condition State 4 **Major distortion, deflection, settlement or misalignment and/or major deterioration affecting structural integrity** may have occurred. Settlement of roadway has occurred.

Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit

## **Miscellaneous Element Index**

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**\_300 Strip Seal Expansion Joint**

**300  
Deck(5)**

**Units: LF of Joint Seal**

This element defines those expansion joint devices which utilize a neoprene type water proof gland with some type of steel extrusion or other system to anchor the gland. Report the estimated lineal feet in each of Condition States 2 and 3. The number of units in Condition State 1 will be the remainder of the units after deducting those reported in Condition States 2 and 3.

**CDOT Note: For strip seal joints covered with a sliding plate, use the condition state language for Element 304 Open Expansion Joint, but code it as Element 300 Strip Seal Expansion Joint.**

Condition State 1 The element shows minimal deterioration. **There is no leakage at any point along the joint.** Gland is secure and has no defects. Debris in joint is not causing any problems. The adjacent deck and/or header is sound.

Feasible actions: 1) DN

Condition State 2 **Signs of seepage** along the joint may be present. The **gland may be punctured ripped or partially pulled out** of the extrusion. Significant debris is in all or part of the joint. **Minor spalls in the deck and/or header may be present adjacent to the joint.**

Feasible actions: 1) DN  
2) Patch/reset clean joint

Condition State 3 **Signs or observance of leakage along the joint** may be present. The **gland possibly has failed from abrasion or tearing.** The gland has **pulled out of the extrusion.** **Major spalls may be present in the deck and/or header adjacent to the joint.**

Feasible actions: 1) DN  
2) Replace gland and patch concrete  
3) Replace joint

Units: LF of Joint Seal

This element defines only those joints filled with a pourable sealant. Report the estimated lineal feet in each of Condition States 2 and 3. The number of units in Condition State 1 will be the remainder of the units after deducting those reported in Condition States 2 and 3.

**CDOT Note: This element includes the joint filler poured on top of expansion joint material between the notch in the top of the abutment and the approach slab.**

Condition State 1 The element shows minimal deterioration. Adhesion is sound with **no signs of leakage**. There are no cohesion cracks. The adjacent deck and/or header is sound.

Feasible actions: 1) DN

Condition State 2 **Minor adhesion and/or cohesion failures** may be present. Signs of seepage along the joint may be present. Joint may be slightly impacted with debris. Minor spalls in deck and/or headers may be present adjacent to the joint.

Feasible actions: 1) DN  
2) Clean joint and replace seal

Condition State 3 **Major adhesion and/or cohesion failures** may be present. **Signs or observance of leakage along the joint** may be present. Joint may be heavily impacted with debris and/or stones.

**Major spalls may be present in the deck and/or header adjacent to the joint.**

Feasible actions: 1) DN  
2) Clean joint; patch spalls and replace seal



Units: LF of Joint Seal

This element defines only those joints filled with a pre-formed compression type seal. Report the estimated lineal feet in each of Condition States 2 and 3. The number of units in Condition State 1 will be the remainder of the units after deducting those reported in Condition States 2 and 3.

**CDOT Note: For compression joint seals covered with a sliding plate, use the condition state language for Element 304 Open Expansion Joint, but code it as Element 302 Compression Joint Seal.**

Condition State 1 The element shows minimal deterioration. Adhesion is sound with **no signs of leakage**. There are **no cohesion cracks**. The adjacent deck and/or header is sound. If joint is armored, there are **no signs of anchorage looseness**.

Feasible actions: 1) DN

Condition State 2 **Signs of seepage along the joint may be present**. There may be small adhesion failures. The gland may show **signs of abrasion or minor tearing**. Significant debris is in all or part of the joint. **Minor spalls in the deck and/or headers may be present adjacent to the joint**. If joint is armored, **looseness of the anchorage may be present**.

Feasible actions: 1) DN  
2) Patch/remove and reseal/clean joint

Condition State 3 **Major adhesion failures may be present**. The gland may have failed from abrasion or tearing. **Signs or observance of leakage** along the joint may be present. **Major spalls may be present in the deck and/or header adjacent to the joint**. If joint is armored, **the anchorage has failed**.

Feasible actions: 1) DN  
2) Replace gland and/or patch spalls  
3) Replace joint

**Units: LF of Joint**

This element defines only those joints that are open and not sealed. Report the estimated lineal feet in each of Condition States 2 and 3. The number of units in condition state 1 will be the remainder of the units after deducting those reported in Condition States 2 and 3.

**CDOT Note: This element includes Finger Plate and Sliding Plate devices, but not sliding plates with a seal (they are either Element 300 Strip Seal Expansion Joint or Element 302 Compression Joint Seal).**

Condition State 1 The element shows **minimal deterioration**. **Joint armor, if present, is secure** and there are **no bent, misaligned or broken fingers**. **The adjacent deck and/or header is sound.**

Feasible actions: 1) DN

Condition State 2 There may be **deck cracking indicating armor anchor loosening**. **Minor spalls** in the **deck and/or header** may be present **adjacent to the joint**. There may be **corrosion on joint armor steel plates**. **Bent or misaligned fingers** are observed.

Feasible actions: 1) DN  
2) Rehab unit

Condition State 3 There may be **advanced corrosion of joint armor or steel plates**. **Major spalls** may be **present in the deck and/or header adjacent to the joint**. **Armor anchors have failed**. There are **missing or broken fingers**.

Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit

**\_305\* Elastomeric Flex-type Joint**

**305\*  
Deck(5)**

**Units: LF of Joint Min Rpt Lgth = One Section GCD21**

This element defines only those joints made of elastomeric seals bolted down to the supports, which are fused together during construction. These joints go by the proprietary names of **Waboflex, General Tire, etc.** Report the quantity of joint in Condition States 2 and 3. The number of units in Condition State 1 will be the remainder of the units after deducting those reported in Condition States 2 and 3.

**CDOT Note: GCD21 - The minimum reporting length for damage limited to the joint is the section length of elastomeric flex-type joint. For joint anchorage zone damage, the reporting length is the sum of the damage lengths and is a multiple of the section length (say the section length is 6', the damage length reported will be 6', 12', 18'...).**

Condition State 1 The element show minimal deterioration. The **bolt anchors are tight.** There may be **minor gouging or missing bolt caps.** There are **no broken pieces.** The adjacent deck is sound. There is no leakage.

Feasible actions: 1) DN

Condition State 2 The element may show signs of **gouging or minor tearing.** There may be **loose sections or missing bolts.** **Minor spalls** in the deck may be present adjacent to the joint. **Minor leakage** in the joint may be present.

Feasible actions: 1) DN  
2) Repair joint  
3) Replace joint

Condition State 3 The joint may show **signs of failure from gouging or tearing.** There may be **missing sections or failed anchors.** **Significant spalls** may be present in the deck adjacent to the joint. **Significant leakage** in the joint is present.

Feasible actions: 1) DN  
2) Repair joint  
3) Replace joint

**\_306\* Asphaltic Plug Expansion Device**

**306\*  
Deck(5)**

**Units: LF of Joint**

This element defines only those joints which are **constructed of layers of rubberized asphalt** leaving no actual opening in the driving surface. Report the quantity of joint in Condition States 2 and 3. The number of units in Condition State 1 will be the remainder of the units after deducting those reported in Condition States 2 and 3.

Condition State 1 There are **no significant cracks and no leakage.**  
Feasible actions: 1) DN

Condition State 2 There **is significant cracking and leakage.**  
Feasible actions: 1) DN  
2) Repair joint

Condition State 3 **Substantial cracking** has caused the device to fail, **allowing water to have significant impact** on other elements.  
Feasible actions: 1) DN  
2) Repair joint  
3) Replace joint

\_307\* Modular Expansion Joint

307\*  
Deck(5)

Units: LF of Joint

This element defines only those joints made up of modules of continuous elastomeric strip or box seals. These devices are usually found on long bridges built since the mid-1980's. Report the quantity of joint in Condition States 2 and 3.

Condition State 1 The element shows minimal deterioration. **All seals are held tight.** The adjacent deck is sound. There is **no leakage.**

Feasible actions: 1) DN

Condition State 2 The element may show signs of **minor tearing.** There **may be loose seals.** **Minor spalls** in the deck may be present adjacent to the joint. **Minor leakage** in the joint may be present.

Feasible actions: 1) DN  
2) Repair joint  
3) Replace joint

Condition State 3 The joint may **show signs of failure from tearing.** **Seals may be missing.** **Significant spalls** may be present in the deck adjacent to the joint. **Significant leakage** in the joint is present.

Feasible actions: 1) DN  
2) Repair joint  
3) Replace joint

Units: LF of Joint

This element defines transverse non-expansion joints in decks - filled and unfilled - and longitudinal deck construction joints. The non-expansion joints may be filled with cork, fiber board, or similar material at the time of construction or they may not be filled. The joint may have a tar type seal poured on top of the filler material. The longitudinal deck construction joints include full depth construction joints, such as those used between different stages of construction and widenings and between prestressed "T" girders without a top deck. Report only the estimated lineal feet of joint in Condition States 2 and 3.

**CDOT Note: This element does not include transverse deck cold joints in continuous decks at the end of a pour.**

Condition State 1 The element shows no deterioration, but **may have very minor leakage**. The filler material is still in place. There may be **minor "D" cracking along the joint**. The **construction joints show no distress**, there **may be very minor leakage**.

Feasible actions: 1) DN

Condition State 2 The **filler material** is still in place, but may be **starting to slip down**. There is **considerable leakage through the joint**. There may be **moderate "D" cracking along the joint**. The **construction joints show moderate leakage**.

Feasible actions: 1) DN  
2) Seal the joint with a pourable seal

Condition State 3 The **filler material has fallen out and the joint is open**. There is **heavy "D" cracking with or without rebars exposed**. The **construction joints show heavy leakage**.

Feasible actions: 1) DN  
2) Seal the joint with a pourable seal  
3) Repair "D" cracking, install backing material, and seal joint with a pourable seal

Units: Each

This element defines only those bridge bearings that are constructed primarily of elastomers, with or without fabric or metal reinforcement inside, which have a metal sole plate with teflon sliding surface. Report the number of bearings in Condition States 2 and 3. The number of bearings in Condition State 1 will be the total number of bearings at the bridge less those reported in Condition States 2 and 3.

Condition State 1 The element shows **no cracking or splitting**. There are **no shear deformations**. Vertical and horizontal alignment is within limits.

Feasible actions: 1) DN

Condition State 2 **Minor cracking, splitting or other deterioration may be present.** Minor deformation may be present. Bearing alignment is still tolerable. Strength and/or serviceability are not affected.

Feasible actions: 1) DN  
2) Reset bearings

Condition State 3 Advanced deterioration. **Significant deformations** may be present. **Top and bottom surfaces may no longer be parallel.** Loss of bearing may be imminent. The teflon and/or alignment may be failed.

Feasible actions: 1) DN  
2) Reset bearings  
3) Replace bearings

\_310 Elastomeric Bearing

310  
Substructure(15)

Units: Each

This element defines only those bridge bearings that are constructed primarily of elastomers, with or without fabric or metal reinforcement. Report the number of bearings in each of Condition States 2 and 3. The number of bearings in Condition State 1 will be the total number of bearings at the bridge less those reported in Condition States 2 and 3.

**CDOT Notes:** When this element is used, DO NOT use Element 311 Movable Bearing (Roller, Sliding, etc.) or Element 313 Fixed Bearing for the steel sole plates or masonry plates. The condition of the steel sole or masonry plates shall be documented in the comments for Element 310 Elastomeric Bearing.

Do not use this element for leveling pads 1/2" or less.

Condition State 1 The element shows little or no deterioration. Shear deformations are correct for existing temperatures.

