

PART 2 – DETAILED VISUAL INSPECTION



Figure A.3 (e) Steel Railing with Steel Posts (Concrete-Filled)

Condition State (for posts): Poor	Performance Deficiency: Load Carrying Capacity
Post split in corner.	This design of post has concrete filled interior, to top of reinforcing steel projecting up from curb (~600mm). With split in post due to freeze-thaw, bond between post and its concrete interior is compromised. Barrier system should be replaced with an approved crash-tested system.

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Figure A.3 (f) Steel Railing

Condition State: Poor	Performance Deficiency: Load Carrying Capacity
Severe corrosion with perforations.	Although guiderail has been added to increase capacity of barrier, the usual spacing of the posts in original installation is substantially larger than that normally used with guiderail, creating potential for extreme deflections of barrier, prior to mobilizing strength of posts. Barrier should be replaced with an approved crash-tested system.

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**Figure A.3 (g) Concrete Guiderail**

Condition State: Poor	Performance Deficiency: Load Carrying Capacity
Severe spalls with exposed reinforcing.	Concrete post and rail system does not meet current standards when in good condition. Barrier system should be replaced with an approved crash-tested barrier system.

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Figure A.3 (h) Steel Flex Beams

Condition State: Poor	Performance Deficiency: Load Carrying Capacity
Permanent deformation of flex beam and posts	
Maintenance Need: Railing System Repair	

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A.4 BEAMS / MAIN LONGITUDINAL ELEMENTS

Figure A.4 (a) Beam Girder/MLE - Stringer

Condition State: Poor	Performance Deficiency: Load Carrying capacity
Very severe corrosion with perforation of stringer web	More than 20% loss of cross-section of Stringer. An evaluation is required to determine the extent of strength reduction

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Figure A.4 (b) Reinforced Concrete Girders

Condition State: Poor	Performance Deficiency: Load Carrying Capacity
Severe spalling on the girder with exposed rebar.	The inspector should consider a structural evaluation.

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Figure A.4 (c) Concrete T-Beam

Condition State: Fair	Performance Deficiency: Load Carrying Capacity
Full height, medium shear crack	Potentially inadequate beam capacity. An evaluation is required to determine the extent of strength reduction

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Figure A.4 (d - New) Concrete Girder

Condition State: Good	Performance Deficiency: None
Concrete is in good condition. Rusting rebar chairs are not an indication of rebar corrosion and are considered to be in good condition.	

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**Figure A.4 (d) Steel Girder**

Condition State: Good	Performance Deficiency: None
Coating has broken down at bottom flange and some light corrosion at the bottom flange has developed with some loose rust but no section loss.	

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Figure A.4(e) – Steel Girder

Condition State: Fair/Poor	Performance Deficiency: None
Coating has broken down at bottom flange and medium to severe corrosion has taken place. The section loss appears to potentially be more than 10%. The inspector should remove the flaking and measure the section loss to confirm the condition.	

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A.5 BRACING



Figure A.5 (a) Steel Beam Bracing

Condition State: Good	Performance Deficiency: None
Light corrosion of bracing systems	

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Figure A.5 (b) Intermediate Diaphragms

Condition State: Good	Performance Deficiency: None
Light patina has formed over the surfaces of bracing angles	



Figure A.5 (c) Top Lateral Bracing In Steel Through Truss

Condition State: Poor	Performance Deficiency: Load Carrying Capacity
Permanent deformation of member	Possible loss of strength and ability to provide lateral support, due to deformation. An evaluation is required to determine the extent of strength reduction

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Condition State: Poor	Performance Deficiency: Load Carrying Capacity
Missing only bolt to connection plate.	Load from diaphragm can not be properly transferred to connecting member.
Maintenance Repair: Structural Steel Repair	

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A.6 COATINGS



Figure A.6 (a) Coating of Through Truss

Condition State: Excellent	Performance Deficiency: Not Applicable
No defects in coating material	

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Figure A.6 (b) Railing

Condition State: Poor	Performance Deficiency: Not Applicable
Coating has completely broken down on the post and top rail. This entire area would be poor. Rust Condition Rating – Category 4	

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Figure A.6 (c) Coating of Connection - Bottom Chord

Condition State: Good/Fair/Poor	Performance Deficiency: Not Applicable
Connection coating is largely in good with a small amount in poor where the coating has broken down and stained by rusting at the very bottom. An equal amount of fair should be included in the condition state quantities.	

