Additional Information

- Classification of Distressed Bridges
- ODOT Bridge Inspection Pocket Coding Guide Excerpts
  - Program Requirements, Condition Ratings for Deck, Superstructure, Substructure, Culverts and Scour
- Concrete Crack Guideline (Reporting Condition Assessment)
- Sufficiency Rating
Classification of Distressed Bridges

**General Qualifications**
To be considered for either structurally deficient or otherwise distressed, a bridge must first meet two criteria:

1. Its inventory route status, NBI Item 5a (BrM: roadway.on_under) must be coded ‘1’, indicating the route is on the structure
2. Its length, NBI item 104 (BrM: bridge.length) must be numeric and greater than or equal to 20 ft.

**Structurally Deficiencies (SD)** (Determined first)
1. A condition rating of 4 or less for any of the following:
   a. Item 58 – Deck Rating (BrM: inspevnt.dkrating)
   b. Item 59 – Superstructure Rating (BrM: inspevnt.suprating)
   c. Item 60 – Substructure Rating (BrM: inspevnt.subrating)
   d. Item 62 – Culvert Rating (BrM: inspevnt.culvrating) but only if the last two digits of item 43 – Design Type (BrM: bridge.designmain) are coded ‘07’ (frame) or ‘19’ (culvert).

OR

2. An appraisal rating of 2 or less for:
   a. Item 67 – Structural Condition (BrM: inspevnt.strrating)

OR

   b. Item 71 – Waterway Adequacy (BrM: inspevnt.waterwadq) but only if the last digit of Item 42 – Type of Service (BrM: bridge.servtypund) is coded 0, 5, 6, 7, 8 or 9, indicating a waterway under the structure.

**Other Deficiencies (OD)** (Determined second)
Some of these classifications are in part determined by route. A bridge carrying an NHS route will have Item 104 (BrM: roadway.NHS_ind) coded ‘1’ and one carrying an Oregon Freight route will have Userkey 15 (BrM: bridge.userkey15) coded ‘yes’.

Any bridge that fits any of the following categories of other deficiencies shall be considered a distressed bridge.

**Bridge Rail**
A bridge’s total rail score is greater than or equal to 11

OR

If both its rail material (performance level) is Aluminum

AND
NBI Item 26 – Functional Classification (*BrM: roadway.funcclass*) is coded 0, 1, 11, or 12, indicating an interstate highway or other freeway bridge.

**Cathodic Protection**
Bridges on or eligible for the National Register of Historic Places (*BrM: bridge. histsig = 1 or 2*) that are also located in a coastal environment and currently cathodically unprotected.

**Load Capacity**
Any bridge on the restricted bridge list
OR
A bridge located on the NHS or Oregon Freight System with Item 67 – Structural Evaluation (*BrM: Inspevnt.strrating*) less than 4
AND
Having continuous trip permits rating factors (*Load Rating Database: LR.P1MVIRF or LR.P2MVIRF*) less than 0.96 (or null) and Type 3-3 Rating factors less than 1.3
OR
A Bridge located on the NHS or Oregon Freight System with Item 103 (*BrM: bridge. tempstruct*) coded ‘T’, indicating a temporary structure or condition.

**Low Service Life**

**Movable Bridges**
Any movable bridges with old, mechanical contact switches that need to be upgraded to modern, solid-state switches.

**Other Geometric Clearances**
Item 43b – Main Structure Type (*BrM: bridge.designmain*) with values < 9 or = 22
AND
Item 68 – Deck Geometry Rating (*BrM: inspevnt.deckgeo*) < 4
AND
The bridge is either on the NHS or an Oregon Freight Route.

**Paint**
Paint system elements (*BrM: eleminsp.elemkey = 390*) with at least 15% in condition state 3 or 4

**Scour**
Item 113 – A Scour Critical bridge (*BrM: inspevnt.scourcrit ≤ 3*) with any quantity of element 6000 - Scour Defect in condition state 3 or 4.
**Timber Structures**

Bridges with timber substructure elements (*BrM: eleminsp.elemkey = 111, 206, 216, 228 or 235*) with combined quantities greater than or equal to 10% in condition state 3 or 4.

**Vertical Clearance**

Bridges on I-5 or I-84 with Item 53 – Vertical Clearance over the structure (*BrM: bridge.vclover*) < 16.5 ft. or bridges over I-5 or I-84 with Item 54B – Vertical Clearance under the structure (*BrM: bridge.vclunder*) < 16.5 ft.