Feasible actions: 1) DN

Condition State 2 **Minor cracking, splitting or other deterioration may be present. Shear deformation may be slightly excessive.** Strength and/or serviceability are not affected.

Feasible actions: 1) DN  
2) Reset bearings

Condition State 3 Advanced deterioration. **Shear deformations may be excessive. Top and bottom surfaces may no longer be parallel.** Loss of bearing may be imminent.

Feasible actions: 1) DN  
2) Reset bearings  
3) Replace unit & reset girders



Units: Each

This element defines those bridge bearings that provide for both deflection and longitudinal movement by means of roller, rocker or sliding mechanisms. Report the number of bearings in each of Condition States 2 and 3. The number of bearings in Condition State 1 will be the total number of bearings at the bridge less those reported in Condition States 2 and 3.

Condition State 1 The element shows little or no deterioration. If a paint system is present, it is sound and functioning as intended to protect the metal. The bearing has **minimal debris and corrosion**. Vertical and horizontal alignment is within limits. **Bearing support member is sound**. Any lubrication system is functioning properly.

Feasible actions: 1) DN

Condition State 2 The paint system, if present, may show **some corrosion with minor pitting**. The assemblies may have moved enough to cause **minor cracking in the supporting concrete**. **Debris build-up is affecting bearing movement**. Bearing alignment is still tolerable.

Feasible actions: 1) DN  
2) Rehab supports and/or reset bearing devices

Condition State 3 **Corrosion is advanced**. There may be **loss of section of the supporting member sufficient to warrant supplemental supports** or load restrictions. Bearing alignment may be beyond tolerable limits. **Shear Keys may have failed**. The lubrication system, if any, may have failed.

Feasible actions: 1) DN  
2) Rehab supports  
3) Replace unit

Units: Each

This element defines those bridge bearings that provide for deflection only. Report the number of bearings in each of Condition States 2 and 3. The number of bearings in Condition State 1 will be the total number of bearings at the bridge less those reported in Condition States 2 and 3.

**CDOT Note: GCD04 - When pulpits or saddles have been added to restore the bearing area, the condition of the bearing may be restored to Condition State 1, however the damaged portion of the girder will continue to be reported. The pulpit or saddle should be coded as Element 313 Fixed Bearing. Do not count the original bearing if a pulpit or saddle has been placed beneath the girder.**

Condition State 1 The element shows little or no deterioration. If a paint system is present, it is sound and functioning as intended to protect the metal. Vertical and horizontal alignment is within limits. **Bearing support member is sound.** Any lubrication system is functioning properly.

Feasible actions: 1) DN

Condition State 2 The paint system, if present, may show **some corrosion with minor pitting.** The assemblies may have moved enough to cause **minor cracking in the supporting concrete.**

Feasible actions: 1) DN  
2) Clean & paint or rest bearings and/or rehab supports

Condition State 3 **Corrosion is advanced.** There may be **loss of section of the supporting member sufficient to warrant supplemental supports or load restrictions.** **Shear Keys may have failed.** The lubrication system, if any, may have failed.

Feasible actions: 1) DN  
2) Rehab supports or bearings  
3) Replace unit

Units: Each

This element defines those high load bearings with confined elastomer. The bearing may be fixed against horizontal movement, guided to allow sliding in one direction, or floating to allow sliding in any direction. Report the number of bearings in Condition States 2 and 3. The number of bearings in Condition State 1 will be the total number of bearings at the bridge less those reported in Condition States 2 and 3.

Condition State 1 The element shows minimal deterioration. The paint or other anticorrosion system is sound and functioning as intended to protect the metal. The bearing has **minimal debris and corrosion**. Vertical and horizontal alignment is within limits. **Bearing support member is sound**. Any lubrication system is functioning properly.

Feasible actions: 1) DN

Condition State 2 The anti-corrosion system may show **some corrosion with minor pitting**. **Debris build-up is affecting bearing movement**. Bearing alignment and load carrying capacity is still tolerable.

Feasible actions: 1) DN  
2) Rehab supports or bearing devices.

Condition State 3 **Corrosion is advanced**. **Bearing alignment and load carrying capacity may be beyond limits**. **Shear keys** and the lubrication system, if any, **may have failed**. **Elastomer may be actively extruding** from the device.

Feasible actions: 1) DN  
2) Rehab bearing devices  
3) Replace unit

Units: Each

This element defines those high load bearings with a hard plastic disk. The bearing may be fixed against horizontal movement, guided to allow sliding in one direction, or floating to allow sliding in any direction. Report the number of bearings in Condition State 1 will be the total number of bearings at the bridge less those reported in Condition States 2 and 3.

Condition State 1 The element shows minimal deterioration. The paint or other anticorrosion system is sound and functioning as intended to protect the metal. The bearing has **minimal debris and corrosion**. Vertical and horizontal alignment is within limits. **Bearing support member is sound**. Any lubrication system is functioning properly.

Feasible actions: 1) DN

Condition State 2 The anti-corrosion system may show **some corrosion with minor pitting**. **Debris build-up is affecting bearing movement**. Bearing alignment and load carrying capacity is still tolerable.

Feasible actions: 1) DN  
2) Rehab supports or bearing devices.

Condition State 3 **Corrosion is advanced. Bearing alignment and load carrying capacity may be beyond limits. Shear keys and the lubrication system, if any, may have failed.**

Feasible actions: 1) DN  
2) Rehab bearing devices  
3) Replace unit

Units: Each

This element defines those structural sections between the bridge abutment and the approach pavement that are constructed of prestressed concrete. These structural sections may be separated into multiple slabs by longitudinal joints (there may be one approach slab per traffic lane or there may only be one approach slab for the entire bridge approach). They may or may not have asphalt overlay.

CDOT Notes: GCD02 - Bridges with approach slabs will have a quantity for the type of joint between the abutment backwall and the approach slab. Also, approach slabs that are on "sleeper slabs" at the end away from the bridge will have a quantity for the type of joint over the "sleeper slab". This joint is between the approach slab and the concrete roadway pavement. If there is a question about there being a "sleeper slab" you should refer back to the plans, if plans are not available, then treat it as not having a "sleeper slab". The total quantity of approach slabs is usually two, however it may be more.

Approach spans that cannot be inspected shall be coded and treated as an approach slab. The total quantity is usually two, but not greater than four (for parallel bridges with a closed median with one structure number). When approach spans are accessible, the appropriate elements shall be coded and quantities reported. The number of spans for the bridge include approach spans which are accessible.

Railroad bridges with approach slabs which are covered with ballast that cannot be inspected should not have the approach slab element coded. Mention the existence of the approach slab in the abutment element comment field.

Condition State 1 The slab has **not settled** and shows no sign of deterioration other than **superficial surface cracks**.

Feasible actions: 1) DN

Condition State 2 **Minor cracking, spalls may be present** but they do not affect the ability of the slab to carry traffic. **Settlement may be occurring** which increases the traffic impact on the bridge.

Feasible actions: 1) DN  
2) Perform mudjacking operations

Condition State 3 **Cracks may extend completely through the slab cross-section, but the slab does not act as if it is broken. Spalls may be heavy** but they do not affect the structural integrity of the slab. **Settlement may be occurring** which increases the traffic impact on the bridge.

Feasible actions: 1) DN  
2) Place overlay  
3) Replace unit

Condition State 4 The **slab is broken or rocks under traffic loads. Settlement is excessive** and cannot be corrected without increasing the size of the slab.

Feasible actions: 1) DN

2) Replace unit

Units: Each

This element defines those structural sections between the bridge abutment and the approach pavement that are constructed of reinforced concrete. These structural sections may be separated into multiple slabs by longitudinal joints (there may be one approach slab per traffic lane or there may only be one approach slab for the entire bridge approach). May or may not have asphalt overlay.

CDOT Notes: GCD02 - Bridges with approach slabs will have a quantity for the type of joint between the abutment backwall and the approach slab. Also, approach slabs that are on "sleeper slabs" at the end away from the bridge will have a quantity for the type of joint over the "sleeper slab". This joint is between the approach slab and the concrete roadway pavement. If there is a question about there being a "sleeper slab" you should refer back to the plans, if plans are not available, then treat it as not having a "sleeper slab". The total quantity of approach slabs is usually two, however it may be more.

Approach spans that cannot be inspected shall be coded and treated as an approach slab. The total quantity is usually two, but not greater than four (for parallel bridges with a closed median with one structure number). When approach spans are accessible, the appropriate elements shall be coded and quantities reported. The number of spans for the bridge include approach spans which are accessible.

Railroad bridges with approach slabs which are covered with ballast that cannot be inspected should not have the approach slab element coded. Mention the existence of the approach slab in the abutment element comment field.

Condition State 1 The slab has **not settled** and shows no sign of deterioration other than **superficial surface cracks**.

Feasible actions: 1) DN

Condition State 2 **Minor cracking, spalls may be present** but they do not affect the ability of the slab to carry traffic. **Settlement may be occurring** which increases the traffic impact on the bridge.

Feasible actions: 1) DN  
2) Perform mudjacking operations

Condition State 3 **Cracks may extend completely through the slab cross-section, but the slab does not act as if it is broken. Spalls may be heavy** but they do not affect the structural integrity of the slab. **Settlement may be occurring** which increases the traffic impact on the bridge.

Feasible actions: 1) DN  
2) Place overlay  
3) Replace unit

Condition State 4 **The slab is broken or rocks under traffic loads. Settlement is excessive** and cannot be corrected without increasing the size of the slab.

Feasible actions: 1) DN

2) Replace unit



Units: Each

This element defines the slope (**embankment or fill**), slope protection, and berm under the bridge. It includes soil, slope paving, riprap, gabions, rock filled baskets, sub-abutments, mechanically stabilized earth, etc.

**CDOT Note: This element is not to be used for scour prevention or repair around piers, full height abutments or wingwalls.**

Condition State 1 The element may have **insignificant settlement, erosion, or may have been pulled away from the abutment less than 3" or there is less than 3" of exposed piling**. There may be little erosion beneath the edges. **Any cracks or displacements are insignificant**. There may be an **erosion trough in the slope less than 1' deep**.

Feasible actions: 1) DN

Condition State 2 There may be **moderate settlement, erosion, and or pulling away from the abutment greater than 3" or there is 3" to 1' of piling exposed**. The concrete paving slabs may have **moderate structural cracks**, or there may be **moderate voids** beneath sections. The **majority of the slope protection is still in place and is functional**. There may be an **erosion trough in the slope 1' to 3' deep**.

Feasible actions: 1) DN  
2) Repair unit

Condition State 3 There may be **major settlement, erosion, greater than 1' of piling exposed, the concrete paving slabs may be buckled or broken**, or there may be **major erosion under the slope paving**. **The original slope protection could be missing**, causing the slope to be substantially unprotected. There may be an **erosion trough in the slope greater than 3' deep**.

Feasible actions: 1) DN  
2) Rehab unit  
3) Replace slope protection

Units: Each

This element defines walls non-integral with the abutments and are usually flared to support the roadway embankment.

**CDOT Note: Wingwalls are defined as any portion outside of the out to out of the deck and includes that portion of U-shaped abutments that parallel the roadway. Any piling in the wingwall is included in the unit and not counted separately.**

Condition State 1 There may be **minor pushing and/or insignificant cracking** but the **joint is near tight**. There may be minimal deterioration, **small spalls in concrete or minor surface rot on timber**. **R1 corrosion** on piles and/or backwalls. There may be **little erosion**.

Feasible actions: 1) DN

Condition State 2 There may be **moderate active pushing or separation** due to settlement and the **joint is open**. There may be **disintegration of the concrete surfaces or some section loss of the timber due to rot**. **R2 corrosion** on piles and/or backwalls. There may be **moderate erosion** at joint or around end.

