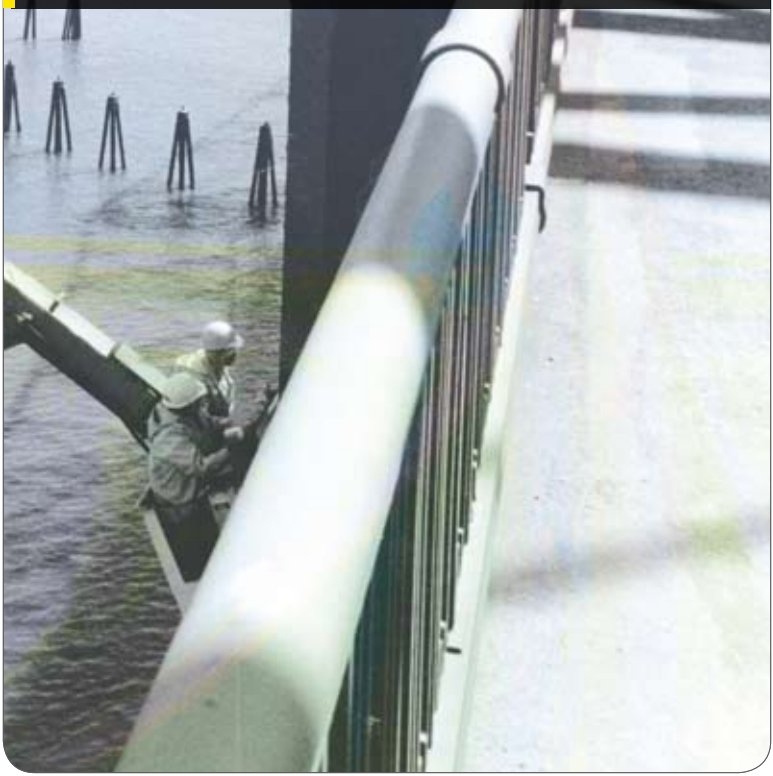
ODOT Bridge Engineering Section

Oregon Department of Transportation

2009 Bridge Inspection Pocket Coding Guide



How to use this Coding Guide

It is extremely important for each inspector to follow the contents of this book as close as possible. Following the book is the only way to obtain statewide or program wide uniformity, consistency, and assure repeatable results. It is totally impractical to establish a separate bridge element for every possible bridge component, nor is it practical to establish condition state language that would specifically address every possible deficiency. Therefore, the bridge inspector must use engineering judgment to arrive at the best fit, without injecting personal biases. As a result, the inspector must often zero in on operative words in the condition state language like “affecting the strength and / or serviceability of the element”. This can also be accomplished by starting with the following basic concepts:

If there are 3 condition states, determine what portion of the element is in a **Good, Fair, or Poor** condition.

If there are 4 condition states, determine what portion of the element is in a **Good, Fair, Poor, or Very Poor** condition.

If there are 5 condition states, determine what portion of the element is in a **Very Good, Good, Fair, Poor, or Very Poor** condition.

The element condition state language is identical to that provided by the AASHTO Core Element Guideline with just a very few changes. The NBI rating guide is identical to that provided in the FHWA Coding Guide. Where those guides use rather subjective terms, instead of changing the language, ODOT decided to implement a number of supplemental rating schemes to help guide the bridge inspector to the most appropriate condition rating for the deficiencies encountered. As a result, the inspector is directed to refer to each when formulating their condition ratings.

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Note:

Deck / Slab Elements

Concrete Decks and Slabs without an Overlay

#12 - Concrete Deck - Bare (SF)

Concrete deck with no surface protection of any type and has uncoated rebar

#26 - Concrete Deck - w/ Coated Bars (SF)

Concrete deck with coated reinforcement.

#27 - Concrete Deck - w/ Cathodic System (SF)

Concrete deck w/ cathodic protection system.

#38 - Concrete Slab - Bare (SF)

Concrete slab with no surface protection of any type and has uncoated rebar.

#52 - Concrete Slab - w/ Coated Bars (SF)

Concrete slab with coated reinforcement.

#53 - Concrete Slab - w/ Cathodic System (SF)

Concrete slab w/ cathodic protection sys.

Condition State Descriptions and Feasible Actions
(Work Candidate Action in parentheses)
Note: Put all in one (1) condition state.

1. **No patched areas or spalls/delaminations exist on either side of the deck.** Do Nothing

2. **Patched areas and/or spalls/delaminations exist on either side of the deck. The combined distressed area is 10% or less of the total deck area.**
   Do Nothing; Repair Spalls/Delaminations (*Min Repair)*; Add A Protective System (*Pr Maint)*

3. **Patched areas and/or spalls/delaminations exist on either side of the deck. The combined distressed area is more than 10% but 25% or less of the total area.**
   Do Nothing; Repair Spalls/Delaminations (*Min Repair)*; Rehabilitate The Deck *(Rehab Elem)*

4. **Patched areas and/or spalls/delaminations exist on either side of the deck. The combined distressed area is more than 25% but less than 50% of the total deck area.**
   Do Nothing; Repair Spalls/Delaminations (*Min Repair)*; Rehabilitate The Deck *(Rehab Elem)*

5. **Patched and/or spalls/delaminations exist on either side of the deck. The combined area of distressed is 50% or more of the total deck area.**
   Do Nothing; Rehabilitate The Deck *(Rehab Elem)*; Replace The Deck *(Repl Elem)*

Condition State 1 (CS 1)

Condition State 2 (CS 2)

Condition State 3 (CS 3)

Condition State 4 (CS 4)

Condition State 5 (CS 5)

Note:

Concrete Decks and Slabs with an AC Overlay

#13 - Conc. Deck - Unprotected w/ AC Overlay (SF)
Concrete deck with an AC overlay and no waterproofing membrane.

#14 - Conc. Deck - Protected w/ AC Overlay (SF)
Concrete deck w/ AC overlay and a water proofing membrane.

#39 - Conc. Slab - Unprotected w/ AC Overlay (SF)
Concrete slab with an AC overlay and no waterproofing membrane.

#40 - Conc. Slab - Protected w/ AC Overlay (SF)
Concrete slab w/ AC overlay and a water proofing membrane.

Condition State Descriptions and Feasible Actions
(Work Candidate Action in parentheses)
Note: Put all in one (1) condition state.

1. **No patched areas or spalls/delaminations exist on either side of the deck.** Do Nothing

2. **Patched areas and/or spalls/delaminations exist on either side of the deck. The combined distressed area is more than 10% or less of the total deck area.** Do Nothing; Repair Spalls/Delaminations (*Min Repair)*; Add A Protective System *(Pr Maint)*

3. **Patched areas and/or spalls/delaminations exist on either side of the deck. The combined distressed area is more than 10% but 25% or less of the total area.** Do Nothing; Repair Spalls/Delaminations. *(Min Repair)*; Rehabilitate The Deck *(Rehab Elem)*

4. **Patched areas and/or spalls/delaminations exist on either side of the deck. The combined distressed area is more than 25% but less than 50% of the total deck area.** Do Nothing; Repair Spalls/Delaminations. *(Min Repair)*; Rehabilitate The Deck *(Rehab Elem)*

5. **Patched and/or spalls/delaminations exist on either side of the deck. The combined area of distressed is 50% or more of the total deck area.** Do Nothing; Rehabilitate The Deck *(Rehab Elem)*; Replace The Deck (*Repl Elem)*

CS 1

CS 2

CS 3

CS 4

CS 5

Note:

Concrete Decks or Slabs with a Thin or Rigid Overlay

#18 - Concrete Deck - Protected w/ Thin Overlay (SF)
Concrete deck protected w/ thin o'lay ≤ 1" thick.

#22 - Concrete Deck - Protected w/ Rigid Overlay (SF)
Concrete deck protected w/ rigid o'lay > 1" thick.

#44 - Concrete Slab - Protected w/ Thin Overlay (SF)
Concrete slab protected w/ thin o'lay ≤ 1" thick.

#48 - Concrete Slab - Protected w/ Rigid Overlay (SF)
Concrete slab protected w/ rigid o'lay > 1" thick.
(Thin Overlays do not include Deck Seals.)

Condition State Descriptions and Feasible Actions
(Work Candidate Action in parentheses)
Note: Put all in one (1) condition state.

1. **No patched areas or spalls/delaminations exist on either side of the deck.** Do Nothing

2. **Patched areas and/or spalls/delaminations exist on either side of the deck. The combined distressed area is 10% or less of the total deck area.**
   Do Nothing; Repair Spalls/Delaminations (*Min Repair)*; Add A Protective System (*Pr Maint)*

3. **Patched areas and/or spalls/delaminations exist on either side of the deck. The combined distressed area is more than 10% but 25% or less of the total area.** Do Nothing; Repair Spalls/Delaminations (*Min Repair)*; Rehabilitate The Deck *(Rehab Elem)*

4. **Patched areas and/or spalls/delaminations exist on either side of the deck. The combined distressed area is more than 25% but less than 50% of the total deck area.** Do Nothing; Repair Spalls/Delams (*Min Repair)*; Rehabilitate The Deck *(Rehab Elem)*

5. **Patched and/or spalls/delaminations exist on either side of the deck. The combined area of distressed is 50% or more of the total deck area.** Do Nothing; Rehabilitate The Deck *(Rehab Elem)*; Replace The Deck (*Repl Elem)*

CS1

CS 2

CS 3

CS 4

CS 5

Note:

#30 - Steel Decks (Corrugated / Orthotropic / Etc.)

Unit of Measure (SF)
Bridge decks constructed of corrugated metal filled with Portland cement concrete or asphaltic concrete. Orthotropic steel deck are also included.

Condition State Descriptions and Feasible Actions
(Work Candidate Action in parentheses)
Note: Put all in one (1) condition state.

1. **There is no evidence of corrosion and any paint system is sound and functioning as intended to protect the metal surface. The surfacing, if any, on the deck has no potholes.** Do Nothing

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. Minor cracking or potholes may exist in the surfacing.** Do Nothing; Seal Cracks And/Or Repair Potholes *(Pr. Maint)*

3. **Surface or freckled rust is moderate to heavy. There may be exposed metal but there is no active corrosion that is causing loss of section. Potholes exist in surfacing and there may be significant cracking.** Do Nothing; Surface Clean And Restore Top Coat *(Part Paint)*; Repair Potholes And Cracks *(Min Repair)*

4. **Corrosion may be present but any section loss due to active corrosion does not yet warrant structural analysis of either the element or the bridge. Potholes may be large and exposing the metal decking.** Do Nothing; Spot Blast, Clean And Paint *(Repl Pain)*; Replace Paint System Or Surfacing *(Ovly Deck)*

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. The surfacing has failed.** Do Nothing; Rehab/Replace Protection System *(Rehab Elem)*; Replace The Unit (*Repl Elem)*

CS 1

CS 2

CS 3

CS 4

CS 5

Note:

#29 - Steel Closed Concrete Filled Grid Decks

Unit of Measure (SF)
Bridge decks constructed of steel grids with either all of the openings or just those in the wheel tracks, are filled with concrete.

Condition State Descriptions and Feasible Actions
(Work Candidate Action in parentheses)
Note: Put all in one (1) condition state.

1. **There is no corrosion. The paint system, if any, is sound. The connectors (welds, rivets, etc.) are sound.** Do Nothing

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.** Do Nothing; Surface Clean *(Pr Maint)*

3. **Surface or freckled rust is moderate to heavy. There may be exposed metal but there is no active corrosion that is causing loss of section. Potholes exist in surfacing and there may be significant cracking.** Do Nothing; Clean And Restore Top Coat *(Part Paint)*; Rehab Connectors And Conc. Filler (*Maj Repair)*

4. **Corrosion may be present but any section loss due to active corrosion does not yet warrant structural analysis of either the element or the bridge. Potholes may be large and exposing the metal decking.** Do Nothing; Spot Blast, Clean And Paint *(Repl Paint)*; Rehab Connectors And Conc. Filler *(Maj. Repair)*

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. The surfacing has failed.** Do Nothing; Rehab Connectors And Conc. Filler And Replace Paint System *(Rehab Elem)*; Replace The Unit *(Repl Elem)*


CS 1


CS 2


CS 3


CS 4


CS 5

#28 - Steel Open Grid Decks

Unit of Measure (SF)
Bridge Decks constructed of steel grids that are open and unfilled.

Condition State Descriptions and Feasible Actions
(Work Candidate Action in parentheses)
Note: Put all in one (1) condition state.

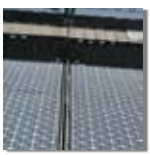
1. **There is no corrosion. The paint system, if any, is sound. The connectors (welds, rivets, etc.) are sound.** Do Nothing

2. **There is little or no corrosion. The paint system, if any, may be showing early signs of distress. The connectors are still sound.** Do Nothing; Surface Clean *(Pr Maint)*

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).** Do Nothing; Clean And Restore Top Coat *(Part Paint)*; Rehab Connectors *(Maj Repair)*

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.** Do Nothing; Spot Blast, Clean And Paint *(Repl Paint)*; Rehab Connectors *(Maj Repair)*

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.** Do Nothing; Rehab Connectors And Replace Paint System *(Rehab Elem)*; Replace The Unit *(Repl Elem)*


CS 1


CS 2


CS 3


CS 4


CS 5

Timber Decks or Slabs (Bare) Elements

#31 - Timber Deck - Bare (SF)

Timber deck constructed without an overlay of any type.

#54 - Timber Slab - Bare (SF)

Timber Slab spans constructed without an overlay of any type.

Condition State Descriptions and Feasible Actions
(Work Candidate Action in parentheses)
Note: Put all in one (1) condition state.

1. **Investigation indicates no decay. Any cracks, splits, or checks present do not extend beyond any surface treatment.** Do Nothing

2. **Decay, insect infestation, abrasion, splitting, cracking, or crushing may extend into untreated wood, but none is sufficiently advanced to affect the serviceability of the bridge.** Do Nothing; Rehab And/ Or Protect Deck *(Min Repair)*

3. **Decay, insect infestation, abrasion, splitting, cracking, or crushing has produced loss of strength or deflection of the element but not of sufficiently advanced to affect the serviceability of the bridge.** Do Nothing; Rehab The Deck *(Rehab Elem)*; Replace The Deck *(Repl Elem)*

4. **Advanced deterioration. Decay, insect infestation, abrasion, splits, cracks, or crushing has produced loss of strength or deflection that affects the serviceability of the bridge.** Do Nothing; Replace The Deck *(Repl Elem)*

CS 1

CS 2

CS 3

CS 4

Timber Decks or Slabs with AC Overlay Elements

#32 - Timber Deck - w/ AC Overlay (SF)

Timber deck with an AC overlay.

#55 - Timber Slab - w / AC Overlay (SF)

Timber Slab span constructed w/ AC overlay.

Condition State Descriptions and Feasible Actions
(Work Candidate Action in parentheses)
Note: Put all in one (1) condition state.

1. **Investigation indicates no decay. Any cracks, splits, or checks present so not extend beyond any surface treatment.** Do Nothing

2. **Decay, insect infestation, abrasion, splitting, cracking, or crushing may extend into untreated wood, but none is sufficiently advanced to affect strength or serviceability of the element. There may be minor potholes or impending potholes in the surfacing.** Do Nothing; Repair Potholes *(Min Repair)*; Rehab And/or Protect Unit *(Ovly Deck)*

3. **Decay, insect infestation, abrasion, splitting, cracking, or crushing has produced loss of strength or deflection of the element but none is sufficiently advanced to affect the serviceability of the bridge. There may be major potholes or impending potholes in the surfacing.** Do Nothing; Rehab The Deck/ Repair Or Replace The AC *(Rehab Elem)*; Replace The Deck And Surfacing *(Repl Elem)*

4. **Advanced deterioration. Decay, insect infestation, abrasion, splits, cracks, or crushing has produced loss of strength or deflection that affects the serviceability of the bridge.** Do Nothing; Replace The Deck And Surfacing (*Repl Elem)*

CS 1

CS 2

CS 3

CS 4

#33 - Deck, Other

Unit of Measure (SF)
Bridge Decks constructed of materials other than concrete, steel, or timber. These deck types are generally prefabricated “Fiber Reinforced Polymer” (FRP) sections and is accompanied with a polymer / rock wearing surface.

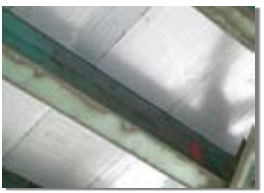
Condition State Descriptions and Feasible Actions
(Work Candidate Action in parentheses)
Note: Put all in one (1) condition state.

1. **The element shows little or no deterioration. The connectors are sound.** Do Nothing

2. **There may be minor deterioration, cracking, and/ or weathering. The connectors may be starting to show signs of distress.** Do Nothing; Rehab The Unit Or Connectors *(Rehab Elem)*

3. **Moderate to major deterioration. Numerous connectors are failing at scattered locations. The strength or serviceability of the section is not yet affected. Fibers may be exposed through the polymer.** Do Nothing; Rehab The Unit Or Connectors *(Rehab Elem)*

4. **Major deterioration in the decking material. Numerous connectors have failed. Section loss in the decking material and/or connectors is sufficient to warrant an analysis of either the element or the bridge.** Do Nothing; Rehab The Unit Or The Connectors (*Rehab Elem)*; Replace The Unit *(Repl Elem)*



CS 1

CS 2

N/A

CS 3

CS 4

Approach Slab Elements

#320 - Prestressed Conc. Approach Slab (EA)

#321 - Reinforced Concrete Approach Slab (EA)

Structural concrete sections, with or without AC overlay that are supported at one end by the bridge.

Condition State Descriptions and Feasible Actions
(Work Candidate Action in parentheses)
Note: Put all in one (1) condition state.

1. **The slab has not settled and shows no sign of deterioration other than superficial surface cracks.** Do nothing

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.** Do nothing; Perform Mudjacking *(Maj Repair)*

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.** Do Nothing; Perform Mudjacking (*Maj Repair)*; Replace The Unit *(Repl Elem)*

4. **The slab is broken or rocks under traffic loads. Settlement is excessive and cannot be corrected without increasing the size of the slab.** Do nothing; Replace The Unit *(Repl Elem)*

CS 1

CS 2

CS 3

CS 4

Bridge Roadway Assessment

#325 - Roadway Impact Assessment (EA)

(Approach Slabs, Expansion Joints, Deck or Wearing Surface)

Note: The information obtained from rating this item is used in the load rating calculations for the structure by determining how much impact traffic is having on the structure and where on the structure it's being applied. This means that the inspector must rate the deficiency and then provide a remark that fully describes its location. This item can only be rated by monitoring traffic and their speed as they approach and traverse the full length of the bridge. ***Traffic impact, can be initiated by either a deficient bridge approach or a deficient vertical profile along the longitudinal axis of the bridge,*** *Example: A deficiency in the approach roadway is launching the traffic out onto the bridge deck, making heavy loads bounce across the bridge deck. This can generally be seen by the dark oily discoloration between the wheel tracks. This means that on bridge approaches where traffic is moving quite fast, the approach could be, as much as, 100 feet back from the end of the bridge. On a bridge with slow speeds, the approach roadway would be quite short. Standard taper = 1" / 50'.*

Condition State Descriptions

Note: Put all in one (1) condition state.

1. **Good Condition. Exceptionally smooth riding surface at approaches, bridge decks, and expansion joints with no noticeable bump. (Justifies an LRFR Impact Factor of 10%).**

2. **Fair Condition. A ride with moderate surface deviations or depressions, causing minor bumps. It is anticipated this will be the most common condition. (Justifies an LRFR Impact Factor of 20%).**

3. **Poor Condition. A rough ride, with significant to severe bumps, or the perception that trucks are being "launched" at the approach to the bridge, deck joints. Traffic speed might need to be reduced until repairs are made. Prioritize and schedule repairs as severity dictates. (Justifies an LRFR Impact Factor of 33%).**

CS 1

CS 2

CS 3

326 - Deck Wearing Surface Condition Assessment (EA)

Note: The physical condition and safe riding quality of the wearing surface is examined and rated for vehicular and bicycle traffic. When the wearing surface is monolithic with the structural deck, only the surface that vehicles bear on is rated. When the wearing surface is separate from the structural deck, the full thickness is assessed. The physical condition and quality of ride will include the ability to shed water, protect the bridge deck, provide skid resistance, and variations in the vertical profile (longitudinally and transversely). Examples: General : accumulation of loose rock, sanding material or water ponding. AC : cracking, raveling, pot holing, shoving, rutting, washboarding, and drying out. Concrete : scaling spalling, cracking, rutting, and exposed rebar. Steel - broken welds, rivets or grates, observed rattling, vibration or deflection under traffic, alignment of the grates. Timber : traffic abrasion, exposed nails, properly fastened to the superstructure, splits, rot/ decay, insect activity, or fire damage. Use same area criteria that was used for traffic impact.

Condition State Descriptions
Note: Put all in one (1) condition state.

1. **Good Condition. At most only minor defects exist that might require minor repairs, such as, small aggregate popouts, surface raveling, scaling, drying out, small delaminations or timber splits. Monitor or schedule repairs.**

2. **Fair Condition. Defects are sufficient to create a traffic safety concern, like polished riding surface, shallow rutting, washboarding, pot or pan holes, spalls, bumps at deck joints, or exposed rebar that are still tight. Also includes traffic safety concerns, like water ponding or accumulation of loose debris such as sanding material. Schedule and prioritize actions as severity dictates.**

3. **Poor Condition. Presents a definite traffic safety hazard such as loose and/or broken exposed rebar or armored corners, protruding attachment nails, broken or missing steel grates. Traffic speeds might need to be reduced. Schedule and prioritize actions as severity dictates.**

CS 1

CS 2

CS 3

Note:

Steel Elements

Painted Steel Elements

#218 - Abutment (EA)

#102 - Closed Web/Box Girder (LF)

#107 - Open Girder/Beam (LF)

#113 - Stringer (stringer/floorbeam system (LF)

#121 - Thru Truss (bottom chord) (LF)

#126 - Thru Truss (excl. bottom chord) (LF)

#131 - Deck Truss (LF) (incl. arch & bottom chord)

#141 - Arch (LF) (incl. arch ribs and spandrel columns

#152 - Floorbeam (LF)

#390 - Paint System - Alkyds (incl. red lead) (SF)

#391 - Paint System - Vinyl (SF)

#392 - Paint System - Epoxies w/Polyurethanes (SF)

#393 - Paint System - Polyurethanes (SF)

#394 - Paint System - Inorganic Zinc (SF)

#202 - Column or Pile Extension (EA)

#231 - Cap (EA)

#250 - Tunnel (LF)

Condition State Descriptions and Feasible Actions
(Work Candidate Action in parentheses)
Note: Use % for each condition state.

1. **There is no evidence of corrosion and any paint systems are sound and functioning as intended to protect the metal surface.** Do Nothing; Surface Clean *(Pr Maint)*

2. **There is little or no active corrosion. Surface or freckled rust may have 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.** Do Nothing; Surface Clean (*Pr Maint)*; Clean And Paint *(Min Repair)*

3. **Surface or freckled rust is moderate to heavy. There may be exposed metal, but there is no measurable loss of section.** Do Nothing; Spot Blast, Clean And Paint *(Part Paint)*

4. **The paint system has failed. Corrosion may be present but any section loss due to active corrosion does not yet warrant a structural analysis of the element or the bridge.** Do Nothing; Spot Blast, Clean And Paint *(Part Paint)*; Replace Paint System *(Repl Paint)*

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.** Do Nothing; Rehab The Unit *(Rehab Elem)*; Replace The Unit *(Repl Elem)*

Note*:** *The primary function of the Paint System is be a protective coding. Therefore, galvanizing and concrete cover on a Concrete Encased Steel Member are considered to be protective coating systems.* ***Analysis required if Section Loss > 10 % of plate thickness in critical load area.

CS 1

CS 2

CS 3

CS 4

CS 5

Unpainted Steel Elements

#219 - Abutment (EA)

#101 - Closed Web/Box Girder (LF)

#140 - Arch (LF) (incl ribs and spandrel columns)

#106 - Open Girder/Beam (LF)

#151 - Floor Beam (LF)

#112 - Stringer (stringer/floorbeam system) (LF)

#201 - Column or Pile Extension (EA)

#120 - Thru Truss (bottom chord) (LF)

#225 - Submerged Pile (EA)

#125 - Thru Truss (excl. bottom chord) (LF)

#230 - Cap (EA)

#130 - Deck Truss (LF) (includes bottom chord)

Condition State Descriptions and Feasible Actions
(Work Candidate Action in parentheses)
Note: Use % for each condition state.

1. **There is little or no corrosion of the unpainted steel. The weathering steel is coated uniformly and remains in excellent condition. Oxide film is tightly adhered. The connectors (welds, rivets, etc.) are sound.** Do Nothing

2. **Surface rust or surface pitting has formed or is forming on the unpainted steel. The weathering steel has not corroded beyond design limits. Oxide film has a dusty to granular texture.** Do Nothing; Clean And Protect *(Part Paint)*

3. **Steel has measurable section loss due to corrosion but does not warrant structural analysis. Oxide film is flaking (1/2 inch in diameter).** Do Nothing; Clean And Protect *(Part Paint)*

4. **Corrosion is advanced. Oxide film has a laminar texture with thin sheets of rust. 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.** Do Nothing; Rehab The Unit (*Rehab Elem)*; Replace The Unit *(Repl Elem)*

CS 1

CS 2

CS 3

CS 4

Note:

#161 - Painted Steel Pin & Hanger and Girder Pin Assemblies

Unit of Measure (EA)
Includes Steel Pin & Hanger Assemblies or Girder Pins that are painted.

Note: *Deformation or restriction of the pin & hanger should be identified by the appropriate smart flag (steel fatigue and/or pack rust).*

Condition State Descriptions and Feasible Actions
(Work Candidate Action in parentheses)
Note: Use % for each condition state.

1. **There is no evidence of corrosion and the paint system is sound and functioning as intended to protect the metal surface.** Do Nothing; Surface Clean *(Pr Maint)*

2. **There is little or no evidence of corrosion. Surface or freckled rust has formed or is forming. The paint system may be peeling, chalking, curling, or showing other early evidence of paint system distress but there is no exposure of metal.** Do Nothing; Surface Clean *(Pr Maint)*; Clean And Paint *(Part Paint)*

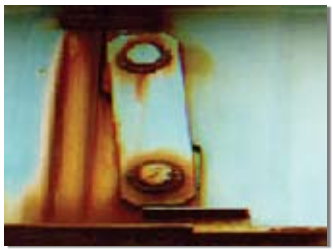
3. **Surface or freckled rust is moderate to heavy. There may be exposed metal but there is no active corrosion that is causing loss of section.** Do Nothing; Spot Blast Clean And Paint *(Part Paint)*

4. **The paint system has failed. Corrosion may be present but any section loss due to active corrosion does not yet warrant structural analysis of either the element or the bridge.** Do Nothing; Spot Blast, Clean And Paint *(Part Paint)*; Replace Paint System Or Surfacing *(Repl Paint)*

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.** Do Nothing; Rehab The Unit *(Rehab Elem)*; Replace The Unit *(Repl Elem)*

CS 1

CS 2



CS 3

CS 4

CS 5

Note:

#160 - Unpainted Steel Pin & Hanger and Girder Pin Assemblies

Unit of Measure (EA)
Includes Steel Pin & Hanger Assemblies or Girder Pins that are not painted, include weathering steel.

***N*ote:** *Deformation or restriction of the pin & hanger should be identified by the appropriate smart flag (steel fatigue and/or pack rust). Use % for each condition state.*

Condition State Descriptions and Feasible Actions
(Work Candidate Action in parentheses)
Note: Use % for each condition state.

1. **There is little or no corrosion of the unpainted steel. The weathering steel is coated uniformly and remains in excellent condition. Oxide film is tightly adhered.** Do Nothing

2. **Surface rust or surface pitting has formed or is forming on the unpainted steel. The weathering steel has not corroded beyond design limits. Oxide film has a dusty to granular texture.** Do Nothing; Clean And Protect *(Part Paint)*

3. **Steel has measurable section loss due to corrosion but does not warrant structural analysis. Oxide film is flaking (1/2 inch in diameter).** Do Nothing; Clean And Protect *(Part Paint)*

4. **Corrosion is advanced. Oxide film has a laminar texture with thin sheets of rust. 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.** Do Nothing; Rehab The Unit *(Rehab Elem)*; Replace The Unit *(Repl Elem)*

CS 1

CS 2

N/A

CS 3

N/A

CS 4

Note:

#147 - Cable (not embedded in concrete)

Unit of Measure (EA)
Steel cables not embedded in concrete that continuously carrying live loads.

***Note**: Deformation or restriction of the pin & hanger should be identified by the appropriate smart flag (steel fatigue and/or pack rust). Use % for each condition state.*

Condition State Descriptions and Feasible Actions
(Work Candidate Action in parentheses)
Note: Use % for each condition state.

1. **There is no evidence of corrosion. Protective coating is sound and functioning as intended to protect the metal surface. Strand and anchor sockets show no signs of distress.** Do Nothing

2. **There is little or no evidence of 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. Strand and anchor sockets show no signs of distress.** Do Nothing; Clean, Restore Coating *(Min Repair)*

3. **Surface or freckled rust is moderate to heavy. There may be exposed metal but there is no active corrosion that is causing loss of section. Protective system is no longer effective. Strand and anchor sockets show no signs of distress.** Do Nothing; Clean, Restore Coating *(Min Repair)*

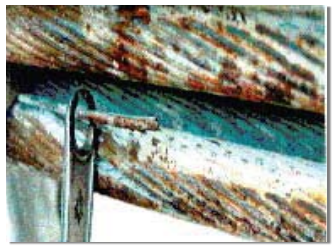
4. **Protective system has failed. Surface pitting may be present but any section loss is incidental and does not affect the strength or serviceability of either the element or the bridge. Cable banding, if any, may show some loosening or slippage. Cable anchor devices may be loosening.** Do Nothing; Rehab The Unit/ Replace Coating *(Rehab Elem)*; Replace The Unit *(Repl Elem)*

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.** Do Nothing; Rehab Unit/ Replace Coating *(Rehab Elem)*; Replace The Unit *(Repl Elem)*

CS 1

CS 2

CS 3



CS 4

CS 5

Note:

Steel Member Supplemental Rating Guideline

The existing language tends to only address the existence of corrosion and the condition of the paint system. The existing condition state language does not address areas of primary concern very well: out-of-plane alignments and section loss. Therefore, this supplemental guideline is being provided rather than modifying the AASHTO Core condition state language.