OR

Bridges located on an NHS or freight route with Item 53 < 16 ft. or bridges over an NHS or freight route with Item 54B < 16 ft.

OR

Any bridge with Item 53 < 14 ft., or any bridge over traffic with item 54B < 14 ft.
**NBI General Condition Rating Table**

For evaluating Items 58, 59 and 60, the following general condition ratings shall be used as a guide

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>N</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>9</td>
<td>Excellent Condition</td>
</tr>
<tr>
<td>8</td>
<td>Very Good Condition</td>
</tr>
<tr>
<td>7</td>
<td>Good Condition – some minor problems</td>
</tr>
<tr>
<td>6</td>
<td>Satisfactory Condition – structural elements show some minor deterioration</td>
</tr>
<tr>
<td>5</td>
<td>Fair Condition – all primary structural elements are sound but may have minor section loss, cracking, spalling, or scour.</td>
</tr>
<tr>
<td>4</td>
<td>Poor Condition – advanced section loss, deterioration, spalling, or scour.</td>
</tr>
<tr>
<td>3</td>
<td>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.</td>
</tr>
<tr>
<td>2</td>
<td>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.</td>
</tr>
<tr>
<td>1</td>
<td>“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.</td>
</tr>
<tr>
<td>0</td>
<td>Failed Condition – out of service – beyond corrective action.</td>
</tr>
</tbody>
</table>

**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 Guidelines**

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 CS rating).
- Severity and density of cracks and the existence of rust staining (Deck & Soffit CS rating).
- Efflorescence on the soffit side of the deck is considered a good indicator as to (1) whether the cracks extend through the deck, (2) whether water is seeping through the cracks and (3) whether corrosion is occurring in the steel reinforcement.
- Existence and severity of construction defects that create additional traffic loading (Roadway Ride Quality Rating).
- Severity of the rutting, scaling or exposure of rebar in the wheel tracks (Wearing Surface Condition).
- Debonded areas of Wearing Surface (Pot/ Pan Holes) (Wearing Surface Condition).

**Timber Deck Supplemental Ratings**

<table>
<thead>
<tr>
<th>Rating</th>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td><strong>Excellent Condition</strong></td>
<td>No noticeable or noteworthy deficiencies which affect the condition of the deck.</td>
</tr>
<tr>
<td>8</td>
<td><strong>Very Good Condition</strong></td>
<td>Tightly secured to the floor system. No crushing, decay or splitting.</td>
</tr>
<tr>
<td>7</td>
<td><strong>Good Condition</strong></td>
<td>Minor checking or splitting with a few loose planks.</td>
</tr>
<tr>
<td>6</td>
<td><strong>Satisfactory Condition</strong></td>
<td>More than 30% of the 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 (&lt; 5%) are in need of replacement.</td>
</tr>
<tr>
<td>Rating</td>
<td>Condition</td>
<td>Description</td>
</tr>
<tr>
<td>--------</td>
<td>-----------</td>
<td>-------------</td>
</tr>
<tr>
<td>5</td>
<td>Fair Condition</td>
<td>Numerous (30 - 40%) planks checked split, decayed, or crushed. 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.</td>
</tr>
<tr>
<td>4</td>
<td>Poor Condition</td>
<td>Majority (&gt; 40%) of the planks are decayed, crushed, or split. Fire damage with significant section loss which may reduce the load carrying capacity. &gt; 10% of the planks need replacement.</td>
</tr>
<tr>
<td>3</td>
<td>Serious Condition</td>
<td>Severe signs of structural distress are visible. Major decay or fire damage is present which has reduced load carrying capacity.</td>
</tr>
<tr>
<td>2</td>
<td>Critical Condition</td>
<td>Advanced deterioration with partial deck failure. May need to close bridge.</td>
</tr>
<tr>
<td>1</td>
<td>“Imminent” Failure Condition</td>
<td>Bridge is closed. Corrective action may put back into light service.</td>
</tr>
<tr>
<td>0</td>
<td>Failed Condition</td>
<td>Bridge is closed. Deck replacement necessary.</td>
</tr>
</tbody>
</table>