Feasible actions: 1) DN  
2) Rehab wall

Condition State 3 There may be **major active pushing or separation** and the **joint is open**. There may be wide **structural cracks** and or **major disintegration** or there is **major section loss to the timber**. **R3/R4 corrosion** on piles and/or backwalls. There may be **major erosion**.

Feasible actions: 1) DN  
2) Rehab wall  
3) Replace wall

**\_327\* Culvert Wingwalls**

**327\*  
Culverts (20)**

**Units: Each**

This element defines walls non-integral with the culvert ends and are usually flared to support the roadway embankment.

**CDOT Note: Wingwalls are the portions outside of the out-to-out of the culvert. Any piling in the wingwall is included in the unit and not counted separately.**

Condition State 1 There may be **minor pushing and/or insignificant cracking** but the **joint is near tight**. There may be minimal deterioration, **small spalls in concrete or minor surface rot on timber**. **R1 corrosion** on piles and/or backwalls. There may be **little erosion**.

Feasible actions: 1) DN

Condition State 2 There may be **moderate active pushing or separation** due to settlement and the **joint is open**. There may be **disintegration of the concrete surfaces or some section loss of the timber due to rot**. **R2 corrosion** on piles and/or backwalls. There may be **moderate erosion** at joint or around end.

Feasible actions: 1) DN  
2) Rehab wall

Condition State 3 There may be **major active pushing or separation** and the **joint is open**. There may be wide **structural cracks** and or **major disintegration** or there is **major section loss to the timber**. **R3/R4 corrosion** on piles and/or backwalls. There may be **major erosion**.

Feasible actions: 1) DN  
2) Rehab wall  
3) Replace wall

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Units: LF of Rail

This element defines all types and shapes of metal bridge railing. Steel, aluminum, metal beam, rolled shapes, etc., will all be considered part of this element. **All elements of the rail must be metal.** Report the lineal feet of railing in each of Condition States 2 through 4. The number of units in Condition State 1 will be the remainder of units after deducting those reported in Condition States 2 through 4.

CDOT SUGGESTED CONDITION STATES FOR CORROSION ON UNPAINTED STEEL ELEMENTS		
	Description	CS
R1	Pitting or surface rust, etc. No measurable section loss	2
R2	Flaking, minor section loss (≤ 10% thickness loss)	3
R3	Flaking, swelling, mod. section loss (10% < thickness loss ≤ 30%) <b>structural analysis is not warranted.</b>	3
R3	Flaking, swelling, mod. section loss (10% < thickness loss ≤ 30%) <b>structural analysis is warranted due to location of corrosion on the member.</b>	4
R4	Heavy section loss (> 30% thickness loss), may have holes through base metal.	4

CDOT Notes: GCD22 - For metal bridge railing with any coated components, use Element 334 Metal Bridge Railing (Coated).

GCD23 - Flex beam rail attached to timber posts in fill over a culvert is usually considered to be a roadway railing. Railing with steel or timber posts in the fill attached to the structure is considered to be bridge railing (Element 333 Miscellaneous - Bridge Railing (Other) for timber posts).

Condition State 1 There is no evidence of active corrosion of the unpainted metal.

Feasible actions: 1) DN

Condition State 2 Surface or freckled rust has formed or is forming on the unpainted metal.

Feasible actions: 1) DN  
2) Clean & paint

Condition State 3 Surface pitting may be present but any section loss due to active corrosion is measurable and does not affect the strength or serviceability of the element.

Feasible actions: 1) DN  
2) Clean & paint

Condition State 4 Corrosion is advanced. Section loss is sufficient to warrant analysis to ascertain the impact on the ultimate strength and/or serviceability of the element.

Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit

Units: LF of Rail

This element defines all types and shapes of reinforced concrete bridge railing. **All elements of the rail must be concrete.** Report the lineal feet of railing in each of Condition States 2 and 3. The number of units in Condition State 1 will be the remainder of units after deducting those reported in Condition States 2 and 3.

**CDOT Notes: Concrete bridge railing with metal components attached shall be considered Element 333 Miscellaneous - Bridge Railing (Other).**

**"Dog House" style bridge railing requires Element 338 Curbs/Sidewalks (Concrete) since the curb is not included in the railing element.**

**Concrete components on concrete rails such as noise barriers, shall be considered part of this element.**

Condition State 1 The element shows no deterioration. **There may be discoloration, efflorescence, and/or superficial cracking** but without effect on strength and/or serviceability.

Feasible actions: 1) DN

Condition State 2 **Minor cracks, surface scaling or spalls** may be present but there is no exposed reinforcing or surface evidence of rebar corrosion.

Feasible actions: 1) DN  
2) Seal cracks, minor patching

Condition State 3 **Some delaminations and/or spalls may be present and some reinforcing may be exposed. Corrosion of rebar may be present but loss of section is incidental** and does not significantly affect the strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN  
2) Clean rebar and patch (and/or seal)

Condition State 4 **Advanced deterioration. Corrosion of reinforcement and/or loss of concrete section is sufficient to warrant analysis** to ascertain the impact on the strength and/or serviceability of either the element or the bridge.

Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit

Units: LF of Rail

This element defines all types and shapes of timber railing. **All elements of the railing (except connectors) must be timber.** Report the lineal feet of railing in each of Condition States 2 and 3. The number of units in Condition State 1 will be the remainder of units after deducting those reported in Condition States 2 and 3.

Condition State 1 There is **no decay**. There may be **minor cracks, splits and/or checks**.

Feasible actions: 1) DN

Condition State 2 There **may be decay** with or without **splitting, cracking, checking or crushing** but **none is sufficiently advanced** to affect serviceability.

Feasible actions: 1) DN  
2) Rehab and/or apply surface treatment

Condition State 3 Advanced deterioration. **Decay, splits, cracks or crushing has produced loss of strength** that may affect the serviceability of the element.

Feasible actions: 1) DN  
2) Replace unit

333 Miscellaneous - Bridge Railing (Other)

333  
Deck(5)

Units: LF of Rail

This element defines all types and shapes of railing except those already defined as METAL, CONCRETE, or TIMBER. This element will include cable rails, combinations of timber, concrete and metal, etc. Metal portions may or may not be painted or galvanized. Report the lineal feet of railing in each of Condition States 2 and 3. The number of units in Condition State 1 will be the remainder of units after deduction those reported in Condition States 2 and 3.

CDOT Notes: The sum of the portions of concrete bridge rails with metal components attached is to be reported as Element 333 Miscellaneous - Bridge Railing (Other).

GCD23 - Flex beam rail attached to timber posts in fill over a culvert is usually considered to be a roadway railing. Railing with steel or timber posts in the fill attached to the structure is considered to be bridge railing (Element 333 Miscellaneous - Bridge Railing (Other) for timber posts).

Condition State 1 The element shows no signs of deterioration. There may be minor cracking, corrosion and/or other minor deterioration having no effect on strength or serviceability.

Feasible actions: 1) DN

Condition State 2 Minor cracking, spalls, decay of timber portions or corrosion of metal may be present.

Feasible actions: 1) DN  
2) Rehab unit

Condition State 3 Advanced deterioration. Corrosion, decay or loss of section is sufficient to warrant analysis to ascertain the impact on the serviceability or strength of the element.

Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit



334 Metal Bridge Railing (Coated)

334  
Deck(5)

Units: LF of Rail

This element defines all types and shapes of metal bridge railing. Steel, aluminum, metal beam, rolled shapes, etc., will all be considered part of this element. **All elements of the rail must be metal. It may be painted or galvanized.** Report the lineal feet of railing in each of Condition States 2 through 5. The number of units in Condition State 1 will be the remainder of units after deduction those reported in Condition States 2 through 5.

CDOT SUGGESTED CONDITION STATES FOR CORROSION ON PAINTED STEEL ELEMENTS		
	Description	CS
Light R1	Slight peeling of the paint, pitting, or surface rust, etc. No measurable section loss	2
R1	Peeling of the paint, pitting, surface rust, etc. No measurable section loss	3
R2	Flaking, minor section loss ( $\leq 10\%$ thickness loss)	4
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is not warranted.</b>	4
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is warranted due to location of corrosion on the member.</b>	5
R4	Heavy section loss ( $> 30\%$ thickness loss), may have holes through base metal	5

**CDOT Note: GCD22 - For metal bridge railing with any coated components, use Element 334 Metal Bridge Railing (Coated).**

This element includes metal attachments such as debris fence and hand rail.

GCD23 - Flex beam rail attached to timber posts in fill over a culvert is usually considered to be a roadway railing. Railing with steel or timber posts in the fill attached to the structure is considered to be bridge railing (Element 333 Miscellaneous - Bridge Railing (Other) for timber posts).

Condition State 1 There is no evidence of active corrosion. Protective coating is sound and functioning as intended to protect the element.

Feasible actions: 1) DN

Condition State 2 There is little or no active corrosion. Surface or freckled rust has formed or is forming. Protective coating may have minor areas of deterioration.

Feasible actions: 1) DN  
2) Clean & restore coating

Condition State 3 Surface or freckled rust is prevalent. Protective coating is no longer effective. There may be exposed metal but there is no active corrosion causing loss of section.

Feasible actions: 1) DN  
2) Clean & restore coating

Condition State 4 Corrosion may be present but any section loss due to active corrosion is measurable and does not affect the strength or serviceability of the element.

Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit

Condition State 5 Corrosion is advanced. Section loss is sufficient to warrant analysis to ascertain the impact on the ultimate strength and/or serviceability of the element.

Feasible actions:      1)    DN  
                             2)    Rehab unit  
                             3)    Replace unit

**\_335\* Culvert Headwalls**

**335\*  
Culvert (20)**

**Units: Each**

This element describes concrete or masonry units at the ends of most culverts to retain the fill. They are usually vertical.

**CDOT Notes:** When bridge rail is attached to a headwall, the headwall element is considered to be between the top of the culvert and the bottom of the railing element.

Noise barriers or other items (for which there are no Pontis elements) may extend the height of the headwall and are considered to be part of the headwall.

This element includes saddlewalls and slope protection used at the ends of pipes.

Condition State 1 There may be insignificant cracking including hairline and light flexure or shear cracks. There may be minor scaling or small spalls without exposed reinforcement.

Feasible actions: 1) DN

Condition State 2 There may be moderate shear or flexure cracks, moderate disintegration or spalls with exposed and rusting reinforcement. There may be loose stones.

Feasible actions: 1) DN  
2) Clean & patch

Condition State 3 There may be heavy shear or flexure cracks or heavy disintegration with significant loss of section to reinforcing. Stones may be missing.

Feasible actions: 1) DN  
2) Clean & patch  
3) Replace

Units: LF Along Centerline

This element defines the steel portion of the curb and/or sidewalk mounted to the bridge. Report the quantity of Condition States 2 through 5.

CDOT SUGGESTED CONDITION STATES FOR CORROSION ON PAINTED STEEL ELEMENTS		
	Description	CS
Light R1	Slight peeling of the paint, pitting, or surface rust, etc. No measurable section loss	2
R1	Peeling of the paint, pitting, surface rust, etc. No measurable section loss	3
R2	Flaking, minor section loss ( $\leq 10\%$ thickness loss)	4
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is not warranted.</b>	4
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is warranted due to location of corrosion on the member.</b>	5
R4	Heavy section loss ( $> 30\%$ thickness loss), may have holes through base metal	5

Condition State 1 There is no evidence of active corrosion and the coating is sound and functioning as intended to protect the metal surface.