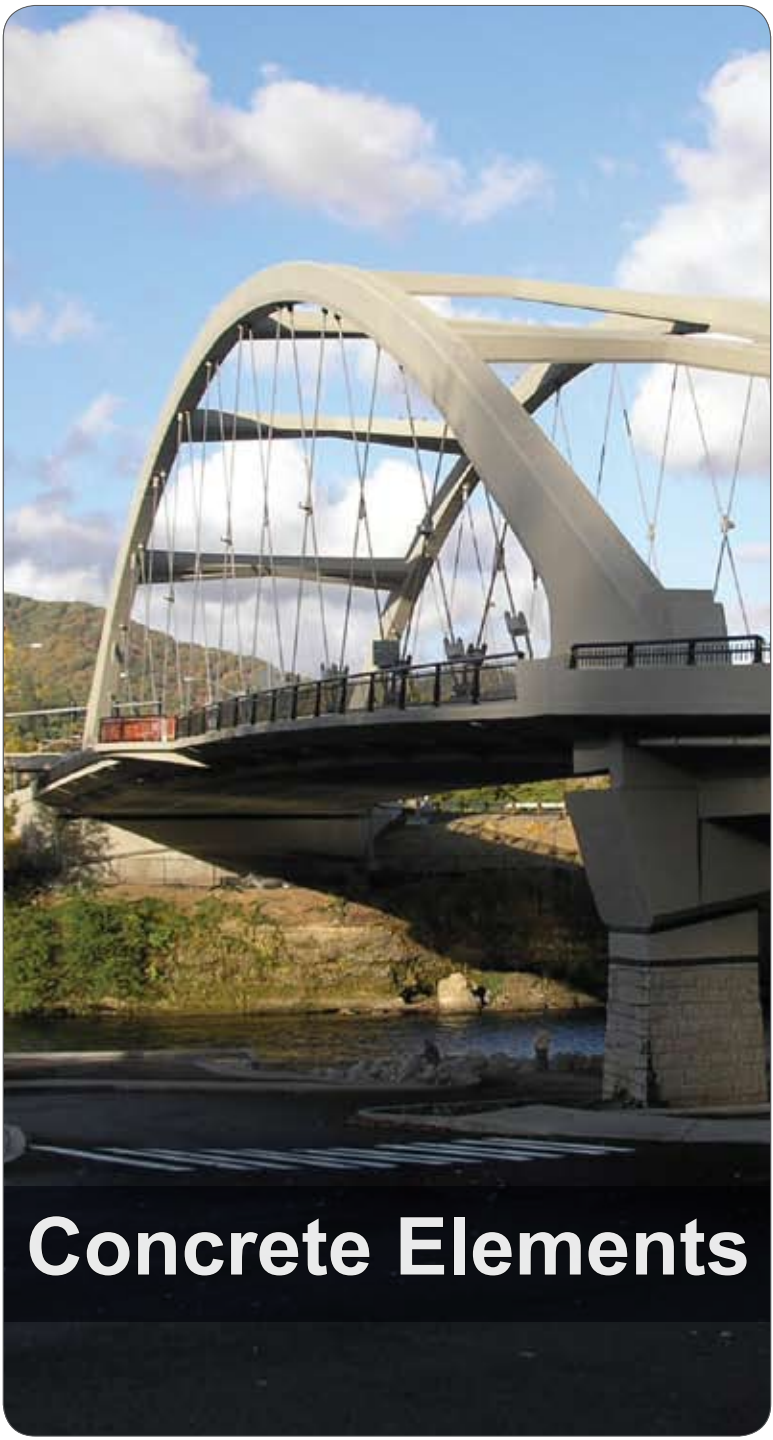
Condition State 1 *There is no evidence of corrosion, section loss, or any other structural deficiencies. The assumption here is that the member is in a pristine condition.*

Condition State 2 *Permanent repairs may have been installed and/or areas of corrosion have been cleaned and painted. The assumption here is that repairs are generally made without removing the dead loads.*

Condition State 3 *There may be exposed metal due to the condition of the protective paint system, but any loss of sect is insignificant (not measurable). Primary importance is given to the amount of section loss and whether or not it's measurable.*

Condition State 4 *Unpainted surface pitting or deep rust scaling may be present, but any loss of section or other structure deficiency exists but does not currently warrant a structural analysis of either the element or the bridge. (Rule of thumb: Section loss is measurable and is < 10% of plate thickness in critical area.) Of primary importance is to assess the ability of the member to carry and/or transfer the loads imparted onto it.*

Condition State 5 *The amount of section loss or other structural deficiency is sufficient to warrant a structural analysis ascertain the impact on the ultimate strength and/ or serviceability of either the element or the bridge. (Rule of thumb: Section loss is measurable and is > 10% of plate thickness in critical area.) Bottom line, this is a determination of whether the member can function as originally intended, taking into account the amount of section loss and other structural deficiencies that might be present.*



Concrete Elements

Reinforced Concrete Elements

#105 - Closed Web/Box Girder (LF)

#215 - Abutment (EA)

#110 - Open Girder/Beam (LF)

#234 - Cap (EA)

#116 - Stringer (stringer/floorbeam system) (LF)

#251 - Tunnel (LF)

#144 - Arch (LF) (includes arch and bottom chord)

#220 - Submerged Pile Cap / Footing (EA)

#155 - Floorbeam (LF)

#221 - Submerged Concrete Spread Footing (EA)

#205 - Column or Pile Extension (EA)

#223 - Submerged Concrete Footing Seal (EA)

#210 - Pier Wall (EA / LF)

#227 - Continuously Submerged Pile (EA)

#255 - Tunnel Portal Conc (EA)

Condition State Descriptions and Feasible Actions
(Work Candidate Action in parentheses)
Note: Use % for each condition state.

1. **The element shows little or no deterioration. There may be discoloration, efflorescence, and/or superficial cracking but without effect on strength or serviceability.** Do Nothing

2. **Minor structural cracks and spalls may be present but there is no exposed reinforcing or surface evidence of rebar corrosion.** Do Nothing; Seal Cracks, Minor Patch *(Pr Maint)*

3. **Some delaminations and/or spalls are 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.** Do Nothing; Clean, Patch, And/or Seal *(Min Repair)*

4. **Advanced deterioration. Corrosion of reinforcement and/or loss of concrete section is sufficient to warrant an analysis to ascertain the impact on the strength and/or serviceability of either the element or the bridge.** Do Nothing, Rehab The Unit (*Rehab Elem)*; Replace The Unit *(Repl Elem)*

***Note**: Abrasion*
CS1 - Loss Of Fines
CS2 - Loss Of Large Aggregate
CS3 - Exposure Of Rebar

***Note**: Inventory Channel and Tee Beams using **Element 110** - Open Girders/Beams*

***Note**: For crack type / size definitions, refer to crack rating guideline on page 47*

CS 1

CS 2

CS 3

CS 4

Prestressed / Post-Tension Concrete Elements

#104 - Closed Web/Box Girder (LF) (incl voided slabs)

#109 - Open Girder/Beam (LF)

#115 - Stringer (stringer/floorbeam system) (LF)

#143 - Arch (LF)

#154 - Floorbeam (LF)

#204 - Column or Pile Extension (EA)

#226 - Submerged Pile (EA)

#233 - Cap (EA / LF)

Condition State Descriptions and Feasible Actions
(Work Candidate Action in parentheses)
Note: Use % for each condition state.

1. **The element shows little or no deterioration. There may be discoloration, efflorescence and/or superficial cracking but without effect on strength or serviceability.** Do Nothing

2. **Minor structural cracks and spalls may be present and there may be exposed reinforcing with no evidence of corrosion. There is no exposure of prestressing system.** Do Nothing; Seal Cracks, Minor Patch *(Pr Maint)*

3. **Some delaminations and/or spalls are 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 bridge.** Do Nothing; Clean, Patch And/or Seal *(Min Repair)*

4. **Delaminations, spalls and corrosion of 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, ailed 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.** Do Nothing, Rehab The Unit *(Rehab Elem)*; Replace The Unit *(Repl Elem)*

***Note**: For crack type / size definitions, refer to crack rating guideline on page 47*

CS 1

CS 2

CS 3

CS 4

Note:

Conc. Crack Guideline : Reporting Condition Assessment
(Applies to all members that distribute loads to other members, with the exception of decks).

All Superficial Cracks: shrinkage, temperature, or all non-live load induced cracks;
* Reinforced Concrete Elements - condition state 1.
* Prestressed Concrete Element - condition state 1.

NBI Item 59 or 60 condition rating of 7 or 8.

Minor Structural Cracks: Shear/Flexure Cracks ≤0.013" or intermittent shear friction zone cracks on 1 side of girder.
* Reinforced Concrete Elements - condition state 2.
* Prestressed Concrete Element - condition state 2.

Small Structural Cracks: Cracks >0.013" but ≤ 0.025" or intermittent shear friction zone cracks on 2 sides
* Reinforced Concrete Elements - condition state 2.
* Prestressed Concrete Element - condition state 3.

NBI Item 59 or 60 condition rating of 6.
*All Structural Cracks ≤ 0.025",

Med. Structural Cracks: Shear Cracks > 0.025" but ≤ 0.040", Flexure cracks > 0.025" ≤ 0.080", or shear friction zone cracks full length on 1 side of girder.
* Reinforced Concrete Elements - condition state 3.
* Prestressed Concrete Element - condition state 4.

NBI Item 59 or 60 condition rating of 5.
*Structural Cracks > 0.025", and
*No evidence of concrete powder present, or
*No evidence of spalling or chipping at edge of crack, or
*The length or width of the concrete crack has not changed.

Large Structural Cracks: Shear Cracks > 0.040",
Flexure Cracks > 0.080, Large shear friction zone cracks full length on both sides of the girder.
* Reinforced Concrete Elements - condition state 4.
* Prestressed Concrete Element - condition state 4.

NBI Item 59 or 60 condition rating of 4.
*Structural Cracks > 0.040"

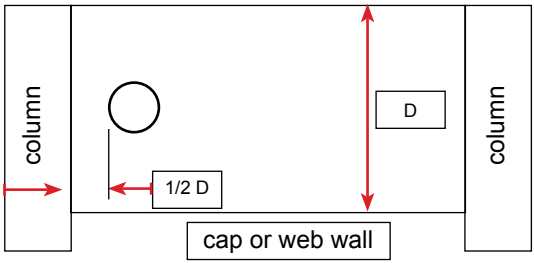
NBI 59 or 60 condition rating of 3 or less.
*Structural Cracks > 0.040" plus,
*Crack length growth is > 6" from previous inspection. or

*Structural Cracks > 0.040" plus,
*There is a measurable lateral off-set across the crack > 0.030"

Crack Monitoring Procedures

Shear Crack is ≥ 0.040”
*Trace crack extents with keel, **and**
*Mark crack ends, **and**
*Measure, mark, and date each crack at or within the L/3 of both ends of the girder.

Disregard X-beam cracks propagating from the utility holes where the distance from the column to the near edge of the **utility hole** is less than 1/2 X-beam depth.



All epoxy injected or sealed cracks will revert the element rating back to condition state 1. However, the NBI condition rating will be unaffected, since epoxy injected cracks are not considered structural repairs - NBI Item 103 will be coded “No”.

Non-Structural Cracks: Caused by shrinkage, temperature, or construction practices.

Structural Cracks: Shear, Flexure, or P/S non-live load induced cracks that are associated with the load path. If access to the interior cells of a RCBG are not available, the amount of transverse cracking in the bottom slab of the box or the face of the exterior stems, can be used as an indicator for the condition assessment of the non-visible stems. Generally, structural cracks are oriented perpendicular to the primary steel reinforcement.

Longitudinal cracks in a P/S concrete member, that follow the P/S duct drape are non-live load stress induced structure cracks.

Other Elements

#145 - Other Arch (LF)

Arches made of masonry or any other material except conc, steel, or timber**.**

#211 - Other Pier Wall (EA / LF)

Walls constructed of materials other than reinforced concrete.

#217 - Other Abutment (EA / LF)

Abutments made of masonry or any other material except concrete or timber.

#253 - Other Tunnel (LF)

Mined tunnel liners constructed of materials other than conc, timber, or steel.

#207 - Other Column (EA)

Columns constructed of materials other than steel, concrete or timber.

Condition State Descriptions and Feasible Actions
(Work Candidate Action in parentheses):
Note: Use % for each condition state.

1. **There is little or no deterioration. Surface defects only are in evidence.** Do Nothing

2. **There may be minor deterioration, cracking, and weathering. Mortar in joints may show minor deterioration.** Do Nothing; Rehab The Unit *(Rehab Elem)*

3. **Moderate to major deterioration and cracking. Major deterioration of joints.** Do Nothing; Rehab The unit *(Rehab Elem)*

4. **Major deterioration, splitting, or cracking of materials may be affecting the structural capacity of the element.** Do Nothing; Rehab The unit *(Rehab Elem)*; Replace The Unit *(Repl Elem)*

CS 1

CS 2

CS 3

CS 4

Timber Elements

Timber Elements

#111 - Open Girder/Beam (LF)

#117 - Stringer (stringer/floorbeam system) (LF)

#135 - Timber Truss / Arch (LF)

#156 - Floorbeam (LF)

#206 - Column or Pile Extension (EA)

#216 - Abutment (EA / LF)

#228 - Continuously Submerged Pile (EA)

#235 - Cap (EA / LF)

#252 - Tunnel (LF)

Condition State Descriptions and Feasible Actions
(Work Candidate Action in parentheses)
Note: Use % for each condition state.

1. Investigation indicates no decay. There may be superficial cracks, splits, and checks having no affect on the strength or serviceability. Do Nothing

2. Decay, insect,/marine borer infestation, abrasion, splitting, cracking, checking, or crushing may exist but none is sufficiently advanced to affect the strength or serviceability of the element. Do Nothing; Rehab, Or Protect The Unit *(Min Repair)*

3. Decay, insect,/marine borer infestation, abrasion, splitting, cracking, or crushing has produced loss of strength or deflection of the element but not of a sufficient magnitude to affect the serviceability of the bridge. Do Nothing; Rehab The Unit *(Rehab Elem)*; Replace The Unit *(Repl Elem)*

4. Advanced deterioration. Decay, insect/marine borer infestation, abrasion, splits cracks, or crushing has produced loss of strength or deflection that affects the serviceability of the bridge. Do Nothing; Rehab The Unit *(Rehab Elem)*; Replace The Unit *(Repl Elem)*


CS 1


CS 2

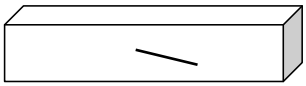

CS 3


CS 4

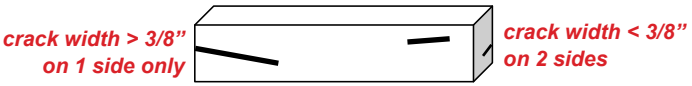
Timber Member Rating Guide

(Piling or Bridge Members) with Cracks, Splits, or Checks:

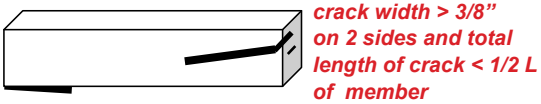
Condition State 1 Superficial cracks, splits, or checks that occur only on one side of the member and have an opening less than 3/8" wide.
(NBI item 59 or 60 condition rating of 7 or 8)



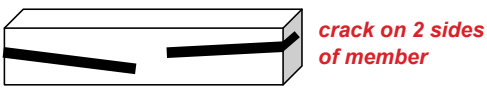
Condition State 2 Includes cracks, splits, or checks that have an opening greater than 3/8" wide, if they occur only one side of the member, or they can have an opening smaller than 3/8" wide, if they occur on both sides of the member.
(NBI item 59 or 60 condition rating of 6)



Condition State 3 The operative words are that we now have measurable loss of strength or the cracks, splits, checks that are located on both sides of the member and all have an opening greater than 3/8" wide, but the length of the crack, check, or split is less than 1/2 the full length of the member.
(NBI item 59 or 60 condition rating of 5)

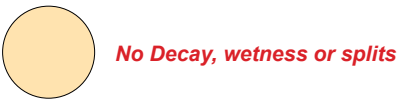


Condition State 4 The operative wording is the loss of strength is affecting the serviceability of the structure. That is, the cracks, splits, or checks are located on both sides and extend more than 1/2 the full length of the member.
(NBI item 59 or 60 condition rating of ≤ 4)

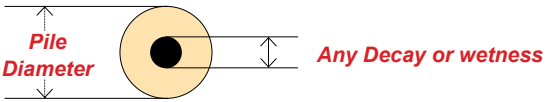


Rating Timber Members that have Decay

Condition State 1 No decay
(NBI item 60 condition rating of 7 or 8)

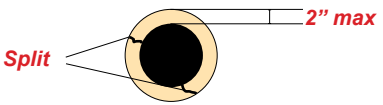


Condition State 2 Decay may exist
- Any noted decay, wetness, soft material or split
(NBI item 60 condition rating of 6)



Condition State 3 Decay not sufficient to affect bridge
- Decay is > 1/2 pile diameter and the shell is > 2
(NBI item 60 condition rating of 5)

Condition State 4 Decay sufficient to affect bridge
- Wood shell ≤ 2” or the shell has large splits, checks or cracks
(NBI item 60 condition rating of ≤ 4)



***Note**: Decayed Timber members that are located side-by-side, would equate to NBI Rating of “3”*

Timber Member Drilling procedure

1. Sound member and pick the most likely area to drill.
2. Drill a horiz. hole into suspected area that contains the potential decay.
3. If decay is found when drilling (2) drill 1 vertical hole into center of found decay; Drill enough test holes to define the limits of the decay through the member cross section.
4. Sound to locate extent of decay on longitudinal axis.
5. Document findings on the timber boring report.

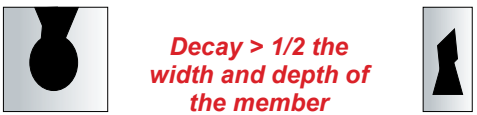
Rating Girders, and Stringers that have Decay:

Conditon State 1 No decay.
(NBI item 59 or 60 condition rating of 7 or 8)

Caps **Girders, Stringers**

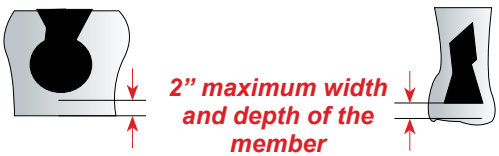
Conditon State 2 Decay may exist -any noted decay, wetness, soft material or split. Decay is > 10% cross-sectional area
(NBI item 59 or 60 condition rating of 5 or 6)

Condition State 3 Decay sufficient to affect element.
Decay is > 30% cross-sectional area
(NBI item 59 or 60 condition rating of 4)



Condition State 4 Decay sufficient to affect bridge or element. Decay is > 50% cross-sectional area with bulging and crushing of member.
(NBI item 59 or 60 condition rating of ≤ 3)

Bulging, Crush **Bulging, Crush**



Culvert Elements

#241 - Concrete Culverts

Unit of Measure (LF of Barrel Length)
All precast and cast-in-place (conventional or prestressed) concrete arch, pipe or box culverts that carry water through the roadway embankment.

Condition State Descriptions and Feasible Actions
(Work Candidate Action in parentheses)
Note: Use % for each condition state.

1. **Superficial cracks and 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.** Do Nothing

2. **Deterioration, minor chloride contamination, minor abrasion, minor cracking, and/or leaching may have begun. There may be deterioration and separation of joints. There may be exposed rebar but no section loss is evident.** Do Nothing; Clean, Patch And/or Seal *(Pr Maint)*

3. **There may be moderate to major deterioration, abrasion, 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. Abrasion may have occurred below the rebar, but the reinforcing has a minimal amount of section loss.** Do Nothing; Rehab The Unit *(Rehab Elem)*

4. **Major deterioration, abrasion, 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.** Do Nothing; Rehab The Unit *(Rehab Elem)*; Replace The Unit *(Repl Elem)*


CS 1


CS 2


CS 3


CS 4

Steel Culvert Elements

#240 - Steel Culvert (LF - Length of Barrel)
All metal (steel, galvanized) culverts.

#243 - Other Culverts (LF - Length of Barrel)
All metal (including aluminum and plastic).

Condition State Descriptions and Feasible Actions
(Work Candidate Action in parentheses)
Note: Use % for each condition state. *Measure % deficient along the flowline of the culvert not the perimeter.*

1. The element shows little or no deterioration. Some discoloration or surface corrosion may exist but there is no metal pitting. There is little or no deterioration or separation of seams. Do Nothing

2. There may be minor to moderate corrosion and pitting, especially at the barrel invert. Little or no distortion exists. There may be minor deterioration and/or separation of seams. Do Nothing; Rehab The Unit *(Rehab Elem)*

3. Significant corrosion, deep pitting or some holes in the invert may exist. Minor to moderate distortion and deflection may exist. Minor cracking or abrasion of the metal may exist. There may be considerable deterioration and/or separation of seams. Do Nothing; Rehab The Unit *(Rehab Elem)*

4. Major corrosion, extreme pitting or holes in the barrel may exist. Major distortion, deflection, or settlement may be evident. Major cracking or abrasion of the metal may exist. Major separation of seams may have occurred. Do Nothing; Rehab The Unit *(Rehab Elem)*; Replace The Unit *(Repl Elem)*

***Note:** Seam Separation*
CS1 - Little or no Separation
CS2 - Minor Separation, Band Covers Separation
CS3 - Considerable Separation, Embankment Exposure not in Flowline
CS4 - Major Separation, Embankment Exposure in the Flowline

CS 1 **CS2** **CS 3** **CS 4**

#242 - Timber Culverts

Unit of Measure (LF of Barrel Length)
All timber box culverts that carry water through the roadway embankment.

Condition State Descriptions and Feasible Actions
(Work Candidate Action in parentheses)
Note: Use % for each condition state.

1. **The timber and fasteners are in sound condition.** Do Nothing

2. **There may be minor decay and weathering, and warped or broken timbers. Corrosion at fasteners and connectors may have begun. There is little or no distortion and/or deflection.** Do Nothing; Rehab The Unit (*Rehab Elem)*

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.** Do Nothing; Rehab The Unit (*Rehab Elem)*

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. Major scour or other deterioration may exist and may affect the load capacity.** Do Nothing; Rehab The Unit (*Rehab Elem);* Replace The Unit (*Repl Elem)*


CS 1


CS 2


CS 3


CS 4


Deck Joint

#300 - Strip Seal Expansion Joints

Unit of Measure (LF)
Only those single cell expansion joint devices which utilize a neoprene type waterproof gland with steel extrusion to anchor the gland. If a header exists, type “Header Material Type” in the remarks for this element.

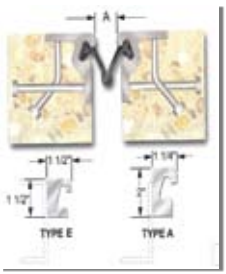
Condition State Descriptions and Feasible Actions
(Work Candidate Action in parentheses)
Note: Use % for each condition state.

1. **There is no leakage at any point along the joint. Gland is secure and has no defects. Debris in the joint is not causing any problems. The adjacent deck and/or header is sound.** Do Nothing

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.** Do Nothing; Patch/reset/clean Joint *(Min Repair)*

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. The steel extrusions may be loose because of anchorage or weld failures.** Do Nothing; Replace Gland, Patch Concrete *(Maj Repair)*; Replace Joint *(Repl Elem)*

Note: *Debris Rule Of Thumb*
CS1 - Debris Below Deck Surface
CS2 - Debris Level With Deck
CS3 - Traffic is Pushing Debris Against the Strip Seal Gland.



CS 1

CS 2

CS 3

#301 - Silicone Joint Seals

#309 - Other Expansion Joint Seals

Unit of Measure (LF)

Pourable joints are those joints that are filled with an approved pourable bridge joint sealer, such as silicone.
It does not include pourable joint fillers, such as asphaltic crack fillers. Type “Header, material type” in the remarks of this element, if it exists.

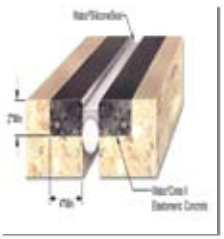
Other Joints that do not fit any of the other type of joints. These joints may include preformed or poured asphaltic fillers, bronze or copper waterstops, AC overlayed joints, Transflex joints, etc. Type “Header, material type” in the remarks of this element, if it exists.

Condition State Descriptions and Feasible Actions
(Work Candidate Action in parentheses)
Note: Use % for each 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. Do Nothing

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 the deck and/or headers may be present adjacent to the joint. Do Nothing; Clean And Replace Seal *(Min Repair)*

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. Do Nothing; Clean, Patch And Replace *(Repl Elem)*



CS 1

CS 2

CS 3

#302 - Polyfoam Compression Joint Seals

#305 - Polychloroprene Compression Joint Seals

Unit of Measure (LF)
Joints filled with a pre-formed compression type seal. Type "Header material type", in the remarks box for these elements.

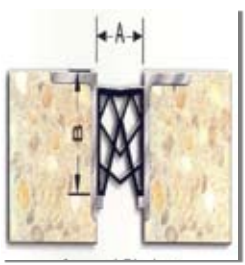
Condition State Descriptions and Feasible Actions
(Work Candidate Action in parentheses)
Note: Use % for each condition state.

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.** Do Nothing

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.** Do Nothing; Patch And Reseal Joint *(Min Repair)*

3. **Major adhesion and/or cohesion failures may be present. The gland possibly has 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.** Do Nothing; Replace Gland, Patch Spalls (*Maj Repair)*; Replace Joint *(Repl Elem)*

Polychloroprene *Polyfoam*



CS 1

CS 2

CS 3

#303 - Modular Joint Assembly / Seals

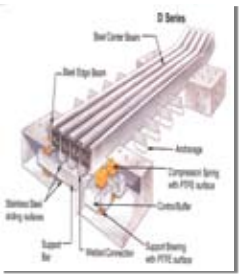
Unit of Measure (LF)
Only those multiple cell joints supported with an assembly mechanism that may or may not have seals. Type “Header, material type” in the remarks box of this element, if it exists.

Condition State Descriptions and Feasible Actions
(Work Candidate Action in parentheses)
Note: Use % for each condition state.

1. The element shows little or no deterioration or damage. The anchors are tight. There are no broken welds. The adjacent deck and/or header is sound. The paint system, if present, is sound and functioning as intended to protect the metal.
Do Nothing

2. The element shows minor deterioration or damage. The paint system, if present, may show some corrosion with slight pitting. There may be minor weld cracking. Looseness of the anchorage/support system may be present. Minor spalls in the deck and/or header may be present adjacent to the joint. Signs of seepage along the joint may be present.
Do Nothing; Patch And Reseal Joint *(Min Repair)*

3. The element shows major deterioration or damage. Corrosion is advanced. The joint anchorage/support system has failed. Major spalls may be present in the deck and/or header adjacent to the joint. Signs or observance of leakage along the joint may be present.
Do Nothing; Rehab The Unit *(Rehab Elem)*; Replace The Unit (*Repl Elem)*



CS 1

CS 2

CS 3

#304 - Open Expansion Joints

Unit of Measure (LF)
Only those joints that are open and not sealed (includes sliding plate and finger joints). Type “Header material type” in the remarks for this element, if it exists.

Condition State Descriptions and Feasible Actions
(Work Candidate Action in parentheses)
Note: Use % for each 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.** Do Nothing

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.** Do Nothing; Rehab The Unit *(Rehab Elem)*

3. **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.** Do Nothing; Rehab The Unit *(Rehab Elem)*; Replace Joint (*Repl Elem)*

CS 1

CS 2

CS 3

#306 - Asphaltic Plug Joint Seals

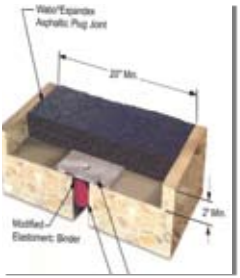
Unit of Measure (LF)
Only those multiple cell joints supported with an assembly mechanism that may or may not have seals. Type “Header, material type” in the remarks box of this element, if it exists.

Condition State Descriptions and Feasible Actions
(Work Candidate Action in parentheses)
Note: Use % for each condition state.

1. The element shows minimal deterioration. There are no signs of cracking, spalling, delaminations, or leakage. Do Nothing

2. The element may show minor cracking along the joint. Minor adhesion and/or cohesion failures may be present. Signs of seepage along the joint may be present. Do Nothing; Rehab The Unit *(Rehab Elem)*

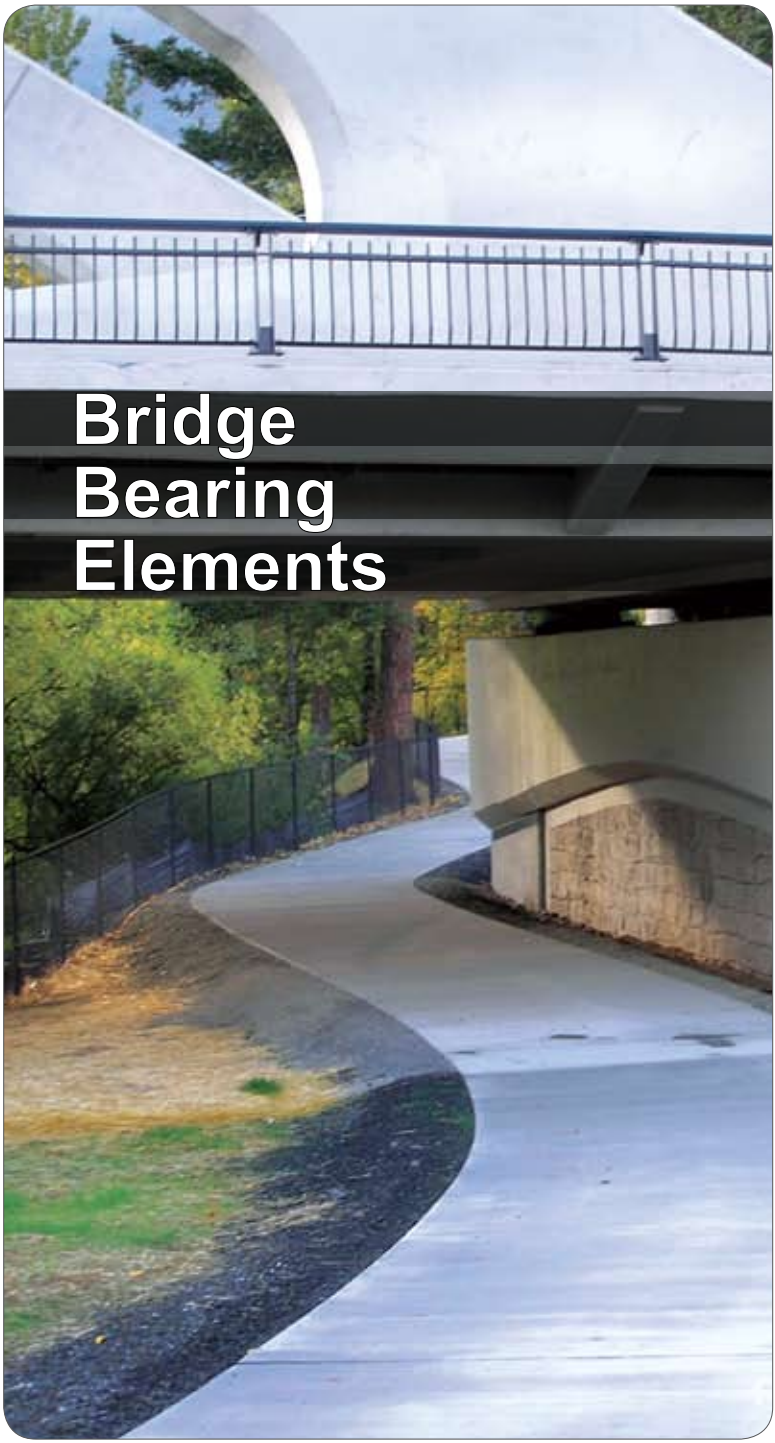
3. Major rutting, spalling and/or delamination failures are present. Signs or observance of leakage along the joint is present. Do Nothing; Replace The Unit *(Repl Elem)*



CS 1

CS 2

CS 3


Bridge
Bearing
Elements

#310 - Elastomeric Bearings

Unit of Measure (EA)
Only those bridge bearings that are constructed primarily of elastomers, with or without fabric or metal reinforcement.

Condition State Descriptions and Feasible Actions
(Work Candidate Action in parentheses)
Note: Use % for each condition state.

1. The element shows little or no deterioration. Shear deformations are correct for existing temperature.
Do Nothing

2. Minor cracking, splitting or other deterioration may be present. Shear deformation may be slightly excessive. Strength and/or serviceability are not affected. Do Nothing; Reset Bearings *(Min Repair)*

3. Advanced deterioration. Shear deformations may be excessive. Top and bottom surfaces may no longer be parallel. Loss of bearing may be imminent. Do Nothing; Reset Bearings *(Min Repair)*; Replace The Unit/Reset Girder *(Repl Elem)*

Note: *As a rule of thumb, the maximum total allowable shear deformation is 1/2 the height of the bearing pad dimension. (1/4 H on each side of the vertical plane).*

Note: *Bulging is considered a noteworthy deficiency, and excessive bulging is considered to be more that 15% of "H".*

CS 1

CS 2

CS 3

#311 - Movable Bearings (roller, slider, etc.)

Unit of Measure (EA)
Bearing definition: Acts as a bond breaker between the superstructure and substructure; Accommodates temperature movements in the superstructure; Allow superstructure deflection rotation without point bearing on the superstructure; Function to spread or distribute loads to a larger area.

