APPENDIX K

Appendix/Attachment Title

Supplement Guide for NBI Condition Ratings

Appendix/Attachment Revision and Year:

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Appendix/Attachment Introduction and Discussion

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. This supplemental guide is to aid with NBI Items:

- NBI Item 58 – Deck
- NBI Item 59 – Superstructure
- NBI Item 60 – Substructure
- NBI Item 62 – Culvert

Appendix/Attachment Description

The guide included in this appendix may be used by inspectors when performing their evaluation of the structure components following an inspection. See Appendix L for the element-level guide.

GENERAL

Element-level condition states may be converted to NBI Condition Ratings and vice versa according to the recommendations below. See Appendix L for element-level guidance. The conversions below are not to be used as a direct correlation but as a tool in weighing element-level condition states to the general condition rating of the component. *A condition rating of '9' shall only be applied to bridges that are not yet open to traffic. If the bridge is open the traffic, the highest permissible condition rating shall be '8'.*

- Condition State 1 = NBI Condition Rating of 9, 8 or 7
- Condition States 2 or 3 = NBI Condition Rating of 6 or 5
- Condition State 4 = NBI Condition Rating of 4 or below

NBI ITEM 58 – DECK

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 bridges.

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. Timber running planks shall be included under the wearing surface assessment.

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

- **9 EXCELLENT CONDITION**
  No noticeable or noteworthy deficiencies which affect the condition of the deck item. *Used for decks on bridges that are not yet open to traffic.*
- **8 VERY GOOD CONDITION**
  Minor transverse cracks with no deterioration, i.e. delamination, spalling, scaling or water saturation.
- **7 GOOD CONDITION**
  Sealable deck cracks, light scaling (less than ¼" depth). No spalling or delamination of deck surface but visible tire wear. Substantial deterioration of curbs, sidewalks, parapets, railing or deck joints (need repair). Drains or scuppers need cleaning.
- **6 SATISFACTORY CONDITION**
  Medium scaling (¼" to ½" in depth). Excessive number of open cracks in deck (5ft intervals or less). Extensive deterioration of the curbs, sidewalks, parapets, railing or deck joints (requires replacing deteriorated elements).

- **5 FAIR CONDITION**
  Heavy scaling (½" to 1" in depth). Excessive cracking and up to 5% of the deck area is spalled; 20-40% is water saturated and/or deteriorated. Disintegrating of deck edges or around scuppers. Considerable leaching through deck. Some partial depth failures, i.e. rebar exposed (repairs needed).
- **4 POOR CONDITION**
  Advanced section loss, deterioration, and spalling.
- **3 SERIOUS CONDITION**
  Loss of section, deterioration of primary structural elements. Shear cracks may be present.
- **2 CRITICAL CONDITION**

  Advanced deterioration of primary structural elements. Shear cracks in concrete may be present. 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 it back in light service.
- **0 FAILED CONDITION**
  Bridge is closed. Deck replacement necessary.

Timber Deck

- **9 EXCELLENT CONDITION**
  No noticeable or noteworthy deficiencies which affect the condition of the deck. *Used for decks on bridges that are not yet open to traffic.*

  8 VERY GOOD CONDITION

  No crushing, rotting or splitting. Tightly secured to floor system. Generally, Element Condition State for Item 31 should be 1 for NBI Condition 8 unless localized deviancies are present.
- **7 GOOD CONDITION**
  Minor checking or splitting with a few loose planks. Generally, Element Condition State for Item 31 should be 1 for NBI Condition 7 unless localized deviancies are present.
- **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. Generally, Element Condition State for Item 31 should be 2 for NBI Condition 6 unless localized deviancies are present.
- **5 FAIR CONDITION**
  Numerous (30 - 40%) planks checked, split, rotted, 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. Generally, Element Condition State for Item 31 should be 3 for NBI Condition 5 unless localized deviancies are present.
- **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. Generally, Element Condition State for Item 31 should be 4 for NBI Condition 4.

- **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. Generally, Element Condition State for Item 31 should be 4 for NBI Condition 3.
- **2 CRITICAL CONDITION**
  Advanced deterioration with partial deck failure. May be necessary to close bridge until corrective action is taken. Generally, Element Condition State for Item 31 should be 4 for NBI Condition 2.
- **1 "IMMINENT" FAILURE CONDITION**
  Bridge is closed. Corrective action may put back into light service. Generally, Element Condition State for Item 31 should be 4 for NBI Condition 1.
- **0 FAILED CONDITION**
  Bridge is closed. Deck replacement necessary.

