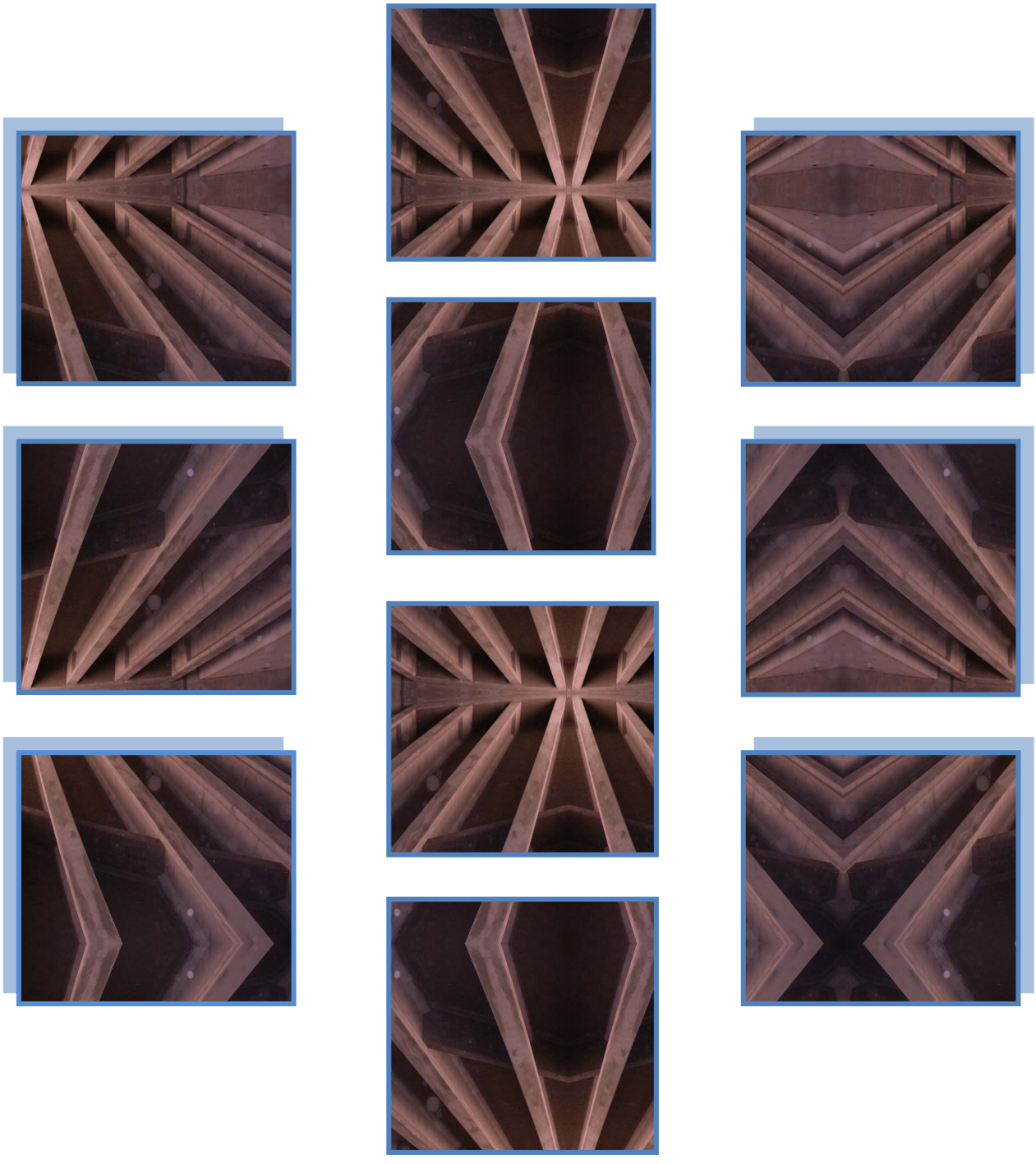
Caltrans Bridge Element Inspection Manual



Revised December 2017

FOREWORD

This Manual is intended as a resource for agencies performing element level bridge inspections. It replaces the AASHTO Guide to Commonly Recognized Structural Elements (1994) and the AASHTO Guide Manual for Bridge Element Inspection as a reference for standardized element definitions, element quantity calculations, condition state definitions, element feasible actions, and inspection conventions.