Condition State Descriptions and Feasible Actions
(Work Candidate Action in parentheses)
Note: Use % for each 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 are within limits. Bearing support member is sound. Any lubrication system is functioning properly.** Do Nothing

2. **The paint system, if present, may show moderate to heavy corrosion with some pitting but still functioning as intended. The assemblies may have moved enough to cause minor cracking in the supporting concrete. Debris buildup is affecting bearing movement. Bearing alignment is still tolerable.** Do Nothing; Clean, Paint, Reset Bearings And/or Rehab Supports *(Min Repair)*

3. **Advanced corrosion with section loss. 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.** Do Nothing; Rehab Supports Or Bearings *(Rehab Elem)*; Replace The Unit *(Repl Elem)*

Note: *Maximum allowable movement is defined as 1/4 of the bearing height or in contact with anchorage constraints.*

CS 1

CS 2

CS 3

#312 - Enclosed / Concealed Bearings

Unit of Measure (LF)
Only those bridge bearings that are enclosed so that they are not open for detailed inspection. (Covers can be removed - not concealed).

Condition State Descriptions and Feasible Actions
(Work Candidate Action in parentheses)
Note: Use % for each condition state.

1. **The element shows little or no deterioration. There are no vertical or horizontal offsets. There is no cracking of support members. The supported member is stable under traffic.** Do Nothing

2. **Both vertical and horizontal offsets are within the capability of the bearings and are not yet significant. The supported member may exhibit minimal vertical movement under traffic. Cracking of support members is not yet significant. There may be insignificant reduction of bearing due to superstructure shortening.** Do Nothing; Rehab The Unit *(Rehab Elem)*

3. **Vertical and/or horizontal offsets are significant indicating bearing failures. There may be significant vertical movement under traffic. Cracking of the support members may be significant. There may be significant reduction of bearing due to superstructure shortening.** Do Nothing; Rehab The Unit *(Rehab Elem)*; Replace The Unit *(Repl Elem)*

Note: *The total quantity can be obtained from the plans or by the number of girder lines. The condition ratings should be based on associated signs of distress in the member that the inspector can see, i.e., the condition of the bearing supports or distress in the bearing at the other end of the span.*

CS 1

CS 2

CS 3

#313 - Fixed Bearings

Unit of Measure (EA)
A support element transferring loads from superstructure to substructure while not allowing any longitudinal movement.

Condition State Descriptions and Feasible Actions
(Work Candidate Action in parentheses)
Note: Use % for each 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 alignments are within limits. Bearing support member is sound.**
   Do Nothing

2. **The paint system, if present, may show moderate to heavy corrosion with some pitting but still functioning as intended. The assemblies may have moved enough to cause minor cracking in the supporting concrete.**
   Do Nothing; Clean, Paint, Reset Bearings And/ Or Rehab Supports *(Min Repair)*

3. **Advanced corrosion with section loss. There may be loss of section of the supporting member sufficient to warrant supplemental supports or load restrictions. Shear keys may have failed.** Do Nothing ; Rehab Supports Or Bearings *(Rehab Elem)*; Replace The Unit *(Repl Elem)*


CS 1


CS 2


CS 3

#314 - Pot or Disk Bearings

Unit of Measure (EA)
Those high load bearings with confined elastomer (pot) or a hard plastic disk (disk). The bearing may be fixed against horizontal movement, guided to allow movement in one direction, or floating to allow sliding in any direction.

Condition State Descriptions and Feasible Actions
(Work Candidate Action in parentheses)
Note: Use % for each condition state.

1. **The element shows minimal deterioration. If a paint or other anti-corrosion system is sound and functioning as intended to protect the metal. The bearing has minimal debris and corrosion. Vertical and horizontal alignments are within limits. Bearing support member is sound. Any lubrication system is functioning properly.** Do Nothing

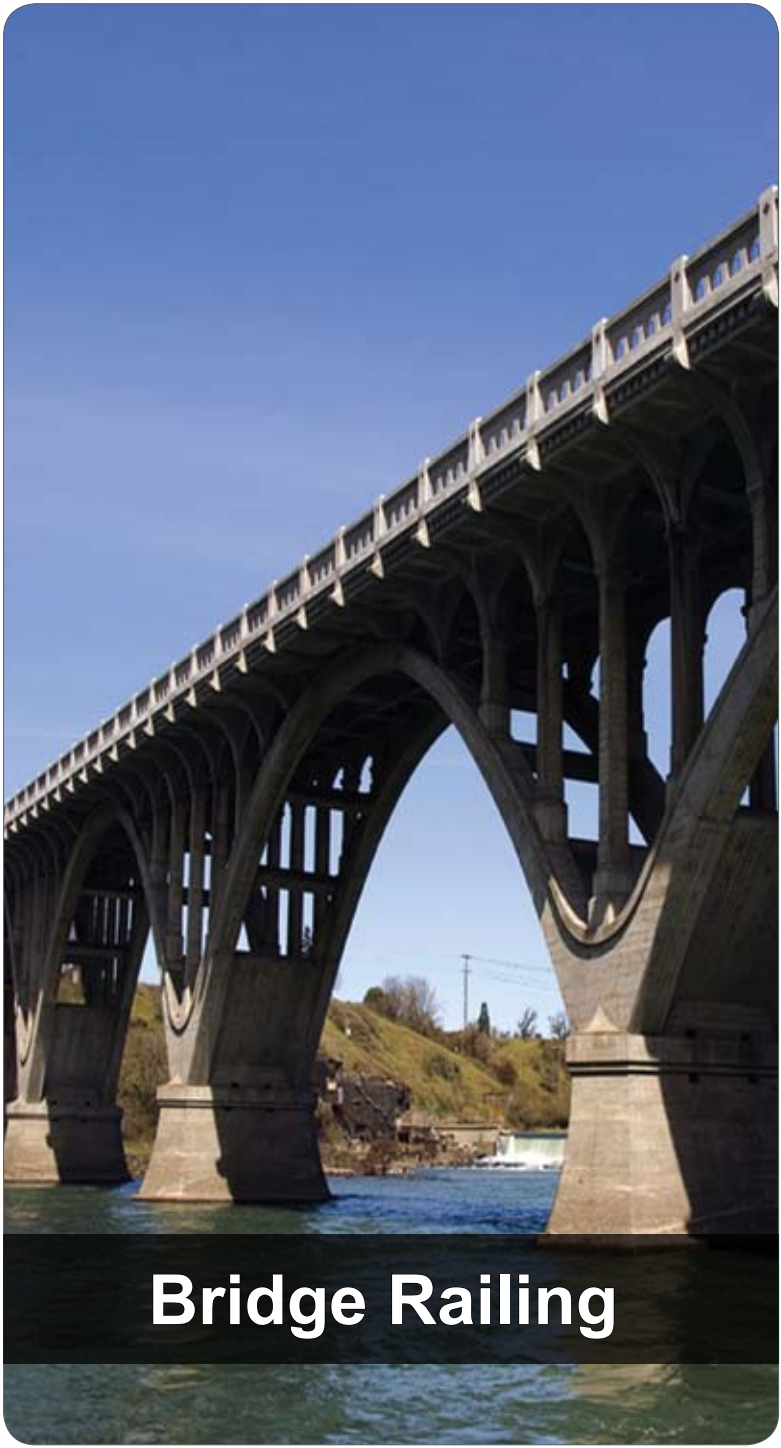
2. **The anti-corrosion system may show some corrosion with minor pitting. Debris buildup is affecting bearing movement. Bearing alignment and load carrying capacity are still tolerable. Sliding surfaces show signs of deterioration.** Do Nothing; Rehab Bearing/supports *(Min Repair)*

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, if present, may be actively extruding from the device. Sliding surfaces may have failed.** Do Nothing; Rehab Bearing Devices *(Rehab Elem)*; Replace The Unit *(Repl Elem*)

CS 1

CS 2

CS 3



Bridge Railing

#331 - Reinforced Concrete Bridge Railing

Unit of Measure (LF)
Rails where the predominate feature is reinforced concrete. Other ornate wood, conc. or metal sections may be present.

Condition State Descriptions and Feasible Actions
(Work Candidate Action in parentheses)
Note: Use % for each condition state.

1. **The element shows little or no deterioration. There may be discoloration, efflorescence, and/or superficial cracking but without effect on the strength and/or serviceability.** Do Nothing

2. **Minor cracking, delaminations and/or spalls may be present and some reinforcing may be exposed in either the railing or anchorages. Corrosion of the rebar may be present but loss of section does not significantly affect the strength and/or serviceability of the element.** Do Nothing; Clean And Patch *(Min Repair)*

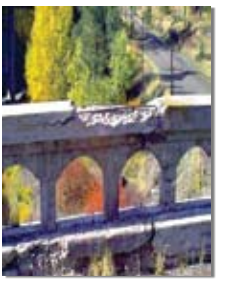
3. **Advanced deterioration. Corrosion of reinforcement and/or loss of concrete section in the railing or anchorages is sufficient to warrant an analysis to ascertain the impact on the strength and/or serviceability of the element.** Do Nothing; Rehab The Unit *(Rehab Elem)*; Replace The Unit *(Repl Elem)*

Note: *In order to assess the condition of the non-concrete members requires the inspector to read in between the lines and zero in on the "strength or serviceability of the element."*

Note: *Generally, as a rule of thumb, superficial cracks are parallel to the primary steel reinforcement. Structural cracks will most like occur in the negative moment regions or are oriented angular to primary steel reinforcement.*

CS 1

CS 2



CS 3

#334 - Coated Metal Bridge Railings

Unit of Measure (LF)
Rails where the predominate feature is coated metal. All types and shapes of coated metal bridge railing coated with paint or protected with galvanizing, or other coating.

Condition State Descriptions and Feasible Actions
(Work Candidate Action in parentheses)
Note: Use % for each condition state.

1. **There is little or no evidence of corrosion. Protective coating is sound and functioning as intended to protect the element.** Do Nothing

2. **There is little or no active corrosion. Surface or freckled rust has formed or is forming on the railing or anchorages. Protective coating may have minor areas of deterioration.** Do Nothing; Clean/ Restore Coating. *(Repl Paint)*

3. **The protective coating has failed. Corrosion may be present on the railing or anchorages, but any section loss does not affect the strength or serviceability of the element.** Do Nothing; Rehab The Unit *(Rehab Elem)*; Replace The Unit *(Repl Elem)*

4. **Corrosion is advanced. Section loss in the railing or anchorages is sufficient to warrant analysis to ascertain the impact on the ultimate strength and/or serviceability of the element.** Do Nothing; Rehab The Unit *(Rehab Elem)*; Replace The Unit *(Repl Elem)*

Note: *In order to assess the condition of the non-metal members requires the inspector to read in between the lines and zero in on the "strength or serviceability of the element."*

Note: *The grout pad has no affect on condition or appraisal.*

Note: *Inventory steel backed timber rail as a steel rail.*

Note: *Use the rail incident SF 370 to record anchor bolt engagement or anchor bolt embedment deficiencies*


CS 1


CS 2


CS 3


CS 4

#330 - Uncoated Metal Bridge Railing

Unit of Measure (LF)
Rails where the predominate feature is uncoated metal. Steel, aluminum, metal beam, rolled shapes, etc. will all be considered part of this element. The element is neither painted nor galvanized.

Condition State Descriptions and Feasible Actions
(Work Candidate Action in parentheses)
Note: Use % for each condition state.

1. **There is little or no evidence of corrosion of the uncoated metal. There may be some surface oxidation, but no section loss is occurring.** Do Nothing

2. **Surface pitting may be present on the railing or anchorages, but any section loss does not affect the strength or serviceability of the element or the bridge.** Do Nothing; Clean And Coat *(Repl Paint)*; Replace The Unit *(Repl Elem)*

3. **Corrosion is advanced. Section loss in the railing or anchorages is sufficient to warrant analysis to ascertain the impact on the ultimate strength and/or serviceability of the element.** Do Nothing; Rehab The Unit *(Rehab Elem)*; Replace The Unit *(Repl Elem)*

Note: *In order to assess the condition of the non-metal members requires the inspector to read in between the lines and zero in on the "strength or serviceability of the element."*

CS 1

CS 2

CS 3

#332 - Timber Bridge Railing

Unit of Measure (LF)
Rails where the predominate feature is timber. The rail posts may or may not be timber.

Condition State Descriptions and Feasible Actions
(Work Candidate Action in parentheses)
Note: Use % for each condition state.

1. **There is no decay. There may be minor cracks, splits, and/ or checks.** Do Nothing

2. **There may be decay with or without splitting, cracking, checking, crushing, or corrosion of anchors but none is sufficiently advanced to affect serviceability.** Do Nothing; Rehab/ Apply Surface Treatment *(Min Repair)*

3. **Advanced deterioration. Decay, splits, cracks, crushing, or corrosion of anchors has produced a loss of strength that may affect the serviceability of the element.** Do Nothing; Replace The Unit *(Repl Elem)*

Note: *In order to assess the condition of the non-timber members requires the inspector to read in between the lines and zero in on the "strength or serviceability of the element."*

CS 1

CS 2

CS 3

#333 - Other Bridge Railings

Unit of Measure (LF)
All types and shapes of bridge railing except those defined as metal, concrete or timber. This element includes masonry/rock or combinations of materials not included in other definitions.

Condition State Descriptions and Feasible Actions
(Work Candidate Action in parentheses)
Note: Use % for each condition state.

1. **The element shows little or no deterioration. There may be minor cracking, corrosion, weathering, and/or other minor deterioration having no affect on strength or serviceability.** Do Nothing

2. **Minor to moderate cracking, spalls, decay of timber portions, or corrosion of metal in the railing or anchorages may be present, but does not significantly effect the strength or serviceability of the element.** Do Nothing; Rehab The Unit *(Rehab Elem)*

3. **Advanced deterioration. Corrosion, decay or loss of section in the railing or anchorages is sufficient to warrant analysis to ascertain the impact on the serviceability or strength of the element.** Do Nothing; Rehab The Unit *(Rehab Elem)*; Replace The Unit *(Repl Elem)*

CS 1

CS 2

CS 3

Miscellaneous Structures

#900 - Abandoned Structure (EA)

#910 - Railroad Structure (EA)

#920 - Sign Structure (EA)

#930 - Ped/Bike Structure (EA)

#940 - Private Structure (EA)

#950 - Flume Structure (EA)

#960 - Drawbridge Elect. / Mech. (EA)

#991 - Fender System, Painted Steel (EA)

#992 - Fender System, Unpainted Steel (EA)

#993 - Fender System, Concrete (EA)

#994 - Fender System, Timber (EA)

#995 - Cathodic Protection System

Condition State Descriptions and Feasible Actions
Note: These are non-NBI structures. Use only 1 condition state.

1. **The element is in good condition.** Do Nothing

2. **The element is in fair condition.** Do Nothing; Repair Structure *(Min Repair)*

3. **The element is in poor condition.** Do Nothing; Repair Structure (*Min Repair)*; Replace Structure *(Repl Elem)*; Remove Structure *(Remove_)*

#995 - Cathodic Protection System

Note: Use only 1 condition state

Visual signs of CP System Condition

- Good - 75% Of Anode Life Remaining; Do Nothing
- Fair - 25% < Anode Life Remaining < 75%; Do Nothing
- Poor - < 25% Of Anode Life Remaining; Repair / Replace Anode

CS 1

CS 2

CS 3

#990 - Miscellaneous Elements

Unit of Measure (EA)
This element does not have a quantity, condition states, or feasible actions. It is used so remarks and recommendations for miscellaneous items are recorded under a common element. This element will only be recorded once in the element portion of the inspection report. The inspector will need to identify the item being referred to as the member in the remarks and maintenance recommendation boxes. **Only list items that need to have their condition monitored.**

Examples are:

Mse Embankment Walls

Luminaires

Pedestrian Screening

Sidewalks Attached to the Bridge

Sign Support Structure Attached to the Bridge

Seismic Retrofits

Covered Bridges,

Slope Paving

Fall Protection Systems

Waterlines, Gas Lines, Utilities

Lighting, Drainage Features in Tunnels

Masonary on Tunnel Portals

Note: *For fall protection system, specify type of system, last inspected by the manufacturer, the condition of the system, and note any precautions.*

Covered Bridge

Cathodic Protection

Seismic Restraints

Fish Baffles

Note: *Typically, all bridge end load paths consist of a footing/pile component. Whereas, the primary function of a MSE Wall is to provide lateral restraint for the approach roadway embankment using engineered earth fill. If MSE Walls were considered to be an integral part of the abutment, selecting the abutment type and assessing the non-visible condition of engineered earth embankment can get very complicated. Therefore, ODOT has decided to follow the KISS Principal.*

The MSE Wall boundary parameters of what should be included in the condition assessment is bounded within a 1:1 slope (angle of repose) line projected in all directions from the end of the bridge / impact panel.

Note: *"Drawbridge Electrical / Mechanical components include those items that are loaded only when the drawbridge operation is engaged, i.e., lift cables, electrical systems, mechanical lift and tie down systems, or the counterweight. Items that carry live loads, i.e., bearings, girders, stringers, access ladders, etc., will be included in the routine bridge inspection using the appropriate bridge element."*

Note:

Condition Assessment Smart Flags

The intent of a smart flag is to report a deficiency that is not modelable by the Bridge Management System (BMS) or is incident driven, i.e., seismic damage, traffic collision, ice, drift flows, fires, etc.

"Associated bridge maintenance recommendations with the appropriate bridge element, not a Smart Flag."

#356 - Steel Fatigue Smart Flag

Unit of Measure (EA)
This 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.

Condition State Descriptions
Note: Put all in one (1) condition state.

1. **Fatigue damage to the bridge has been repaired or arrested. The bridge may still be fatigue prone.**

2. **Fatigue damage exists which is not arrested (normally, this condition state would be used the first time the element is identified and at any other time when additional fatigue damage occurs).**

3. **Fatigue damage exists which warrants analysis of the element to ascertain the impact on the serviceability or strength of the element.**

CS 1

CS 2

CS 3

#357 - Pack Rust Smart Flag

Unit of Measure (EA)
This 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.

Condition State Descriptions
Note: Put all in one (1) condition state.

1. **The connection is showing signs of rusting between plates. Seams of the connections exhibit rust staining.**

2. **Rusting between plates is beginning to distress the connection. Minor swelling exists.**

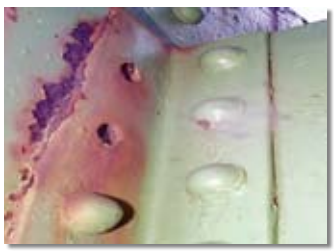
3. **Rusting between plates has caused serious distress to the connection. The plates may be badly distorted, however, all connectors (rivets/bolts) are still functioning.**

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.**

CS 1

CS 2

CS 3



CS 4

#358 - Deck Cracking Smart Flag

Unit of Measure (EA)
This condition state language addresses deck cracking on the topside. It does not include the condition of any AC.

Condition State Descriptions
Note: Use % for each 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.**

2. **Unsealed cracks exist in the deck that are of moderate size (0.025 to 0.060 in. wide) or density (3' to 10' apart).**

3. **Unsealed cracks exist in the deck that are of moderate size (0.025 to 0.060 in. wide) and density (3' to 10' apart).**

4. **Unsealed cracks exist in the deck that are of severe size (>0.060 in. wide) and/or density (<3' apart).**

CS 1

CS 2

CS 3

CS 4

#359 - Soffit Cracking Smart Flag

Unit of Measure (EA) (Undersurface of conc. deck/slab)
This condition state language addresses deck distresses through visual inspection of the deck soffit (undersurface). On box girders this is for the bottom side of the top slab only.

Condition State Descriptions
Note: Use % for each condition state.

1. **The undersurface of the deck or slab has little or no symptoms of distress. Any cracking that is present is only superficial. (No more than 1 or 2 dispersed cracks per soffit panel).**

2. **The undersurface of the deck shows no rust staining or spalling that could be attributed to active corrosion. Cracking and efflorescence on the undersurface is light to moderate. (2 to 4 cracks dispersed cracks over a soffit panel).**

3. **The undersurface of the deck shows no evidence that active corrosion is occurring. Cracking and efflorescence on the undersurface is moderate to heavy. (5 or more transverse cracks per soffit panel).**

4. **Light to moderate rust staining and/or spalling on the undersurface of the deck indicates that active corrosion is occurring in the deck. Cracking and/or efflorescence on the undersurface is heavy to severe. (Dense tight cracks that form map patterns or cracks with rust stains).**

5. **Heavy to severe rust staining and/or spalling on the undersurface of the deck indicates that active corrosion is occurring in the deck. Cracking and/or efflorescence on the undersurface is severe. (Dense, wider active cracks/ chipped edges along cracks, can form map patterns with rust stains).**


CS 1


CS 2


CS 3


CS 4


CS 5

#360 - Settlement Smart Flag

Unit of Measure (EA)

This condition state language addresses substructure settlement distresses, which are evident during visual inspections. It's primary purpose is to identify bridge 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 Descriptions

Note: Put all in one (1) 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.**

2. **Settlement or rotation of the bridge supporting elements show signs of continuing and if left unarrested could cause adverse impacts to the bridge.**

3. **Settlement or rotation of the bridge supporting elements is significant enough to warrant analysis of the bridge.**

CS 1

CS 2

CS 3

#361- Scour Smart Flag

Unit of Measure (EA)

This condition state language addresses scour distresses, which are evident during the visual inspection. It's primary purpose is to identify bridges that are experiencing scour and to provide some measure of the magnitude of that scour. The scour being reported here is the local bridge or culvert scour that is affecting the structure and not channel scour or in the general vicinity of the structure.

Condition State Descriptions

Note: Put all in one (1) condition state.

1. **Scour exists at the structure site but is of little concern to the structural integrity of the bridge.**

2. **Scour exists at the structure site and if left unchecked could adversely impact the structural integrity of the bridge.**

3. **Scour is significant enough to warrant analysis of the structure.**

CS 1

CS 2

CS 3

#362 - Traffic Impact Smart Flag

Unit of Measure (EA)

This condition state language addresses structurally significant damage, of superstructure elements only, due to traffic impact. **Report substructure damage using SF 373. Do not use SF 362 and SF 372 together.**

Condition State Descriptions

Note: Put all in one (1) condition state.

1. **Impact damage has occurred and has been repaired. Prestressing system is covered by patch concrete. Steel has been straightened or repaired.**

2. **Impact damage has occurred. Prestressing system and reinforcement is exposed, but is not impaired. Steel strength does not threaten the serviceability of the bridge.**

3. **Impact damage has occurred. There is broken reinforcement and strength of the member is impaired. Analysis is warranted to ascertain the serviceability of the bridge.**

CS 1

Exposed Reinforcement

CS 2

Broken Reinforcement

CS 3

#363 - Section Loss Smart Flag

Unit of Measure (EA)

This condition state language addresses section loss in areas of steel members which warrant analysis (e.g., beam/girder web in high shear areas, beam/girder flanges in high moment areas, bottom chords of through trusses, etc.). This flag should be used when a steel element reaches condition state 4, or for those elements having section loss but have been repaired or cleaned and painted over.

Condition State Descriptions

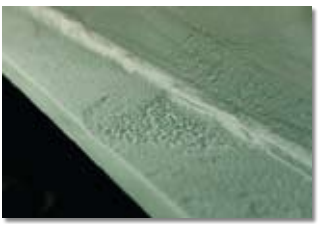
Note: Put all in one (1) condition state.

1. **Section loss to the element has been repaired or cleaned and painted over.**

2. **Section loss to the element exists and has not been repaired or painted over. Structural analysis is not yet warranted.**

3. **Measurable section loss to the element exists that warrants analysis to determine the serviceability of the element or the bridge. An analysis has been done, and it has been determined that serviceability has not been affected.**

4. **Section loss has affected the load carrying capacity or serviceability of the bridge. (Code this condition state only after a structural analysis has been completed.)**



CS 1

CS 2

CS 3

CS 4

#370 - Incident Rail Smart Flag

#371 - Incident Deck Smart Flag

#372 - Incident Superstructure Smart Flag

#373 - Incident Substructure Smart Flag

#374 - Incident Approach Embankment Smart Flag

Unit of Measure (EA)
This condition state language addresses structurally significant damage that occurred during some incident, like fire, seismic event, traffic accident, construction or flooding event. This reportable damage was determined to be incident driven and should not be included in the condition assessment of the element.

Condition State Descriptions
Note: Put all in one (1) condition state.

1. **Incident damage has occurred and has been repaired. Member reinforcement is adequately protected. All structural members have been straightened or repaired to the point where they can continue to function as originally designed.**

2. **Incident damage has occurred. Member reinforcement is exposed, but is not impaired. Strength of the member does not threaten the serviceability of either the element or the bridge.**

3. **Incident damage has occurred and strength of the member is impaired. Analysis is warranted to ascertain the serviceability of either the element or the bridge.**

Note: *Due to the importance of monitoring traffic collision damage to the superstructure, do not substitute SF 372 for SF 362.*




NBI Section
Table of Contents

A copy of the 2004 National Bridge Inspection Standards and the associated Questions and Answers can be obtained by navigating to: **www.fhwa.dot.gov/bridge/nbis**

NBI Item 36

Traffic Safety Features

The primary purpose of a traffic railing is to contain vehicles. and redirect errant vehicles on the bridge." Variations in traffic volume, speed, vehicle mix, roadway alignment, under-structure activities and conditions, and other factors combine to produce a vast variation in traffic performance needs from one site to another. However, all test levels are intended to guard against bumper, wheel and hood snagging for automobiles and to provide a stable post-impact trajectory for automobiles, light trucks and passenger vans. Large trucks and buses receive increasing attention within increasing test levels. Single unit truck is of significant concern at the TL-4 level and larger trucks are of major concern at the TL-5 and above levels. Although other vehicles are considered important, designing for the large trucks ensures good performance with most other large vehicles.

The 2005 FHWA Bridge Rail Guide - provides an index for six Test Levels (matrix):

Test Level	Impact Speed	Vehicle Type
TL-1	30	820 kg Car ; 2000 kg Pickup
TL-2	45	820 kg Car ; 2000 kg Pickup
TL-3	62	820 kg Car ; 2000 kg Pickup
TL-4	62 50	820 kg Car ; 2000 kg Pickup 8,000 kg Single Unit Truck
TL-5	62 50	820 kg Car ; 2000 kg Pickup 36,000 kg Tractor Trailer
TL-6	62 50	820 kg Car ; 2000 kg Pickup 36,000 kg Tanker Truck

Proper coding of this item requires the inspector to utilize the following steps: (www.safety.fhwa.dot.gov)

Step 1

Determine what test level is appropriate for the bridge site. Use posted speed as indicator for appropriate test level requirement All state routes require at least a TL- 3 or higher application. Local agencies could be TL- 1 or higher. All interstate routes require at least a TL- 4 or higher application.

Step 2
Identify and compare the existing railing with the approved standard drawings.

Step 3
Determine whether the existing rail transition meets current standards. (Br Std Dwgs)

Step 4
Determine whether the existing approach rail meets current standards. (RD440)

Step 5
Determine whether the end treatment meets current standards.

(a) Bridge Railings

Standard Bridge Railing Drawings

BR139		Expansion Joint w/ Conc Rail Detail skew > 20 degrees	
BR200	43495	Concrete Bridge Rail - Type F	2002
BR206	43497	Std 2 Tube Curb Mounted Rail	2002
BR208	43498	Std 3 Tube Curb Mounted Rail	2002
BR216	50507	Sidewalk Mounted Combination Bridge Rail	2002
BR220	50508	Flush Mounted Combination Bridge Rail	2002
BR223		Standard Combination Rail	2002
BR226	50494	Standard 2-Tube Side Mount Rail	2002
BR233	43542	Standard Thrie-Beam Rail (side mount)	2002
BR240		Standard Protective Fencing	2002
BR241		Standard Protective Fencing	2002
BR246		Standard Pedestrian Rail	2002
BR250	46610	Pedest. Rail on Sidewlk Mnted Conc. Parap.	2002
BR253	47204	Sidewlk Mnt Conc Parap. w Chain Lk Fence	2002
BR256	47168	Pedest. Rail on Type F Conc. Bridge Rail	2002
BR260	43855	Chain Link Fence on Type F Conc Bridge Rail	2002
BR263		Std. Conc Median Barr. at Br Expan. Jnts (Type F)	2002
BR266		Standard Modified Type 2A Rail (Culverts)	2002
BR273	47646	Thrie Bm Rail Retrofit for Curb & Parap. Rail	2002
BR280	49060	Type F Conc Br Rail Repl of Exist Parap. Rail	2002
BR283	49061	Type F Conc Br Rail Ret. of Exist Parap. Rail	2002
BR286	50030	Retrofit Stand Steel Br Rail w Sidewalk	2002
BR290		42” Tall Type F Concrete Bridge Rail	

Standard Transition Detail Drawings

BR203	43496	Std Concrete Bridge Rail to Guardrail Transition	2002
BR207		Std 2-Tube Curb Mount Rail to guardrail Transition	2002
BR 209	43499	Std 3-Tube Curb Mount Rail to guardrail Transition	2002
BR216	50507	Std Sidewlk Mnt Comb Br Rail to guardrail Trans	2002
BR220	50508	Std Flush Mnt Comb Br Rail to guardral Transition	2002
BR230	50595	Std 2-Tube Side Mount Rail Transition	2002
BR233	43542	Std Thrie-Beam Rail Transition	2002
BR236		Trailing End Guardrail Conn to Conc Bridge Rail	2002
BR266		Standard Modified Type 2A Railing	2002
BR270	45803	Flex Beam Rail Trans Conn Curb and ParapBr Rail	2002
BR273	47646	Thrie Beam Rail Ret for Curb and Parap Rail Trans	2002
BR280	49060	Type F Conc Rail Repl of Exist Parap Rail Trans	2002
BR283	49061	Type F Conc Br Rail Ret of Exist Parap Rail Trans	2002
BR286	50030	Retrofit for Stand Steel Br Rail with Sidewlk Trans	2002
RD470		Guardrail Over Low-Fill Culverts	
RD505		Concrete Barrier Cast-in-Place	
RD520		Cast-in-Place Concrete Barrier Trans to Br Rail	
RD530		Guardrail Transition to Concrete Barrier	
RD550		Cast-in-Pl Tall Conc Barrier Trans to Br Rail	
RD560		Cast-in-Pl Barrier to Trans to Standard Conc Barrier	

Standard Approach Guard Rail Drawings

RD400	Standard Guardrails and Metal Median Barrier
RD405	Standard Guardrails and Metal Median Barrier Parts
RD410	Standard Thrie-Beam Guardrail Transition Parts
RD415	Guardrail and Metal Median Barrier Parts
RD420	Energy Absorbing Terminal
RD440	Guardrail Installation at Bridge Ends
RD470	Guardrail Over Low-Fill Culverts
RD500	Precast Concrete Barrier Pin and Loop Assembly
RD505	Concrete Barrier Cast-in-Place
RD515	Median Barrier Anchoring Details
RD516	Securing Concrete Barrier to Roadway

RD535	Concrete Barrier (Modified) Around Median Obstacle
RD545	Precast Tall (42”) Concrete Barrier

Standard Approach Guardrail End Terminal Drawings

RD420	Energy Absorbing Terminal
RD425	Non-Energy Absorbing Terminal (3’ or 4’ Flare)
RD440	Guardrail Installation at Bridge Ends
RD450	Guardrail Anchors (Steel)
RD450	Guardrail Anchors (Concrete)
RD510	Concrete Barrier Terminal

(b) Transitions

There must be an adequate approach rail to bridge rail transition, in order to reduce the likelihood of a vehicle snagging, pocketing, or penetrating the transition. To be found acceptable the transition must exhibit the following:

- Firmly connected to the bridge rail, **and** Gradual stiffening of the rail / post system as it approaches the end of the bridge rail, and
- Have a block between the rail element **and** the post and use double thickness thrie beam rail section **and**
- Have at least five post spacings of 18.75” next to the bridge end + 3 spaces of 37.5”,
- In low speed locations where approach rail is not used, the bridge rail end should be tapered down or shielded by using a crash cushion.