Steel Deck

- **9 EXCELLENT CONDITION**
  No noticeable or noteworthy deficiencies which affect the condition of the steel deck. *Used for decks on bridges that are not yet open to traffic.*
- **8 VERY GOOD CONDITION**
  Tightly secured to floor system with no rust. Generally, Element Condition State for Items 28, 29 or 30 should be 1 for NBI Condition 8 unless localized deviancies are present.
- **7 GOOD CONDITION**
  Loose at some connections with minor rusting. A few cracked welds and/or broken grids. Generally, Element Condition State for Items 28, 29 or 30 should be 1 for NBI Condition 7 unless localized deviancies are present.
- **6 SATISFACTORY CONDITION**
  Considerable rusting with indications of initial section loss. Loose at many locations. Some cracked welds and/or broken grids. Generally, Element Condition State for Items 28, 29 or 30 should be 2 for NBI Condition 6 unless localized deviancies are present.
- **5 FAIR CONDITION**
  Heavy rusting with areas of section loss. Loose at numerous locations. Numerous cracked welds and/or broken grids. Generally, Element Condition State for Items 28, 29 or 30 should be 3 for NBI Condition 5 unless localized deviancies are present.
- **4 POOR CONDITION**
  Heavy rusting resulting in considerable section loss and some holes through deck. Many welds cracked and/or grids broken. Generally, Element Condition State for Items 28, 29 or 30 should be 4 for NBI Condition 4.
- **3 SERIOUS CONDITION**
  Severe signs of structural distress are visible. Generally, Element Condition State for Items 28, 29 or 30 should be 4 for NBI Condition 3.
- **2 CRITICAL CONDITION**
  Many holes through deck. Generally, Element Condition State for Items 28, 29 or 30 should be 4 for NBI Condition 2.
- **1 "IMMINENT" FAILURE CONDITION**
  Bridge is closed. Corrective action may put back in light service. Generally, Element Condition State for Items 28, 29 or 30 should be 4 for NBI Condition 1.

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

NBI ITEM 59 – SUPERSTRUCTURE

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

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

A superstructure with at least one saddle may not be evaluated greater than satisfactory condition. Superstructures with saddles which have **deterioration but have no observed movement** may be considered in satisfactory condition (6). Saddles with **increased movement and/or deterioration** may be considered in fair condition (5) or worse.

Concrete Superstructure

- **9 EXCELLENT CONDITION**
  New Condition. *Used for superstructures on bridges that are not yet open to traffic.*
- **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 spalling or delamination. Load capacity of structure members unaffected.
- **6 SATISFACTORY CONDITION**
  Structural members show some minor deterioration. Hairline structural cracks may be present.
- **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 is 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.

Prestressed Concrete Superstructure

- **9 EXCELLENT CONDITION**
  No noticeable or noteworthy deficiencies which affect the condition of the superstructure. *Used for superstructures on bridges that are not yet open to traffic.*
- **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.
- **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 concrete section loss in the web, but not occurring at the same location as 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. Corrective action may put back into light service.

- **0 FAILED CONDITION**
  Bridge is closed and out of service.

Timber Superstructure

- **9 EXCELLENT CONDITION**
  No noticeable or noteworthy deficiencies which affect the condition of the superstructure. *Used for superstructures on bridges that are not yet open to traffic.*
- **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, fire damage or crushing of beams or stringers. 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**
  Bridge is closed. Corrective action may put back in light service.
- **0 FAILED CONDITION**
  Bridge is closed. Replacement necessary.

Steel Superstructure

- **9 EXCELLENT CONDITION**
  No noticeable or noteworthy deficiencies which affect the condition of the superstructure. *Used for superstructures on bridges that are not yet open to traffic.*
- **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**
  Bridge is closed. Corrective action may put back in light service.
- **0 FAILED CONDITION**
  Bridge is closed. Replacement necessary.

NBI ITEM 60 – SUBSTRUCTURE

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.

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. If the rating factor for Item 113 is 4 or less, the rating factor for NBI Item 60 Substructure may require revision.

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

- **9 EXCELLENT CONDITION**
  No noticeable or noteworthy deficiencies which affect the condition of the substructure. *Used for substructures on bridges that are not yet open to traffic.*
- **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 effect on bearing area. Leakage of expansion devices have initiated minor cracking. Some rusting of steel without measurable section loss.
- **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**
  Bridge is closed. Corrective action may put back in light service.
- **0 FAILED CONDITION**
  Bridge is closed. Replacement necessary.

Steel Substructure

- **9 EXCELLENT CONDITION**
  No noticeable or noteworthy deficiencies which affect the condition of the substructure. *Used for substructures on bridges that are not yet open to traffic.*
- **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**
  Bridge is closed. Corrective action may put back in light service.
- **0 FAILED CONDITION**
  Bridge is closed. Replacement necessary.

Timber Substructure

A substructure with spliced piles or piles with stud-ups may not be evaluated greater than satisfactory condition (6). Timber substructures with a **minor quantity (less than 25%) of spliced piles or piles with stud-ups** may be considered in satisfactory condition (6). Timber substructures with **over 25% of timber piles spliced or piles with stud-ups** may be considered in fair condition (5) or worse. Timber substructures with **over 75% of timber piles spliced or piles with stud-ups** may be considered in poor condition (4) or worse.