**Steel Deck Supplemental Ratings**

<table>
<thead>
<tr>
<th>Rating</th>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Excellent Condition</td>
<td>No noticeable or noteworthy deficiencies which affect the condition of the steel deck.</td>
</tr>
<tr>
<td>8</td>
<td>Very Good Condition</td>
<td>Tightly secured to floor system with no rust.</td>
</tr>
<tr>
<td>7</td>
<td>Good Condition</td>
<td>Loose at some connections with minor rusting. A few cracked welds and/or broken grids.</td>
</tr>
<tr>
<td>6</td>
<td>Satisfactory Condition</td>
<td>Considerable rusting with indications of initial section loss. Loose at many locations. Some cracked welds and/or broken grids.</td>
</tr>
<tr>
<td>5</td>
<td>Fair Condition</td>
<td>Heavy rusting with areas of section loss. Loose at numerous locations. Numerous cracked welds and/or broken grids.</td>
</tr>
<tr>
<td>4</td>
<td>Poor Condition</td>
<td>Heavy rusting resulting in considerable section loss and some hole through deck. Many welds cracked and/or grids broken.</td>
</tr>
<tr>
<td>3</td>
<td>Serious Condition</td>
<td>Severe signs of structural distress are visible.</td>
</tr>
<tr>
<td>2</td>
<td>Critical Condition</td>
<td>Many holes through deck.</td>
</tr>
<tr>
<td>1</td>
<td>“Imminent” Failure Condition</td>
<td>Bridge is closed. Corrective action may put back in light service.</td>
</tr>
<tr>
<td>0</td>
<td>Failed Condition</td>
<td>Bridge is closed. Deck replacement necessary.</td>
</tr>
</tbody>
</table>
**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 the NBI rating, except in extreme situations, but should be noted in the inspection report.

On a bridge 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**

<table>
<thead>
<tr>
<th>Rating</th>
<th>Condition Description</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>9</strong></td>
<td><strong>Excellent Condition</strong></td>
</tr>
<tr>
<td><strong>8</strong></td>
<td><strong>Very Good Condition</strong></td>
</tr>
<tr>
<td><strong>7</strong></td>
<td><strong>Good Condition</strong></td>
</tr>
<tr>
<td><strong>6</strong></td>
<td><strong>Satisfactory Condition</strong></td>
</tr>
<tr>
<td><strong>5</strong></td>
<td><strong>Fair Condition</strong></td>
</tr>
<tr>
<td><strong>4</strong></td>
<td><strong>Poor Condition</strong></td>
</tr>
<tr>
<td><strong>3</strong></td>
<td><strong>Serious Condition</strong></td>
</tr>
<tr>
<td><strong>2</strong></td>
<td><strong>Critical Condition</strong></td>
</tr>
</tbody>
</table>
1 **“Imminent”**  
**Failure Condition**  
Bridge is closed. Major deterioration or section loss present on primary structural element, obvious vertical or horizontal movement is affecting the structure's stability. Corrective action may put the structure back into light service.

0 **Failed Condition**  
Bridge is closed. Replacement necessary.

**Prestressed Concrete Superstructure Supplemental Rating Guideline**

9 **Excellent Condition**  
No noteworthy deficiencies.

8 **Very Good Condition**  
Non-structural cracks.

7 **Good Condition**  
Non-structural cracks. No rust stains.

6 **Satisfactory Condition**  
Minor concrete damage or deterioration. Non-structural cracks. Minor exposure of reinforcement.

5 **Fair Condition**  
Isolated and minor exposure of prestressing strand(s) may be present. Hairline structural cracks with little or no rust staining.

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. 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 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 and are 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. Replacement is necessary.

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**Timber Superstructure Supplemental Rating Guidelines**