BR 203	Conc Br Rail to Guardrail Transition (steel post)	TL-4
BR 230	2-Tube Side Mount Rail Transition (steel post)	TL-4
BR 203	Conc Br Rail to Guardrail Transition (timber post)	TL-3
BR 230	2-Tube Side Mount Rail Transition (timber post)	TL-3
BR 207	2-Tube Curb Mounted Rail Transition (steel post)	TL-4
BR 270	Rail Transition Details Flex Beam (steel post)	TL-4
BR 207	2-Tube Curb Mounted Rail Transition (timber post)	TL-3
BR 270	Rail Transition Details Flex Beam (timber post)	TL-3
BR 209	3-Tube Curb Mount Rail - Rail Transition (steel post)	TL-4
BR 276	Rail Transition Details Flex Beam Rail (steel post)	TL-4
BR 209	3-Tube Curb Mount Rail - Rail Transition (timber post)	TL-3

BR 276 Rail Transition Details Flex Beam Rail (timber post) TL-1

Sidewalk Mounted Combination Rail (BR216)

Thrie-Beam Rail and Transition (BR233)

Flush Mounted Combination Rail (BR220)

Thrie Beam Rail Retrofit for curb and parapet rail (BR273)

Retrofit for Std Steel Handrail with sidewalk (BR286)

Concrete Bridge Rail trailing end Connection to Guardrail (BR 236)

Note: *Dimension from bridge rail attachment to first post is shown on standard drawings.*

(c) Approach Guardrail

The structural adequacy and compatibility of approach guardrail with transition designs should be determined. Rarely does the need for a barrier stop at the end of a bridge. Thus an approach guardrail with adequate length and structural qualities to shield motorists from the hazards at the bridge site needs to be installed. If the approach guardrail is a short radius bend, due to driveway requirements, the guardrail must have two concrete anchors installed.

One anchor at the end of the run and one closer to the bridge end. Otherwise, acceptable guardrail design suggestions are contained in the AASHTO Roadside Design Guide and subsequent FHWA or AASHTO guidelines, must be either:

Acceptable Approach Guardrail

As minimum Metal guardrail consisting of a 12’ - 6” Type 3, 37’ - 6” Type 2A rail, along with an end anchor connection cable or ground strut bar, or Concrete shoulder or median barrier. Std Modified Type 2A Rail (BR266) **minimal used over a culvert.**

18.5’ transition + 12.5’ type 3 + type 2A calc need based on route classification + end treatment. **Rather than calculate the required length of each bridge approach railing, use the following rules-of-thumb.**

- Low speed / low volume - at least 100’ total
- 45 mph - at least 150’ total
- 55 mph - at least 275’ total
- Interstate - at least 300’ total

(d) Approach Guardrail End Terminals

Guardrail end terminals are protective systems that prevent errant vehicles from impacting hazards, by gradually decelerating the vehicle to a stop. These systems are connected to the ends of guardrail runs and work in concert with the guardrail run to shield rigid objects or hazardous conditions that cannot be removed, relocated, or made break-away. All end terminals utilize W-Beam rail and breakaway timber posts, or steel hinged posts, which are set in steel foundation tubes for ease of replacement. There are a variety of guardrail terminals that are approved for use. Of primary importance is that the impacting vehicle is to be gradually decelerated with these systems.

ODOT's current standards are contained in the ODOT Roadway Section Technical Bulletin No. HDM 05 - 03, effective date Oct 27, 2005. The bulletin addresses three general points, the vehicular **approach to a terminal impact, the point of impact, and post-impact.** The current standard requires **the approach roadway surface** to be widened to ensure that a vehicle impacts a terminal in a head-on manner without dropping a wheel off of the edge of the pavement. **The point of impact** makes a distinction between the performance capabilities of energy-absorbing vs. non energy-absorbing terminals. The decision was made to use only energy-absorbing terminals on the State Highway System. However, Local Agencies can still use non-energy absorbing terminals on their transportation systems.

The post-impact issue is that virtually all current guardrail terminals will gate, that is to let a vehicle pass through the device when hit at an angle between the head and third post in from the head. This means that a reasonable, traversable recovery area should be provided behind as many guardrail terminals as is practical. And lastly, the use of the wide 8 foot flare will be terminated. Today's terminals do not function well with a wide, high angled flared end.

List of approved end treatments can be found in the ODOT Qualified Products List along with their Test Level (State must ≥ TL3)

Acceptable Energy-Absorbing End Treatments

Energy Absorbing Ends (RD 420) - ends that have the blunt square or rectangular flat plate nose, that spits the guardrail out either the roadway or off-roadway side of the end piece.

SKT (Sequential Kinking Terminal)

Note: *Tight radius flared end treatments generally do not meet current standards on a State Highway.*

Acceptable Non-Energy Absorbing

End Treatments (Use on Local Agency Highways only - can be TL-2)

8 or 6 post SRT-350 (Slotted Rail Terminal)

Buried End (RD435) - must have 1:1 side slope

Regent QPL

The end treatment can be the wrap around “Type B & C End Piece”. (RD 415, 425, 430, 435, 445)

The data collected shall apply only to the route on the bridge. Collision damage or deterioration of the elements are not considered when coding this item. Traffic safety features is a 4-digit code composed of 4 segments.

#36A Bridge Railings **#36C Approach Guardrail**

#36B Transitions **#36D Approach Guardrail Ends**

The reporting of these features shall be as follows:

Code	Description
0	Inspected feature does not meet currently acceptable standards or a safety feature is required and non is provided.
1	Inspected feature meets currently acceptable standards.
N	Not applicable or a safety feature is not required.

Safety Features Notes

On **one-way facilities** or where the rail end is not exposed to approaching traffic, an approach guardrail and transition may not be required if a site hazard does not exist (i.e. slope).

On **two-way facilities**, if an approach guardrail is required, it will be required on all 4 corners of the bridge.

Culverts - Unless the rail posts are physically attached to the RCBC top slab or culvert headwall, Item 36, should be coded “NNNN”. The railing must conform to Standard drawing BR 266

When is an Approach Guardrail not required? - An approach railing is required on all bridge approaches with 2-way traffic.

FHWA Safety web site : http://safety.fhwa.dot.gov/

Construction Deficiencies vs Meeting Standards NBI 36

Configuration - incorrect post spacing, incorrect railing thickness, spacer blocks, etc. would be considered.

Construction incompleteness like missing nuts, washers, etc. would not be considered but would require the posting of a maintenance recommendation.

Note: *Refer to Rail Incident SF 370*

NBI Item 41

Structure Open, Posted, or Closed to Traffic

This item provides information about the actual operational status of a structure. The field review could show that a structure is posed, but Item 70 - Bridge Posting may indicate that posting is not required. This is possible and acceptable coding since Item 70 is based on the operating stress level and the governing agency's posting procedures may specify posting at some stress level less than the operating rating.

One of the following codes shall be used:

Code	Description
A	Open, no restriction.
B	Open, posting recommended but not legally implemented. (all signs not in place or not correctly 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.
G	New structure not yet open to traffic.
K	Bridge closed to all traffic.
P	Posted for load (may include other restrictions such as temporary bridges which are load posted).
R	Posted for other load-capacity restriction (speed, number of vehicles on bridge, etc.).

Closed Structures

If a structure has been closed to traffic, NBI Item 41 should be coded with a “K”. If positive steps are being taken to replace or fix the bridge, the bridge can still be considered an NBI Structure. However, it positive steps are not being actively pursued, NBI Item 112, should be coded an “N”. If the structure has been “permanently closed”, the inspector could start using element 900 - “Abandoned Structure” and implement an inspection frequency in accordance with the appropriate flowchart. Permanently closed is defined as having non-removable barriers and/or can not be traversed.

Closed Structure with Detour in place

Keep original bridge inventory number, Use Misc Abandoned Structure Elem 900 to record condition of original bridge (good, fair, poor), list and rate elements on the detour structure, all elements will have a temp repair designation (NBI Item 103=T), NBI Item 41=E, NBI Item 58, 59, 60, 61, or 62 will be based on the condition of the old original structure.

Since closed bridges are considered to be Non-NBI structures a FC Inspection is not required.

NBI Item 41

Structure Status: If a structure is physically posted with a load restriction will be coded “P”, irregardless of whether the posting is above the state legal load or not. The determining factor can be found in the coding of NBI Item 70.

NBI Item 43 (Main Span Type)

NBI Item 44 (Approach Span Type)

Record the description on the inspection form and indicate the type of structure with a 3-digit 2 segment code:

Segment	Description
43A/44A	Kind of material and/or design
43B/44B	Type of design and/or construction

The first digit indicates the kind of material and/or design and shall be coded using one of the following codes:

Code	Description
1	Concrete
2	Concrete Cont.
3	Steel
4	Steel Cont.
5	Prestressed Concrete
6	P/S Concrete Continuous
7	Wood or Timber
8	Masonry
9	Alum., Cast Iron
0	Other

The second and third digits indicate the predominant type of design and/or type of construction and shall be coded using one of the following codes:

Code	Description	Code	Description
01	Slab	12	Arch - Thru
02	Stringer or Girder	13	Suspension
03	Girder Floorbeam Sys.	14	Stayed Girder
04	Tee Beam	15	Movable - Lift
05	Box Beam or Mult-Gir.	16	Movable - Bascule
06	Box Beam or Single-Gir.	17	Movable - Swing
07	Frame	18	Tunnel
08	Orthotropic	19	Culvert (incl. frames)
09	Truss - Deck	20	Mixed Type
10	Truss - Thru	21	Seg. Box Girder
11	Arch - Deck	22	Channel beam
00	Other		

Notes: *NBI Item 43: Coding Concrete Slabs vs Concrete Box Beams (based on standard drawing nomenclature)*

- 12” to 26” depth = concrete slab (101)
- ≥ 33” depth = box beams - (105)
- Std Dwg 20215 for Slabs & boxes

Notes: *NBI Item 43: ODOT elected to inventory all concrete bridges that were designed as “T-Beams” as “Concrete Girders” and use 102 or 202 to code this item.*

Since bridge section is continually querying the database in order to formulate the Bridge Program, instead of using “Mixed Type”, the bridge inspector should use the most predominant feature that needs to be monitored.

Items 58 through 62

Indicate the Condition Ratings

#58 Deck **#60 Substructure** **#62 Culverts**

#59 Superstructure **#61 Channel Protection**

Condition ratings are used to describe the existing, in-place bridge as compared to the (new) as-built condition. Evaluation is for the materials related, physical condition of the deck, superstructure, and substructure components of a bridge.

The condition evaluation of channels and channel protection and culverts is also included. Condition codes are properly used when they provide an overall characterization of the general condition of the entire component being rated, unless there is a chance of failure or load capacity issues (NBI Rating ≤ 3). Conversely, they are improperly used if they attempt to describe localized or nominally occurring instances of deterioration or disrepair (NBI Rating ≥ 4).

Correct assignment of a condition code must, therefore, consider both the severity of the deterioration or disrepair and the extent of which it is widespread throughout the component being rated.

This is referred to as employing the weak link concept.

Change NBI rating threshold to follow "weak link" concept

- **≥ 4 do not use weak link concept**
- **≤ 3 use weak link concept**

The load-carrying capacity will not be used in evaluating condition items. The fact that a bridge was designed for less than current legal loads and may be posted shall have no influence upon condition ratings.

Portions of bridges that are being supported or strengthened by temporary members will be rated based on their actual condition; that is the temporary members are not considered in the rating of the item.

Completed bridges not yet open to traffic, if rated, shall be coded as if open to traffic.

NBI General Condition Rating Table

The following general condition ratings shall be used as a guide in evaluating Items 58, 59, and 60.

Code	Description
N	NOT APPLICABLE.

9 EXCELLENT CONDITION.

8 VERY GOOD CONDITION - NO PROBLEMS NOTED.

7 GOOD CONDITION - some minor problems.

6 SATISFACTORY CONDITION - structural elements show some minor deterioration.

5 FAIR CONDITION - all primary structural elements are sound but may have minor section loss, cracking, spalling or scour.

4 POOR CONDITION - advanced section loss, deterioration, spalling or scour.

3 SERIOUS CONDITION - loss of section, deterioration, spalling or scour have seriously affected primary structural components. Local failures are possible. Fatigue cracks in steel or shear cracks in concrete may be present.

2 CRITICAL CONDITION - advanced deterioration of primary structural elements. Fatigue cracks in steel or shear cracks in concrete may be present or scour may have removed substructure support. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.

1 "IMMINENT" FAILURE CONDITION - major deterioration or section loss present in critical structural components or obvious vertical or horizontal movement affecting structure stability. Bridge is closed to traffic but corrective action may put back in light service.

0 FAILED CONDITION - out of service - beyond corrective action.

NBI Item 58

Deck Condition Assessment

This item describes the overall condition rating of the deck. Rate and code the condition in accordance with the above general condition ratings. Code **N** culverts and other structures without decks e.g., filled arch bridge.

Concrete decks should be inspected for cracking, scaling, spalling, leaching, chloride contamination, potholing, delamination, and full or partial depth failures. Steel grid decks should be inspected for broken welds, broken grids, section loss, and growth of filled grids from corrosion.

Timber decks should be inspected for splitting, crushing, fastener failure, and deterioration from rot. The condition of the wearing surface / protective system, joints, expansion devices, curbs, sidewalks, parapets, fascias, bridge rail, and scuppers shall not be considered in the overall deck evaluation. However, their condition shall be noted on the inspection form.

Decks integral with the superstructure shall be rated as a deck only and not how they may influence the superstructure rating (for example, rigid frame, slab, deck girder or T-beam, voided slab, box girder, etc.). Similarly, the superstructure of an integral deck-type bridge will not influence the deck rating.

Concrete Deck Supplemental Rating Guideline

In order to properly rate the condition of the concrete deck, the bridge inspector must incorporate the element level condition assessment ratings into the NBI Rating for the Deck, such as:

- Severity and density of spalls, delaminations, or patched areas ► **Deck / Slab Element Condition State Rating.**
- Severity and density of cracks and the existence of rust staining ► **Deck & Soffit Smart Flag Condition State Rating.**
- Severity of the rutting, scaling, or exposure of rebar in the wheel tracks ► **Wearing Surface Condition Rating**
- Existence and Severity of construction defects that creates additional traffic loading ► **Roadway Impact Rating**
- Area of Wearing Surface Debondment (Pot / Pan Holes) ► **Roadway & Wearing Surface Condition Rating.**

Timber Deck Supplemental Ratings

9 **EXCELLENT CONDITION**
No noticeable or noteworthy deficiencies which affect the condition of the deck.

8 **VERY GOOD CONDITION**
No crushing, rotting or splitting. Tightly secured to floor system.

7 **GOOD CONDITION**
Minor checking or splitting with a few loose planks.

6 **SATISFACTORY CONDITION**
More than 30% of planks are checked or split but sound. Some loose planks. Fire damage limited to surface scorching with no measurable section loss. Some wet areas noted. A few planks (under 5%) are in need of replacement.

5 FAIR CONDITION
Numerous (30 - 40%) planks checked, split, rotted, or rushed. Majority of planks are loose. Fire damage limited to surface charring with minor, measurable section loss. Some planks (5 - 10%) are in need of replacement.

4 POOR CONDITION
Majority (over 40%) of the planks are rotted, crushed, or split. Fire damage with significant section loss which may reduce the load carrying capacity of the member. Over 10% of the planks are in need of replacement.

3 SERIOUS CONDITION
Severe signs of structural distress are visible. Major decay or fire damage is present which has substantially reduced the load carrying capacity of the deck.

2 CRITICAL CONDITION
Advanced deterioration with partial deck failure. May be necessary to close bridge until corrective action is taken.

1 "IMMINENT" FAILURE CONDITION
Bridge is closed. Corrective action may put back into light service.

0 FAILED CONDITION
Bridge is closed. Deck replacement necessary.

Steel Deck Supplemental Ratings

9 EXCELLENT CONDITION
No noticeable or noteworthy deficiencies which affect the condition of the steel deck.

8 VERY GOOD CONDITION
Tightly secured to floor system with no rust.

7 GOOD CONDITION
Loose at some connections with minor rusting. A few cracked welds and/or broken grids.

6 SATISFACTORY CONDITION
Considerable rusting with indications of initial section loss. Loose at many locations. Some cracked welds and/or broken grids.

5 FAIR CONDITION
Heavy rusting with areas of section loss. Loose at numerous locations. Numerous cracked welds and/or broken grids.

4 **POOR CONDITION**
Heavy rusting resulting in considerable section loss and some holes through deck. Many welds cracked and/or grids broken.

3 **SERIOUS CONDITION**
Severe signs of structural distress are visible.

2 **CRITICAL CONDITION**
Many holes through deck.

1 **"IMMINENT" FAILURE CONDITION**
Br. is closed. Corrective action may put back in light service.

0 **FAILED CONDITION**
Bridge is closed. Deck replacement necessary.

NBI Item 59

Superstructure Condition Assessment

This item describes the physical condition of all structural members. Rate and code the condition in accordance with the previously described general condition rating. Code **N** for all culverts.

The structural members should be inspected for signs of distress which may include cracking, deterioration, section loss, and malfunction and misalignment of bearings.

The condition of bearings, joints, paint system, etc. shall not be included in this rating, except in extreme situations, but should be noted on the inspection form.

On bridges where the deck is integral with the superstructure, the superstructure condition rating may be affected by the deck condition. The resultant superstructure condition rating may be lower than the deck condition rating where the girders have deteriorated or been damaged.

Fracture Critical components should receive careful attention because failure could lead to collapse of a span or the bridge.

Concrete Superstructure Supplemental Rating Guideline

9 **EXCELLENT CONDITION**
New Condition.

8 **VERY GOOD CONDITION**
No noteworthy deficiencies which affect the load capacity of structural members.

7 GOOD CONDITION
Some minor problems. Non-structural hairline cracks without disintegration. Load capacity of structure members unaffected.

6 SATISFACTORY CONDITION
Structural members show some minor deterioration. Hairline structural cracks may be present. (Refer to the concrete crack guideline for the structural crack type/size criteria.)

5 FAIR CONDITION
All structural members are sound (load capacity unaffected) but may have substantial deterioration or disintegration. Hairline structural cracks or spalls present with minor section loss of reinforcing steel possible.

4 POOR CONDITION
Extensive disintegration. Measurable structural cracks or large spall areas. Generally, reinforcing steel exposed with measurable section loss. Load capacity of structural members are affected.

3 SERIOUS CONDITION
Severe disintegration of concrete. Large structural cracks may be present. Generally, reinforcing steel exposed with advanced stages of corrosion. Local failures or loss of bond possible.

2 CRITICAL CONDITION
Advanced deterioration of primary structural elements. Concrete disintegration around reinforcing steel with loss of bond. Some reinforcing steel may be ineffective due to corrosion or loss of bond. Numerous large structural cracks may be present. Localized failures of bearing areas may exist. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.

1 IMMINENT" FAILURE CONDITION
Bridge is closed to traffic. Major deterioration or section loss present on primary structural elements, obvious vertical or horizontal movement is affecting the structure's stability. Corrective action may put back in light service.

0 FAILED CONDITION
Bridge is closed; Out of service. Beyond corrective action; replacement necessary.

8 VERY GOOD CONDITION
Non-structural cracks less than 0.013”.

7 GOOD CONDITION
Non-structural cracks between 0.013” and 0.016”.
No rust stains.

6 SATISFACTORY CONDITION
Minor concrete damage or deterioration. Non-structural cracks over 0.016”. Isolated and minor exposure of mild steel reinforcement may be present.

5 FAIR CONDITION
Isolated and minor exposure of prestressing strand(s) may be present. Hairline structural cracks with little or no rust staining. (For structural crack type / size definitions refer to the crack rating guideline)

4 POOR CONDITION
Moderate damage or deterioration to concrete portions of the member exposing reinforcing bars or prestressing strands. Possible bond loss. Structural cracks with medium to heavy rust staining may be present.
Loss of camber.

3 SERIOUS CONDITION
Severe damage to concrete and reinforcing elements of the member. Severed prestressing strand(s) are visibly deformed. Major or total loss of concrete section in bottom flange. Major loss of concrete section loss in the web, but not occurring at the same location as of concrete section loss in the bottom flange. Horizontal misalignment to member or negative camber. Unless closely monitored it may be necessary to restrict or close the bridge until corrective action is taken.

2 CRITICAL CONDITION
Critical damage to concrete and reinforcing elements of member. This damage may consist of one or more of the following:

- Structural Cracks extend across the bottom flange or in the web directly above the bottom flange damage.
- An abrupt lateral offset as measured along the bottom flange or lateral distortion of exposed prestressing strands.
- Excessive vertical misalignment.

- Longitudinal cracks at the interface of the web and the top flange that are not closed below the surface damage.

1 "IMMINENT" FAILURE CONDITION
Critical damage requiring the replacement of a member. Bridge is closed to traffic.

0 FAILED CONDITION
Bridge is closed and out of service.

Timber Superstructure Supplemental Rating Guidelines

9 EXCELLENT CONDITION
No noticeable or noteworthy deficiencies which affect the condition of the superstructure.

8 VERY GOOD CONDITION
Minor cracking or splitting of beams or stringers at non-critical locations.

7 GOOD CONDITION
Insignificant decay, cracking, or splitting of beams or stringers.

6 SATISFACTORY CONDITION
Some decay, cracking or splitting of beams or stringers. Fire damage limited to surface scorching with no measurable section loss.

5 FAIR CONDITION
Moderate decay, cracking, splitting or minor crushing of beams or stringers. Fire damage limited to surface charring with minor, measurable section loss.

4 POOR CONDITION
Extensive decay, cracking, splitting, or crushing of beams or stringers or fire damage. Load capacity of the member is affected.

3 SERIOUS CONDITION
Severe decay, cracking, splitting, crushing of beams or stringers, or major fire damage.
Load carrying capacity of the member is substantially reduced.

2 CRITICAL CONDITION
Beam defects noted in condition state 2 have resulted in local failures. Unless closely monitored, it may be necessary to close the bridge until corrective action is taken.

1 "IMMINENT" FAILURE CONDITION
Br. is closed. Corrective action may put back in light service.

0 FAILED CONDITION
Br. is closed. Replacement necessary.

Steel Superstructure Supplemental Rating Guidelines

9 EXCELLENT CONDITION
No noticeable or noteworthy deficiencies which affect the condition of the superstructure.

8 VERY GOOD CONDITION
No visible rust.

7 GOOD CONDITION
Some rust without any section loss.

6 SATISFACTORY CONDITION
Initial section loss (minor pitting, scaling, or flaking) in non-critical areas.

5 FAIR CONDITION
Initial section loss in critical areas. Fatigue or out-of-plane bending cracks may be present in non-critical areas. Hinges may be showing minor corrosion problems.

4 POOR CONDITION
Significant (measurable) section loss in critical areas. Fatigue or out-of-plane bending cracks may be present in critical areas. Hinges may be frozen from corrosion.

3 SERIOUS CONDITION
Severe section loss or cracking in critical areas. Minor failures may have occurred.

2 CRITICAL CONDITION
Severe section loss in many areas with holes rusted through at numerous locations in critical areas.

1 "IMMINENT" FAILURE CONDITION
Br. is closed. Corrective action may put back in light service.

0 FAILED CONDITION
Br. is closed. Replacement necessary.

NBI Item 60

Substructure Condition Assessment

This item describes the physical condition of piers, abutments, piles, fenders, footings, or other components. Rate and code the condition in accordance with the previously described general condition ratings. Code **N** for all culverts.

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

As per FHWA directive, if the scour code (NBI Item 113) = 2 or less, then the substructure rating (NBI 60) must also be rated as a "2" or less.

The substructure condition rating shall be made independent of the deck and superstructure. Integral-abutment wingwalls to the first construction or expansion joint shall be included in the evaluation. For non-integral superstructure and substructure units, the substructure shall be considered as the portion below the bearings. For structures where the substructure and superstructure are integral, the substructure shall be considered as the portion below the superstructure.

Concrete Substructure Supplemental Rating Guidelines

9 EXCELLENT CONDITION
No noticeable or noteworthy deficiencies which affect the condition of the substructure. Insignificant scrape marks caused by drift or collision.

8 VERY GOOD CONDITION
Shrinkage cracks, light scaling, or insignificant spalling which does not expose reinforcing steel. Insignificant damage caused by drift or collision with no misalignment and not requiring corrective action.

7 GOOD CONDITION
Deterioration or initial disintegration, cracking with some leaching, or spalls on concrete or masonry units with no affect on bearing area. Leakage of expansion devices have initiated minor cracking. Some rusting of steel without measurable section loss. (For structural crack type / size definitions see crack guideline.)

6 SATISFACTORY CONDITION
Moderate deterioration or disintegration, spalls, cracking, and leaching on concrete or masonry units with little or no effect on bearing areas.

5 FAIR CONDITION
Many concrete or masonry units show some section loss with exposed reinforcing steel possible. Scour may be progressive and/or is becoming more prominent with a possibility of exposing top of footing, but no misalignment or settlement noted.

4 POOR CONDITION
Structural cracks in concrete and masonry units. Extensive scouring or undermining of footing affecting the stability of the unit and requiring corrective action.

3 SERIOUS CONDITION
Severe disintegration of concrete. Generally, reinforcing steel exposed with advanced stages of corrosion. Bearing areas seriously deteriorated with considerable loss of bearing. Severe scouring or undermining of footings affecting the stability of the unit. Settlement of the substructure may have occurred. Shoring may be necessary.

2 CRITICAL CONDITION
Concrete cap is soft and spalling with reinforcing steel exposed with no bond to the concrete. Top of concrete cap is split or concrete column has undergone shear failure. Scour is sufficient that substructure is near state of collapse. Pier has settled.

1 "IMMINENT" FAILURE CONDITION
Br. is closed. Corrective action may put back in light service.

0 FAILED CONDITION
Br. is closed. Replacement necessary. Timber Substructure Supplemental Rating Guidelines

9 EXCELLENT CONDITION
No noticeable or noteworthy deficiencies which affect the condition of the substructure. Insignificant scrape marks caused by drift or collision.

8 VERY GOOD CONDITION
Insignificant damage caused by drift or collision with no misalignment and not requiring corrective action.

7 GOOD CONDITION
Insignificant decay, cracking, or splitting of timber. Minor scouring may have occurred.

6 SATISFACTORY CONDITION
Some initial decay, cracking or splitting of timber. Fire damage limited to surface scorching with no measurable section loss. Shallow, local scouring may have occurred near foundation.

5 FAIR CONDITION
Moderate decay, cracking, splitting or minor crushing of timber; a few secondary members may need replacement. Fire damage limited to surface charring with minor, measurable section loss. Some exposure of timber piles as a result of erosion, reducing penetration.

4 POOR CONDITION
Substantial decay, cracking, splitting, or crushing of primary timber members, requiring some replacement. Fire damage with significant section loss of timber which may reduce the load carrying capacity of the member. Extensive exposure of timber piles as a result of erosion, reducing the penetration and affecting the stability of the unit. Additional cross bracing or backfilling is required.

3 SERIOUS CONDITION
Severe section loss in critical stress areas. Major fire damage to timber which will substantially reduce the load carrying capacity of the member. Bearing areas seriously deteriorated with considerable loss of bearing. Settlement of the substructure may have occurred. Shoring is considered necessary.

2 CRITICAL CONDITION
Primary timber members crushed or split and ineffective. Scour is sufficient that substructure is near collapse to close the bridge until corrective action is taken.

1 "IMMINENT" FAILURE CONDITION
Br. is closed. Corrective action may put back in light service.

0 FAILED CONDITION
Bridge is closed. Replacement necessary.

Steel Substructure Supplemental Rating Guidelines

9 EXCELLENT CONDITION
No noticeable or noteworthy deficiencies which affect the condition of the substructure. Insignificant scrape marks caused by drift or collision.

8 VERY GOOD CONDITION
Insignificant damage caused by drift or collision with no misalignment and not requiring corrective action.

7 GOOD CONDITION
Some rusting of steel without measurable section loss. Minor scouring may have occurred.

6 SATISFACTORY CONDITION
Initial (measurable) loss of steel section. Shallow, local scouring may have occurred near foundation.

5 FAIR CONDITION
Measurable section loss in steel members. Scour may be progressive and /or is becoming more prominent with a

possibility of exposing top of footing, but no misalignment settlement noted.

4 POOR CONDITION
Extensive section loss in steel members. Additional cross bracing or backfilling is required. Extensive scouring or undermining of footing affecting the stability of the unit and requiring corrective action.

3 SERIOUS CONDITION
Severe section loss in critical stress areas. Bearing areas seriously deteriorated with considerable loss of bearing. Settlement of the substructure may have occurred. Shoring considered necessary to maintain the safety and alignment of the structure.

2 CRITICAL CONDITION
Structural steel members have critical section loss with holes in the web and/or knife-edged flanges typical. Scour is sufficient that substructure is near state of collapse. Pier has settled.

1 "IMMINENT" FAILURE CONDITION
Br. is closed. Corrective action may put back in light service.

0 FAILED CONDITION
Br. is closed. Replacement necessary.

NBI Item 61

Channel and Channel Protection Condition Assessment

This item describes the physical conditions associated with the flow of water through the bridge such as stream stability and the condition of the channel, riprap, slope protection, or stream control devices including spur dikes. The inspector should be particularly concerned with visible signs of excessive water velocity which may affect undermining of slope protection, erosion of banks, and realignment of the stream which may result in immediate or potential problems.

Note: *Three items of primary importance that needs to be integrated into the condition assessment: the condition of the "Banks", "Control Devices" and "Debris / Vegetation Accumulation".*

9 There are no noticeable or noteworthy deficiencies which affect the condition of the channel.

8 Banks are protected or well vegetated. River control devises such as spur dikes and embankment protection are not required or in stable condition

7 Bank protection is in need of minor repair. River control devices and embankment protection have a little minor damage. Banks and/or channel have minor amounts of drift.

6 Bank is beginning to slump. River control devices and embankment protection have widespread minor damage. There is minor streambed movement evident. Debris is restricting the waterway slightly.

5 Bank protection is being eroded. River control devices and/or embankment have major damage. Trees and brush restrict the channel.

4 Bank and embankment protection is severely undermined. River control devices have severe damage. Large deposits of debris are in the waterway.

3 Bank protection has failed. River control devices have been destroyed. Streambed aggradation, degradation, or lateral movement has changed the waterway to now threaten the bridge and/or approach roadway.

2 The waterway has changed to the extent the bridge is near a state of collapse.

1 Bridge is closed because of channel failure. Corrective action may put back in light service.

0 Bridge is closed because of channel failure. Replacement necessary.

NBI Item 61 - Channel Supplemental Rating Guideline

9 Alignment: Good. Scour: No indication of bed scour or bank erosion. Obstructions : No obstructions.

8 Alignment: Adequate. Scour: No indication of bed scour or bank erosion. Obstructions: no obstructions.

7 Alignment: Fair. Scour: Mild bank erosion and bed scour. Obstructions: minor debris accumulation.

6 Alignment: Not desirable. Scour: Moderate bed scour or bank erosion occurring. Obstructions: Minor sedimentation and debris.

5 Alignment: Channel alignment beginning to change. Scour: Significant bed scour or bank erosion requiring investigation to determine need and nature of corrective

measures. Obstruction: Waterway moderately restricted by trees, shrubs, or sedimentation.

4 Alignment: Is causing embankment erosion and undercutting of structure. Scour: Protection required due to bed scour or bank erosion. Obstructions: Partial blockage of channel enough to increase the flow velocity in the immediate vicinity of the bridge substructure units."

3 Alignment: Scour due to alignment threatening structure or approach embankment. Scour: The structure has been displaced or settled due to bank erosion. Obstructions: Drift is directing channel flow towards the bridge bent.

2 Alignment: Structure or approach weakened by scour due to poor alignment. Scour: Structure or roadway weakened by bank erosion or bed scour, danger of collapse with next flood. Obstructions: Channel blocked by massive drift accumulation.