Feasible actions: 1) DN

Condition State 2 **There is little or no active corrosion.** Surface or freckled rust has formed or is forming. The coating may be chalking, peeling, curling or showing early evidence of coating distress but **there is no exposure of metal.**

Feasible actions: 1) DN  
2) Surface clean  
3) Surface clean & restore top coat

Condition State 3 **Surface or freckled rust is prevalent.** The coating is no longer effective. There **may be exposed metal** but there is no active corrosion which is causing loss of section. There is **slight deterioration in the sidewalk, but poses no hazard to pedestrians.**

Feasible actions: 1) DN  
2) Spot blast, clean & paint

Condition State 4 **The coating has failed.** Surface pitting may be present but any section loss due to active corrosion does not yet warrant structural analysis of the element. There is **sufficient deterioration in the sidewalk and does pose a hazard to pedestrians.**

Feasible actions: 1) DN  
2) Spot blast, clean & paint  
3) Repair or minor rehab & paint

Condition State 5 **Corrosion has caused section loss and is sufficient to warrant structural analysis** to ascertain the impact on the ultimate strength and/or serviceability of the element. There is **advanced deterioration of the sidewalk and should be closed to pedestrians.**

Feasible actions: 1) DN

- 2) Major rehab unit
- 3) Replace unit

Units: LF Along Centerline

This element defines the steel portion of the curb and/or sidewalk mounted to the bridge. Report the quantity of Condition States 2 through 4.

CDOT SUGGESTED CONDITION STATES FOR CORROSION ON UNPAINTED STEEL ELEMENTS		
	Description	CS
R1	Pitting or surface rust, etc. No measurable section loss	2
R2	Flaking, minor section loss (≤ 10% thickness loss)	3
R3	Flaking, swelling, mod. section loss (10% < thickness loss ≤ 30%) <b>structural analysis is not warranted.</b>	3
R3	Flaking, swelling, mod. section loss (10% < thickness loss ≤ 30%) <b>structural analysis is warranted due to Location of corrosion on the member.</b>	4
R4	Heavy section loss (> 30% thickness loss), may have holes through base metal.	4

Condition State 1 **There is little or no corrosion** of the unpainted steel. The weathering steel is coating uniformly and remains in excellent condition.

Feasible actions: 1) DN

Condition State 2 **Surface rust, surface pitting, has formed or is forming** on the unpainted steel. The weathering steel has not corroded beyond design limits. Weathering color is yellow orange to light brown. There is **slight deterioration in the sidewalk, but poses no hazard to pedestrians.**

Feasible actions: 1) DN  
2) Clean & paint

Condition State 3 **Steel has measurable section loss due to corrosion but does not warrant analysis.** Weathering steel is dark brown or black. There is **sufficient deterioration in the sidewalk and does pose a hazard to pedestrians.**

Feasible actions: 1) DN  
2) Repair or minor rehab & paint

Condition State 4 Corrosion is advanced. **Section loss due to corrosion is sufficient to warrant structural analysis** to ascertain the impact on the ultimate strength and/or serviceability of either the element or the bridge. There is **advanced deterioration in the sidewalk and should be closed to pedestrians.**

Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit

**\_338\* Curbs/Sidewalks (Concrete)**

**338\*  
Deck(5)**

**Units: LF Along Centerline**

This element defines the concrete portion of the curb and/or sidewalk mounted to the bridge. Report the quantity of Condition States 2 through 4.

**CDOT Notes: Sidewalks which are at the same level of the bridge deck (with or without curbs) are to be coded as Element 338 Curbs/Sidewalks (Concrete).**

**Curb adjacent to a sidewalk is considered to be subsidiary to and part of Element 338 Curbs/Sidewalks (Concrete). Report one length per sidewalk.**

Condition State 1 The element shows little or no deterioration. There **may be discoloration, light efflorescence, and/or superficial cracking** but does not affect the strength or serviceability of the element.

Feasible actions: 1) DN

Condition State 2 **Minor cracks, delaminations, scale, and/or spalls may be present but no exposed reinforcing or surface evidence of rebar corrosion** and does not affect the strength and/or serviceability of the element. There is **slight deterioration in the sidewalk but poses no hazard to pedestrians.**

Feasible actions: 1) DN  
2) Seal cracks, minor patch

Condition State 3 **Some delaminations, scale, and/or spalls may be present and some reinforcing may be exposed.** Corrosion of rebar may be present but **loss of section is incidental** and does not significantly affect the strength and/or serviceability of the element. There is **sufficient deterioration in the sidewalk and does pose a hazard to pedestrians.**

Feasible actions: 1) DN  
2) Seal cracks, minor patch  
3) Clean rebar & patch (and/or seal)

Condition State 4 **Advanced deterioration. Heavy scale, and/or spalling, corrosion of reinforcement and/or loss of section is sufficient to warrant analysis** to ascertain the strength and/or serviceability of the element. There is **advanced deterioration in the sidewalk and should be closed to pedestrians.**

Feasible actions: 1) DN  
2) Rehab unit  
3) Replace unit

Units: LF Along Centerline

This element defines the timber portion of the curb and/or sidewalk mounted to the bridge. Report the quantity of Condition States 2 through 4.

Condition State 1 The element shows **no** deterioration or **decay**. There **may be superficial checks, cracks, or splits** having no effect on the strength or serviceability of the element.

Feasible actions: 1) DN

Condition State 2 **Decay, checking, splitting or cracking, or splintering from collision may exist** but not of a sufficient magnitude to affect the strength or serviceability of the element.

There is **slight deterioration in the sidewalk, but poses no hazard to pedestrians.**

Feasible actions: 1) DN  
2) Repair and/or protect unit

Condition State 3 **Decay, checking, splitting or cracking, or splintering and/or broken/missing portions from collision has produced loss of strength** of the element **but not of a sufficient magnitude** to affect the serviceability of the element. There is **sufficient deterioration in the sidewalk and does pose a hazard to pedestrians.**

Feasible actions: 1) DN  
2) Rehab unit

Condition State 4 **Advanced decay and/or deterioration.** Splitting, cracking, splintering, or broken/missing portions (> 10' in length) has produced loss of strength and does affect the serviceability of the element. There is advanced deterioration in the **sidewalk and should be closed to pedestrians.**

Feasible actions: 1) DN  
2) Replace unit



**\_340\* Concrete Coating (Superstructure)**

**340\*  
Superstructure(10)**

**Units: Each**

This element defines the colored **mortar-based acrylic concrete coating used for aesthetic treatment** of bridges. Report the condition state which most accurately represents the condition of the entire bridge.

**CDOT Note: This element applies to any coating applied to the concrete elements. Colored concrete is not included.**

Condition State 1 The coated concrete surfaces have **peeling, bad staining, or graffiti less than 5%** of the covered surface area.

Feasible actions: 1) DN

Condition State 2 The coated concrete surfaces have **peeling, bad staining, or graffiti between 5% and 20%** of the covered surface area.

Feasible actions: 1) DN  
2) Rehab/clean coating  
3) Replace coating

Condition State 3 The coated concrete surfaces have **peeling, bad staining, or graffiti greater than 20%** of the covered surface area.

Feasible actions: 1) DN  
2) Rehab/clean coating  
3) Replace coating

**\_341\* Concrete Coating (Substructure)**

**341\*  
Substructure(15)**

**Units: Each**

This element defines the **colored mortar-based acrylic concrete coating** used for aesthetic treatment of bridges. Report the condition state which most accurately represents the condition of the entire bridge.

**CDOT Note: This element applies to any coating applied to the concrete elements. Colored concrete is not included.**

Condition State 1 The coated concrete surfaces have **peeling, bad staining, or graffiti less than 5%** of the covered surface area.

Feasible actions: 1) DN

Condition State 2 The coated concrete surfaces have **peeling, bad staining, or graffiti between 5% and 20%** of the covered surface area.

Feasible actions: 1) DN  
2) Rehab/clean coating  
3) Replace coating

Condition State 3 The coated concrete surfaces have **peeling, bad staining, or graffiti greater than 20%** of the covered surface area.

Feasible actions: 1) DN  
2) Rehab/clean coating  
3) Replace coating

342\* Sign Attachment to Bridge

342\*  
Superstructure(10)

Units: Each

This condition state language addresses the condition of the attachment utilized to connect overhead signs to bridges. These attachments support overhead signs (**SIGN**, **CSIGN**, **BSIGN**, **DSIGN**, and bridge mounted signs (**BMS**)). Examine the lower portions of the vertical sign member within 4' of the attachment (referred to as the "sign connection" below) for cracks and distress. Inspect the entire frame in the case of a BMS.

**CDOT Notes: Bridge components in the vicinity of the attachment are to be inspected for any signs of deterioration or distress and the condition reported with the appropriate element.**

The following sentence should be modified for the situation and included in the comments for this element: "<Sign Str. No. \_\_\_\_\_> <A BMS> is attached to <the girder> <the bridge rail/deck> <the girder and bridge rail/deck> <a retaining wall with or without traffic railing> <the pier> of this bridge."

Condition State 1 The attachment and sign connection are not showing significant signs of deterioration.

Feasible actions: 1) DN

Condition State 2 The attachment and sign connection are showing signs of deterioration but they are not of concern at this time.

Feasible actions: 1) DN

Condition State 3 The attachment and sign connection are showing signs of deterioration and warrant analysis.

Feasible actions: 1) Perform analysis

Condition State 4 The attachment and sign connection are showing signs of severe deterioration or distress which warrant either immediate repair or removal of the attachment.

Feasible actions: 1) Immediate repair  
2) Immediate removal

343\* Pole Attachment to Bridge

343\*  
Superstructure(10)

Units: Each

This condition state language addresses the condition of miscellaneous pole attachments connected to bridges. These attachments include **signal poles, light poles, camera poles, or any other item which utilizes a pole** that is attached to a bridge. The pole attachment **does not include regulatory traffic signs**. Examine portions of the pole within 4' of the bridge attachment (referred to as the "pole connection" below) for cracks and distress.

**CDOT Note: Bridge components in the vicinity of the attachment are to be inspected for any signs of deterioration or distress and the condition reported with the appropriate element.**

Condition State 1 The attachment and pole connection are not showing significant signs of deterioration.

Feasible actions: 1) DN

Condition State 2 The attachment and pole connection are showing signs of deterioration but the are not of concern at this time.

Feasible actions: 1) DN

Condition State 3 The attachment and pole connection are showing signs of deterioration and warrant analysis.

Feasible actions: 1) Perform analysis

Condition State 4 The attachment and pole connection are showing signs of severe deterioration or distress which warrant either immediate repair or removal of the attachment.

Feasible actions: 1) Immediate repair  
2) Immediate removal

Units: LF Along Centerline

This element defines the formed concrete lined portions of tunnels only, it may or may not have sheet metal panels or tile walls or ventilation ducts. Report the quantity of Condition States 2 through 4.

Condition State 1 The element shows **minimal deterioration** such as **hairline cracks** < 1/32", **efflorescence stains**, or **light scale** < 1/4" deep.

Feasible actions: 1) DN

Condition State 2 The element **show deterioration** such as: **Cracks** 1/32" to 1/16" in width, **efflorescence deposits or stalactites without dripping water**, **scale** 1/2" deep, **but no delaminations or spalls**. **Efflorescence** on the lining surface is **light to severe**, but affects **less than 10% of lining area**.

Feasible actions: 1) DN  
2) Seal cracks or control water

Condition State 3 The element shows **moderate deterioration** such as: **Cracks** > 1/16" in width, **efflorescence deposits, dripping water**, **scale** to 3/4" deep, **delaminations or spalls** < 1" deep. **Efflorescence** on the lining surface is **light to severe**, but affects **10% to 25% of lining area**.