- **9 EXCELLENT CONDITION**
  No noticeable or noteworthy deficiencies which affect the condition of the substructure. *Used for substructures on bridges that are not yet open to traffic.*
- **8 VERY GOOD CONDITION**
  No crushing, brooming rotting or splitting. Insignificant damage caused by drift or collision with no misalignment and not requiring corrective action.
- **7 GOOD CONDITION**
  Minor checking or splitting with a few loose timber connections. Insignificant decay, brooming, cracking, or splitting of timber. Minor scouring may have occurred.
- **6 SATISFACTORY CONDITION**
  More than 30% of piles are checked or split but sound. Some loose connections. Fire damage limited to surface scorching with no measurable section loss. Some wet areas noted. A few piles (under 5%) are in need of replacement. Some initial decay, brooming, cracking or splitting of timber. Shallow, local scouring may have occurred near foundation.
- **5 FAIR CONDITION**
  Numerous (30 - 40%) piles checked, split, rotted, or crushed. Majority of timber connections are loose. Fire damage limited to surface charring with minor, measurable section loss. Some piles (5 - 10%) are in need of replacement. Moderate decay, brooming, cracking, splitting or minor crushing of timber; a few secondary members may need replacement. Some exposure of timber piles as a result of erosion, reducing penetration.
- **4 POOR CONDITION**
  Majority (over 40%) of the piles 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 piles are in need of replacement. Substantial decay, brooming, cracking, splitting, or crushing of primary timber members, requiring some replacement. 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 signs of structural distress are visible. Major decay or fire damage is present which has substantially reduced the load carrying capacity of the timber piles bents. Bearing areas seriously deteriorated with considerable loss of bearing. Settlement of the substructure may have occurred. Shoring is considered necessary.
- **2 CRITICAL CONDITION**
  Advanced deterioration with partial timber pile bent failure. May be necessary to close bridge until corrective action is taken. Primary timber members crushed or split and ineffective. Scour has occurred at the substructure to the extent the substructure is near collapse. It may be needed to close the 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. Timber pile bent replacement necessary.

NBI ITEM 62 – CULVERT

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.

General Culvert

- **9 EXCELLENT CONDITION**
  No deficiencies. *Used for culverts that are not yet open to traffic.*
- **8 VERY GOOD CONDITION**
  No noticeable or noteworthy deficiencies which affect the condition of the culvert. Insignificant scrape marks caused by drift.
- **7 GOOD CONDITION**
  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 SATISFACTORY CONDITION**
  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-symmetrical shape, significant corrosion or moderate pitting.
- **5 FAIR CONDITION**
  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 POOR CONDITION**
  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 SERIOUS CONDITION**
  Any condition described 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 CRITICAL CONDITION**
  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 "IMMINENT" FAILURE CONDITION**
  Bridge Closed. Corrective action may put back in light service.
- **0 FAILED CONDITION**
  Bridge Closed. Replacement necessary.

Corrugated Metal Culvert Pipe

- **9 EXCELLENT CONDITION**
  No deficiencies. *Used for culverts that are not yet open to traffic.*
- **8 VERY GOOD CONDITION**
  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 GOOD CONDITION**
  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 SATISFACTORY CONDITION**
  Shape: fair, top half has smooth curvature but bottom half has flattened significantly. 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 FAIR CONDITION**
  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 POOR CONDITION**
  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 SERIOUS CONDITION**
  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 CRITICAL CONDITION**
  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 "IMMINENT" FAILURE CONDITION**
  Shape: partially collapsed with crown in reverse curve. Seams: failed. Road: closed to traffic.
- **0 FAILED CONDITION**
  Pipe: totally failed. Road: closed to traffic.

Concrete Culverts

- **9 EXCELLENT CONDITION**
  No deficiencies. *Used for culverts that are not yet open to traffic.*
- **8 VERY GOOD CONDITION**
  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 GOOD CONDITION**
  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 SATISFACTORY CONDITION**
  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 delamination; scaling less than 0.25" deep or small spalls present on the invert or bottom of top slab. Footings: minor scour near footings.
- **5 FAIR CONDITION**
  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 POOR CONDITION**
  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 rebar with area heavily corroded; extensive surface scaling on invert greater than 0.5" deep.
- **3 SERIOUS CONDITION**
  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, delamination, 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 CRITICAL CONDITION**
  Alignment: critical; culvert not functioning due to severe 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 "IMMINENT" FAILURE CONDITION**
  Culvert: partially collapsed. Road: closed to traffic. Footings: severe undermining resulting in partial collapse.
- **0 FAILED CONDITION**
  Culvert: total failure of culvert and fill. Road: closed to traffic.