1 Alignment: Channel directed at embankment causing severe scour of approach embankment. Scour: Structure or approach weakened, danger of immediate collapse. Roadway: Closed to traffic.

0 Alignment: Washed out by flood action. Roadway: Closed to traffic.

Note: *The bridge inspector will use the following boundary parameter when rating this NBI Item: 4 bridge length upstream and 4 bridge lengths downstream.*

NBI Item 62

Culvert Condition Assessment

This item evaluates the alignment, settlement, joints, structural condition, scour, and other items associated with culverts.

The rating code is intended to be an overall condition evaluation of the culvert. Integral wingwalls to the first construction or expansion joint shall be included in the evaluation. For a detailed discussion regarding the inspection and rating of culverts, consult Report No. FHWA-IP-86-2, Culvert Inspection Manual, July 1986.

Item 58 - Deck, Item 59 - Superstructure, and Item 60 Substructure shall be coded N for all culverts.

Rate and code the condition in accordance with the previously described general condition ratings and the following descriptive codes:

Code	Description
N	Not Applicable. Use if structure is not a culvert.
9	No deficiencies.
8	No noticeable or noteworthy deficiencies which affect the condition of the culvert. Insignificant scrape marks caused by drift.
7	Shrinkage cracks, light scaling, and insignificant spalling which does not expose reinforcing steel. Insignificant damaged caused by drift with no misalignment and not requiring corrective action. Some minor scouring has occurred near curtain walls, wingwalls, or pipes. Metal culverts have a smooth symmetrical curvature with superficial corrosion and no pitting.
6	Deterioration or initial disintegration, minor chloride contamination, cracking with some leaching, or spalls on concrete or masonry walls and slabs. Local minor scouring at curtain walls, wingwalls, or pipes. Metal culverts have a smooth curvature, non-sysmetrical shape, significant corrosion or moderate pitting.
5	Moderate to major deterioration or disintegration, extensive cracking and leaching, or spalls on concrete or masonry walls and slabs. Minor settlement or misalignment. Noticeable scouring or erosion at curtain walls, wingwalls, or pipes. Metal culverts have significant distortion and deflection in one section, significant corrosion and deep pitting.
4	Large spalls, heavy scaling, wide cracks, considerable efflorescence, or opened construction joint permitting loss of backfill. Considerable settlement or misalignment. Considerable scouring or erosion at curtain walls, wingwalls, or pipes. Metal culverts have significant distortion and deflection throughout, extensive corrosion or deep pitting.
3	Any condition describe in Code 4 but which is excessive in scope. Severe movement or differential settlement of the segments, or loss of fill. Holes may exist in walls or slabs. Integral wingwalls nearly severed from culvert. Severe scour or erosion at curtain walls, wingwalls or pipes. Metal culverts have extensive corrosion or deep pitting with scattered perforations.

2 Integral wingwalls collapsed, severe settlement of roadway due to loss of fill. Section of culvert may have failed and can no longer support embankment. Complete undermining at curtain walls and pipes. Corrective action required to maintain traffic. Metal culverts have extreme distortion and deflection throughout with extensive perforations due to corrosion.

1 Br. Closed. Corrective action may put back in light service.

0 Br. Closed. Replacement necessary.

Corrugated Metal Culvert Pipe (CMP) Supplementals

8 Shape: good, smooth curvature in barrel. Horizontal: with 10% of design. Seams or Joints: tight, no openings. Metal: Aluminum - superficial corrosion, slight pitting. Steel - superficial rust, no pitting.

7 Shape: generally good, top half of pipe smooth but minor flattening of bottom. Horizontal Diameter: within 10% of design. Seams or Joints: minor cracking at a few bolt holes, minor joint or seam opening, potential for backfill infiltration. Metal: Aluminum - moderate, no attack of core alloy. Steel - moderate rust, slight pitting.

6 Shape: fair, top half has smooth curvature but bottom half has flattened significant. Horizontal Diameter: within 10% of design. Seams or Joints: minor cracking at bolts is prevalent in one seam in lower half of pipe. Evidence of backfill infiltration through seams or joints. Metal: Aluminum - significant corrosion, minor attack of core alloy. Steel - fairly heavy rust, moderate pitting.

5 Shape: generally fair, significant distortion at isolated locations in top half and extreme flattening of invert. Horizontal Diameter 10 to 15% greater than design. Seams or Joints: moderate cracking at bolt holes along one seam near bottom of pipe, deflection of pipe caused by backfill infiltration through seam or joint. Metal: Aluminum - significant corrosion, moderate attack of core alloy. Steel -scattered heavy rust, deep pitting.

4 Shape: marginal significant distortion throughout length of pipe, lower third may be kinked. Horizontal Diameter: 10 to 15% greater than design. Seams or Joints: Moderate cracking at bolt holes on one seam near top of pipe, deflection caused by loss of backfill through open joints Metal: Aluminum - extensive corrosion, significant attack of core alloy. Steel - extensive heavy rust, deep pitting.

3 Shape: poor with extreme deflection at isolated locations, flattening of crown, crown radius 20 to 30 feet. Horizontal Diameter: > 15% of design. Seams: 3” long cracks at bolt holes on one seam. Metal: Aluminum - extensive corrosion attack of core alloy, scattered perforations. Steel - extensive heavy rust, deep pitting, scattered perforations.

2 Shape: critical, extreme distortion and deflection throughout pipe, flattening of crown, crown radius over 30 feet. Horizontal Diameter: > 20% than design. Seams: plate cracked from bolt to bolt on one seam. Metal: Aluminum - extensive perforations due to corrosion. Steel - extensive perforations due to rust.

1 Shape: partially collapsed with crown in reverse curve. Seams: failed. Road: closed to traffic.

0 Pipe: totally failed. Road: closed to traffic.

Concrete Culverts (RCBC’s) Supplementals

8 Alignment: good, no settlement or misalignment. Joints: tight with no defects apparent. Concrete: no cracking, spalling or scaling present; surface in good condition. Footings: good with no invert scour.

7 Alignment: generally good; minor misalignment at joints; no settlement. Joints: joint material deteriorated at isolated locations. Concrete: minor hairline cracking at isolated locations; slight spalling or scaling present on invert or bottom of the top slab. Footings: good with only minor invert scour.

6 Alignment: fair, minor misalignment and settlement at isolated locations. Joints: joint material generally deteriorated, minor separation, possible infiltration or exfiltration; minor cracking or spalling at joints allowing exfiltration. Concrete: extensive hairline cracks, some with minor delaminations; scaling less than 0.25” deep or small spalls present on the invert or bottom of top slab. Footings: minor scour near footings.

5 Alignment: generally fair; minor misalignment or settlement; possible piping. Joints: open and allowing backfill to infiltrate; significant cracking or spalling at joints. Concrete: crack opening > 0.12”; significant delamination and moderate spalling exposing reinforcing steel; large areas of surface scaling > 0.25” deep. Footings: moderate scour along footing; protective measures may be required.

4 Alignment: marginal; significant settlement and misalignment, evidence of piping. Joints: differential movement and separation of joints, significant infiltration or exfiltration at joints. Concrete: extensive cracking with crack opening > 0.12” (1/8”) with efflorescence; spalling has caused exposure of rebars with are heavily corroded; extensive surface scaling on invert greater than 0.5” deep.

3 Alignment: poor with significant ponding of water due to sagging or misalignment pipes; end section drop-off has occurred. Joints: significant openings and differential movement; infiltration or exfiltration causing misalignment of culvert and settlement or depressions in roadway. Concrete: extensive cracking with spalling, delaminations, and slight differential movement; scaling has exposed reinforcing steel in bottom of top slab or invert. Footings: severe undermining with slight differential settlement causing minor cracking or spalling in footing and walls.

2 Alignment: critical; culvert not functioning due to sever misalignment. Concrete: severe cracks with significant differential movement; concrete completely deteriorated in isolated locations in top slab or invert. Footings : severe undermining with significant differential settlement causing severe cracks.

1 Culvert: partially collapsed. Road: closed to traffic. Footings: severe undermining resulting in partial collapse.

0 Culvert: total failure of culvert and fill. Road: closed to traffic.

NBI Item 70

Bridge Posting

The National Bridge Inspection Standards require the posting of load limits only if the maximum legal load configurations in the State exceeds the load permitted under the operating rating. If the load capacity at the operating rating is such that posting is required, this item shall be coded 4 or less. If no posting is required at the operating rating, this item shall be coded 5.

This item evaluates the load capacity of a bridge in comparison to the State legal load. It differs from Item 67 - Structural Evaluation in that Item 67 uses Item 66 - Inventory Rating, while the bridge posting requirement is based on Item 64 - Operating Rating.

Although posting a bridge for load-carrying capacity is required only when the maximum legal load exceeds the operating rating, highway agencies may choose to post at a lower level.
This posting practice may appear to produce conflicting coding when Item 41 - Structure Open, Posted or Closed to Traffic is coded to show the bridge as show the bridge as actually posted at the site and Item 70 - Bridge Posting is coded as bridge posting is not required. Since different criteria are used for coding these 2 items, this coding is acceptable and correct when the highway agency elects to post at less than the operating rating. Item 70 shall be coded 4 or less only if the legal load of the State exceeds that permitted under the operating rating.

The use or presence of a temporary bridge affects the coding. The actual operating rating of the temporary bridge should be used to determine this item. However, the highway agency may choose to post at a lower level. This also applies to bridge shored up or repaired on a temporary basis. The degree that the operating rating is less than the maximum legal load level may be used to differentiate between codes. As a guide and for coding purposes only, the following values may be used to code this item:

Code	Relationship of Operating Rating to Maximum Legal Load
5	Equal to or above legal loads
4	0.1 - 9.9% below
3	10.0 - 19.9% below
2	20.0 - 29.9% below
1	30.0 - 39.9% below
0	> 39.9% below

Note: *Due to the state's continuous trip permits, if a bridge is posted for something above the state maximum legal load, NBI Item 41 = P and NBI Item 70 = 5*

Note: *All load rating data is downloaded the load rating database at least twice per year (April & October) in prep for the FHWA submittal.*

NBI Item 71

Waterway Adequacy

This item appraises the waterway opening with respect to passage of flow through the bridge. The following codes shall be used in evaluating waterway adequacy. Where overtopping frequency information is available, the chance of overtopping descriptions mean the following: **Remote:** > 100 yrs. **Slight:** 11 - 100 yrs. **Occasional:** 3 - 10 yrs. **Frequent:** < 3 yrs.

Code	Description
N	Bridge not over a waterway.
9	Bridge deck and roadway approaches above flood water elevations. Chance of overtopping is remote.
8	Bridge deck above roadway approaches. Slight chance of overtopping roadway approaches.
6	Slight chance of overtopping bridge deck and roadway approaches.
4	Bridge deck above roadway approaches. Occasional chance of overtopping roadway approaches with insignificant traffic delays.
3	Bridge deck above roadway approaches. Occasional chance of overtopping roadway approaches with significant traffic delays.
2	Occasional overtopping of bridge deck and roadway approaches with significant traffic delays.
2	Frequent overtopping of bridge deck and roadway approaches with significant traffic delays.
2	Occasional or frequent overtopping of bridge deck and roadway approaches with severe traffic delays.
0	Bridge closed.

Note: *These codes are for Principal Arterials, Interstate Freeways or Expressways. If the route is an Other Principal, Minor Arterial, or Major Collector the code may be interpolated upward. If the route is a Minor Collector or Local the code may be interpolated above that of a Minor Arterial or Major Collector.*

NBI Item 72

Approach Roadway Alignment

Code the rating based on the adequacy of the approach roadway alignment. This item identifies those bridges which do not function properly or adequately due to the alignment of the approaches. It is not intended that the approach roadway alignment be compared to current standards but rather to the existing highway alignment. This concept differs from other appraisal evaluations. The establishment of set criteria to be used at all bridge sites is not appropriate for this item. The basic criteria is how the alignment of the roadway approaches to the bridge relate to the general highway alignment for the section of highway the bridge is on.

The individual structure shall be rated in accordance with the general appraisal rating guide in lieu of specific design values. The approach roadway alignment will be rated intolerable (a code of 3 or less) only if the horizontal or vertical curvature requires a substantial reduction in the vehicle operating speed from that on the highway system. A very minor speed reduction will be rated a 6, and when a speed reduction is not required, the appraisal code will be an 8. Additional codes may be selected between these general values.

Speed reductions necessary because of structure width and not alignment shall not be considered in evaluating this item.

Assessment Guide

- *No reduction from the average speed used on the highway = 8*
- *1/5 speed reduction (minor reduction) = 6*
- *1/2 speed reduction (intolerable) = 3*

NBI Item 103

Temporary Structure Designation

Code this item to indicate situations where temporary structures or conditions exist. This item should be blank if not applicable. Temporary structure(s) or conditions are those which are required to facilitate traffic flow. This may occur either before or during the modification or replacement of a structure found to be deficient. Such conditions include the following:

- Bridges shored up, including additional temporary supports.
- Temporary repairs made to keep a bridge open.
- Temporary structures, temporary runarounds or bypasses.
- Other temporary measures, such as barricaded traffic lanes to keep the bridge open.

Any repaired structure or replacement structure which is expected to remain in place without further project activity, other than maintenance, for a significant period of time shall not be considered temporary. Under such conditions, that structure, regardless of its type, shall be considered the minimum adequate to remain in place and evaluated accordingly.

If this item 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:

Item 10 - Inventory Route, Minimum Vertical Clearance

Item 41 - Structure Open, Posted, or Closed to Traffic

Item 47 - Inventory route, Total Horizontal Clearance

Item 53 - Minimum Vertical Clearance Over Bridge Roadway

Item 54 - Minimum Vertical Underclearance

Item 55 - Minimum Lateral Underclearance on Right

Item 56 - Minimum Lateral Underclearance on Left

Item 70 - Bridge Posting

NBI Item 108

Wearing Surface / Protective System

The wearing surface and deck protective system shall be coded using a 3 segment code composed of the following:

1st Digit - (Item 108A): Type of Wearing Surface

Code	Description
1	Monolithic Concrete (incl HPC) (placed with struct. deck)
2	Integral non-mod.- Concrete Overlay
3	Structural Overlays w/modified additive
4	Low Slump Concrete
5	Epoxy or Polymer Overlay
6	Bituminous (AC)
7	Wood or Timber
8	Gravel
9	Other
0	None (no additional concrete thickness or wearing surface is included in the deck)
N	Not Applicable (applies only structures with no deck)

2nd Digit - (Item 108B): Type of Membrane

1	Built-up
2	Preformed Fabric
3	Epoxy
8	Unknown
9	Other
0	None
N	Not Applicable (applies only structures with no deck)

3rd Digit - (Item 108C): Deck Protection

1	Epoxy Coated Reinforcing
2	Galvanized Reinforcing
3	Other Coated Reinforcing (Stainless)
4	Cathodic Protection
6	Polymer Impregnated
7	Internally Sealed
8	Unknown
9	Other
0	None
N	Not Applicable (applies only structures with no deck)

Note: *Code a Micro-silica Structural Overlay as "Latex Concrete or Similar Additive". Consider a polymer thin overlay to be the same as an "Epoxy Overlay".*

Note: *If the concrete cover over the top mat of rebar is < 2", code 1st digit = "0".*

NBI Item 113

Scour

Use a single-digit code as indicated below to identify the current status of the bridge regarding its vulnerability to scour. Evaluations shall be made by the hydraulic/geotechnical/ structural engineers. Guidance on conducting a scour evaluation is included in the FHWA Technical Advisory T5140.23 titled, "Evaluating Scour at Bridges". Detailed engineering guidance is provided in the Hydraulic Engineering Circular 18 entitled "Evaluating Scour at Bridges".

If the scour code (NBI Item 113) = 2 or less, then the substructure rating (NBI 60) must also be rated as a "2" or less. And other affected items (i.e. load rating, superstructure rating) should be revised to be consistent with severity of observed scour and resultant damage to the bridge.

A plan of action should be developed for each scour critical bridge (see FHWA Technical Advisory T 5140.23, HEC 18 and HEC 23). A scour critical bridge is one with abutment or pier foundation rated as unstable due to (1) observed scour at the bridge site (rating factor of 2, 1, or 0), or (2) a scour potential as determined from a scour evaluation study (rating factor of 3). It is assumed that the coding of this item has been based on an

engineering evaluation, which includes consultation of the NBIS field inspection findings.

Code	Description
N	Bridge not over waterway.
U	Bridge with “unknown” foundation that has not been evaluated for scour. Until risk can be determined, a plan of action should be developed and implemented to reduce the risk to users from a bridge failure during and immediately after a flood event (see HEC 23).
T	Bridge over “tidal” waters that has not been evaluated for scour, but considered low risk. Bridge will be monitored with regular inspection cycle and with appropriate underwater inspections until an evaluation is performed. (“Unknown” foundations in “tidal” waters should be coded “U”.)
9	Bridge foundation (including piles) on dry land well above flood water elevations.
8	Bridge foundations determined to be stable for the assessed or calculated scour condition. Scour is determined to be above top of footing (Example A) by assessment (i.e., bridge foundations are on rock foundations that have been determined to resist scour within the service life of the bridge), by calculation or by installation of properly designed countermeasures (see HEC 23).
7	Countermeasures have been installed to mitigate an existing problem with scour and to reduce the risk of bridge failure during a flood event. Instructions contained in a plan of action have been implemented to reduce the risk to users from a bridge failure during or immediately after a flood event.
6	Scour calculation/evaluation has not been made. (Use only to describe case where bridge has not yet been evaluated for scour potential).
5	Bridge foundations determined to be stable for assessed or calculated scour condition. Scour is determined to be within limits of footing or piles (Example B) by assessment (i.e., bridge foundations are on rock foundations that have been determined to resist scour within the service life of the bridge), by calculations or by installation of properly designed countermeasures (see HEC 23).

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

3 Bridge is scour critical; bridge foundations determined to be unstable for assessed or calculated scour conditions: (1) Scour within limits of footing or piles (Example B) or (2) Scour below spread-footing base or pile tips (Example C).

2 Bridge is scour critical; field review indicates that extensive scour has occurred at bridge foundations, which are determined to be unstable by: (1) a comparison of calculated scour and observed scour during the bridge inspection, or (2) an engineering evaluation of the observed scour condition reported by the bridge inspector in Item 60. Immediate action is required to provide scour countermeasures.

1 Bridge is scour critical; field review indicates that failure of piers / abutments is imminent. Bridge is closed to traffic. Failure is imminent based on: (1) a comparison of calculated and observed scour during the bridge inspection, or (2) an engineering evaluation of the observed scour condition reported by the bridge inspector in Item 60.

0 Br. is scour critical. Br. has failed and is closed to traffic.

A. Above top of footing

B. Within limits of footing or piles

C. Below pile tips or spread ftg

Scour: Erosion generally refers to loss of bank material and a lateral movement of the channel. Scour is more related to a lowering of the stream bed due to the removal and transporting of stream bed material by flowing water. Scour may be classified into two types: local scour and general scour.

(1) Local scour is located at and usually caused by a specific flow obstruction or object which causes a constriction of the flow.

(2) General scour extends farther along the stream and is not localized around a particular obstruction. General scour can involve a gradual, fairly uniform degradation or lowering of the stream channel. It can also result in abrupt drops in the channel that move upstream during peak flows. This type of scour is referred to as head cutting. Head cutting may be a serious problem, if it is occurring in the channel downstream from the structure, since it may threaten the structure as it moves upstream.

That is if the scour code (NBI Item 113) = 2 or less, then the substructure rating (NBI 60) must also be rated as a "2" or less.

Process for Monitoring Scour and Coding NBI Item 113 Scour Code

The **above water bridge inspectors** will be responsible for performing the following:

- Assure that a X-Channel Profile is on file for every bridge that is located over a waterway.
- Assure that a UW Inspection is performed on all structures with bridge elements in non-wadable waterway.
- Review and question the reasonableness of the designated scour code for the bridge. If the scour code seems unreasonable, request that the scour evaluation be reviewed by the ODOT Bridge Hydraulics Engineer along with sufficient field data, pictures, and a narrative description that supports that conclusion, i.e., scour countermeasures installed.

The **ODOT Underwater Dive Team** will perform the following:

- Assure that the ODOT Scour Database is kept current and up-to-date.
- Assure that an UW Inspection is performed on all structures with bridge elements in a non-wadable waterway.
- Assure that all structures over water have a X-Channel Profile and that it is current and up-to-date.

- Review and question the reasonableness of the designated scour code for the bridge. If the scour code seems unreasonable, request that the scour analysis be reviewed by the ODOT Bridge Hydraulics Engineer along with field data, pictures, and a narrative description that supports that conclusion, i.e., scour countermeasures installed.

The **ODOT Bridge Hydraulics Engineer Unit** will perform the following:

- Perform a Scour Evaluation on all new and existing structures in the inventory that are located over a waterway.
- Provide the UW Dive Team Manager and the Bridge Inventory Coordinator with sufficient scour evaluation information and documentation to support the coding of NBI Item 113.
- Evaluate all scour countermeasures to see if they were designed and constructed in accordance with HEC 18.
- Respond to reasonableness review questions generated by the bridge inspectors in the field.

The **ODOT Bridge Inventory Coordinator** will perform the following:

- Keep the ODOT Hydraulics Engineer, the UW Inspection Unit, and the above water inspectors posted on all new structures.
- Assure that the most up-to-date information is coded in the Bridge Inspection Database for the FHWA Submittals.

Note: *Only the ODOT Bridge Hydraulic Engineer will be allowed to change NBI Item 113 - Scour Code.*

NBI Notes (Non-dynamic items)

Historical Structure (NBI 37)

Structures that meet the following criteria:

► Slab, beam and girder bridges that exhibit any of the following:

- Very early construction
- Extreme scale or other engineering challenge
- Ornate or architectural treatment (railing, entrance pylons, facia, orate details)
- Bridge that embody distinctive technology, Requires further study. i.e. largest of its kind, etc.

- Truss bridge built before 1955.
- Arch bridge built before 1955.

Code	Description
1	Bridge is on the National Register of Historic Places
2	Bridge is eligible for the National Register
3	Bridge is possibly eligible for the National Register.
4	Historic significance is not determinable at this time.
5	Br. is not eligible for the National Register of Historic Places.

NBI Web Site : http://www.fhwa.dot.gov/bridge/nbis/

Process for Obtaining Bridge Clearance

The bridge inspection team leader is responsible for assuring information contained in the bridge inventory and any on-bridge clearance signing is accurate and up-to-date. NBI Bridge Inventory Clearance Items are as follows:

Item 10 - Inventory route, Minimum Vertical Clearance

Item 32 - Approach Roadway Width

Item 50 - Curb and Sidewalk Widths

Item 51 - Bridge Roadway Width, curb-to-curb

Item 52 - Deck Width, out-to-out

Item 53 - Minimum Vertical Clearance over Bridge Roadway

Item 54 - Minimum Vertical Underclearance (ft-in)

Item 55 - Minimum Lateral Underclearance on right (0.1 ft)

Item 56 - Minimum Lateral Underclearance on left (0.1 ft)

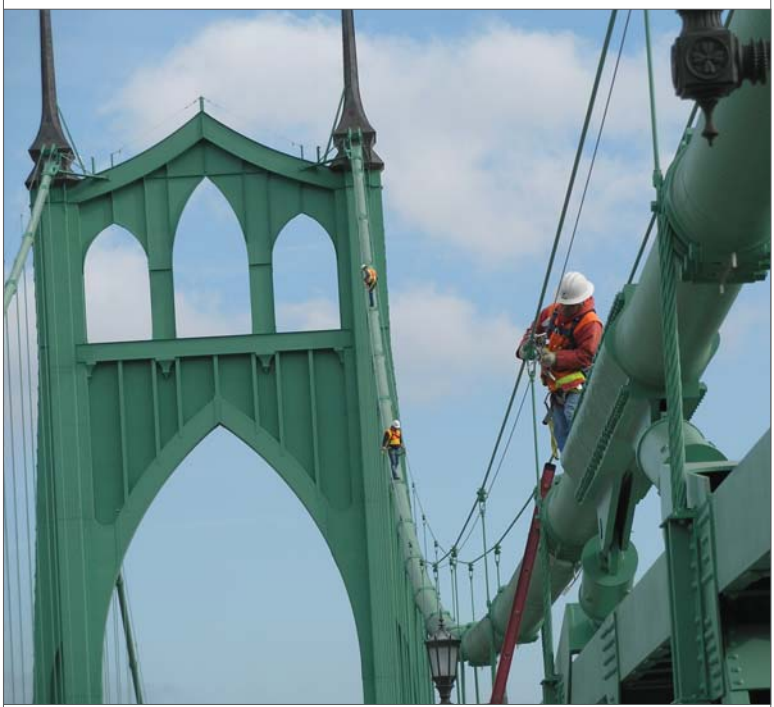
The bridge clearance diagrams can be accessed either via the ODOT Bridge Inspection Report Web Page or the Bridge Clearance folder on Bridge Server ‘S7000B. All clearance dimensions reported are exact dimensions with no buffer. For repeatability purposes, all vertical dimensions are measured directly over each fog, skip line, and face of barrier.

NBI Item 64 & 66

Non-Load Rating Structure

Until such time as a load rating has been performed, so the Sufficiency Rating can be calculated, use the following assumed values:

- If the bridge is concrete or steel, built after 1944 and the superstructure or substructure are ≥ 6 ► use HS-20 loading.
- If the bridge is concrete or steel, built before 1944 and the superstructure or substructure are ≥ 6 ► use HS-15 loading.
- If the bridge is concrete or steel and the superstructure or substructure are ≤ 5 ► use a default value of H-10 loading.
- If the bridge is timber and the superstructure or substructure are ≥ 6 ► use HS-15 loading.
- If the bridge is timber and the superstructure or substructure are ≤ 5 ► use H-10 loading.



NBI Item 125

Embankment Protection

Use a single-digit code as indicated below to identify the adequacy of the embankment protection and an assessment of the potential for channel scour to occur in the bridge roadway approach embankment. The area that is to be considered for this assessment is bounded by the following parameters: Defined within a 1:1 slope (angle of repose) line projected in all directions from the end of the bridge / impact panel, with the height being measured at the first interior bent. This means that the assessment area for a bridge that is quite high will cover a considerably large area, whereas the assessment area on a low bridge will cover a rather small area. The height of the bridge is measured at the first interior bent.

Embankment Erosion could be a result of channel alignment, roadway surface run-off, or flows in the adjacent roadway drain ditch.

Guidance on conducting an evaluation of at the embankment protection is offered in the ODOT Hydraulics Manual, Chapters 3 and 10.

Code	Description
9	Slopes evaluated as above flood flow elevations.
8	Slopes evaluated as stable to resist the flood of maximum scour potential.
7	Slopes have countermeasures installed to correct a previously existing scour prob. and the slopes are now stable.
6	Slope evaluation has not been made.
5	Slopes evaluated as presently stable.
4	Slopes evaluated as poorly protected against flooding; additional protection is needed to resist the flood of maximum scour potential
3	Slopes evaluated to be vulnerable and not protected.
2	Embankment Erosion has occurred and if left unchecked, would affect the functionality of the approach roadway, shoulder, or the stability of the approach railing. Immediate action is required to mitigate the deficiency.

Bridge Inspection Coding Guide Commentary

COMMENTARY (General Notes)

Rules of Orientation and Unit Labeling Conventions

Generally, very few people in the field have in their possession a complete copy of the bridge plans. In order to clearly lead the reader of the bridge inspection report to the specific location, the bridge inspector must adhere to the following rules:

Rules of Orientation

Looking ahead on line at increasing milepost or increasing city street addresses.

If mileposts or city street addresses are unavailable, assume that milepoint “0” is located at the road connection with the higher road classification, i.e., milepoint zero is probably not at the dead end.

If all else fails, orientate with the object under the structure - looking upstream at increasing river MP or at increasing mileposts of the route under and numbering bents / spans from left to right.

Substructure Labeling Convention

All bridge substructure / foundation connection points will be labeled as bents. Piers are called bents.

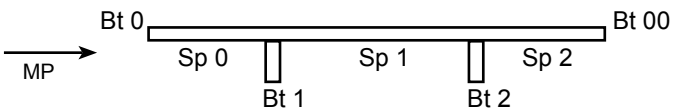
Rules for Numbering Bridge Bents

Looking ahead on line at increasing milepost or increasing city street addresses, the bents are number in consecutive order starting with the number “1”.

Cantilevered bridge ends are not classified as a bent. However, to allow location of deficiencies, the leading cantilevered bridge end is labeled bent “0” and the trailing cantilevered bridge end id labeled bent “00”.

Rules for Numbering Bridge Spans

Looking ahead on line at increasing milepost or increasing city street addresses, the spans are numbered in consecutive order, following the designated bent with the same number, i.e., Span 1 would follow bent 1. Since the leading cantilevered bridge end is labeled “0”, the following span would be labeled span “0”.



Rules for Labeling Traffic Lanes

Looking ahead on line at increasing milepost or increasing city street addresses, the lanes are numbered numerically in consecutive order, from right to left.

Rules for Numbering Bridge Members

Looking ahead on line at increasing milepost or increasing city street addresses, **all permanent bridge members** are numbered in consecutive order, from left to right, starting with the number “1”.

All **truss panel points** will be numbered consecutively in the same direction as the designated bent / span number, along with several designations to indicate where the panel point is located in the truss i.e., L (left truss), R (right truss), L0 (leading end of lower chord), U1 (leading end of upper chord), or M1 (intermediate connection point), with L0 being located over the first bearing supporting the leading end of the truss.

If the bridge has **INTERMEDIATE SPANS or COLUMNS** that are founded on a larger arch span, the spans and support columns will be numbered consecutively, in the same direction as the designated bent / span numbers, alphabetically along with the larger span number designation, i.e., 5A, 5B, etc., where columns 5A are located directly over bent 5.

If the structure has a **Y-Leg or K-frame Substructure**, the Y-Leg SPAN directly above the Y-leg footing will carry that bent / span number, along with an “A” designation. The next ensuing span will carry the bent number along with a “B” designation. When looking at a profile of the structure with the bent numbers increasing from left to right, the Y-leg COLUMNS on the left will carry the bent number along with an “A” designation, and the Y-leg columns on the right will carry a “B” designation.

If the structure has a bent with **multiple rows of piling**, the piling rows will be listed in alphabetical order along with that designated bent number.

In order to locate specific **Rivets** in a connection**,** the rivets are numbered left to right in consecutive order starting from the upper left corner of the riveted connection

General - Inventory

Inventory CFR 650.315 requires an inventory file to be created and maintained for all structures subject to the NBIS. These are structures that *1) Fit the definition of a bridge 2) Located on a public road 3) Carry vehicular traffic 4) Maintained by a public agency and 5) Does not include commercial parking structures or their ingress or egress ramps.* However, ODOT requires all structures that are located on, over, under or immediately adjacent to a designated state highway route, that are 6 feet or larger, where a structure failure could cause an immediate endangerment or impact to the traveling public. That portion of the structure must be inventoried and periodically inspected by a certified bridge inspector.

Closed Structure Inventory If a superstructure has been closed and all traffic has been shifted over onto a detour structure, that is to remain in place longer than 5 years, the inventory should be handled as follows:

- The existing structure must be permanently closed to traffic.
- NBI Item 41 should be changed to an “E”.
- Reduce the list of elements for the existing structure to only 1 - element “900”.
- So that ODOT is not double dipping on the acquisition of federal funds, a new file should not be created specifically for the detour structure. That is to say all information associated with the detour structure must be integrated into the original bridge inventory file.
- Add the list of elements contained in the detour bridge to the existing bridge file
- All elements contained in the existing structure file will have NBI Item 103 = T
- The inspector is to perform and report an element level inspection on the detour structure
- All NBI Ratings (58, 59, 60, 61, or 62) will be related to the existing structure.
- The inspection frequency should continue as specified for the original bridge

Inventory If the superstructures of two immediately adjacent structures are not connected, they should be inventoried as two separate structures. Especially, if one is older and in worse condition than the other.