Feasible actions: 1) DN  
2) Seal cracks or control water  
3) Patch delaminations, spalls, or

scale

Condition State 4 The element shows **severe deterioration** such as: **Cracks** > 1/4" in width, **efflorescence deposits, dripping water**, **scale** > 3/4" deep, **delaminations or spalls** > 1" deep. **Efflorescence** on the lining surface is **light to severe**, but affects **more than 25% of lining area**.

Feasible action: 1) DN  
2) Seal cracks or control water  
3) Patch delaminations, spalls, or

scale

4) Replace concrete lining

\_351\* Tunnel (Unlined/Unsupported)

351\*  
Tunnel(25)

Units: LF Along Centerline

This element defines the unlined/unsupported (rock) portion of tunnels only. Report the quantity of Condition States 2 through 4.

Condition State 1 The element shows **minimal deterioration** such as: **Minimal water leakage** and the joints in the **rock are tight**.

Feasible actions: 1) DN

Condition State 2 The element **shows deterioration** such as: **Joints in the rock are open** < 1/2" in width, **water leakage**, and **no loose rocks**.

Feasible actions: 1) DN  
2) Control water

Condition State 3 The element shows **Moderate deterioration** such as: **Joints in the rock are open** > 1/2" in width, **water leakage**, or **loose rocks** < 1", water leakage, loose rocks > 1' in diameter. **Serviceability is affected and warrants further investigation**.

Feasible actions: 1) DN  
2) Control water  
3) Minor repair

Condition State 4 The element shows **Severe deterioration** such as: **Joints in the rock are open** > 1", **water leakage**, **loose rocks** > 1' in diameter, **small rocks falling onto the roadway or minor cave-ins**.

Feasible actions: 1) DN  
2) Control water  
3) Minor repair

\_352\* Tunnel (Unlined/Supported)

352\*

Tunnel(25)

Units: LF Along Centerline

Note: If a timber or steel set or rock bolt fails, the LF reported will be from adjacent good sets or rock bolts on either side.

This element defines the unlined portion of tunnels supported by timber or steel sets or rock bolts only, backing boards or planks and cribbing behind the sets or wire mesh in conjunction with rock bolts and may have leaking water. Report the quantity of Condition States 2 through 4.

Condition State 1 This element shows **minimal deterioration** such as: **Minor checking in the timber sets, no deformation of the steel sets or loose rock bolts.**

Feasible actions: 1) DN

Condition State 2 This element shows **deterioration** such as: **Checking, splitting, some flanges may be locally bent on the steel sets** but they are not deformed, **rock bolts are still tight, minor rock sloughing** behind or between the sets or cribbing.

Feasible actions: 1) DN  
2) Minor repair

Condition State 3 This element shows **moderate deterioration** such as: **Crushing of timber sets, steel sets have some locally bent flanges** but **sets are not deformed, rock bolts are still tight**, cribbing is loose or falling out and **considerably rock sloughing** behind the cribbing or **small rocks are falling onto the roadway.**

Feasible actions: 1) DN  
2) Major repair

Condition State 4 This element shows **severe deterioration** such as: **Failure of timber sets, deformation of the steel sets, loose rock bolts, rocks falling onto the roadway.**

Feasible actions: 1) DN  
2) Major repair  
3) Replace

Units: LF Along Centerline

This element defines the shotcrete lined portion of tunnels only, may or may not have rock bolts and wire mesh reinforcement. Report the quantity of Condition States 2 through 4.

Condition State 1 The element shows **minimal deterioration** such as: **Light cracking in the shotcrete** with or without efflorescence stains, **minimal water leakage**.

Feasible actions: 1) DN

Condition State 2 The element **shows deterioration** such as: **Cracks in the shotcrete** < 1/2" in width, **efflorescence, stalactites, delaminations, spalls, or water leakage**. **Efflorescence** on the lining surface is **light to severe**, but affects **less than 10% of lining area**.

Feasible actions: 1) DN  
2) Control water  
3) Minor repair

Condition State 3 The element shows **moderate deterioration** such as: 1/2" < **cracks in the shotcrete** < 1" in width, **efflorescence, delaminations, spalls, loose rocks** < 1' in diameter, or **water leakage**. **Efflorescence** on the lining surface is **light to severe**, but affects **10% to 25% of lining area**.

Feasible actions: 1) DN  
2) Control water  
3) Repair

Condition State 4 The element shows **severe deterioration** such as: **Cracks in the shotcrete** > 1" in width, **efflorescence, delaminations, spalls, loose rocks** > 1' in diameter, or **water leakage**. **Efflorescence** on the lining surface is **light to severe**, but affects **more than 25% of lining area**.

Feasible actions: 1) DN  
2) Control water  
3) Major repair



## ***SmartFlag Index***

- 355\*-3- Steel Diaphragms
- 356 -3- Steel - Fatigue
- 357 -4- Pack Rust (Superstructure)
- 358 -4- Deck Surface Cracking
- 359 -5- Soffit of Concrete Decks and Slabs
- 360 -3- Settlement
- 361 -3- Scour
- 362 -3- Traffic Impact (Superstructure)
- 370\*-3- Traffic Impact (Substructure)
- 371\*-3- Traffic Impact (Deck)
- 372\*-3- False Bent/Temporary Support
- 373\*-4- Pack Rust (Substructure)
- 399\*-5- Alkali-Silica Reactivity (ASR)

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**\_SmartFlag 355\* Steel Diaphragms**

**355\*  
Superstructure(10)**

**Units: Each**

This SmartFlag defines the steel intermediate and end diaphragms in steel or prestressed/precast concrete girder bridges. Report only the quantity of diaphragms that meet Condition States 1 through 3.

**CDOT Notes: Retain this SmartFlag even though repairs have been made.**

**Include comments concerning damage to diaphragm members with the appropriate girder element.**

Condition State 1 The bolts in the connections have been replaced or have been tightened. All welded connections are still sound including the welded stiffener connection to the web.

Condition State 2 There are loose or missing bolts in the connections and the connections are loose. The welded connections, including the welded stiffener connection to the web, are basically sound but there may be visible cracks (< 1/2" in length) in the weld.

Condition State 3 There are loose and missing bolts in the connections, and the diaphragm is ineffective. There is distress in the welded connections or the welded stiffener connection to the web (fatigue cracks or broken welds).

Units: Each

This SmartFlag exists only on those **bridges with steel elements which are already showing fatigue damage**. It should not be applied to steel bridges prior to fatigue damage becoming apparent. Once established, deterioration modeling can be used to obtain transition probabilities.

**CDOT Notes: Retain this SmartFlag once repairs are made.**

Condition State 1 **Fatigue damage to the bridge has been repaired or arrested.** The bridge may still be fatigue prone.

Condition State 2 **Fatigue damage exists** which is not arrested (normally, this condition state would be used the first time the condition is identified and at any other time when additional fatigue damage occurs.)

Condition State 3 **Fatigue damage exists which warrants analysis** of the element to ascertain the serviceability of the element or bridge.

Units: Each

This SmartFlag **defines only those connections** (including shapes in contact in built-up members) of steel bridges which are **already showing signs of rust packing** between steel plates **as in trusses, riveted plate girders and cover plates.**

CDOT Note: The "Each" unit is defined as a location; 20 locations equals a quantity of 20. If there are many locations on a member, estimate a quantity and give the general locations such as top or bottom flange cover plates, gusset plates on lower cord vertical connection plates, etc.

Condition State 1 The connection is **showing signs of rusting between plates.** Seams of the connections exhibit rust staining.

Condition State 2 **Rusting between plates is beginning to distress** the connection. **Minor swelling** exists.

Condition State 3 **Rusting between plates has caused serious distress** to the connection. **The plates may be badly distorted,** however all connectors (rivets/bolts) are still functioning.

Condition State 4 **Rusting between plates has caused serious distress to the connection which warrants analysis** of the bridge to ascertain the impact on the serviceability of the bridge. Some rivets or other connectors may have popped or are no longer effective.

Units: Each

This condition state language addresses deck cracking. Once a deck begins to show other distress more significant than cracking (spalling/delamination) the status of this SmartFlag is probably not important.

CDOT SUGGESTED CONDITION STATES FOR CRACKS IN ASPHALT SURFACING						
SPACING (S) IN METERS (FEET)						
W I D T H (W)	I N mm (in)	S > 3 M (10 ft)	2 < S ≤ 3 (6) (10)	1 < S ≤ 2 (3) (6)	S < 1 M ( < 3 ft)	
		≤ 3 mm (≤ 1/8 in)	1	1	2	3
		3 < W ≤ 6 (1/32) (1/16)	1	2	3	4
		6 < W ≤ 10 (1/4) (3/8)	2	3	4	4
		> 10 mm ( > 3/8 in)	3	3	4	4

CDOT SUGGESTED CONDITION STATES FOR CRACKS IN CONCRETE DECK						
SPACING (S) IN METERS (FEET)						
W I D T H (W)	I N mm (in)	S > 3 M ( > 10 ft)	2 < S ≤ 3 (6) (10)	1 < S ≤ 2 (3) (6)	S ≤ 1 M (≤ 3 ft)	
		≤ 1 mm (≤ 1/32 in)	1	1	2	3
		1 < W ≤ 2 (1/32) (1/16)	1	2	3	4
		2 < W ≤ 3 (1/16) (1/8)	2	3	4	4
		> 3 mm ( > 1/8 in)	3	3	4	4

**CDOT Note:** This SmartFlag shall not be used when the condition state of the deck element is worse than Condition State 1.

Condition State 1 The surface of the deck is cracked, but the cracks are either filled/sealed or insignificant in size and density to warrant repair activities.

Condition State 2 Unsealed cracks exist which are of moderate size or density.

Condition State 3 Unsealed cracks exist in the deck which are of moderate size and density.

Condition State 4    **Unsealed cracks** exist in the deck which are **severe size and/or density**.

Units: Each

This condition state language addresses deck distresses through visual inspection of the deck soffit (under-surface). It is extremely valuable when the top surface of the deck is covered with an overlay.

CDOT SUGGESTED CONDITION STATES FOR SmartFlag 359 - BOTTOM OF DECK			
Cracking/Efflorescence	Rust Stain/Spalling	% of Total Deck Area	Condition State
Light to severe	none	< 10%	2
Light to severe	none	10% < TDA ≤ 25%	3
Light to severe	Light to moderate	> 25%	4
Light to severe	Heavy to severe	> 25%	5

**CDOT Notes: Do not use with timber deck or slab, steel decks or Element 60 Deck - Railroad.**

**This SmartFlag is generally not used when there are stay-in-place deck forms or when the soffit of the deck or slab is not visible.**

Condition State 1 The under-surface of the deck or slab has no symptoms of distress. Any cracking that is present is only superficial.

Condition State 2 The under-surface of the deck or slab shows no evidence that active corrosion is occurring in the deck (There is no rust staining or spalling which could be attributed to active corrosion). However, the cracking and/or efflorescence on the under-surface is light to moderate. *CDOT Add: However, the cracking and/or efflorescence on the under-surface is light to severe, but affects less than 10% of deck area.*

Condition State 3 The under-surface of the deck or slab shows no evidence that active corrosion is occurring in the deck (There is no rust staining or spalling which could be attributed to active corrosion). However, the cracking and/or efflorescence on the under-surface is heavy to severe. *CDOT Add: However, the cracking and/or efflorescence on the under-surface is light to severe, but affects 10% to 25% of deck area.*

Condition State 4 Light to moderate rust staining and/or spalling on the under-surface of the deck indicates that active corrosion is occurring in the deck. *CDOT Add: However, the cracking and/or efflorescence on the under-surface is light to severe, but affects more than 25% of deck area.*

Condition State 5 Heavy to severe rust staining and/or spalling on the under-surface of the deck indicates that active corrosion is occurring in the deck. *CDOT Add: However, the cracking and/or efflorescence on the under-surface is light to severe, but affects more than 25% of deck area.*



Units: Each

This condition state language addresses substructure settlement distress which is evident during visual inspections. Its' primary purpose is to identify bridges that are experiencing settlement and to provide some measure of the magnitude of that settlement. The normal CoRe condition state language for substructure elements does not address settlement.