<table>
<thead>
<tr>
<th>Rating</th>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Excellent Condition</td>
<td>No or noteworthy deficiencies.</td>
</tr>
<tr>
<td>8</td>
<td>Very Good Condition</td>
<td>Minor cracking or splitting of beams or stringers at non-critical locations.</td>
</tr>
<tr>
<td>7</td>
<td>Good Condition</td>
<td>Insignificant decay, cracking, or splitting of beams or stringers.</td>
</tr>
<tr>
<td>6</td>
<td>Satisfactory Condition</td>
<td>Some decay, checking, or splitting present. Fire damage limited to surface scorching with no measurable loss of section.</td>
</tr>
<tr>
<td>5</td>
<td>Fair Condition</td>
<td>Moderate decay, cracking, splitting, or minor crushing of beams or stringers. Fire damage limited to surface charring with minor, measurable section loss.</td>
</tr>
<tr>
<td>4</td>
<td>Poor Condition</td>
<td>Extensive decay, cracking, splitting, cracking or crushing or fire damage. Load capacity of member is affected.</td>
</tr>
<tr>
<td>3</td>
<td>Serious Condition</td>
<td>Severe decay, checking splitting, cracking, or crushing or fire damage. Load capacity of member is affected.</td>
</tr>
<tr>
<td>2</td>
<td>Critical Condition</td>
<td>Advanced deterioration. Members have resulted in local failures. Unless monitored closely, it may be necessary to close the bridge until corrective action is taken.</td>
</tr>
</tbody>
</table>
| 1      | “Imminent”
   Failure Condition  Bridge is closed. Corrective action may put back in light service. |
| 0      | Failed Condition  Bridge is closed. Replacement necessary. |
**Steel Superstructure Supplemental Rating Guidelines**

<table>
<thead>
<tr>
<th>Rating</th>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Excellent Condition</td>
<td>No noticeable or noteworthy deficiencies which affect the condition of the superstructure.</td>
</tr>
<tr>
<td>8</td>
<td>Very Good Condition</td>
<td>No visible rust.</td>
</tr>
<tr>
<td>7</td>
<td>Good Condition</td>
<td>Some rust without any section loss.</td>
</tr>
<tr>
<td>6</td>
<td>Satisfactory Condition</td>
<td>Initial section loss (minor pitting, scaling, or flaking) in non-critical areas.</td>
</tr>
<tr>
<td>5</td>
<td>Fair Condition</td>
<td>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.</td>
</tr>
<tr>
<td>4</td>
<td>Poor Condition</td>
<td>Significant (measurable) section loss in critical areas. Fatigue or out-of-plane bending cracks may be preset in critical areas. Hinges may be frozen from corrosion.</td>
</tr>
<tr>
<td>3</td>
<td>Serious Condition</td>
<td>Severe section loss or cracking in critical areas. Minor failures may have occurred.</td>
</tr>
<tr>
<td>2</td>
<td>Critical Condition</td>
<td>Severe section loss or cracking in many areas with holes rusted through at numerous locations in critical areas.</td>
</tr>
<tr>
<td>1</td>
<td>“Imminent” Failure Condition</td>
<td>Bridge is closed. Corrective action may put back in light service.</td>
</tr>
<tr>
<td>0</td>
<td>Failed Condition</td>
<td>Bridge is closed. Replacement necessary.</td>
</tr>
</tbody>
</table>

**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.

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.
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**

<table>
<thead>
<tr>
<th>Rating</th>
<th>Condition</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>Excellent Condition</td>
<td>No noteworthy deficiencies.</td>
</tr>
<tr>
<td>8</td>
<td>Very Good Condition</td>
<td>Shrinkage cracks, light scaling, or insignificant spalling. No rebar exposed. Insufficient damage caused by drift.</td>
</tr>
<tr>
<td>7</td>
<td>Good Condition</td>
<td>Initial disintegration or deterioration, cracking with leaching, or spalls on concrete or masonry units with no effect on bearing area. Leakage of expansion devices has initiated minor cracking. Some rusting of steel without measurable section loss. Some rust without any section loss.</td>
</tr>
<tr>
<td>6</td>
<td>Satisfactory Condition</td>
<td>Moderate deterioration or disintegration, spalls, cracking, and leaching on concrete or masonry units with little or no effect on bearing areas.</td>
</tr>
<tr>
<td>5</td>
<td>Fair Condition</td>
<td>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.</td>
</tr>
<tr>
<td>4</td>
<td>Poor Condition</td>
<td>Structural cracks in concrete and masonry units. Extensive scouring or undermining of footing affecting the stability of the unit and requiring corrective action.</td>
</tr>
<tr>
<td>3</td>
<td>Serious Condition</td>
<td>Severe disintegration. Exposed rebar with advanced stages of corrosion. Bearing areas have considerable loss of bearing. Severe scour or undermining of footing is affecting the stability. Settlement may have occurred; shoring may be necessary.</td>
</tr>
<tr>
<td>2</td>
<td>Critical Condition</td>
<td>Exposed rebar is not bonding with the concrete. Large structural cracks present. Substructure is</td>
</tr>
</tbody>
</table>
near state of collapse due to scour. Pier has settled.