Inventory - State inventory contains all structures that are 6 feet and larger. Local and Other Agency inventory only contains the NBI structures (20 feet and longer).

Non-NBI Bridges Inventory all non-NBI bridges using bridge elements not a culvert element. Inspect non-NBI bridges at the frequency specified for a NBI bridge, not as per the accepted culvert inspection frequency guideline.

Detour Structures If a detour structure is constructed during the course of a bridge replacement project, the structure is treated in the same manner as a temporary repair (coding items 10, 41, 47, 53, 54, 55, 56, and 70 accordingly), with one exception: the detour bridge elements will be added to the bridge inventory and periodically inspected at the frequency dictated by the condition of the original bridge. Original bridge number is retained.

Reporting Incident Driven Deficiencies vs Deterioration If a deficiencies is cased by some non-deterioration mode the deficiency must be reported using one of the smart flags. If the deficiency is deterioration related, report using one of the core bridge elements.

Serviceability Term definition as used in the condition state language is that the element is no longer functioning as the bridge designer had intended.

Reporting Bridge Strengthening Measures If the strengthening measure has been classified as a temporary repair, NBI item 103 = Y for the bridge element that was strengthened, NBI item 41 (Status) = D, and the temporary measures would not be inventoried. If the strengthening measures are classified as “Permanent Repairs”, NBI Item 103 = N, for the bridge elements that were strengthened, NBI Item 41 (Status) = A, and the strengthening measures would be inventoried and documented accordingly, also fill out the info on the ODOT tab in PONTIS.

Permanent strengthening measures are usually considered to be those OTIA type repairs such as externally supported, externally reinforced or post-tensioned, FRP wraps, or internally doweled members. Temporary measures are usually considered to be short term repairs, until a more significant action can be taken, such as temporary structural shoring.

(**Note**: Refer to NBI Item 103 for more details)

Amending Bridge Data The SI&A and/or the bridge condition assessment data must be updated when the structure data has

changed significantly (2 NBI numbers, 2 Element CS ratings, inventory data that affects the sufficiency rating).

Accomplish by highlighting the structure on the list in PONTIS, clicking the “New” button, checking the duplicated data and element boxes, and then selecting either “interim or one of the special inspections” in the Primary Type box of the dialog window. Next, placing an inspection note as to what portion of the bridge was inspected or changed in the “Inspection Notes” box on the “Notes” tab and the “Element Notes” box on the Condition tab.

Note: *Be sure to check the ODOT Tab to make sure the “Inspection” date entries are correct.*

Scheduling Next Activity When scheduling the next inspection, always schedule for the 1st day of the month. All routine inspections are due within the month they are due. All other inspections are due within the year they are due.

Clearance Dimensions “All structures that have a clearance less than 15 foot must have a clearance sign, showing the exact dimension, posted on the structure, at the location of the restriction.” If any dimensional change is noted that might restrict vehicular traffic, the inspector must immediately notify ODOT Motor Carrier Office and update the clearance diagram. All clearance documents will contain exact dimensions only. Only the Motor Carriers applies the 4” buffer when routing trucking industry.

Location of Bridge Clearance Information Data is contained on: SI&A, Bridge log, Bridge Clearance Diagrams, and Motor Carriers Database, e.g.

- Raw Bridge Clearance Information - VCMS Laptop
- SI&A Clearance Information - Bridge Inventory Database
- Bridge Clearance Diagrams - Bridgemgmt on Server S7000B
- Official Bridge Clearance Information (Corporate Data) - in ITIS
- Bridge Log Clearance Information - on Dick Groff’s computer

Users of Bridge Clearance Information Bridge Section - STIP Planning, FHWA - Military Planning, Motor Carriers - Freight Routing, Project Managers - Project Development, And Districts - Incident Management

Required Clearance Information Minimum vertical clearance measurement **over lane line,** exterior lane stripes, edge of pavement or face of barrier. Horizontal dimension of each lane line and width of shoulders.

Condition Assessments As noted on page **4** it is of utmost importance that the physical condition of all members be evaluated with due reference to the associated load path and assessing the ability of that member to carry and transfer all loads imparted onto it. This concept will have a direct impact on the quantity being reported in a given condition state.

Condition Assessment of Members - Determining how much of a member should be reported in a particular condition state, unless otherwise stated, depends on how the member is supported. Only the portion located between adjacent supports should be included in a particular condition state assessment. Exception - reporting all in 1 condition state.

Inspection Remarks - Describe any condition or deficiency that is note worthy or has a potential for getting worse.

As a minimum, remarks should be made for any condition state rating of 3 or worse. There should also be a description of any temporary repair that may exist.

Inspection Remarks - Noteworthy Remarks are generally those that are associated with the load path, items that might create a traffic hazard, or items that might intensify our concerns for scour at the bridge site. Use Miscellaneous Element 990 to address items that are not associated with a bridge element.

Miscellaneous Elements - The purpose of this element is so the bridge inspector can enter “Remarks” and “Maintenance Recommendations” on non-inventoried members. Since they cover a variety of items, they do not have a quantity, condition states or feasible actions. Condition State 1 will always show 100%.

Paint System - Do not use this element for structures that only have painted members that would normally not be included in a structure paint project.

Temporary Repairs - Do not include members that are associated with temporary repairs in the element quantity. The condition assessment of the bridge is reported as if the temporary repairs were not there.

Concrete Deterioration - Concrete cover performs the same function as a paint system on a steel bridge. Therefore anything that reduces that protective cover, whether from traffic abrasion, streambed abrasion, or construction deficiencies such as a rock pocket can be considered as deterioration of the member.

Collision Damage Repairs - If a portion of the original cross sectional area of a structural member is permanently removed,

during the course of making repairs, it would be appropriate to use the “Section Loss Smart Flag” (#363), to report the situation.

Condition Reporting - Since the information generated by the element level inspection is used to drive the PONTIS Bridge Management System, deterioration is reported using the Condition States for the element. Since Incident damage is not modelable, it is generally reported by using one of the available smart flags.

Railroad Structures - A copy of the bridge inspection report on these structures should be forwarded to Zach Hunter, ODOT Railroad Liaison. Zach forwards the inspection reports on to the appropriate railroad company for their disposition. Zach Hunter Contact Info: 355 Capitol St NE, Rm 417, Salem, OR 97301

Image Documentation - Available file storage space should be considered when filing images. Stored images on the bridge server should meet the following criteria:

- *Plan View of the bridge*
- *NBI rating of 4 or less*
- *Profile View of the bridge*
- *A portion of an element is in the most advanced condition .*
- *Load Posting Signs state of deterioration*
- *Note worthy deficiencies that have the potential for getting worse*
- *Temporary Repairs*
- *Historical Bridge Plaques*

The image label should include a “IM” prefix, bridge number, and a name or description of the item being viewed

File Naming Conventions - In order for the bridge inspection web page queries to work properly, the inspection file names must adhere to the following file naming convention, where XXXXXX = bridge no; extension can be .xls or .doc

- *Boring (folder) - TBXXXXXX.xls*
- *Underwater Inspections (folder) - UWXXXXXX.xls*
- *Bridge Clearance (folder) - CLXXXXXX.xls*
- *Cross Channel Profiles (folder) - XCXXXXXX.xls*
- *Deck Surveys (folder) - DKXXXXXX.xls*
- *Concrete Shear Cracks (folder) - CRXXXXXX.xls*
- *Drawbridge Inspections (folder) - DWXXXXXX.xls*
- *Tunnel Inspection Reports (folder) - TUXXXXXX.xls*
- *Fracture Critical Inspections (folder) - FCXXXXXX.xls*
- *Sign Support Structure (folder) - SSXXXXXX.xls*
- *Job Hazard Assessment (folder) - JHAXXXXX.doc*
- *Fatigue Prone Inspections (folder) - FPXXXXXX.xls*

Official Inspection Report of Record

Signed by the Bridge Inspection Team Leader and filed in the ODOT Bridge Section file. Signature certifies the inspection was performed in accordance with the NBIS.

Business Practices of Making Changes to the Official Bridge Inspection Report

Updating required when the inspector becomes aware that the condition assessment of a structure has changed (2 NBI Rating Numbers or 2 Element CS Ratings) within 90 days (state) or 180 days (local).

Can perform and file a cursory inspection if the next scheduled routine inspection is within 6 months. Otherwise, will require a full inspection of the entire bridge and filing a new inspection-of-record.

All reports must be dynamic, rather than having separate reports for separate inspection dates. If a report (worksheet) is located on several different tabs, all info needs to be wrapped into the first tab. Cross-channel profiles must be “published” because macros can not be converted to a .pdf file format. All sketches and images must be inserted into the document rather than simply providing a link.

The routine inspection report is considered to be a compilation of all known bridge condition information. Therefore, the bridge inspector is responsible for collecting, collating, and integrating the information into the routine inspection report.

“When the bridge inspector signs and posts the official bridge inspection report-of-record they are considered to be the official owner of that report and the data contained in that report at that point in time. However, as time passes conditions do and will change. As a result, others might enter additional information into the file but is limited to remarks or maintenance/repair recommendations. Only the assigned bridge inspector is authorized to change the condition assessment ratings.”

Note Boxes

Each bridge inspector is required to leave enough notes to help the user of the Bridge Inspection Report to interpret the information contained in the report or plan a future activity on the structure. Notes such as:

Remarks Box Notes to provide additional information and help clarify why the bridge inspector rated a particular element. As a minimum, a remark is required for NBI rating < 5 or a portion of an element is in CS 3 or worse. This box is located on the Condition Tab and is associated with each particular element.

Inspection Notes Box Notes to provide additional information about the inspection. Information that includes but not limited to: what additional resources are needed for the inspection or prescribing the bridge inspection strategy, like: schedule the UBIT on every other inspection, or, whether freight mobility is an issue and the process for obtaining a notification from motor carriers, or listing other ancillary assessments that have either been completed or need to be accomplished like: Health Monitoring by Steve Lovejoy or Scour Assessments by John Woodroof for coding NBI Item 113 - when was the assessment performed and by whom. This box is located on the “Notes” Tab.

Bridge Notes Box Notes about the bridge itself, like: Features to be aware of like a railroad, railroad contact information to schedule a flagger, U.S. Coast Guard contact info, whether transient cages are located on the bridge, what keys are needed to access, etc. This box is located on the “Notes” Tab.

Embankment Notes Box Notes about the condition assessment of the approach roadway, when it was performed and by whom (ODOT Bridge Hydraulics Engineer). This box is located on the ODOT Tab.

Load Rating Notes Box Notes about the load rating of the bridge, what members have been strengthened, using what strengthening method or other structural changes that have been made to the bridge not shown on the plans, information on the posting status (Posting data found on photo image, Item 41 changed from one code to and another and why, maintenance that affected the posting status, and temporary repairs. This box is located on the ODOT Tab.

Detour Length Notes Box Notes describing the detour route and how the detour length was calculated. This box is located on the ODOT Tab, Structure Units side tab, in PONTIS.

GPS Coordinate Information Box Where the coordinates came from and how they were obtained, by whom and when. This box is located on the ODOT Tab, Structure Units side tab in PONTIS

Legal Truck Configurations and Loads

Single	Type 3	25 Tons
Semi	Type 3S-2	40 Tons
Combination	Type 3-3	40 Tons

Load Rating Review Notification Criteria

Load raters only need to be notified for bridges that are open to traffic, where there are concerns that the conditions has changed and the issues have not been addressed, like:

- NBI Condition Rating Changes (58, 59, 60)

** If the Load Rating Factor < 1.5 and the condition rating drops to a 3 or less.*

- Increases in Dead Load on a Bridge

** If the Load Rating Factor ≤ 1.1& the WS thickness increases ≥ 2".*

** If the Load Rating Factor is ≥ 1.1& the WS thickness is 5" or more.*

** If the Load Rating Factor is ≤ 1.1 and the Bridge Rail changed from a post and rail configuration to a concrete barrier configuration.*

- Change in the Traffic Impact

** If the Load Rating Factor is <1.1 and Element 325 drops to CS 3.*

- Changes in Temporary Repair Designation

** Adequacy or Condition of Temporary Shoring is questionable.*

** Temp Shoring is changed to Permanent Repairs - NBI Items 103 and 41.*

** Permanent Repairs are determined to be Temporary - NBI Items 103 and 41.*

- It has been determined that the structure is not properly posted - NBI Item 41 = B

In order to document that the load rater notification protocols were followed and to allow the monitoring the status of the request, following the notification the bridge inspector will need to post a maintenance recommendation to review the load rating and assign the recommendation to the load raters. This will allow the request to be monitored via the bridge inspection web page.

Load Posting Signs

- The Weight Limit (R12-1) sign carrying the legend "Weight Limit (XX Tons)" may be used to indicate vehicle weight restrictions including load.

- Where the restriction applies to axle weight rather than gross load, the legend may be “Axle Weight Limit (XX Tons)”- R12-2.
- To restrict trucks of certain sizes by reference to empty vehicle in residential districts, the legend may be “No Trucks Over (XX Tons) Empty Weight” - R12-3.
- In areas where multiple regulations of the type described above are applicable, a sign combining the necessary messages on a single panel may be used, such as Weight Limit (XX Tons) per Axle, (XX Tons) Gross - R12-4.
- Posting of specific load limits may be accomplished by use of the Weight Limit symbol or truck silhouette sign (R12-5). A sign containing the legend “Weight Limit” on the top two lines, and showing three different truck silhouettes and their respective weight limits for which restrictions apply may be used, with the weight limits shown to the right of each symbol as (XX Tons). A bottom line of legend stating “Gross Weight” may be included if needed for enforcement purposes.

Link to Manual Uniform Traffic Control Devices

“www.mutcd.fhwa.dot.gov”

General - Maintenance Needs

Prioritization of Maintenance Needs

Use the pick list in PONTIS to identify all maintenance needs.

Critical - Needs to prevent the structure from being load posted (58, 59, 60, 61, or 62 should have a rating of ≤ 3, NBI 113 = 2)

Urgent - To be repaired As-Soon-As-Possible or to address a specific traffic safety concern. (58, 59, 60, 61 or 62 should have a rating of ≥ 4.)

Routine or Schedule - Schedule the repair activity with other bridge maintenance activities.

Monitor - For the bridge maintenance personnel to schedule site visits when in the area.

Deficiency Documentation and Follow-up Expectations

Our primary concern is to assure that the **structural condition** of the elements that are associated with the load path, items associated with potential **traffic hazards**, or items associated with **bridge scour** are adequately addressed.

The **EXPECTATION** is that the bridge inspection report will contain the following:

If NBI 58, 59, 60, 61 or 62 is rated a “5” or below or A portion of the element is in condition state 3 or below.

- A Remark is made that supports the rating and a specific Maintenance Recommendation for the deficiencies

If NBI 58, 59, 60, 61,or 62 is rated a “4” or below, or A portion of the member is in the most advanced condition state.

- In addition to the above, photographic or sketch documentation of the deficiencies will also be provided

If NBI 58, 59, 60, 61, or 62 is rated a “3” or below and a portion of the member is in the most advanced condition state

- In addition to the above, the bridge inspector will immediately initiate the Critical Deficiency Actions specified in the ODOT Critical Follow-up Document (notification of the appropriate agency officials).
- Notify the Load Rater.

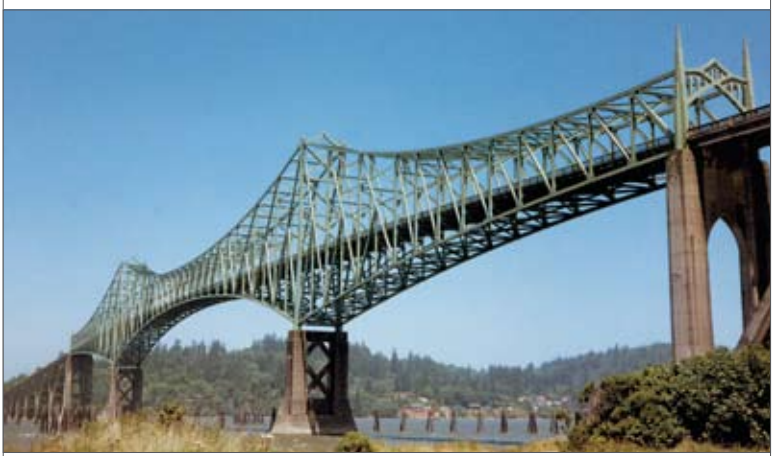
If NBI 113, 58, 59, 60, 61 or **113** is rated a “2” or below and a portion of the member is in the most advanced condition state, or If a structural deficiency requires either a complete or partial

bridge closure, or requires an immediate load restriction of the bridge until repairs can be accomplished, initiate the Significant Deficiency Actions:

- Immediately contact the appropriate agency officials to inform them of the situation, followed by
- A thorough, fully detailed narrative report, supplemented with pertinent digital .jpg images (forward to FHWA).
- Update the bridge inspection database and submit an updated bridge inspection report of record.
- Notify the Load Rater.

QA Itinerary Select

- Bridge is on critical follow-up list
- Bridge is Load Restricted / Posted
- Bridge has Critical / Urgent Bridge Maintenance Needs
- Sufficient Rating is < 50
- Sufficient Rating increasing or sudden drop without maintenance activity
- Inspection frequency ≤ 12 months
- Bridge is scour critical
- NBI Item 113 = 2
- Review work of all inspectors in area
- Review insp on a variety of bridge types and materials
- Quality and thoroughness of supporting supplemental reports/images/documents



Deck Notes

Concrete Deck Description

Transfers loads laterally to a superstructure member. Deck primary reinforcement runs transversely to the center line of the roadway. Slab primary reinforcement runs parallel to the roadway center line.

Concrete Deck Inventory

All spans that are not considered to be a reinforced concrete slab or voided pre-stressed concrete slab, will have a deck element inventoried. The only time a deck element is inventoried on a RC Slab or a Voided P/S Concrete Slab is when a reinforced concrete deck unit is placed on top of the pre-cast concrete units.

Concrete Deck Inventory

For deck areas with multiple protection system, inventory according to the following hierarchy: cathodic system, coated bars, rigid overlay, thin overlay, then AC overlay.

Case 1: If a cast-in-place reinforced concrete deck has been installed on top of precast or pre-fabricated superstructure units, a deck would be inventoried.

Case 2: If separate pre-fabricated deck units are placed on top of pre-cast or pre-fabricated superstructure units, a deck would be inventoried.

Case 3: If the superstructure consists of channel beams (upside down tubs) the stems are assumed to be the same as a girder and the top of the tub is considered to be the same as a deck unit. In this case, a deck would be inventoried.

Case 4: If the superstructure consists of a reinforced concrete slab, a deck will not be inventoried.

Deck Ratings

The deck elements will only be rated if they are present. However, the inspector will provide an NBI Deck Rating irregardless.

If a deck is covered with AC, it is permissible to base the condition assessment on a deck survey report.

If the traffic abrasion has not exposed the deck rebar, report the condition in the Wearing Surface Rating. If the traffic abrasion is extensive enough to expose the deck rebar to traffic impact, consider the deficiency the same as a concrete spalls or delamination in the deck.

Deck Joints

Deck joints are inventoried only where all the following exist:

- There is dis-continuity in the deck reinforcement, **and**
- There is dis-continuity in the superstructure, **and**
- The superstructure members reside on bearings.
- Transverse joint between bridge end and a traffic impact panel. Transverse joints between the end of the bridge and the approach AC is inventoried only when there is an impact panel present.

Deck Joints Covered with AC

By definition, deck joints that are sealed with a poured bituminus crack filler or covered with an AC overlay, should be inventoried as an “Other Expansion Joint - Element #309.

Open joints on each end of a drawspan should be inventoried and rated accordingly.

Longitudinal Deck Joints

Even though these joints are not exactly for expansion or contraction, they should be inventoried and rated accordingly.

Soffit Cracking Smart Flag (#359)

ODOT elected not to follow the national standard of putting all in one base on a percent of deck area exhibiting distress, due to the conflicting condition state language vs percentage statements.

Concrete Deck w/ AC Inventory

Inventory this element when there’s a significant increase in the dead load. This means that the AC extends at least one full span length of a girder line.

Measuring AC Depth

The purpose of recording the AC depth is to correctly calculate the dead load on a structure. The number recorded may be the determining factor of whether a structure is load posted. Coming up with the most correct value takes a certain amount of judgment on the part of the inspector. Here are some examples:

- If the AC depth varies longitudinally on a single span, measure at the middle of the span or take an average depth.
- If the AC depth varies transversely on a single span, gutter-to-gutter, locate and record the maximum **average** depth.
- If the AC depth varies from span-to-span, on a multi-span structure, record the max. depth located on a full girder line.

- Make sure to note in the remarks box what parameter controlled the AC depth. Core all depths > 5”.

Sidewalk Rules

If the sidewalk is cast monolithically with the bridge, the sidewalk is considered to be part of deck and railing element.

If the sidewalk is added to an existing bridge, the sidewalk and railing elements will be inventoried using a Miscellaneous Element 990.

If the sidewalk is self supporting on its own structure, the structure will be inventoried using Element 930.8.35

Bridge Rail Notes

Quantity Measure the length of railing (traffic and/or pedestrian) on the bridge, include railing attached to approach slabs and wing walls.

Inventory If there is more than one railing type at a given location, inventory the type based on the most predominant, crash approved material. The only time there should be two rails inventoried is when there is a separate traffic and pedestrian rail separately by a sidewalk, or if there are two different rail types at two different locations on the bridge. The following 4 cases help guide the coding of the first digit for NBI Item 36:

Case 1: If there are more than one rail type on a single mounting, inventory the type based on the most predominant crash approved material. Ex: A single tube metal rail is mounted on top of a concrete base rail, the concrete rail would be inventoried. If a multi-tube metal rail is mounted on top of a short concrete curb the metal rail would be inventoried.

Case 2: If an additional curb mounted traffic rail has been installed in addition to the original bridge rail, both rail types would be inventoried. If either of the two rail types meet current standards the first digit of NBI 36 = 1.

Case 3: If steel metal tubes have been installed in front of and attached to the concrete posts of an existing bridge rail, as shown on Standard Drawing BR286, the metal rail would be inventoried and the first digit of NBI 36 = 1

Case 4: If there are two different rail types at two different locations on a bridge, both rail types would be inventoried.
Ex: If the original concrete bridge railing is still in-place and a curb mounted metal thrie-beam traffic rail has been installed next to the traffic lane, both rail types would be inventoried. The idea is that both rails are still in-place and both are still maintained.

Protective Screening Do not inventory protective screening as bridge railing. Use the miscellaneous element / member.

Bridge Rail Anchorages The condition of the curbing and/or attachment brackets are considered to be included in the condition assessment, because they have a direct affect on the strength and/or serviceability of the element.

Report Rail Impact Damage Use the Traffic Impact SF (Element 370)

Concrete Spindles Concrete spindles are considered to be an integral part of the bridge rail structure as should be considered in the condition assessment.

Condition State Language In order to report the condition of the railing posts, zero in on the operative wording “affect the strength and/or serviceability of the element”.

Roadway Notes

Depth of Wearing Surface Thin and rigid overlays are considered to be part of the deck. As a result the WS thickness = 0”.

NBI Item 28, Lanes On All lanes that carry highway traffic which are striped or otherwise operated as a full width traffic lane, including merge and ramp lanes, for the entire length of the structure shall be inventoried.

Approach AC The purpose for recording the AC is for the load rating calculations. Therefore, when the approach AC encroaches onto a bare concrete bridge deck to effect the dead load that resides on a particular span, another deck element should be inventoried and fully explained in the “Remarks”.

Superstructure Notes

Concrete Slabs Slabs are similar to decks except that the main reinforcing bars run parallel to the roadway centerline. Use the same hierarchy as for decks.

Open Girders Precast units (including channel beams or double “T” sections) are measured as a single open girder. The quantity = length x # of sections.

Girder Definition Girders are larger longitudinal members that are supported by a substructure unit. Timber stringers are considered to be timber girders.

Stringers Stringers are smaller longitudinal members that are typically supported by floorbeams.

Voided Prestressed Concrete Slabs These members have hollow tubes and are considered to be “closed web box girders”. For precast sections (voided and 1 cell boxes) the quantity = the length of each section X # of sections. For a larger, cast-in-place, structure, the quantity = the span length X # of cells. Use Element # **104** - Prestressed Conc. Closed Web/Box Girder. NBI Item 43/44 (Span Type) use 501 - Prestressed Concrete Slabs.

Trusses Measure truss elements along each truss line. The quantity based on a horizontal distance as measured along the curb. A vertical member is typically 1 or 2 LF.

Arches Measure and rate all arches in the same manner as a truss. Spandrel columns are not inventoried. Typically the verticals at each end of the arches are inventoried as columns, pier walls, or abutments. Multiple arches are considered to be continuous. However, the verticals at each bent are still inventoried as columns or pier walls.

Seismic Restraint Cables Cables should be snug tight during max girder contraction, slightly loose during max expansion.

Cable Elements Inventory these elements only if they continuously carry live loads. Drawbridge cables are considered to be a component of the drawbridge lift mechanism. Therefore, they are not included in the cable element inventory.

Painted Steel Elements Galvanizing is accepted as a paint system.

Bearings By definition a bearing can provide any of the following functions:

- Acts as a bond breaker between superstructure and substructure, or
- Accommodate temperature movements in the superstructure, or
- Allow superstructure deflection or rotation without point bearing on substructure, or
- Function to spread or distribute loads to a larger area.

Floorbeams Floorbeams transfer loads laterally and is supported by a superstructure element. Quantity is LF as measured the length of the beam.

Paint System Quantity and % deterioration ratings is based on SF of surface area of the coating system. Include areas of

painted substructure if they would be part of a structure paint project. Do **not** use this element for structures that only have painted substructure and/or rail elements.

Soffit Cracking SF (359) To make things simple, include the bottom of the cantilevered sidewalk and elements that do not have an associated deck element.

Sidewalk Beams The longitudinal beams supporting a cantilevered sidewalk, should be inventoried using the appropriate stringer element. If the sidewalk beam is supported by a mid-span haunch, the haunch can be considered a floorbeam.

Inspection of Timber Members It can not be over emphasized as to the value of sounding the surface of a timber member during the performance of a routine bridge inspection, especially when the timber boring was performed by someone other than the bridge inspector.

Rigid Frames If a structural frame (has moment resistant connections between the superstructure and the substructure to produce an integral and elastic structure) has traffic running through the barrel, the structure should be inventoried as a regular bridge, with a superstructure and a substructure.

Collision Damage Repairs If a portion of the original cross sectional area of a structural member was permanently removed, during the course of making repairs, it might be appropriate to use the “Section Loss Smart Flag” (#363), to report the situation.

Reporting Condition Assessment of Tunnels Tunnels are coded as “under” records and are not considered to carry highway traffic on top of the tunnel. Report the condition assessment using the “Tunnel Elements” and their associated condition state language. The coding of NBI Items 58, 59, and 60, would serve no purpose.

Tunnel Portals We have noted that problems are more likely to occur in the areas of tunnel portals than in the rest of a tunnel. This is probably due to an increase of stress at the portal caused by what could loosely be referred to as “boundary effects”. A number of factors could be involved, including such things as lower strength of soil/weathered rock exposed at the surface compared to more competent rock farther in the tunnel, change in stress paths as the tunnel nears the portal and increase in groundwater infiltration (rainwater may be following the competent rock/soil-weathered rock interface down the slope to the tunnel mouth). Due to the noted increase in problems

in the tunnel portal area a portal element is being added to the concrete elements. In some instances the portal element may be well defined, for example by a thicker liner section as shown on the plans, a construction joint or as a change in liner type such as concrete to timber. In other instances the portal element may be difficult or impossible to distinguish from the rest of the tunnel liner. In these cases the portal element may be defined as the first 20 feet of the concrete liner.

Tunnel Wearing Surface There is some value in reporting the condition of wearing surface in a tunnel.

Concrete Deck Arch Bridges NBI Item 43 “Main Span Type” for a multiple span concrete deck arch bridge should be coded as continuous - “211”.

Deck Arches The vertical spandrel columns are not inventoried because they are considered to be part of the deck arch, similar to the verticals in a deck truss. The columns directly over a bent are considered columns and not a member of the arch.

Concrete Channel Beams Instead of creating a specific element for these structure members, ODOT elected to inventory precast channel beams as “concrete open girders” with a “concrete deck”. However, NBI Item 43 will be coded as channel beams (122). Count each precast channel beam unit as one girder. Do not count the number of stems.

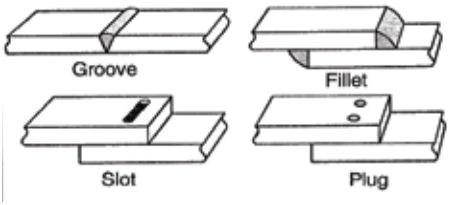
Tee Beams Since its not clear whether a given **RCDG** structure was designed as a Tee Beam, ODOT elected to inventory these superstructure members as “concrete open girders” with a “concrete deck”. In this case, NBI Item 43 would also be coded as concrete girders (102, 202, 502, or 602). Since we do not have an element for Tee Beams, inventory the P/S Bulb-Tee superstructure members using element 109 - P/S Concrete Open Girder, plus code NBI Item 43 / 44 as a Tee-Beam = 504.

Riveted Connections Critical Connections: Truss connections, Built-up Girder connections, Floorbeam to Girder and Floorbeam to Stringer connections. Non-critical Connections: Stiffeners, Wind Bracing, Bearing Members, Truss stability member connections. If 50% or more of either rivet head is gone reject the rivet. If 25% or more of either head base, next to where the plate bares, reject the rivet.

If 20% or more of the rivets in a critical connection are rejectable, then replacing the connection is warranted and the deficiency would be reported in CS 5. For non-critical connections the threshold is 40% of the rivets and would also be reported to be in CS 5.

Fatigue Categories

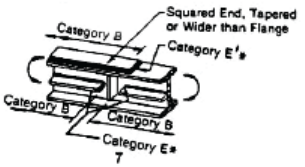
Weld Types:



Note: Type E and E' Details and selected D Details

Cover plates that have been welded onto a member

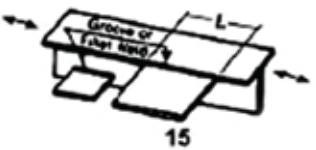
Category E'



Cover Plate Bottom Flange

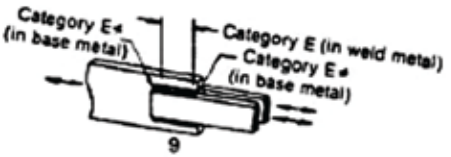
(Long) Attachments that interrupt the flow of stress

Category E



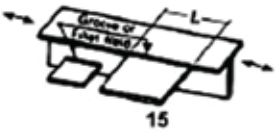
Intermittent fillet welds

Category E



Details that are attached using a fillet weld

Category E



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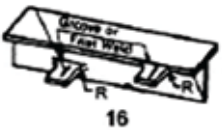

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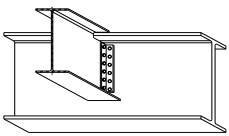
Rough Burn Holes

Category E

Stringer / Floorbeam connections (riveted connections, net section) and Cope Corner

Category D



Intersecting Welds

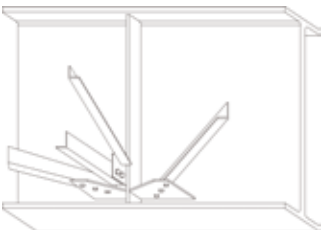
Welds that run into each other, overlap, touch, or have a gap between the toes of less than 1/4”

Category E

Intersecting Welds, weld gaps

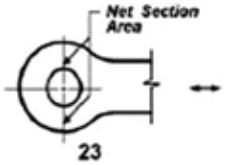
Tri-axial constraint detail (Hoan Detail)

A 3-dimensional stress state, which reduces the effective ductility of the material.