Condition State 1 Some of the bridge supporting elements are **showing signs of visible settlement or rotation** but, due to earlier repairs or other signs, the **settlement appears to have stabilized.**

Condition State 2 **Settlement or rotation** of the bridge supporting elements **show signs of continuing** and, if left un-arrested, could **cause adverse impacts on the bridge.**

Condition State 3 Settlement or rotation of the bridge supporting elements is **significant enough to warrant analysis of the bridge.**

Units: Each

This condition state language addresses scour distresses which are evident during visual inspections. Its primary purpose is to identify bridges that are experiencing scour and to provide some measure of the magnitude of scour. This SmartFlag may not be needed provided NBI Item113 is used to record observed scour.

**CDOT Note: The observed scour must be located at a substructure unit, i.e. an abutment or pier.**

Condition State 1 Scour exists at the bridge site but is of little concern to the structural integrity of the bridge.

Condition State 2 Scour exists at the bridge site and if left unchecked could impact the structural integrity of the bridge.

Condition State 3 Scour is significant enough to warrant analysis of the bridge.

Units: Linear Feet

This condition state language addresses **distress** of any superstructure elements due to traffic impact.

CDOT Note: Retain this SmartFlag after the damage has been repaired but report 1' in Condition State 1. Record and retain the date(s) of each impact, inspection, and repair in the comment field for this SmartFlag as follows: IMP-MM/DD/YY, ISP-MM/DD/YY, REP-MM/DD/YY. Provide all three items of information and use a question mark for any information not known and a zero if the item has not been repaired, i.e. IMP-MM/?/YY, ISP-MM/DD/YY, REP-00/00/00.

Do not use this SmartFlag for insignificant damage, such as a scratch or minor scrape.

Condition State 1 Impact damage has occurred and **has been repaired**. Prestressing system is covered by patch concrete. **Steel has been straightened or repaired.** *CDOT Add: Damage to the timber member has been repaired or is minor.*

Condition State 2 Impact damage has occurred. **Prestressing system is exposed but is not impaired.** **Steel strength does not threaten the serviceability** of the bridge. *CDOT Add: Damage to the timber member does not threaten the serviceability of the bridge.*

Condition State 3 Impact has occurred and the **strength of the member is impaired.** **Analysis is warranted** to ascertain the serviceability of the bridge. *CDOT Add: Damage to the timber member warrants analysis to ascertain serviceability of the bridge.*

Units: Linear Feet

This condition state language addresses **distress** of any substructure elements due to traffic impact.

CDOT Note: Retain this SmartFlag after the damage has been repaired but report 1' in Condition State 1. Record and retain the date(s) of each impact, inspection, and repair in the comment field for this SmartFlag as follows: IMP-MM/DD/YY, ISP-MM/DD/YY, REP-MM/DD/YY. Provide all three items of information and use a question mark for any information not known and a zero if the item has not been repaired, i.e. IMP-MM/?/YY, ISP-MM/DD/YY, REP-00/00/00.

Do not use this SmartFlag for insignificant damage, such as a scratch or minor scrape.

Condition State 1 Impact damage has occurred and **has been repaired**. Prestressing system is covered by patch concrete. **Steel has been straightened or repaired.** *CDOT Add: Damage to the timber member has been repaired or is minor.*

Condition State 2 Impact damage has occurred. **Prestressing system is exposed but is not impaired.** **Steel strength does not threaten the serviceability** of the bridge. *CDOT Add: Damage to the timber member does not threaten the serviceability of the bridge.*

Condition State 3 Impact has occurred and the **strength of the member is impaired.** **Analysis is warranted** to ascertain the serviceability of the bridge. *CDOT Add: Damage to the timber member warrants analysis to ascertain serviceability of the bridge.*

Units: Linear Feet

This condition state language addresses **distress of any deck elements due to traffic impact**. This includes curbs, rails, but not expansion devices.

CDOT Note: Retain this SmartFlag after the damage has been repaired but report 1' in Condition State 1. Record and retain the date(s) of each impact, inspection, and repair in the comment field for this SmartFlag as follows: IMP-MM/DD/YY, ISP-MM/DD/YY, REP-MM/DD/YY. Provide all three items of information and use a question mark for any information not known and a zero if the item has not been repaired, i.e. IMP-MM/?/YY, ISP-MM/DD/YY, REP-00/00/00.

Do not use this SmartFlag for insignificant damage, such as a scratch or minor scrape.

Condition State 1 Impact damage has occurred and **has been repaired**. Prestressing system is covered by patch concrete. Steel has been **straightened or repaired**. *CDOT Add: Damage to the timber member has been repaired or is minor.*

Condition State 2 Impact damage has occurred. **Prestressing system is exposed** but is **not impaired**. Steel strength **does not threaten the serviceability** of the bridge. *CDOT Add: Damage to the timber member does not threaten the serviceability of the bridge.*

Condition State 3 Impact has occurred and the **strength of the member is impaired**. **Analysis is warranted** to ascertain the serviceability of the bridge. *CDOT Add: Damage to the timber member warrants analysis to ascertain serviceability of the bridge.*

\_SmartFlag 372\* False Bent/Temporary Support

372\*  
Substructure(15)

Units: Each

This condition state language addresses the use of false bents and other temporary supports under the superstructure. These supports may be used to **temporarily** raise the load carrying capacity of the bridge or as a **temporary repair** for a superstructure or substructure element.

CDOT Note: Code NBI Item103 = T and Item41 = B, D, E, or P when this SmartFlag is used. If Item103 is coded T, then all data recorded for the structure shall be for the condition of the structure without temporary measures, except for the following items which shall be for the temporary structure:

- Item10 - Inventory Route, Minimum Vertical Clearance
- 41 - Structure Open, Posted, or Closed to Traffic
- 47 - Inventory Route, Total Horizontal Clearance
- 53 - Minimum Vertical Clearance Over Bridge Roadway
- 54 - Minimum Vertical Underclearance
- 55 - Minimum Lateral Underclearance on Right
- 56 - Minimum Lateral Underclearance on Left
- 70 - Bridge Posting

Item41 Code

- B = Open, posting recommended but not legally implemented.
- D = Open, would be posted or closed except for temporary shoring, etc. to allow for unrestricted traffic.
- E = Open, temporary structure in place to carry legal loads while original structure is closed and awaiting replacement or rehabilitation.
- P = Posted for load.

Condition State 1 The false bent/temp. support is **functioning as intended**. All components are as constructed, **there is full bearing with the superstructure**, and the **foundation is sound**.

Condition State 2 There are **some superstructure elements not bearing as intended** or constructed, the false bent/temp. support is **loose and not stable**, the **foundation is starting to be undermined** by water/wind etc.

Condition State 3 The false bent/temp. support is **no longer in contact with superstructure**, the **foundation is undermined to the point of affecting its stability**, it is **no longer functioning as intended or constructed**.

\_SmartFlag 373\* Pack Rust (Substructure)

373\*  
Substructure(15)

Units: Each

This SmartFlag **defines only those connections** (including shapes in contact in built-up members) of steel bridges which are **already showing signs of rust packing** between steel plates.

CDOT Notes: This includes steel bearings, not sole plates on poured in girders.

The "Each" unit is defined as a location; 20 locations equals a quantity of 20. If there are many locations on a member, estimate a quantity and give the general locations such as top or bottom flange cover plates, gusset plates on lower cord vertical connection plates, etc.

Condition State 1 The connection is **showing signs of rusting between plates**. Seams of the connections exhibit rust staining.

Condition State 2 **Rusting between plates is beginning to distress** the connection. **Minor swelling** exists.

Condition State 3 **Rusting between plates has caused serious distress** to the connection. The **plates may be badly distorted**, however all connectors (rivets/bolts) are still functioning.

Condition State 4 **Rusting between plates has caused serious distress to the connection which warrants analysis** of the bridge to ascertain the impact on the serviceability of the bridge. Some rivets or other connectors may have popped or are no longer effective.

SmartFlag 399\* Alkali-Silica Reactivity (ASR)

399\*

Substructure(15)

Units: Sq. Ft.

The condition states for this SmartFlag identify the individual concrete components of the bridge i.e., Deck, Superstructure, Substructure, and Wingwalls.

Use the following condition states to identify the component with **suspected ASR**. Record the **estimated Square Feet** in the appropriate condition state. The Total Quantity is the sum of quantities in Condition States 2 through 5 and can be as large as 99999. The quantity in **Condition State 1 will be ignored**.

Condition State 2 = Deck (deck, curbs, sidewalks, rails etc.)

Condition State 3 = Superstructure

Condition State 4 = Substructure (abuts., piers, caps,  
columns/piling)

Condition State 5 = Wingwalls



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## ***Remaining Element Index***

- 501\*- Channel Condition
- 502\*- Channel Protection Material and Condition
- 504\*- Bank Condition
- 505\*- Debris
- 510\*- Waterway Adequacy
- 520\*- Approach Roadway Alignment
- 600\*- General Remarks

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**\_501\* Channel Condition**

**501\*  
Streambed(30)**

**Units: N/A**

This element describes the actual physical condition of that part of the waterway that is associated with the flow of water through the bridge. A comment would normally describe conditions that might adversely affect the flow of water through the channel. A condition state will not be determined, however, using the NBI definition, this condition will be used in part to determine the code for NBI Item61.

**If there are no comments for this element, do not include it in the inspection report.**

**\_502\* Channel Protection Material and Condition**

**502\*  
Streambed(30)**

**Units: N/A**

This element describes the material used to protect the banks and streambed of the waterway in association with the bridge, but excluding the slope protection at the bridge. The comment would describe the material and the condition of the channel protection material. Use this element for **check dams, aprons, and materials used to protect the channel**. A condition state will not be determined, however, using the NBI definition, this condition will be used in part to determine the code for NBI Item61.

If there is no specific channel protection, this element should not be used.

**If there are no comments for this element, do not include it in the inspection report.**

**\_504\* Bank Condition**

**504\*  
Streambed(30)**

**Units: N/A**

This element describes the actual physical condition of the bank of the waterway that is associated with the flow of water through the bridge. A comment would normally describe conditions that might adversely affect the flow of water through the channel. A condition state will not be determined, however, using the NBI definition, this condition will be used in part to determine the code for NBI Item61.

**If there are no comments for this element, do not include it in the inspection report.**

**\_505\* Debris**

**505\*  
Streambed(30)**

**Units: N/A**

This element describes the debris found in and around the waterway associated with the bridge. The comment would describe the material and its location in the channel. A condition state will not be determined, however, using the NBI definition, this condition will be used in part to determine the code for NBI Item61.

**If there are no comments for this element, do not include it in the inspection report.**

**\_510\* Waterway Adequacy**

**510\*  
Waterway(35)**

**Units: N/A**

**CDOT Note: GCD15 - If there are no comments for Element 510 Waterway Adequacy or Element 520 Approach Roadway Alignment, remove the elements from the report.**

This element describes the appraisal of the waterway opening with respect to passage of the flow of water through the bridge. Use comments to describe this appraisal if an adverse condition exists. A condition state will not be determined however, and using the NBI definition, this condition will be used to determine the code for NBI Item71.