<table>
<thead>
<tr>
<th></th>
<th>“Imminent” Failure Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Bridge is closed. Corrective action may put back in light service.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Failed Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td>Bridge is closed. Replacement necessary.</td>
</tr>
</tbody>
</table>

**Timber Substructure Supplemental Rating Guidelines**

<table>
<thead>
<tr>
<th></th>
<th>Excellent Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td>No noticeable or noteworthy deficiencies which affect the condition of the substructure. Insignificant scrape marks caused by drift or collision.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Very Good Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>Insignificant damage caused by drift or collision with no misalignment and not requiring corrective action.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Good Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>7</td>
<td>Insignificant decay, cracking, or splitting of timber. Minor scour may have occurred.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Satisfactory Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>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.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Fair Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>5</td>
<td>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.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Poor Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>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.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Serious Condition</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>Severe section loss in critical stress areas. Major fire damage to timber which will</td>
</tr>
</tbody>
</table>
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
Bridge 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 reliable 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 or 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
Bridge is closed. Corrective action may put back in light service.

0 Failed Condition
Bridge is closed. Replacement necessary.

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), Item 60 (Substructure) shall be coded ‘N’ for all culverts.

Culvert Condition Rating Guidelines

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, no exposed rebar. Insignificant damage caused by drift with no misalignment, no corrective action required. Some minor scouring occurred near 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 wingwalls, or pipes. Metal culverts have a smooth curvature, non-symmetrical shape, significant corrosion, or moderate pitting.

5 Moderate to major deterioration. Extensive cracking and leaching, or spalls on concrete or masonry walls and slabs. Minor settlement or misalignment.
Noticeable scouring or erosion at wingwalls. 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 described in 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 Bridge closed. Corrective action may put back into light service.

0 Bridge closed. Replacement necessary.

**NBI Item 113, Scour Code**

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”.

There are two main objectives to be accomplished in inspecting bridges for scour:

- Accurately record the current condition of the bridge and the streambed and
- Identify conditions that are indicative of potential problems with scour and streambed stability for further review and evaluation.

**Scour Code Rating Guidelines**

- 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).
1. 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 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 of 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 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 condition; 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 or
   2. Scour below spread-footing base or pile tips.

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. A 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 Bridge is scour critical. Bridge has failed and is closed to traffic.

Process for Monitoring Scour and Coding NBI Item 113 Scour Code

Note: Only an ODOT Hydraulics Engineer may change this item

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

► Assure that X-Channel Profile is on file for every bridge that is located over a waterway.
► Assure that an underwater inspection is performed on all structures with bridge elements in non-wadeable waterway.
► Review and question the reasonableness of the designated scour code for the bridge. If the scour code seems unreasonable, request that 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 the Underwater Inspections are performed on all structures with bridge elements in non-wadeable waterway.
► Assure that all assigned major structures over water have an X-Channel Profile and that it is current and up-to-date using a dive boat and fathometer.
► 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, images and a narrative description that supports that conclusion, i.e. scour countermeasures installed.
The ODOT Bridge Hydraulics Engineer will perform the following:

► Perform a scour evaluation on all new and existing structures in the inventory that are located over a waterway.
► Enter the Scour Code (NBI Item 113) in the Bridge Inventory Database.
► Produce and post the Scour Plan of Action for bridge owners.
► Evaluate all scour countermeasures to see if they were designed and constructed in accordance with HEC 18.
► Respond to the reasonableness review questions generated by the bridge inspectors in the field.

The ODOT Bridge Inventory Coordinator will perform the following:

► Keep the Bridge Hydraulics Engineer, Underwater Inspection Unit, and the above water inspectors posted of new structures.
► Assure that the most up-to-date information is coded in the Bridge Inspection Database for the FHWA Submittals.
Concrete Crack Guideline

Concrete Crack Guideline – Reporting Condition Assessment
Applies to all members that distribute loads to other members, with the exception of decks.