At Net Section of eyebar heads and pin plates

Category E



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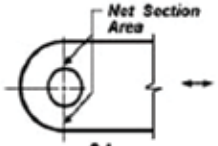

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***Directions**: Record the fatigue detail on the FC / FP Inspection Report and bring to attention of the ODOT Fracture Control Engineer. Place a FP inspection strategy note in the inspection notes box.*

Substructure Notes

Abutments ODOT decided to inventory all bridge end bents as abutments rather than lumping them in with the interior bents because of the following: (1) Abutments support the appr. roadway embankment where interior bents do not; (2) they transfer loads from superstructure to the foundation, which an interior bent does as well, and (3) since the abutments have direct contact with the earthen embankment, the environment and deterioration curves differ from an interior bent. The exceptions to this rule is when a bridge end does not provide embankment support such as cantilevered bridge end.

Abutment Type Monitoring the condition of the bridge components contained in the load path is much more critical than the embankment support function of an end bent. Therefore, the inventoried abutment type should be controlled by the most predominant material type contained within the load path components of an end bent.

Pier Walls Inventory the member as a pier wall if the unit is greater than half the deck width, as measured along the exposed bottom face of the wall at ground level. Pier walls can have a continuous footing or be supported on a pile foundation. A pier wall differs from a column / web wall in that the primary steel reinforcement has a uniform spacing along the length of the wall.

Pier walls are considered to be all inclusive meaning that a cap will not be inventoried on top of a pier wall.

Typically, pierwalls are all inclusive and will not have a cap on top of a pierwall, with only one exception: If the structure is a large major structure like the Yaquina Bay, McCullough, or St. Johns Bridges, that have a large bent component that bears on top of a massive concrete pierwall. In this case, the bent components would be inventoried using the appropriate element.

Caps Caps are integral transverse beams that are supported by a substructure element, and typically transfer loads laterally. These include sills. Record the number of caps. A cap / post / sill frame bent will have 2 caps inventoried.

Do not include the length of diaphragms, corbels, or stacked caps. Stacked caps are considered to be a single full-depth unit and rated accordingly. Stacked caps differ from the cap / sill configuration by the lack of blocking or posts between the members. If a stacked cap is encountered with differing materials the most predominant primary load carrying material type will control which element will be inventoried. Pile supported Caps generally differ from pile supported pier walls in that the primary steel reinforcement is typically transverse to the roadway.

Columns Inventory the member as a column if the unit is less than half the width of the deck, as measured along the exposed bottom face of the column at ground line. These include columns, posts, piling and pedestals.

Rating Non-visible Elements If the posts / piling are only partially exposed, the total quantity can be obtained from the plans. Ratings on non-visible posts / piling spreadfootings shall be based on associated signs of distress.

Occasionally, what the bridge inspector sees and what the bridge plans provide can be two completely separate things. Example: The bridge inspector sees a steel pipe pile, but the plans show that the steel pipe pile is filled with a reinforced concrete filling. Therefore, the bridge plans should take precedence over what is visible. In this case, a concrete column would be inventoried rather than a steel column.

Cap / Pile Bearing If a cap does not bear uniformly on a support pile, the deficiency is best reported using the settlement smart flag (#360). For condition assessment purposes, shims or blocking located between the top of the pile and the cap bottom is considered to be an extension of the pile. A shim differs from a corbel in that they do not support a spliced cap.

If a support column is located directly under each girder the cross-beam will not be inventoried as a cap. However, in order for the cross beam to fit into the definition of a cap there must be eccentricity equal to at least 1 column width.

Mud Sills Timber mud sills are an important structural member and therefore should be inventoried. Since they look and act similar to timber cap, they will be inventoried as a cap rather than creating a totally separate element number.

Concrete Pedestals Since we do not have a concrete footing element ODOT decided to lump the concrete pedestals in with the concrete piling / concrete pile extensions because they perform similar functions, are in similar environments and have similar deterioration curves.

Abrasion Loss of fines (CS 1), Loss of large aggregate (CS 2), Exposure of reinforcement (CS 3). Abrasion is noteworthy with the rebar is exposed to the elements (CS 3).

Culvert Notes

By definition A culvert is a drainage structure beneath an embankment. Typically they: carry water, they are surrounded by a fill or an embankment, they may or may not have a bottom, the design/construction plans are generally standard culvert drawings.

Inventory State Inventory includes all culverts that are 6 feet and larger. Local agency inventory may or may not include any structures of non-NBI length.

Inventory Measure the length of each barrel. The Culvert Quantity (NBI Item 118) = the average length of barrel at flowline.

Structure Length (NBI Item 49) = length between the inside faces of the exterior walls as measured parallel to the roadway centerline. The clear span between the barrels of multiple barreled culverts can not be more than 1/2 the smaller diameter. The total Element Quantity = the sum of all of the barrel lengths.

Rigid Frames A structural frame has moment resistant connections between the superstructure and the substructure to produce an integral and elastic structure, NBI Item 43 could be coded as being continuous. If the structure carries water through an embankment, the structure should be inventoried as a culvert, otherwise, it's a bridge.

Approach Condition When performing a condition assessment on a culvert, the approach condition should be rated because it provides information that pertains to settlement of the structure or other embankment movement.

Double Box Culverts For the coding of NBI Item 43, double RCBC's are considered to be concrete continuous. Therefore, the item should be coded "219".

Definitions *Distortion*: deflecting in a non-symmetrical dimension, racking the pipe.

Deflection: horizontal dimension increases and the vertical dimension decreases.

Settlement: having a belly. Originally constructed on a flat grade, will generate a belly when loaded with fill.

Misalignment: Alignment differential that may have been caused by improper installation, undermining, or uneven settlement of fill.

Assessment All culverts with less than 8 ft. of fill, need to be assessed as to it's ability to carry traffic loads. If the fill is more than 8ft, the culvert needs to be assessed as to it's ability to carry water and protect the embankment from scour.

Elements 325 and 326 Ratings should accompany all culvert inspection reports as a measure of any potential voids in the embankment over the culvert. It is very difficult to discern whether embankment erosion is occurring along the outside of the culvert. Therefore, a dip in the roadway embankment or WS can be a good indicator.

Culvert Liners If a new permanent liner that is of sufficient quality that it could be considered the new load carrying section is placed in an existing culvert the new clear span dimension would be inventoried for this structure. If this new dimension is less than 6 feet, the structure should be retired.

Channel Notes

X-Channel Profiles As per FHWA regulations, all structures over a waterway, must be monitored for scour.

Providing a X-Channel Profile fits that purpose. The X-Channel Profile priority and inspection frequency is obtained from the Scour Monitoring Flowchart.

X-Channel Profiles If possible, the cross-channel profile should be taken at the location of maximum scour, or on the upstream side of the bridge.

Channel & Channel Protection Rating (NBI Item 61) The intent of a dry overflow structure is to provide extra release area during high-water events. Therefore, NBI Item 61 should be given a numerical rating other than “N”.

X-Channel Profiles vs Underwater Dive Inspections The divers perform a hands-on condition assessment of the bridge elements located below the water line, measuring scour in the immediate vicinity of the bridge foundation, and recording the amount and location of drift and debris. Whereas, the X-Channel Profile monitors scour and/or channel movement across the entire stream channel by overlaying multiple years cross-sections and overlaying bridge substructure units onto the profile so that the criticality of the scour can be more accurately monitored.

NBI Item 60 “In accordance with the FHWA Coding Guide, if the Scour Code (NBI Item 113) is coded a “2”, the condition rating for the substructure (NBI Item 60) must be consistent. In this case, the term consistent is defined to mean **“the same”.** This is to say that if NBI Item 113 is a 2 or less, then NBI Item 60 must be a 2 or less.

NBI Item 61 Channel and Channel Protection Condition Assessment - The bridge inspector will use the following boundary parameters when rating this NBI Item: 4 bridge length upstream and 4 bridge lengths downstream.

NBI Item 113 Scour Code - In order for this item to be lowered to a “2”, the deficiency must pass the following criteria: (1) the bridge must be scour critical, and (2) a field review indicates that extensive scour has occurred at the bridge foundation, and immediate action is required to provide scour countermeasures. *A field review indicates that extensive scour has occurred at the bridge foundation, which are determined to be **“unstable”.***

NBI Item 113 *State bridges to be coded by ODOT Bridge Hydraulics Engineer. Local Agency bridges to be coded by ODOT Local Agency Bridge Engineer.* If the inspector feels that the coding is incorrect, they must follow **procedures** provided on **page 124.**

Element 325 and 326 It is very difficult to discern whether embankment erosion is occurring along the outside of the culvert. Therefore, a dip in the roadway embankment or WS can be a good indicator.”

Br. Inspection Frequency Guideline

In accordance with CFR 650.313(b) at least one team leader must be at the bridge site at all times during each initial, routine, in depth, fracture critical member, and underwater inspection. A team leader is not required to participate in a Special, Damage to structure, or Scour Monitoring.

Establishing Bridge Inspection Frequencies

Certain bridges, because of such features as age, traffic characteristics, state of maintenance and known deficiencies, require a bridge inspection at some identifiable frequency. It is the responsibility of the inspector to identify such bridges, to establish and maintain that inspection frequency, and to record all required data. It is implied that during the course of a routine bridge inspection that the inspector observed and is providing a condition assessment of the entire bridge.

Initial Inspection (Performed within 90 days following completion of a project)

- New Structure
- Upon Completion of Major Structural Rehab
- Inspection of a Bridge in a Designated Construction Zone

Routine Inspection (Performed on the entire structure at a specified frequency)

- Cursory Inspection
- Routine Inspection
- Closed Structure

In-depth Inspections (Performed on only a portion of the structure at a specified frequency)

- Fracture Critical
- Fatigue Prone
- Underwater
- In-depth Inspections
- Concrete Crack

Special Inspections (Performed at the discretion of the bridge owner to monitor a specific structural deficiency)

- Damage to structure (high load collisions / navigation traffic)
- Scour Monitoring / Highwater / Ice Events
- Timber Boring
- Deck Survey
- Drawbridge Electrical / Mechanical
- Corrosion Survey
- Following a Seismic Event
- Following a Fire

New Structure Perform an initial inventory and condition assessment within 90 days of the official opening of the structure to traffic. The official opening to traffic is defined as when all substantial construction work has been completed, i.e., issuance of the 2nd notice.

Cursory Inspections

- An interim inspection of the major structural components and critical deficiencies to assure that the structural integrity is unchanged since the last scheduled inspection. The next scheduled routine inspection will occur within 6 months.
- This inspection is performed out of the scheduling sequence and is generally used when modifying the inspection schedule on a route, or modifying the work schedule of the assigned bridge inspector.
- Requires a routine inspection report to be filed.

Structure Major Rehab Perform an initial inventory and condition assessment within 90 days of the official opening.

Inspect the structure at least every 12 months if any of the following conditions exist:

- Primary Structural Element **(NBI Item 58, 59, 60, 61 or 62)** has an NBI Condition Rating **≤ 3** (On agency critical follow-up list)
- Primary Structural Element is in a condition state that represents the most advanced deterioration and is affecting the load capacity of the structure.
- The general condition of the bridge is considered to be poor.
- Temporary repairs on a primary structural element is considered to be in a poor condition.
- The bridge has an operating load rating factor **< 0.80** for any of the legal truck configurations.

Inspect the structure more frequently than every 12 months if any of the following conditions exist:

- The bridge has a load capacity issue.
- Local failures are possible.
- Any of the concrete shear cracks are continuing to grow.
- A serious traffic hazard is noted.

The intent of these inspections is to monitor a specific structural deficiency and not to perform a full inspection of the bridge and has been determined to fit the definition of a special inspection

as defined in CFR 650.305. In accordance with the CFR provision, these inspections are scheduled at the discretion of the bridge owner and may be performed by personnel other than a certified bridge inspection team leader (CFR 650.313(b)).

Direction on which Inspection should be recorded in the SI&A 92C/ 93C slot.

Top priority are the In-depth Inspections, next is the damage to structure inspections, and last the special inspections. In-depth Inspections are: Fatigue Prone Detail or the Pin & Hanger Inspections. Special Inspection have been defined as: Scour Monitoring, Timber Boring, Deck Surveys, Drawbridge Electrical / Mechanical. Damage to structure inspections can follow: Vehicular or Navigation Traffic Collision, High water events, Ice Flows, Seismic Events, or Fires.

Other Bridge Inspection Frequency Parameters

Case 1 Inspection of a Closed Bridge not in a designated construction zone: Bridge Fits the following:

* Structure has been closed utilizing permanent vehicular traffic barriers:

► Perform a cursory routine inspection every 24 months

► Code NBI Items 112=N, 41=K, and 67, 68, 69, 71, and 72=0 (bridge closed)

* Structure is not closed using permanent vehicular traffic barriers or if the appropriate NBI Items have not been coded accordingly:

► Perform a routine inspection at a frequency that is based on the condition of the structure as if the bridge were not closed.

Case 2 Inspection of a Bridge in a Designated Construction Zone:

Case 2a The Bridge site fits the following:

* The bridge is in an active construction zone, but it's still in-service and carrying traffic.

► Perform a routine inspection at a frequency that is based on the condition of the original structure.

► Coordinate the inspection with the contract administrator.

Case 2b The Bridge site fits the following:

* The original bridge is still in-place, has been permanently closed, and All traffic has been shifted over onto a detour

structure, Construction activity is non-existent and the detour structure is scheduled to remain in-use for a period longer than 5 years:

► Perform a routine inspection on both the original bridge and the detour bridge at a frequency based on the condition of the detour structure.

► Code NBI Item 41=E, add the detour structure elements to the existing bridge element list, code the original structure elements as having a temporary repair in-place (NBI 103=T), record NBI Items 58, 59, 60, 61, or 62 as they relate to the original structure, and code NBI Items 10, 41, 47, 53, 54, 55, 56, and 70 accordingly. Do not create a new file specifically for the detour bridge.

Case 2c Bridge site fits the following:

* Construction is active, The original bridge is still in-place, has been permanently closed, all traffic has been shifted over onto a detour structure that was constructed in accordance with approved shop drawings, which is scheduled to remain in-place for a short duration.

► Perform a cursory routine inspection on only the original structure. The contract administrator is to monitor the condition of the detour structure. Code the NBI Items as presented above.

Case 2d Bridge site fits the following:

* The original structure is in the process of being modified with significant dimensional changes or alterations like widening or raising. Traffic is staged and/or restricted from using portions of the bridge.

► The bridge condition assessment inspector is not responsible for inspecting or reporting on the condition of the bridge for the duration of the contract. The construction contract administrator is responsible for monitoring the condition of the existing structure in accordance with approved project plans and specs, until the 2nd notice has been issued. When the 2nd notice is issued, the bridge inspector will perform and report on the condition of the bridge within 90 days.

Case 3 Initial Inspection following the completion of a construction project.

Case 3a Bridge Site fits the following:

* All of the structures contained in a construction zone are substantially complete, with no significant work remaining, and open to traffic.

► The construction project administrator is responsible for monitoring the condition of the structure(s) in accordance with approved project plans and specs, until the 2nd notice has been issued. When the 2nd notice has been issued, the bridge inspector will perform and report on the condition of the bridge within the timeframe specified by the NBIS.

Case 3b Bridge Site fits the following:

* Project contains a large number of structures where construction on some structures are substantially complete, open to traffic and have no work remaining much sooner than the issuance of the 2nd notice.

► The designated bridge inspector must coordinate the inspection with the construction project administrator, perform and report the results of the initial inspection on the opened structures within the timeframe specified in the NBIS, following becoming aware of the opening of the structure to traffic.

Inspection Frequency of Closed Structures

► If the structure has been "physically" closed using permanent vehicular traffic barriers – perform routine inspection every 24 months.

► If the structure has not been closed utilizing permanent vehicular traffic barriers or if the appropriate NBI Items have not been coded accordingly – inspect the bridge at the frequency specified as if the bridge were not closed.

NBI Item 112 = N, NBI Item 41 = K, and NBI Item 67, 68, 69, 71, and 72 = 0 (bridge closed).

Bridge Inspections

Routine, Fracture Critical, Underwater, and In-depth Inspections must be performed by a Certified Bridge Inspection Team Leader. Damage and Special Inspections do not.

Emergency Response Roles & Responsibilities

- The primary emergency response lead role lies with the respective ODOT District Office.
- The primary local agency liaison during all emergency responses lies with the ODOT Local Governments Section.
- The primary entity to provide structural support is the ODOT Region Tech Centers.
- ODOT Bridge Section functions as a supportive technical resource to those in the field. The bridge inspection staff must be kept in the loop due to bridge condition assessment reporting responsibilities.

Concrete Structural Crack Inspection Frequency Guideline

Inspect the structure at least every 12 months, if any of the following conditions exist

- The structural crack > 0.040 with lateral offset > 0.030” or crack length growth > 6” from previous intersection, and
- Any of those conditions shown under the Routine Inspection Frequency guideline exist.

Type of Crack Whether the crack is shear, flexure, shear-friction-zone, or non-live load induced has a direct affect as to how the deficiency is rated. Shear is much more critical because tension rebar development is more questionable than say a flexure crack where there is sufficient development. Shear cracks tend to be located in the web vs flexure cracks tend to extend down thru the tension steel to the bottom of the girder.

Location of Crack The location of the crack can also be used to determine the type of crack. Shear cracks tend to be located in the high shear zone which is located in the first third and last third of a simple span girder, which tends to be bounded by diaphragms (points of inflection) and/or girder haunches and oriented in a diagonal direction with the top of the crack sloped towards mid-span. Flexure cracks, on the other hand, typically are located in the middle third of a girder and they tend to be are oriented more in a vertical direction. The above described locations can vary if the structure is continuous.

Scour Monitoring Frequency Decision Chart

X- Channel Profiles

An X- Channel Profiles will be performed on all structures located over a waterway.

- If the structure is scour critical, the Profile will be performed during the next routine inspection.
- If the structure is not scour critical, the Profile will be performed as the work load permits.

Check and Update the X- Channel Profile at least every 10 years if the following conditions exist:

- The NBI Item 113 (Scour Code) is coded as not being scour critical (coding = 4 or greater), or
- The NBI Rating 61 (Channel and Channel Protection) has been rated **≥ 7** – minor debris present, or
- The Scour Smart flag is in **CS 1**.

Check and Update the X-Channel Profile at least every 4 years if the following conditions exist

- The NBI 113 (Scour Code) is coded as being scour critical (coding ≤ 3, has an Unknown foundation (U), or founded on a spreadfooting)
- The NBI Rating 61 (Channel and Channel Protection) has been rated = 6 – protection has minor damage, or
- The Scour Smart flag is in **CS 2**.
- There is a measurable difference in the channel profile due to degredation, aggredation or migration.
- The thalweg has migrated laterally and is below the top of the footing.

Check and Update the X-Channel Profile at least every 2 years if the following conditions exist

- The NBI Item 113 (Scour Code) is coded as being scour critical (coding = 3 or less or a U), and
- The Scour Smart flag has been turned on and is in condition state 2 or 3, or
- The NBI Rating 61 (Channel and Channel Protection) has been rated < 5 – protection has major damage.
- There is a measurable difference in the channel profile due to degredation, aggredation or migration.
- The thalweg has migrated laterally and is below the top of the footing.

Underwater Inspections

An Underwater Bridge Inspection will be performed on all structures with bridge substructure elements located in non-wadable water.

The Underwater Inspection will be performed every 5 years if the following conditions exist

- NBI Item 113 (Scour Code) is coded **≥ 5**. * *The Scour Smart flag has not been turned on.*
- NBI Item 60, Substructure Condition Assessment **≥ 8**. * *NBI Rating 61 (Channel and Channel Protection) ≥ 8.*

The Underwater Inspection will be performed every 4 years if the following conditions exist

- NBI Item 113 (Scour Code) is coded = 4.
- The Scour Smart flag has not been turned on.

- NBI Item 60, Substructure Condition Assessment = 6 or 7.
- NBI Rating 61 (Channel and Channel Protection) = 7.

The Underwater Inspection will be performed every 2 years if the following conditions exist

- NBI Item 113 (Scour Code) = 3 or less or a U.
- Scour Smart flag is in condition state 1.
- NBI Item 60, Substructure Condition Assessment = 5 or 6.
- NBI Rating 61 (Channel and Channel Protection) = 6.
- Element 223 (Submerged Seal Footing) is exposed.

The Underwater Inspection will be performed on an annual basis if the following conditions exist:

- NBI Item 113 (Scour Code) = 2.
- Scour Smart flag is in condition state 2 or 3.
- NBI Item 60, Substructure Condition Assessment ≤ 5.
- NBI Rating 61 (Channel and Channel Protection) ≤ 5.
- Element 223 (Submerged Seal Footing) is exposed
- Combination of age, environment, history, importance, etc.

Note: *It's up to the above water bridge inspector to assure that the underwater bridge inspection is being performed and to incorporate the results of the underwater inspection into the overall condition assessment of the bridge.*

Bridge Deck Survey Guidelines

During every routine inspection, the bridge inspector will fully assess the condition of the concrete deck for the following characteristics: Quality of Ride, Corrosion Related Defects, Structural Related Defects, the Wearing Surface, and the Construction Quality of the Bridge Deck.

Quality of Ride If any of the following "Quality of Ride" deficiencies exist, the bridge inspector will initiate a prioritized bridge maintenance recommendation that would address the deficiency.

The Deck Wearing Surface Condition Assessment is rated ≤ 4,
The Roadway Impact Assessment is rated ≤ 4,

Corrosion Related Determine whether the defects are in fact, "Corrosion Related". If any of the following conditions exist, the bridge inspector needs to instigate the specified actions:

Concrete Deck Element is in condition state 3, chain drag and map the bridge deck.

Concrete Deck Element is in condition state 4, take cores and test quality of deck materials.

Protective Wearing Surface Determine the depth of any potholes, spalls, or delaminations. If any of the following conditions exist, the bridge inspector needs to instigate the specified actions:

Pothole does not extend into the concrete substrate, make a maintenance recommendation to address the defect.

Potholes extends into the concrete substrate, takes cores and evaluate the quality of the deck materials.

Structural Related Defects Deck thickness = 6” and map cracking on either side of deck - recommend a structural overlay. High impact areas, deck thickness = 6” and map cracking on either side of deck - recommend deck shoring. If top rebar cover is < 1” on any portion of the deck, the first digit for coding NBI Item 108 should = 0.

Construction Quality If the bridge inspector finds defects that are related to the Quality of the Construction, such as listed below, the inspector will take cores and have the deck materials evaluated. Fire Damage, Freeze -Thaw Damage, Alkali-Aggregate Reactions, Sulfate Attack, Traffic Abrasion, Segregation Consolidation

Inspection of Complex Structural Details (NBI Item 93)

By definition a Critical Feature or Special Detail:

- **Usually Complex, Unique Design Details, or Operational Features that requires additional technical expertise and/or support to properly evaluate their condition.**
- **A thorough bridge inspection requires specialized skills such as climbing or an inordinate amount of time or manpower to properly access and evaluate all components.**

The bridge inspector will assure that the following specified activities have been performed so the information can be integrated into the routine condition assessment of the bridge:

Movable Drawspans

Drawbridge electrical and mechanical inspections are defined to be a “Special Inspection”. Therefore, in accordance with CFR 650.305, they are scheduled at the discretion of the bridge owner, they are performed by a technical expert in the field who is not necessarily a bridge inspection team leader. The inspection frequency guideline for drawspans on the state system are as follows:

- Bridge Preservation Unit will coordinate a cursory inspection of the drawspan operational mechanisms ANNUALLY.
- Bridge Preservation Unit will perform an in-depth inspection of the drawspan operational mechanisms every 6 years.

Initial base line data will be collected during the initial inspection, followed by a hands-on, in-depth inspection when there is a cause for concern or at least every 10 years.

- **Large CONCRETE structures located in a HIGHLY CORROSIVE ENVIRONMENT.**
  (Electrical Potentials, Chloride Contents, Amount of Section Loss in the Steel Reinforcement)
- **The structure has a CABLE SUSPENDED span.**
  (Amount of corrosion and/or broken strands in the suspension cables and evaluate transient load paths)
- **The structure is a CONCRETE SEGMENTAL bridge.**
  (Post-Tensioning System Corrosion, longitudinal cracking, and investigate concrete creep and/or PT relaxation)
- **The bridge has ELECTROSLAG WELDS.**
  (NDT Testing and/or Fatigue Cracks in the welds)
- **The structure has special details that warrant an in-depth inspection.**
  (Redundant pin & hangers, truss I-bars, drawbridge trunnion shafts, stringer floorbeam connections, tunnel roof support rods, drawbridge lift cables, etc.)

Inspection of Steel Fatigue Sensitive Members

In the State of Oregon, steel fatigue is monitored and reported in the following manner:

1. An acceptable level of inspection for a routine inspection of steel members, should detect loss or degradation of rivets or bolts, steel fatigue cracks, extent of rust, section loss, bent or damaged members, and a condition assessment

of the protective paint system. This level of inspection is usually visual, and can be at some distance, using binoculars, not hands-on. The date of this inspection is recorded in NBI 90 & 91.

2. By definition, if the structure does not provide load path redundancy as described in the FHWA Bridge Inspectors Reference Manual (BIRM) 8.3.15, it is considered to be Fracture Critical and inspected accordingly: a close-up, hands-on, inspection, performed at least every 24 months, preferably at the same time as the routine inspection. The date of this inspection is recorded in NBI 92A & 93A and the condition of the FC members, are recorded on the routine and the FC Inspection Report.
3. Likewise, if the redundant structural members contain fatigue sensitive details that require additional attention, the CFR requires an In-depth, close-up, inspection to be performed on the members and details to identify any deficiency not readily detectable using routine inspection procedures. We refer to these inspections as Fatigue Prone Inspections and the condition of these members are recorded on the routine and the FP Inspection Report and the date is recorded in NBI 92C & 93C. The frequency of these inspections, are established, utilizing a risk based assessment.

Fatigue Prone Inspections Frequencies

The inspector has the responsibility of thoroughly and accurately reporting the condition of the bridge with emphasis on problems with the potential to adversely affect safety. To that end, the bridge inspector must identify and report the condition of the redundant bridge members that contain fatigue sensitive details. A fatigue prone member differs from a fracture critical member by the available load path redundancy. By definition a fatigue prone detail has the propensity to support the propagation of a fatigue crack in the steel member or its connection.

These fatigue cracks are frequently a result of cyclic loading that occurs near, a weld, a material flaw, or a change in the cross-sectional area of a member. Redundant fatigue prone details have been defined to be:

- Redundant Pin & Hanger Assemblies
- Redundant Pin & Eye-Bar Members and their connections
- Coped Corners
- Stringer/Floorbeam Connections

- Built-up members using a welded cover plate
- Details attached with a groove weld that is subject to longitudinal loading
- Intermittent fillet welded connections
- Rough burn holes in the member
- Nicks and gouges, deeper than 1/4”
- Corroded areas with more than 20% section loss of the cross-sectional area
- Unauthorized field attachments, welded to a tension zone of a member

Fatigue Prone Detail Inspections

All members that contain a fatigue prone detail will have an initial base line condition assessment. All follow-up NDE and in-depth inspections are to be performed at a frequency that is based on the condition of the member. **A hands-on visual Fatigue Prone Detail Inspection will be performed a minimum of every 10 years.**

- Initial Baseline Inspection - Hands-on Visual Inspection. Record on the FP Inspection Form
- Inspect every 10 years if the Fatigue, Section Loss, or Pack Rust Smartflags are in CS1 for that member. ***Note:*** *At a minimum, inspect every 10 years if Fatique Prone Details are different.*
- Inspect every 6 years if the Fatigue, Section Loss, or Pack Rust Smartflags are in CS2 for that member.
- Inspect every 2 years if the Fatigue, Section Loss, or Pack Rust Smartflags are in CS3 for that member or the member has a previous NDE indication of the existence of a fatigue crack.

Timber Member Inspections Frequencies

All timber members will have an initial base line condition assessment based on a hands-on visual assessment, sounding, and/or boring, and documented on the timber boring report. The timber member condition state rating assessment is based on the sketches and diagrams shown on page 52, 53, and 54. A follow-up inspections, **sounding (recommended minimum 3 lb hammer)** or boring will occur at a frequency that is based on the condition of each particular member:

- Initial Baseline Inspection ► Hands-on Visual Inspection, Sounding or Boring. Report in CS 1.

- Rebore every 10 years if that member is being reported in CS 2.
- Rebore every 6 years if that member is being reported in CS 3.
- Rebore every 2 years if that member is being reported in CS 4.

Timber Member Inspections

The bridge inspector will assess the condition of all the timber components visually and/or sounding with at least a 3 lbs hammer during every routine inspection.

The entire timber boring report will be update or rebored at the following intervals:

Structure is located West of the Coast Range and member has been in service longer than 20 years.

► Bore at least every 8 years.

Structure is located within the Western Oregon region and the member has been in service longer than 25 years.

► Bore at least every 10 years.

Structure is located East of the Cascades and the member has been in service longer than 30 years.

► Bore at least every 12 years.

Specific timber members will be immediately rebored if any of the following defects are found:

- The member sounds hollow or previously noted decay information has not been updated with the last 4 years.
- The member is bulging or has visible signs of crushing.
- The member is heavily split or cracked.
- The member has a full-width, full length split parallel to the grain of the wood.
- The member has a full-width, full length cross grain crack in the wood.
- Signs of ant or beetle activity as indicated by the dust piles and/or small pinholes in or in the vicinity of the member. Check the structural integrity of the member by coring, UT sounding, or testing with a stress wave accelerometer.
- There are signs of marine borer activity as indicated by the necking down of the timber member, small pen holes through the surface treatment, or the presence of limnoria or bankia in the vicinity of the member.

Bore the timber member at points of bearing, around bolted connections, at the ground or mud line, and areas that are directly exposed to wet/dry cycles, with a sterile bit.

Note: *the location and extent of the deficiency on the timber boring log and review the load rating to determine whether other remedial actions are necessary.*

In order to minimize section loss in the members, it is highly recommended to bore using one of the ODOT Resistograph tools. Record the results on the timber boring report for the bridge.

Other types of Inspections

Utilization of Under Bridge Inspection Truck (UBIT)

The bridge inspectors are expected to utilize the UBIT to gain hands on access during the following inspections:

- Fracture Critical Inspections
- Fatique Prone Details Inspections
- Timber Boring
- Bridges where the deck to streams is greater than 30 ft.

Periodic Inspection of Accessible Box Girder Cells

All bridge inspectors are charged with the responsibility to inspect each structure a thoroughly as necessary to clearly establish its condition and to insure its continued safe operation. However, the accessible box girder cells are considered to be confined spaces. If the space is a permit entry, an enormous amount of prep work is required prior to and during each entry process. Therefore, the intent of this guideline is to balance the benefits gained against the required expenditure of resources

The interior of a box girder section will be inspected at the specified intervals, if the following criteria is encountered:

- The interior of all box girder sections will be inspected at least every **10 years.**
- Visual Indications on the exterior of the box shows that something out of the ordinary is occurring inside, i.e. water from a utility pipe, asphalt from the wearing surface, etc.
  ► Inspect ASAP.

- The structure has structural elements that can only be viewed from inside of the box sections, such as: pin and hanger assemblies, bearings, modular deck joint assemblies, or integral cross-beams. ► Inspect during every routine inspection.
- Areas inside of the box section where water occasionally puddles are noted ► Inspect at least every 4 years.
- The box section shows signs of active corrosion: If areas of pack rust or section loss due to corrosion are noted. ► Inspect during every routine inspection. Otherwise inspect at least every **6 years**.
- The Box Girder Sections constructed on a curve where distortion induced or out-of-plane bending problems might exist. ► Inspect at least every **6 years.**
- Fatigue Cracking has been noted in a steel member. ► Inspect during **every routine inspection.**
- The steel box section is considered to be Fracture Critical. ► Inspection frequency indicated by FC chart.
- The exterior of a concrete box girder section has 0.040" shear cracks. ► Inspection frequency indicated by Concrete Shear Crack chart.

Non-NBI Culvert Inspection Frequency Guideline

During every routine inspection the bridge inspector will fully assess the condition of the culvert. This guideline provides certain criteria that is based on the state of maintenance and/or know deficiencies that might warrant the next follow-up inspection to be performed more often than the specified 48 month inspection frequency norm.