**520\* Approach Roadway Alignment**

**520\*  
Approach RWY(40)**

**Units: N/A**

**CDOT Note: GCD15 - If there are no comments for Element 510 Waterway Adequacy or Element 520 Approach Roadway Alignment, remove the elements from the report.**

This element describes the appraisal of the approach roadway alignment with respect to the existing roadway alignment. Use comments to describe this appraisal if an adverse condition exists. A condition state will not be determined however, and using the NBI definition, this condition will be used to determine the code for NBI Item72.

Units: N/A

This element is used for general remarks about the bridge, conditions in the general area of the bridge, vehicle parking, access to the bridge, existence of utilities, history of the bridge from local property owners, etc. as well as a continuation of element condition narratives. If this is used for further element narration, be sure to begin the comment with the element number you are referring to in the report.

If utilities are carried by the bridge, include the word "Utility" or "Utilities" in this element along with a brief description and the type of utility, if known. Show the utilities on the structure sketch.

Include the word "Access" followed by a brief description of where to access the bridge, any special equipment necessary (a 6' or 12' ladder, under-bridge inspection crane, etc.), lock key number, and any other information that may be helpful in order to access the bridge.

**\*\*\*Unpainted Steel Elements\*\*\***

- 101 - Closed Web/Box Girder (LF)
- 106 - Open Girder (LF)
- 112 - Stringer (LF)
- 120 - Bottom Chord Through Truss (LF)
- 125 - Thru Truss Excluding Bottom Chord (LF)
- 130 - Deck Truss (LF)
- 140 - Arch (LF)
- 146 - Cable not embedded in concrete - Uncoated (EA)
- 151 - Floor Beam (LF)
- 160 - Pin and Hanger Assembly (EA)
- 201 - Column or Pile Extension (EA)
- 230 - Cap (LF)

CDOT SUGGESTED CONDITION STATES FOR CORROSION ON UNPAINTED STEEL ELEMENTS		
	Description	CS
R1	Pitting or surface rust, etc. No measurable section loss	2
R2	Flaking, minor section loss ( $\leq 10\%$ thickness loss)	3
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is not warranted.</b>	3
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is warranted due to location of corrosion on the member.</b>	4
R4	Heavy section loss ( $> 30\%$ thickness loss), may have holes through base metal.	4

Condition State 1    **There is little or no corrosion** of the unpainted steel. The weathering steel is coating uniformly and remains in excellent condition.

Feasible Actions:    1)    DN

Condition State 2    **Surface rust, surface pitting, has formed or is forming** on the unpainted steel. The weathering steel has not corroded beyond design limits, and the color is yellow orange to light brown.

Feasible Actions:    1)    DN  
                                  2)    Clean & Paint

Condition State 3    **Steel has measurable section loss due to corrosion but does not warrant structural analysis.** Weathering steel is dark brown to black.

Feasible Actions:    1)    DN  
                                  2)    Clean & Paint

Condition State 4    **Corrosion is advanced. Section loss is sufficient to warrant structural analysis** to ascertain the impact on the ultimate strength and/or serviceability of either the element or the bridge.

Feasible Actions:    1)    DN  
                                  2)    Rehab Unit  
                                  3)    Replace Unit



**\*\*\*\*Painted Steel Elements\*\*\*\***

- 102 - Closed Web/Box Girder (LF)
- 107 - Open Girder (LF)
- 113 - Stringer (LF)
- 121 - Bottom Chord Through Truss (LF)
- 126 - Thru Truss Excluding Bottom Chord (LF)
- 131 - Deck Truss (LF)
- 141 - Arch (LF)
- 147 - Cable not embedded in concrete - Coated (EA)
- 152 - Floor Beam (LF)
- 161 - Pin and Hanger Assembly (EA)
- 202 - Column or Pile Extension (EA)
- 231 - Cap (LF)

CDOT SUGGESTED CONDITION STATES FOR CORROSION ON PAINTED STEEL ELEMENTS		
	Description	CS
Light R1	Slight peeling of the paint, pitting, or surface rust, etc. No measurable section loss	2
R1	Peeling of the paint, pitting, surface rust, etc. No measurable section loss	3
R2	Flaking, minor section loss ( $\leq 10\%$ thickness loss)	4
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is not warranted.</b>	4
R3	Flaking, swelling, mod. section loss ( $10\% < \text{thickness loss} \leq 30\%$ ) <b>structural analysis is warranted due to location of corrosion on the member.</b>	5
R4	Heavy section loss ( $> 30\%$ thickness loss), may have holes through base metal	5

Condition State 1 There is no evidence of active corrosion and the paint system is sound and functioning as intended to protect the metal surface.

Feasible Actions: 1) DN 2) Surface Clean

Condition State 2 **There is little or no active corrosion. Surface or freckled rust has formed or is forming.** The paint system may be chalking, peeling, curling or showing other early evidence of paint system distress but **there is no exposure of metal.**

Feasible Actions: 1) DN 2) Surface Clean 3) Surface Clean & Restore Top Coat

Condition State 3 **Surface or freckled rust is prevalent.** The paint system is no longer effective. **There may be exposed metal** but there is no active corrosion which is causing loss of section.

Feasible Actions: 1) DN 2) Spot Blast, Clean & Paint

Condition State 4 The **paint system has failed. Surface pitting may be present** but any section loss due to corrosion does not yet warrant structural analysis of either the element or the bridge.

Feasible Actions: 1) DN 2) Spot Blast, Clean & Paint 3) Replace Paint System

Condition State 5 **Corrosion has caused section loss and is sufficient to warrant structural analysis** to ascertain the impact on the ultimate strength of the element or the bridge.

Feasible Actions: 1) DN 2) Major Rehab Unit  
3) Replace Unit

**\*\*\*\*P/S Concrete Elements\*\*\*\***

- 104 - Closed Web/Box Girder (LF)
- 109 - Open Girder (LF)
- 115 - Stringer (LF)
- 143 - Arch (LF)
- 154 - Floor Beam (LF)
- 204 - Column or Pile Extension (EA)
- 226 - Submerged Pile (EA)
- 233 - Cap (LF)

CDOT SUGGESTED CONDITION STATES FOR CRACKS IN PRESTRESSED CONCRETE GIRDERS			
CS1	CS2	CS3	CS4
≤ 0.10 mm (≤ 0.004 in)	0.10 < W ≤ 0.25 (0.004 in) (0.009 in)	0.25 < W ≤ 0.76 (0.009 in) (0.030 in)	W > 0.76 mm (> 0.030 in)

CDOT SUGGESTED CONDITION STATES FOR PERCENT LOSS OF BEARING AREA			
LOSS OF BEARING AREA(%)			
PERCENT LOSS	≤ 10%	10 < % ≤ 20	> 20%
CONDITION STATES	2	3	4

Condition State 1 The element **shows no deterioration**. There may be **discoloration, efflorescence, and/or superficial cracking** but without effect on the strength and/or serviceability.

Feasible Actions: 1) DN

Condition State 2 **Minor cracks and spalls** may be present and there may be **exposed reinforcing with no evidence of corrosion**. There is no exposure of the prestressing system.

Feasible Actions: 1) DN  
2) Seal Cracks, Minor Patching

Condition State 3 Some **delaminations and/or spalls** may be present. There may be **minor exposure but no deterioration of the prestress system**. **Corrosion of the non-prestressed reinforcement may be present** but loss of section is incidental and does not significantly affect the strength and/or serviceability of either the element or the bridge.

Feasible Actions: 1) DN  
2) Clean steel & Patch, (&/or Seal)

Condition State 4 **Delaminations, spalls and corrosion of the non-prestressed reinforcement are prevalent**. There may also be **exposure and deterioration of the prestress system** (manifested by **loss of bond, broken strands or wire, failed anchorages, etc.**). There is sufficient concern to **warrant an analysis** to ascertain the impact on the strength and/or serviceability of the element or the bridge.

Feasible Actions: 1) DN  
2) Rehab Unit  
3) Replace Unit

**\*\*\*\*Reinforced Concrete Elements\*\*\*\***

- 105 - Closed Web/Box Girder (LF)
- 110 - Open Girder (LF)
- 116 - Stringer (LF)
- 144 - Arch (LF)
- 155 - Floor Beam (LF)
- 205 - Column or Pile Extension (EA)
- 210 - Pier Wall (LF)
- 215 - Abutment (LF)
- 220 - Submerged Pile Cap/Footing (EA)
- 221\*- Pile Cap/Footing (EA)
- 227 - Submerged Pile (EA)
- 234 - Cap (LF)

SUGGESTED CONDITION STATES FOR CRACKS IN MILDLY REINFORCED CONCRETE GIRDERS						
WIDTH (W) in millimeters (inches)						
TYPE OF CRACK	NONE	≤ 0.8 mm (≤ 1/32 in)	0.8 < W ≤ 2 (1/32) (1/16)	2 < W ≤ 2.5 (1/16) (3/32)	2.5 < W ≤ 3 (3/32) (1/8)	W > 3 mm (> 1/8 in)
SHEAR	1	2	2	3	4	4
FLEXURE	1	1	2	3	4	4
DIAGONAL	1	2	2	3	3	4

CDOT SUGGESTED CONDITION STATES FOR PERCENT LOSS OF BEARING AREA			
LOSS OF BEARING AREA (%)			
PERCENT LOSS	≤ 10%	10 < % ≤ 20	> 20%
CONDITION STATES	2	3	4

Condition State 1 The element shows no deterioration. There **may be discoloration, and/or superficial cracking** but without effect on the strength and/or serviceability.

Feasible Actions: 1) DN

Condition State 2 **Minor cracks and spalls may be present** but there is **no exposed reinforcing or surface evidence of rebar corrosion.**

Feasible Actions: 1) DN  
2) Seal cracks, Minor Patching

Condition State 3 **Some delaminations and/or spalls may be present and some reinforcing may be exposed. Corrosion of the rebar may be present but loss of section is incidental** and does not significantly affect the strength and/or serviceability of either the element or the bridge.

Feasible Actions: 1) DN  
2) Clean rebar and Patch (and/or seal)

Condition State 4 Advanced deterioration. **Corrosion of the reinforcement and/or loss of section is sufficient to warrant analysis** to ascertain the impact on the strength and/or serviceability of the element or the bridge.

Feasible Actions: 1) DN  
2) Rehab Unit  
3) Replace Unit

**\*\*\*\*Timber Elements\*\*\*\***

- 111 - Open Girder (LF)
- 117 - Stringer (LF)
- 135 - Truss/Arch (LF)
- 156 - Floor Beam (LF)
- 235 - Cap (LF)

CDOT SUGGESTED CONDITION STATES FOR TIMBER GIRDERS, STRINGERS, CAPS AND FLOORBEAMS		
Splits < 3 ft long or checks > 1" deep = CS 2	Splits ≥ 3 ft long = CS 4	Any stress related full width crack (thickness of the section) = CS 4

CDOT SUGGESTED CONDITION STATES FOR PERCENT LOSS OF BEARING AREA			
LOSS OF BEARING AREA(%)			
PERCENT LOSS	≤ 10%	10 < % ≤ 20	> 20%
CONDITION STATES	2	3	4

**CDOT Note: The worst condition state for the entire timber girder or stringer length is to be reported per girder or stringer (GCD01).**

Condition State 1 Investigation indicates **no decay**. There may be **superficial cracks, splits, and checks** having no effect on the strength or serviceability.

- Feasible Actions: 1) DN

Condition State 2 **Decay, insect infestation/marine borer infestation, abrasion, splitting, cracking, checking or crushing may exist** but none is sufficiently advanced to affect serviceability of the element.

- Feasible Actions: 1) DN  
2) Rehab &/or Protect Unit

Condition State 3 **Decay, insect infestation, abrasion, splitting, cracking or crushing** has produced **loss of strength of the element but not of sufficient magnitude** to affect the serviceability of the bridge.