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

**All Superficial Cracks:** Cracks < 0.012” and spacing > 3’
- Shrinkage, temperature or all non-live load induced cracks
- Majority of the reinforced concrete elements – Condition State 1

**NBI Item 59 or 60 condition rating of 6**

**Superficial Cracks:** Cracks < 0.012” and spacing < 3’ but > 1’
- Shrinkage, temperature or all non-live load induced cracks
- Majority of the Reinforced Concrete Elements – Condition State 2

**Minor Structural Cracks:** Cracks ≥ 0.012” but ≤ 0.05” and spacing > 3’
- Intermittent shear friction zone cracks on 1 side of girder
- Majority of the Reinforced Concrete Elements – Condition State 2

**NBI Item 59 or 60 condition rating of 5**

**Minor Structural Cracks:** Cracks ≥ 0.012” but ≤ 0.05” and spacing > 1’
- Intermittent shear friction zone cracks on 1 side of girder.
- Majority of the reinforced concrete elements – Condition State 2

**Medium Structural Cracks:** Cracks ≥ 0.05” and spacing > 1’,
- Intermittent shear friction zone cracks on 2 sides.
- Majority of the reinforced concrete elements – Condition State 2
- No evidence of concrete powder present
- No evidence of spalling or chipping at edge of crack
- The length or width of the concrete crack has not changed

**NBI Item 59 or 60 condition rating of 4**

**Medium Structural Cracks:** Cracks ≥ 0.05” or structural cracks spacing < 1’
- Shear friction zone cracks full length one side of girder.
- Majority of the reinforced concrete elements – Condition State 3
- No evidence of concrete powder present
- No evidence of spalling or chipping at edge of crack
- The length or width of the concrete crack has not changed
NBI 59 or 60 condition rating of 3

Large Structural Cracks: Cracks ≥ 0.05” or structural cracks spacing < 1’
► Shear friction zone cracks full length on both sides of the girder
► Any of the reinforced concrete elements – Condition State 4
► Evidence of concrete powder present
► Evidence of spalling or chipping at edge of crack
► The length or width of the concrete crack has changed

NBI 59 or 60 condition rating of 3 or less

Large Structural Cracks: Cracks ≥ 0.05” or structural cracks spacing < 1’
► Crack length growth is > 6” from previous inspection
OR
► There is a measurable lateral offset across the crack of > 0.03”

Notes
► 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 load path. If accesses to the interior 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
► FRP repair should be assigned at least a “6” NBI rating
► All epoxy-injected, sealed cracks or engineered structural repair will revert the defect rating back to condition state 1.
► Epoxy-injected cracks are not considered structural repairs, however, thus do not affect NBI ratings
► Patching on concrete will revert to condition state 2
**Sufficiency Rating**

**Sufficiency Rating – Related NBI Items**

The sufficiency rating formula is a method of evaluating highway bridge data by calculating four separate factors to obtain a numeric value which is indicative of bridge sufficiency to remain in service. The result of this method is a percentage in which 100 percent would represent an entirely sufficient bridge and zero percent would represent an entirely insufficient or deficient bridge. The four factors are: (1) structural adequacy and safety (55% max); (2) serviceability and functional obsolescence (30%); (3) essentiality for public use (15%); and (4) special reductions (-13% max).

NBI Items that are part of the Sufficiency Rating Calculation are as follows:

1. **Structural Adequacy and Safety**
   - NBI Item 59 – Superstructure
   - NBI Item 60 – Substructure
   - NBI Item 62 – Culvert
   - NBI Item 66 – Inventory Rating

2. **Serviceability and Functional Obsolescence**
   - NBI Item 28 – Lanes on Structure
   - NBI Item 29 – Average Daily Traffic
   - NBI Item 32 – Approach Roadway Width
   - NBI Item 43 – Structure Type, Main
   - NBI Item 51 – Bridge Roadway Width
   - NBI Item 53 – Vertical Clearance Over Deck
   - NBI Item 58 – Deck Condition
   - NBI Item 67 – Structural Evaluation
   - NBI Item 68 – Deck Geometry
   - NBI Item 69 – Underclearances
   - NBI Item 71 – Waterway Adequacy
   - NBI Item 72 – Approach Roadway Alignment
   - NBI Item 100 – STRAHNET Highway Designation
3. Essentiality for Public Use
   NBI Item 19 – Detour Length
   NBI Item 29 – Average Daily Traffic
   NBI Item 100 – STRAHNET Highway Designation

4. Special Reductions
   NBI Item 19 – Detour Length
   NBI Item 36 – Traffic Safety Features
   NBI Item 43 – Structure Type, Main
2018
BRIDGE CONDITION REPORT

Oregon Department of Transportation