The condition assessment and follow-up inspection frequency will be based on the following rule of thumb: If the fill height is less than 8 feet, the structure will be assessed as to its ability to carry live loads as well as its ability to protect the embankment from scour. If the fill height is more than 8 feet, the structure is assumed to carry no live loads. Areas of the culvert that are of concern are: Vertical and horizontal alignment, tightness of the joints, condition of the culvert materials, the shape of the existing culvert as compared to its original designed shape, and the condition of the foundation/embankment that supports the culvert.

New Structure - Perform an initial inventory and condition assessment inspection within 90 days of the official opening of the structure to traffic.

48 Month Inspection Frequency - The culvert is functioning as intended. Any repairs represent a rehab of the structure. 100% of the culvert is in Condition State 1 or 2. NBI Item 62 Rating = 6 or better.

24 Month Inspection Frequency - Whether there are any deficiencies that might pose a safety concern or potentially damage property, dip in the roadway that is transverse to the travel lane, or evidence of backfill piping is present, or a portion of the culvert is in condition state 3 and NBI Item 62 Rating = 5.

12 Month Inspection Frequency - Deficiencies could cause more extensive damage if not repaired, or a portion of the culvert is in Condition State 3, or NBI Item 62 Rating = 3 or 4 **or where NBI 113 = 2.**

6 Month Inspection Frequency - Signs of culvert failure exist, i.e., buckling in the bottom of a CMP, etc. Inspect before and after the high runoff season (October and April). A portion of the culvert is in Condition State 4. NBI Item 62 Rating = 2 or less **or where NBI 113 = 2.** The intent of these inspections is to monitor a known deficiency which is defined as a special inspection and is performed at the discretion of the bridge owner and may be performed by personnel other than a certified Bridge Inspector.

Bridge Inspector Safety

Job Hazard Assessment (JHA)

ODOT is committed to a safe and healthy workplace through continuous improvement efforts in accident prevention, education, equipment maintenance, and compliance with all state and federal regulations. Safety is a fundamental responsibility of all employees and is equal to other organizational objectives such as cost, quality, and productivity

OR OSHA General Requirements, 1910.132(d)(1), states that each employer shall assess the workplace to determine if hazards are present, or are likely to be present, which necessitate the use of personal protective equipment (PPE).

1910.132(d)(2) states that the employer shall verify that the required workplace hazard assessment has been performed through a written certification that identifies the workplace evaluated; the person certifying that the evaluation has been performed; the date(s) of the hazard assessment; and identifies the document as a certification of hazard assessment.

1910.132(f)(1) states that the employer shall provide training to each employee who is required by this section to use PPE.

ODOT Advisory ADV99002 specifies that each manager is to look at each given task, breaking it down into successive steps, analyzing each step for safety and operational needs, and providing recommendations for procedures that meet those needs. The mitigation of the identified hazards will required:

Find a new method of doing the job; Change or modify physical conditions that create hazards; Eliminate physical or environmental hazards still present by changing procedures; Reduce the frequency of the task; Eliminate the necessity of the task by developing an alternative practice, which would limit the exposure to the hazard. The manager should review all employee recommendations and every effort shall be made to eliminate hazards. Each employee shall participate in the development and are responsible for implementation and using safe work practices.

ODOT Bridge Section has developed a generic Bridge Inspection Job Hazard Assessment. The generic assessment is posted on the bridge server and is contained in this guideline.

In addition to the generic assessment, each ODOT Bridge Inspector has been directed to perform a hazard assessment for each assigned structure. These bridge specific hazard assessments will also be posted on the bridge server and available via the ODOT Bridge Inspection Reports Web Page with the idea that each entity will be able to incorporate the bridge specific hazard assessment information into their assigned tasks. As a minimum the bridge specific assessment should include:

- Specify how to safely egress traffic, where to park, and how to ingress back into traffic
- Specify how best to safely approach and access each structure
- Identify the location of all hazardous materials and details, and how to mitigate each.

Each JHA must include the date of the document and who it was created by.

A culvert or box girder can be a "Permit Required Confined Space" If it contains one or more of the following:

- Contains or has the potential to contain a hazardous atmosphere;
- Contains material that has the potential to engulf an entrant;
- Has an internal configuration such that an entrant could be trapped or asphyxiated;
- Contains any other serious safety or health hazard.

Recommended Entry Guidelines:

1. Assess the approach to the space point of entry for hazards. Proceed if safe to do so.
2. At the mouth of the point of entry check for the following:
   - Blockage inside of the culvert as indicated by the lack of light passing through or the indication of an excess of water (more that 2 feet in depth).
   - Lack of air flow.
   - Presence of hazardous materials in the water or surrounding area or presence of a sheen on the water surface.
   - Water depth should be less than 2 feet.

3. If the inspector feels that a potential hazard that poses an immediate danger to life and health, then the inspector should address the hazard before entry. Attention should be paid to slip, trip and drowning hazards.
4. The selection of personal protective equipment will vary at each culvert and is left to the judgement of the inspector.
5. If at any time during the entry if an inspector feels dizzy, nauseous, light headed or disoriented in any way they are to exit immediately and then proceed to treat the culvert as a permit required confined space until a thorough evaluation proves otherwise.

Status of Culverts as Confined Spaces

Inspectors should ensure that before performing any construction activity inside of a culvert that they perform an assessment as outlined in ODOT's Permit Required Confined Space program before proceeding with the work.

Construction Activity includes: cutting with a torch, grinding with a power tool, applying a coating, epoxies or paints; flame spray applications; operation of gas power tools.

Precautions to be taken when measuring X-Channel Profiles

1. When continuous work is being performed on a bridge deck, always use appropriate traffic warning signs.
2. Where possible always tie off before performing any work over the side of a bridge.
3. Where tying off is not possible, do not expose the upper torso of your body out beyond the vertical plan of the bridge railing.
4. If the bridge inspector kneels along side of the bridge parapet railing, a traffic spotter should be utilized along with making sure your feet and legs are well protected from traffic.

Use of Fall Restraint Systems

The bridge inspector must assess the condition of the existing fall restraint system prior to using.

Prior to using the fall restraint system, the bridge inspector must full aware of how to use the system.

Do not use a vehicle to anchor a fall restraint system when the vehicle is parked on the bridge deck immediately adjacent to the travel lanes.

Precautions to be taken before entering a Confined Space

1. All entrants must have completed the “Confined Space Awareness” Training Class
2. Make sure communication equipment is on-hand and operable and a communication net has been established.
3. Assure air meter is fully functional and it monitors: oxygen content, hydrogen sulfide, and carbon monoxide levels.
4. Before physical entry is made, test the air quality in and around the point of entry.
5. Immediately upon entry, test air quality in top and bottom of the box girder section.
6. Continue to monitor the air quality throughout the inspection procedure until the entry team leaves the space.
7. If a prohibited condition arises, the team will immediate vacate the space and treat it as a “Permit Req. Space”.

Resource Directory

ODOT BRIDGE ENGINEERING COMMUNITY RESOURCE DIRECTORY

March 09, 2009

WORK UNIT	AREA	NAME	TITLE	OFFICE PH. NO.	CELL PH. NO.	PAGER NO.	FAX NO.	HOME PH. NO.
Bridge	Salem	Bruce Johnson	State Bridge Engineer	503 - 986-3344	503 - 580-6876	503 - 589-5312	503 - 986-3407	
Br. Program	Salem	Bert Hartman	Bridge Program Manager	503 - 986-3395			503 - 986-3407	
Br. Program	Salem	Dick Groff	Senior Load Rating Engineer	503 - 986-3397				
Br. Program	Salem	Joe Charbonneau	Load Rating Engineer	503 - 986-3387				
Br. Program	Salem	Nam Bui	Local Agency Load Rating Engineer	503 - 986-3382				
Br. Program	Salem	Jon Rooper	Load Rating/Permit Review	503 - 986-3357				
Br. Program	Salem	Richard King	Major Br. Maintenance Engineer	503 - 986-6575				
Br. Program	Salem	Bruce Novakovich	Senior Bridge Systems Engineer	503 - 986-3378				
Br. Program	Salem	Darryl Morse	Bridge Data Systems Analyst	503 - 986-3339				
Br. Program	Salem	Dawn Mach	Bridge Financial Analyst	503 - 986-3358				
Br. Program	Salem	Anna Dunlap	State STIP Coordinator	503 - 986-3391				
Br. Program	Salem	Erick Cain	Local Agency STIP Coordinator	503 - 986-3384				
Br. Program	Salem	Theresa Yih	Bridge Program System Analyst	503 - 986-3498				
Br. Operations	Salem	Gary Bowling	Bridge Operations Manager	503 - 986-3402	503 - 930-2914		503 - 986-3407	503 - 363-3677
Br. Operations	Salem	Jeff Swanstrom	Senior Bridge Inspector	503 - 986-3337	503 - 302-7998	503 - 373-2936		503 - 370-9361
Br. Operations	Salem	Darrell Haugeberg	Bridge Inventory Coordinator	503 - 986-3347	503 - 302-6129			
Br. Operations	Salem	Kevin Davidson	Struct. Des. Engineer, Dwgs & Specs	503 - 986-3342	503 - 510-0622			
Br. Operations	Salem	Hormoz Seradj	Senior Struct. Des. Engineer, Steel	503 - 986-3346				
Br. Operations	Salem	Craig Shike	Senior Struct. Des. Engineer, Concrete	503 - 986-3323				
Br. Operations	Salem	Steve Tuttle	Local Agency Inspec. Coordinator	503 - 986-3401	503 - 510-2066			503 - 371-0780
Br. Operations	Salem	Albert Nako	Senior Struct. Des. Engineer, Seismic	503 - 986-3333	503 - 510-0622			
Br. Operations	Salem	Gene Leon	Senior Structural Drafter, QA	503 - 986-3319				
Br. Operations	Salem	Jeff Silbernagel	Senior Structural Drafter, Standards	503 - 986-3362				

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WORK UNIT	AREA	NAME	TITLE	OFFICE PH. NO.	CELL PH. NO.	PAGER NO.	FAX NO.	HOME PH. NO.
Br. Operations	Salem	Chittirat Amawattana	Document Control	503 - 986-3240			503 - 986-3407	
Br. Operations	Salem	Katie Pritchard	Vertical Clearance Vehicle	503 - 986-3505	503 - 931-4764			
Br. Operations	Salem	Rick Shorb	Underwater Inspection Leader	503 - 986-2979	503 - 559-0162		503 - 986-2864	
Br. Operations	Salem	Jason Ottosen	Sounding Coordinator	503 - 986-2978				
Br. Operations	Milwaukie	Bob Schmidt	Region 1 Bridge Inspector	971 - 673-7003	503 - 969-1091	971-673-7010	503 - 731-3260	503 - 238-6535
Br. Operations	Milwaukie	Stan Gamolo	Reg. 1 Assistant Bridge Inspector	971 - 673-7004	503 - 559-2519		503 - 731-3260	503 - 653-6456
Br. Operations	Salem	Bill Burns	Region 2 Bridge Inspector	503 - 986-2659	503 - 932-2509		503 - 653-3085	503 - 537-9262
Br. Operations	Salem	Orren Vann	Reg.2 Assistant Bridge Inspector	503 - 986-5760	503 - 559-2662		503 - 653-3085	503 - 390-5446
Br. Operations	Roseburg	Bob Bowne	Region 3 Bridge Inspector	541 - 957-3587	541 - 580-7128	541 - 677-4731	541 - 957-3591	541 - 679-8926
Br. Operations	Bend	Mike Pulzone	Region 4 Bridge Inspector	541 - 388-6188	541 - 419-1688		541 - 388-6108	541 - 382-3201
Br. Operations	La Grande	Kelley McAlister	Region 5 Bridge Inspector	541 - 963-1371	541 - 429-1349		541 - 963-9079	
Br. Preserv.	Salem	Ben Tang	Bridge Preservation Manager	503 - 986-3324	503 - 551-1197		503 - 986-3407	503 - 991-5536
Br. Preserv.	Salem	Ray Bottenberg	Senior Corrosion Engineer	503 - 986-3318	503 - 551-7934			
Br. Preserv.	Salem	Steve Lovejoy	Senior Mechanical Engineer	503 - 986-3326	503 - 931-4764			
Br. Preserv.	Salem	Quentin Smith	Corrosion Engineer	503 - 986-4029				
Br. Preserv.	Salem	Mats Halvardson	Structural Design Engineer	503 - 986-3325				
Br. Preserv.	Salem	David K Johnson	Electrical Engineer	503 - 986-3329				
Br. Preserv.	Salem	Chris Leedham	Structural Design Engineer	503 - 986-3383				
Br. Preserv.	Salem	Jan Six	Senior Geotechnical Engineer	503 - 986-3377	503 - 508-3705			
Br. Preserv.	Salem	John Woodroof	Senior Hydraulics Engineer	503 - 986-3366				
Br. Preserv.	Salem	James Garrard Jr	Corrosion Systems Designer	503 - 986-3315				
Br. Preserv.	Salem	Tom Ohren	CAD/Graphics Technician	503 - 986-4020				

Br. Delivery	Salem	Ray Mabey	OTIA-III Technical Center Manager	503 - 986-3350	503 - 881-7678		503 - 986-4469	
Br. Delivery	Salem	Tim Dodson	Transportation Engineer	503 - 986-3311				
Br. Delivery	Salem	Ron Reisdorf	Senior Construction Engineer	503 - 986-3127				
Materials	Portland	Jim Sabel	NDT Testing (Portland Insp. Crew Ldr)	503 - 653-3083	503 - 708-9805	503 - 237-2765	503 - 653-3085	503 - 640-5911
Materials	Portland	John Lowengart	Welding and NDT Inspector	503 - 653-3083	503 - 701-7676		503 - 653-3085	
R1 Tech Ctr	Portland	Tony Stratis	Bridge Unit Manager	503 - 731-8490	503 - 347-2344		503 - 731-8531	
R1 Tech Ctr	Portland	Nowzar Ardalan	Senior Structural Design Engineer	503 - 731-4964				
R1 Tech Ctr	Portland	[Vacant]	Structural Design Engineer	503 - 731-3262				
R1 Tech Ctr	Portland	Susan Kocher	Structural Design Engineer	503 - 731-8491				
R1 Tech Ctr	Portland	Frederick Mangubat	Structural Design Engineer	503 - 731-8554				
R1 Tech Ctr	Portland	[Vacant]	Structural Designer	503 - 731-8211				
R1 Tech Ctr	Portland	Thiet Nguyen	Structural Design Engineer	503 - 731-8537				
R1 Tech Ctr	Portland	Robert Tovar	Structural Design Engineer	503 - 731-8484				
R1 Tech Ctr	Portland	Tony Johnson	Senior Structural Drafter	503 - 731-8481				
R1	Portland	Karla Keller	Reg. 1 Maint./Operations Manager	503 - 731-8559	503 - 312-9735	503 - 921-2588	503 - 731-8259	
R1	Portland	Duc Phan	Reg. 1 Electrician	503 - 653-3124	503 - 969-1031	503 - 969-1031	503 - 653-3291	
R2 Tech Ctr	Salem	Bernie Kleutsch	Interim Bridge/Geo-Hydro Manager	503 - 986-2646	503 - 551-0084	503 - 316-4805	503 - 986-2622	
R2 Tech Ctr	Salem	Al Heyn	Senior Structural Design Engineer	503 - 986-2774				
R2 Tech Ctr	Salem	Ron Balcketer	Structural Design Engineer	503 - 986-2771				
R2 Tech Ctr	Salem	[Vacant]	Structural Design Engineer	503 - 986-2818				
R2 Tech Ctr	Salem	Rick Hart	Structural Design Engineer	503 - 986-2778				
R2 Tech Ctr	Salem	[Vacant]	Structural Design Engineer	503 - 986-2830				
R2 Tech Ctr	Salem	Mark Lusby	Structural Design Engineer	503 - 986-2811				
R2 Tech Ctr	Salem	Matt Stucker	Structural Design Engineer	503 - 986-2791				
R2 Tech Ctr	Salem	Sean White	Structural Design Engineer	503 - 986-2787				

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WORK UNIT	AREA	NAME	TITLE	OFFICE PH. NO.	CELL PH. NO.	PAGER NO.	FAX NO.	HOME PH. NO.
R2 Tech Ctr	Salem	Lynn Boge	Structural Drafter	503 - 986-2823			503 - 986-2622	
R2 Tech Ctr	Salem	Sandy Gish	Structural Drafter	503 - 986-2789				
R2	Salem	Richard Fenske	R 2 Maintenance/Operations Manager	503 - 986-2667	541 - 912-4050	503 - 918-0418	503 - 986-2630	
R2	Salem	Richard Spear	Region 2 Electrician	503 - 986-2706	503 - 932-1483	503 - 918-1817		
R3 Tech Ctr	Roseburg	James Burford	Bridge & Highway Design Manager	541 - 975-3573	541 - 643-0989		541 - 957-3604	
R3 Tech Ctr	Roseburg	Bob Grubbs	Senior Structural Design Engineer	541 - 957-3579	541 - 580-2531			
R3 Tech Ctr	Roseburg	Kevin Corlew	Structural Design Engineer	541 - 957-3625				
R3 Tech Ctr	Roseburg	[Vacant]	Bridge Designer					
R3 Tech Ctr	Roseburg	Angelito Delacruz	Bridge Designer	541 - 957-3566				
R3 Tech Ctr	Roseburg	Linda Coffel	Bridge/Roadway Drafter	541 - 957-3614				
R3 Tech Ctr	Roseburg	Billy Shafer	Bridge/Roadway Drafter	541 - 957-3630				
R3 Tech Ctr	White City	Thomas "Dan" Roberts	Bridge/Roadway Drafter	541 - 774-6367			541 - 957-3615	
R3	Roseburg	Terry Brock	Region 3 Electrician	541 - 957-3667	541 - 580-8533	541 - 440-0250		
R3	Coast	Larry Sanborn	Region 3 Electrician	541 - 269- 5217	541 - 290-0404	541 - 266-5981		
R4 Tech Ctr	Bend	Randy Davis	Bridge / Geo / Env Manager	541 - 388-6334				
R4 Tech Ctr	Bend	John Ostendorff	Bridge/Geotech Design Engineer	541 - 388-6002	541 - 388-6383		541 - 388-0476	
R4 Tech Ctr	Bend	Michael Graves	Structural Drafter	541 - 388-6263				
R4	Bend	Eric Hansen	Region 4 Electrician	541 - 388-6221 x 272	541 - 280-5185	541- 617-4465	541 - 388-6231	
R5 Tech Ctr	La Grande	Mark Hanson	Bridge / Geo / Env Manager	541 - 963-1361	541 - 786-0905			
R5 Tech Ctr	La Grande	Ashok Tirodkar	Senior Structural Design Engineer	541 - 963-1350			541 - 963-9079	
R5 Tech Ctr	La Grande	Scott W Hayes	Structural Design Engineer	541 - 963-1346				
Local Gov.	Salem	Holly Winston	Senior Local Br. Standards Engineer	503 - 986-3356			503 - 986-3749	

Construction	Salem	Ivan Silbernagel	Structure Paint Engineer	503 - 986-3018	503 - 510-6213			
Construction	Salem	Mike Dunning	Qualified Products	503 - 986-3059	503 - 510-3897	503 - 361-1862	503 - 986-3096	
Construction	Salem	Scott Nelson	Structural Materials Engineer	503 - 986-3056	503 - 881-7001			
Construction	Salem	Terry Thames	Structure Quality Engineer	503 - 986-3019	503 - 510-3758			
Construction	Salem	Bill Bennett	Asst. Structure Quality Engineer	503 - 986-6628	503 - 881-5650		503 - 986-3111	
Maintenance	Salem	Lucy Moore	State Maint. & Operations Engineer	503 - 986-3005	503 - 931-9557		503 - 986-3032	
Maintenance	Salem	Rose Gentry	Emergency Response	503 - 986-3020	503 - 881-6570	503 - 918-4521		
Emerg. Dispatch	Station 1		Station 1 Dispatch	503 - 283-5859				
Emerg. Dispatch	Station 2		Station 2 Dispatch	503 - 362-0457			503 - 371-5924	
Emerg. Dispatch	Station 3		Station 3 Dispatch	503 - 858-3103				
Emerg. Dispatch	Station 4		Station 4 Dispatch	541 - 383-0121	866 - 228-4164			
Equipment	Salem	Scott Holtsclaw	UBIT Dispatcher	503 - 986-2743	503 - 510-7606		503 - 986-2717	
FHWA	Salem	Tim Rogers	Division Bridge Engineer	503 - 587-4706	503 - 949-6258		503 - 399-5838	
WSDOT	Olympia	Grant Griffin	Local Agency Bridge Engineer	360 - 705-7870				
WSDOT	Olympia	Glen Scroggins	Bridge Preservation Engineer	360 - 570-2557				
WSDOT	Olympia	George Comstock	Regional Insp Engineer	360 - 664-0448				
WSDOT	Olympia	Harvey Coffman	Br Preservation Engineer	360 - 753-4739				360 - 491-2795
WSDOT	Olympia	Kapur Juqesh	Br & Structures Engineer	360 - 705-7207			360 - 705-6814	
ITD	Boise	Matt Farrar	Bridge Engineer	208 - 334-8538				
ITD	Boise	Barry Gwin	Br. Maintenance Manager	208 - 334-8472	208 - 867-7854			
ITD	Boise	Kathleen Slinger	Br Inspection Engineer	208 - 334-8407			208 - 334-8256	
District 1	Astoria	David Neys	District Manager	503 - 325-7222	503 - 791-0757	503 - 338-1463	503 - 325-1314	
District 1	Astoria	Steve Carter	Asst. District Manager	503 - 325-7222	503 - 440-0937	503 - 440-0937	503 - 325-1314	503 - 325-5718
District 1	Astoria	[Vacant]	N. Coast Bridge Maintenance Supervisor	503 - 325-3580	503 - 338-8416	503 - 338-8416	503 - 325-5976	
District 1	Seaside	Dan McFadden	Bridge Crew Coordinator	503 - 738-5753	503 - 440-0949	503 - 338-3472	503 - 738-0621	
District 1	Astoria	Joshua Ransom	Drawbridge Coordinator	503 - 325-5851	503 - 791-0049	503 - 791-0049	503 - 325-5976	503 - 325-1006

ODOT BRIDGE ENGINEERING COMMUNITY RESOURCE DIRECTORY

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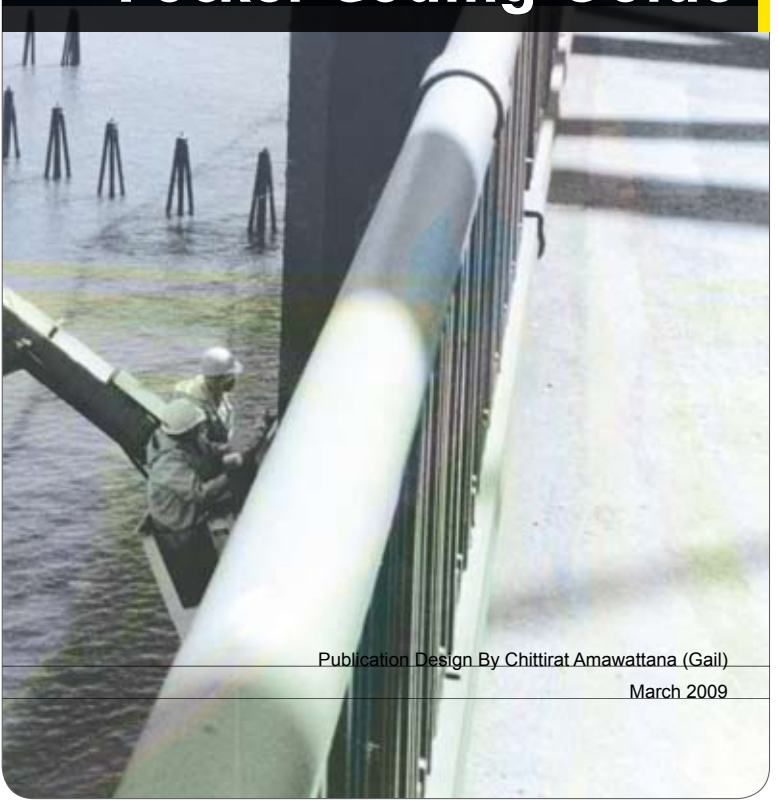
WORK UNIT	AREA	NAME	TITLE	OFFICE PH. NO.	CELL PH. NO.	PAGER NO.	FAX NO.	HOME PH. NO.
District 2A	Sylvan	Ron Kroop	District Manager	503 - 229-5266	503 - 969-1776		503 - 297-6058	
District 2A	Milwaukie	Sam Hunaidi	Assistant District Manager	503 - 229-5670	503 - 969-1779	503 - 921-4802	503 - 297-6058	
District 2A	Milwaukie	Morrie Stover	Bridge Crew Supervisor	503 - 731-8326	503 - 969-1093	503 - 921-4818	503 - 731-8346	360 - 693-5070
District 2A	Milwaukie	Mike Gehring	Assistant Bridge Crew Supervisor	503 - 731-8327	503 - 969-1094	503 - 921-4817	503 - 731-8346	
District 2A	Milwaukie	Geoffrey Bowyer	Region 1 TMOC Manager	503 - 731-4703	503 - 702-9085	503 - 921-2576	503 - 731-4555	
District 2A	Milwaukie	[Vacant]	Region 1 TMOC Office	503 - 731-4652			503 - 731-4555	
District 2B	Clackamas	Ted Miller	District Manager	971 - 673-6215	503 - 539-8215		503 - 653-5655	
District 2B	Milwaukie	Bobby Walker	Assistant District Manager	503 - 673-6216	503 - 784-6535	503 - 921-4951	503 - 653-5655	
District 2B	E. Portland	Bob Sork	Bridge Crew Supervisor	503 - 257-4395	503 - 880-2396	503 - 880-2396	503 - 731-4555	
District 2B	E. Portland	Bill Terrel	Bridge Coordinator	503 - 257-4395	503 - 709-2669	503 - 709-2669	503 - 257-4360	
District 2B	E. Portland	Marc Gross	Drawbridge Supervisor	503 - 283-5801	503 - 880-4126	503 - 204-6254	503 - 283-5721	360 - 993-0319
District 2C	Troutdale	Larry Olson	District Manager	503 - 665-4514	503 - 720-4484	503 - 237-1655	503 - 665-4519	503 - 761-9306
District 2C	Troutdale	Jim McNamee	Interim Assistant District Manager	503 - 665-4451	503 - 970-6302	503 - 237-1394	503 - 665-4519	
District 3	Salem	Don Jordan	District Manager	503 - 986-2874	503 - 932-4103	503 - 918-2271	503 - 986-2881	503 - 588-3101
District 3	Salem	Greg Adams	Interim District 3 Bridge Supervisor	503 - 986-2802	503 - 932-4273	503 - 932-4273	503 - 986-2769	
District 3	Salem	Don Spier	Interim District 3 Bridge Coordinator	503 - 986-2892	503 - 793-3750		503 - 986-2881	
District 4	Corvallis	Bob Doran	District Manager	541 - 757-4211	541 - 740-5163	541 - 370-3238	541 - 757-4111	
District 4	Corvallis	Dean Fuller	Assistant District Manager	542 - 757-4211				
District 4	Corvallis	Jeff Norman	Bridge Crew Coordinator	541 - 757-4195	541 - 231-0114	541 - 758-7904	541 - 757-4290	541 - 623-0104
District 4	Albany	Rich Stinson	Bridge Crew Coordinator	541 - 967-2056	541 - 936-0221		541 - 967-2072	
District 4	Ona Beach	Ron Beatty	Bridge Crew Coordinator	541 - 563-6400 x 6	541 - 912-3558	541 - 265-1734	541 - 563-6406	
District 5	Eugene	Michael Spaeth	District Manager	541 - 744-8080	541 - 954-8915		541 - 726-2509	
District 5	Springfield	Don Angermayer	District 5 Operations Coordinator	541 - 736-2841	541 - 502-9585	541 - 502-9585	541 - 726-2509	

District 5	Eugene	Brad Henry	District 5 Bridge Supervisor	541 - 686-7642	503 - 954-0768	503 - 710-0235	541 - 686-7541	503 - 393-8643
District 5	Eugene	Mike Philpott	Bridge Crew Coordinator	541 - 686-7621	541 - 501-7368	541 - 683-0370	541 - 686-7541	
District 7	Roseburg	Darin Neavoll	District Manager	541 - 957-3683	541 - 580-7125	541 - 440-0344	541 - 957-3591	
District 7	Coos Bay	Bryan Mast	Reg 3 Bridge Maintenance Mgr.	541 - 267-5681	541 - 404-0020	541 - 440-2967	541 - 267-6290	541 - 672-9781
District 7	Coos Bay	Tom Harlow	Assistant Bridge Crew Coordinator	541 - 269-0821	541 - 290-0440	541 - 269-4725	541 - 957-3662	541 - 267-6290
District 8	Medford	Jerry Marmon	District Manager	541 - 774-6355	541 - 890-2579		541 - 830-6408	541 - 582-4622
District 8	Grants Pass	Bryan Mast	Maintenance Manager	541 - 474-3149x3160	541 - 659-3196	541 - 774-0332	541 - 471-2864	
District 8	Grants Pass	Bill Long	Bridge Crew Coordinator	541 - 474-3149x3176	541 - 890-7017	541 - 774-0250	541 - 471-2864	541 - 479-3146
District 9	The Dalles	Sam Wilkins	District Manager	541 - 296-2215			541 - 296-1629	541 - 298-7900
District 9	The Dalles	Shane Johnson	Bridge Crew Supervisor	541 - 296-4774	541 - 980-4978	541 - 506-1024	541 - 296-7707	541 - 296-4364
District 10	Bend	Pat Creedican	District Manager	541 - 388-6192			541 - 388-6022	
District 11	Klamath Falls	Mike Stinson	District Manager	541 - 883-5662	541 - 891-7962		541 - 883-5589	541 - 273-7527
District 11	Klamath Falls	Randy Bednar	Asst. District Manager	541 - 883-5785	541 - 891-5347		541 - 883-5589	541 - 882-4650
District 11	Klamath Falls	Jim Stone	Bridge Crew Supervisor	541 - 883-5538	541 - 891-7871		541 - 883-5589	541 - 884-9175
District 12	Pendleton	George Ruby	District Manager	541 - 276-1241			541 - 276-5767	
District 12	Pendleton	Robert Cash	District Bridge Coordinator	541 - 276-7416	541 - 969-7563		541 - 276-5767	541 - 278-8011
District 12	LaGrande	Devon Talley	Region 5 Bridge Crew Manager	541 - 963-1586	541- 786-0977		541 - 963-0249	541 - 523-9701
District 13	LaGrande	Mike Buchanan	District Manager	541 - 963-8406			541 - 963-0249	541 - 562-6156
District 13	LaGrande	Devon Talley	Region 5 Bridge Crew Manager	541 - 963-1586	541- 786-0977		541 - 963-0249	541 - 523-9701
District 13	LaGrande	Ed Kennicott	District Bridge Coordinator	541 - 963-8103	541- 786-0978		541 - 963-0249	541 - 963-5319
District 14	Ontario	Ric Young	District Manager	541 - 889-9115x222	541- 823-3008		541 - 889-6600	208 - 642-1198
District 14	LaGrande	Devon Talley	Region 5 Bridge Crew Manager	541 - 963-1586	541- 786-0977		541 - 963-0249	541 - 523-9701
District 14	Ontario	Jesse Collins	District Bridge Coordinator	541 - 473-2950	541 - 881-7576		541 - 473-2876	
Contractors		F.E. Ward, Inc.		360 - 573-8929				
		Hamilton Const.		541 - 746-2426				
		Holm II, Inc.		503 - 769-2649				
DAS	Salem		Motorpool	503 - 378-4377				

ODOT Bridge Engineering Section

Oregon Department of Transportation

2009 Bridge Inspection Pocket Coding Guide



Publication Design By Chittirat Amawattana (Gail)

March 2009