- Feasible Actions: 1) DN  
2) Rehab Unit  
3) Replace Unit

Condition State 4 Advanced deterioration. **Decay, insect infestation, abrasion, splits, cracks or crushing** has produced **loss of strength** that affects the serviceability of the bridge.

- Feasible Actions: 1) DN  
2) Rehab Unit  
3) Replace Unit

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## **Appendix A Miscellaneous**

**Minor corrections to newly printed inspection reports** are to be made by a **red marker** on both the original inspection report and the unattached copy in the structure folder. The information in **the data base is to be corrected** as well.

**Comments in the inspection reports** are to be in **Type Case** (upper and lower case). Existing comments in UPPER CASE are to be re-typed. The use of ('YY PHOTOS) is acceptable, i.e. ('97 PHOTOS). **Avoid abbreviations in the Maintenance Activities** field.

All necessary **Maintenance Activities/Items** noted are to be included in the inspection report regardless of whether they will be done.

**Special Inspections** or partial inspections are required for particular structural components of selected bridges. NBI Item92C will have the appropriate code and NBI Item93C is updated with the date of inspection. **NBI Items 90A** (regular inspection date) **and 90B** (inspection team) **are not to be updated for partial inspections.**

NBI **Item122B** is to be coded **R for revisits** to bridges which are under construction or need to have inspection completed at another time. A date when the bridge may be inspected should be written on a note and placed in the structure folder. **The M must be removed from Item122B for new inspections.**

### **Pontis Program Quirks**

Structure numbers must match exactly otherwise the program will think it is a new structure. Since both upper and lower case letters are used, no rules can be set. Lower case letters are only used for the third portion of the structure number on minor structures followed by the word "MINOR" in upper case. There are two spaces between a single lower case letter designation and the word "MINOR". For example, E-17-bp MINOR only has one space, however E-17-p MINOR has two spaces.

When adding elements to a bridge, **Item122C should have the inspection quarter coded** rather than leaving it blank. This will allow **the added element to be downloaded** when it is 'X-Picked'.

When duplicating or editing comments, the condition states need to be correct in the top most entry for that particular element. They do not need to be edited for each additional block of comments.

July 1998

The **printed comment size** for an element **is limited to five full fields plus one additional line.** Additional comments may be recorded in Element 600 General Remarks field(s) for that element.



## **Appendix B**

### **Abbreviations**

Abut. = Abutment	Gus. = Gusset
Adj. = Adjacent	H.L. = Hairline
Agg. = Aggregate	Horiz. = Horizontal
Align. = Alignment	Hvy. = Heavy
Allig. = Alligator	Int. = Interior
& = And	Jt. (s) = Joint (s)
Asph. = Asphalt	Lat. = Lateral
@ = At	Lat. Br. = Lateral
Bracing	
Brg. (s) = Bearing (s)	Len. = Length
B.S. = Both Sides	Lt. = Left
Btwn = Between	Longit. = Longitudinal
Bot. = Bottom	Low. = L = Lower
C.L. = Centerline	Med. = Medium
Ctr. = Center	Mid. = Middle
[ = Channel	Mod. = Moderate
Col. (s) = Column (s)	N = North
Conc. = Concrete	Neop. = Neoprene
Cond. = Condition	# = Number
Conn. = Connection	Pl. = Plate
Contam. = Contamination	Rehab. = Rehabilitate
Corr. = Corrosion	Rt. = Right
Cr. = Crack	Shldr. = Shoulder
Deg. = Degree	S = South
Delam. = Delamination	SIP = Stay-in-Place
Deter. = Deterioration	S.F. = Square Feet
Diag. = Diagonal	Stalac. (s) = Stalactite (s)
Diam. = Diameter	Stl. = Steel
Diaph. = Diaphragm	Stgr. (s) = Stringer (s)
Disint. = Disintegrate	Stiff. (s) = Stiffener (s)
D.S. = Downstream	T. Welds = Tack Welds
E = East	Trans. = Transverse
Efflor. = Efflorescence	Typ. = Typical
Elev. = Elevation	U = Upper
Expan. = Expansion	U.S. = Upstream
F.B. = Floorbeam	Vert. = Vertical
Fwd. = Forward	Wtr. stain = Water stain
F.L. = Full Length	W = West
Flg. = Flange	w/ = with
Ft. = Feet	A1 = Abutment 1
Gir. (s) = Girder (s)	P2 = Pier 2

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## **Appendix C**

### **CDOT Bridge Maintenance Activities**

All bridge maintenance activities are in the Structure Maintenance series (351 to 399).

The limits of the bridge maintenance activities are from the backface of abutment to backface of abutment and the adjacent approaches. These activities include but are not limited to the following:

<b>Activity Number</b>	<b>Maintenance Activity</b>
<b>351.00</b>	<b>Bridge/Structural Visual Inspection/Monitoring</b>
<b>352.00</b>	<b>Cleaning or Washing</b>
352.01	Clean out drains.
352.02	Remove sand and debris from bridge decks/sidewalks/curbs/joints/abutments/piers/truss members.
<b>353.00</b>	<b>Bridge Deck Repair, etc.</b>
353.01	Seal open joints (non-expansion).
353.02	Tighten/repair timber decks.
353.03	Shore up bad concrete decks or patch holes through them.
353.04	Patch delaminations, spalls, or potholes in deck surfaces (concrete or asphalt), seal concrete deck surfaces, install waterproofing membrane.
353.05	Repair/replace metal decking.
353.06	Repair/extend/redirect deck drains.
353.07	Repair joints (non-expansion) e.g. "D" cracking.
353.08	Pavement crack sealing.
353.09	Overlay candidate, contact Staff Bridge.
<b>354.00</b>	<b>Superstructure</b>
354.01	Repair damaged girders/truss members (collision).
354.02	Repair girders/truss members(non-collision).
354.03	Not used.
354.04	Remove formwork/debris from inside box girders.
354.05	Repair or maintenance work in tunnels or at tunnel portals.
<b>355.00</b>	<b>Clean and Paint bridge</b>
355.01	Clean and paint bridge (include bearings).
355.02	Clean and spot paint bridge (include bearings).
355.03	Clean and paint bridge rail.

- 356.00 Curbs and Rail**  
356.01 Replace damaged bridge rail.  
356.02 Repair/Replace curb/sidewalk or wheel guard.
- 357.00 Bearings**  
357.01 Remove sand/debris from around bearings.  
357.02 Clean, lubricate if necessary, and paint bearings if necessary.  
357.03 Replace bearings/bearing area (pulpits or saddles).  
357.04 Replace concrete bearing area.  
357.05 Reset bearings.
- 358.00 Substructure**  
358.01 Repair/replace backing planks/piles/caps in abutments or piers (timber only).  
358.02 Repair, shore up, or replace damaged substructure where it could cause the bridge to fail (imminent only).  
358.03 Fill scour holes around piers, abutments, and at ends of CBC's.  
358.04 Remove water/wind borne debris from structure or channel.  
358.05 Repair/replace damaged/deteriorated concrete/steel or exposed piles in abutments/piers/headwalls.  
358.06 Repair/replace wingwalls, with piles, backing planks, deadman etc.
- 360.00 Approach Slabs and Slope Protection**  
360.01 Repair low approaches.  
360.02 Fill voids or holes at the backface of the abutments and the approaches.  
360.03 Replace/repair berms/fill slopes and slope protection.
- 364.00 Expansion Joints**  
364.01 Repair/replace expansion joints and seals.  
364.02 Tighten expansion joint.
- 398.00 Miscellaneous Bridge Work**  
Describe the type of miscellaneous work needed that is not covered under another activity e.g. wrong structure number, loose utilities, etc.
- 399.00 Maintenance Requiring Engineering**  
Describe the condition that requires engineering before maintenance can proceed with the repair.

## 307\* Modular Expansion Joint

307\*  
Deck(5)

Units: LF of Joint

This element defines only those joints made up of modules of continuous elastomeric strip or box seals. They have been used in Colorado since the mid-1980's on bridges where larger movements occur. It is necessary to inspect the components within each support bar box and the control springs to see that they are in place and functioning properly. The weld between each support bar and transverse beam must be inspected for cracks. A joint with a broken weld is characterized by the emission of a metallic noise under traffic (a non-metallic "thump-thump" noise from tires contacting the transverse beams while traveling across the joint is normal). The condition of the joint can deteriorate rapidly if just one component is missing or broken and repairs are not made immediately. A joint that is left unrepaired may become unrepairable and require replacement. It is for this reason the owner of the bridge needs to be informed when the joints are in Condition States 2 or 3 (**CDOT: specify Maintenance Activity 399 and notify the Bridge Management Engineer**). Report the quantity of joint in Condition States 2 and 3.

Condition State 1 The element shows minimal deterioration. **All seals are held tight.** The adjacent deck is sound. There is **no leakage.** All components within the support bar boxes and the control springs are in place and functioning properly. The support bar bearings and compression springs have an acceptable amount of wear. The welds between the support bars and the transverse beams are not cracked.

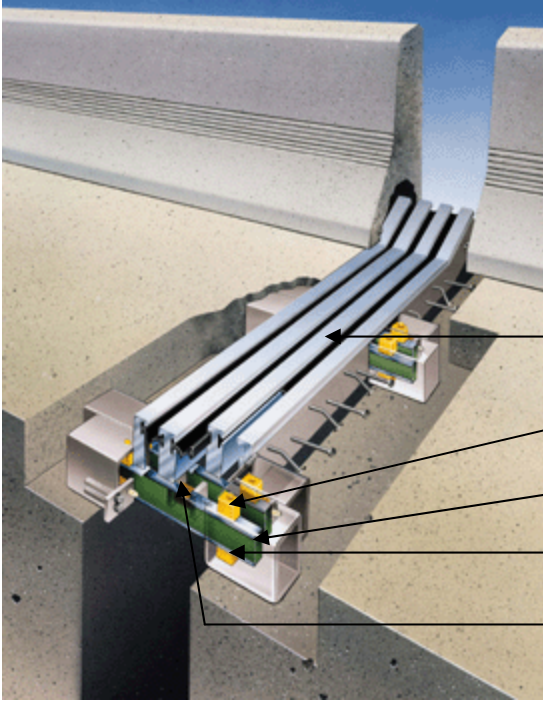
Feasible actions: 1) DN

Condition State 2 The element may show signs of **minor tearing** and may be **making a metallic noise under traffic.** There **may be loose seals.** **Minor spalls** in the deck may be present adjacent to the joint. **Minor leakage** in the joint may be present. The **weld** between a support bar and a transverse beam may be **cracked or broken.** The support bar bearings and compression springs have an unacceptable amount of wear or the control springs are deteriorated.

Feasible actions: 1) DN  
2) Repair joint  
3) Replace joint

Condition State 3 The joint may **show signs of failure from tearing** and may be **making a metallic noise under traffic (the transverse beam(s) may be observed moving).** **Seals may be missing.** **Significant spalls** may be present in the deck adjacent to the joint. **Significant leakage** in the joint is present. The support bar bearings or compression springs or the control springs may have fallen out. The **welds** between multiple support bars and transverse beams may be **cracked or broken.**

Feasible actions: 1) DN  
2) Repair joint  
3) Replace joint



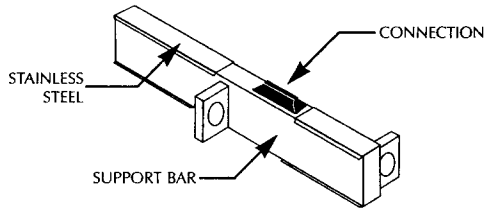
Transverse beam

Compression spring

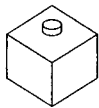
Support bar

Bearing

Control spring



Support bar - the connection shown is the welded connection with transverse beam.



Compression spring



Bearing



Control spring