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Figure A.6 (d) Through Truss – Connection of Primary Components

Condition State: Poor	Performance Deficiency: Not Applicable
Coating is peeling in various locations	

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A.7 CULVERTS

Figure A.7 (a) Multi-Plate Pipe Arch

Condition State: Poor	Performance Deficiency: Load Carrying Capacity
Medium crimping of corrugations. Quantity is measured as the area of the crimping zone only	Possible inadequate capacity to support applied loading

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Figure A.7 (b) Multi-Plate Pipe Arch

Condition State: Poor	Performance Deficiency: Excessive Deformations
Severe cracks along bolt line in the valley corrugations of the haunch lap joint. Quantity is measured as the area of the circumferential band where cracks exist (i.e., there is a small band (under the ridge bolt) that is not cracked and is not Poor	Severe local deformation has occurred. Present strength is just adequate, but local or general collapse of the pipe may occur suddenly

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Figure A.7 (b) Multi-Plate Pipe Arch

Condition State: Poor	Performance Deficiency: Excessive Deformations, Load Carrying Capacity
Deformation and reverse curvature of culvert roof, plus cusping (separation of plates at joint <10mm. Quantity is measured as the area of the circumferential band for the length that reverse curvature extends	Possible inadequate capacity to support applied loading and local or general collapse may occur suddenly

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Figure A.7 (bc) Multi-Plate Pipe Arch

Condition State: Poor	Performance Deficiency: Load Carrying Capacity
Separation of culvert units. Quantity is measured as the band area where the separation occurs	Present strength appears adequate, but local continued loss of support material for soil-steel culvert may lead to general collapse of the pipe

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Figure A.7 (d) Multi-Plate Pipe Arch

Condition State: Good/Fair	Performance Deficiency: None
Moderate rust along waterline with section loss < 10%, light rust elsewhere	



Figure A.7 (e) Multi-Plate Pipe Arch

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Condition State: Poor	Performance Deficiency: Load Carrying Capacity
Severe rusting along floor of culvert with perforations. Quantity is measured as the circumferential band area where there are perforations and the actual area of corrosion where the section loss is >10%, but no perforations exist	Severe rusting has occurred. Present strength is just adequate, but local or general collapse of the pipe may occur suddenly. Inspector should look closely at the asphalt above for any sink holes.



Figure A.7 (f) Multi-plate Pipe Arch

Condition State: Good	Performance Deficiency: None
Steel joint looks like it is trying to separate in this area. No deformations have been observed. Inspector should monitor the area for any deformations.	

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Figure A.7 (g) Concrete Arch Culvert

Condition State: Poor	Performance Deficiency: None
Very wide crack with rust staining	There is a potential for load carrying capacity if the inspector can confirm that there is also deformations near the crack area.

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Figure A.7 (h) Wood Culvert Barrel

Condition State: Fair/Poor	Performance Deficiency: None
Fair: Fire Damage to barrel is in the 5-10% section loss due to charring.	
Poor: Hole in centre wall (2 cell structure)	

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A.8 DECKS

Figure A.8 (a) Exposed Concrete Deck of a Voided Slab

Condition State: Fair	Performance Deficiency: None
Medium longitudinal cracks in deck top surface at the void locations	Material defects unlikely to cause reduction in load carrying capacity

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Figure A.8 (b) Wooden Deck

Condition State: Fair/Poor	Performance Deficiency: Rough Riding Surface
Wooden wearing surface has areas of 5-10% section loss and >10% section loss of the wood boards due to weathering and rot.	

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Figure A.8 (c) Deck Top

Condition State: Good	Performance Deficiency: RNone
All medium cracks in asphalt are considered to reflect a good condition of the underlying concrete deck.	

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**Figure A.8 (d) Deck Drain**

Condition State: Poor	Performance Deficiency: None
Severe corrosion of deck drain with perforations.	

**Figure A.8 (e) Steel Deck Drain**

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Condition State: Good	Performance Deficiency: Deck Drainage
Light corrosion with no section loss or flaking.	Deck drain should be extended below the steel member to avoid salt spray.



Figure A.8 (g) Deck Drain with Basin

Condition State: Fair	Performance Deficiency: None
Light corrosion of basin	



Figure A.8 (g) Rigid Frame, Thick Slab Soffit

Condition State: Poor	Performance Deficiency: Load carrying capacity
Large area of soffit spalled, exposing many lines of reinforcing steel, all at mid-span of a rigid frame.	Enhanced inspection should be scheduled to determine extent of the lost bond of reinforcing steel to concrete over such a large area of the mid-span soffit.

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Figure A.8 (h) Thick Slab Soffit

Condition State: Fair and Poor	Performance Deficiency: None
Fair: Medium longitudinal cracks. Poor: Some spalling with exposed corroded reinforcement	

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Figure A.8 (i) Soffit of a Thin Slab

Condition State: Excellent	Performance Deficiency: None

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Figure A.8 (n) Deck Soffit End – Thick Slab

Condition State: Poor	Performance Deficiency: None
Large spall at deck end with exposed rebar and wide diagonal crack in corner caused by expansion movement of the bridge deck against the ballast wall.	

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Figure A.8 (o) Deck Soffit Exterior – Thin Slab

Condition State: Poor	Performance Deficiency: None
Spalls with exposed corroded rebar and delaminations at deck exterior underneath construction joint of the barrier wall.	