This manual incorporates suggested changes that were submitted by many inspecting agencies, consultant inspection firms and training instructors helped improve this updated version. AASHTO would like to thank member agencies for their continued dedication to continue to improve bridge inspection in the United States.

AASHTO also would like to recognize the dedication and tireless efforts of the following technical team members who worked together to develop this manual:

Name	Agency	Role
Michael B. Johnson	Caltrans	Team Lead
Wade Casey	FHWA	Technical Team Member
Larry O'Donnell	FHWA	Technical Team Member
Paula Allec	Caltrans	Technical Support
Allen R. Marshall	Allen R. Marshall Consulting LLC.	Manual Development Consultant
Derek Soden	FHWA	Technical Team Member

This page intentionally left blank.

Table of Contents

SUPPLEMENTS:

Column and Pile (February 2016)
Scour Defect (February 2016)
Concrete Crack Quantification (September 2016)

INTRODUCTION

The proper assessment of the condition of bridge elements is the cornerstone of sound bridge management. The introduction of element inspection condition methods in the early 1990s represented a significant advancement in the bridge inspection practice and has been adopted by the vast majority of all State Transportation Departments in the United States. Bridge owners nationwide have recognized the benefits of detailed condition assessments through the use of the raw inspection information, expanded performance measures, and bridge management system deterioration forecasting and evaluation. As the use of element level inspection techniques has proliferated, the need for updates and enhancements to the standard element specification has been identified. This Manual for Bridge Element Inspection incorporates improvements through changes in the measurement units of decks and slabs, the development of a wearing surface element, the standardization of the number of element states, the development of protective coating elements for concrete and steel, as well as deck protection systems.

Elements constructed of innovative materials are also identified. The goal of this manual is to completely capture the condition of bridges in a simple, effective way that can be standardized across the nation while providing the flexibility to be adapted to both large and small agency settings.

This manual is not intended to supplant proper bridge and element inspection training or the exercise of engineering judgment by the inspector or professional engineer.

This page intentionally left blank.

Section 1 - Background

1.1 - Condition Assessment Philosophy: Multi-Path and Defect Concepts

The Manual for Bridge Element Inspection builds on the element level condition assessment methods developed in the AASHTO Guide for Commonly Recognized Structural Elements. Improvements have been made to fully capture the condition of the elements by reconfiguring the element language to utilize multiple distress paths within the defined condition states. The multi-path distress language provides the means to fully incorporate all possible defects within the overall condition assessment of the element. The overall condition of an element can be utilized in this aggregate form, or broken down into specific defects present as desired by the agency for Bridge Management System (BMS) use.

The Manual for Bridge Element Inspection provides a comprehensive set of bridge elements that are designed to be flexible in nature to satisfy the needs of all agencies. The complete set of elements capture the components necessary for an agency to manage all aspects of the bridge inventory utilizing the full capability of a BMS.

The element set presented within includes two element types identified as National Bridge Elements (NBE) or Bridge Management Elements (BME). The combination of these two element types comprise the full AASHTO element set. All of the elements, whether they are NBE or BME, have the same general condition assessment characteristics:

1. Standard number of condition states – 4
2. The standard condition states are comprised of good, fair, poor, and severe general descriptions
3. Units of measure are LENGTH in feet, AREA in square feet, and EACH for enumerated elements.

1.2 - National Bridge Elements (NBEs)

The National Bridge Elements represent the primary structural components of bridges necessary to determine the overall condition and safety of the primary load carrying members. The NBEs are a refinement of the deck, superstructure, substructure, and culvert condition ratings defined in the Federal Highway Administration's Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges. Additional elements included in this section are bridge rail and bearings. The NBEs are designed to remain consistent from agency to agency across the country in order to facilitate and standardize the capture of bridge element condition at the national level. In order to capture the diversity of new element design types and materials, many elements in this category have an 'Other' type element defined.

1.3 - Bridge Management Elements (BMEs)

Bridge Management Elements include components of bridges such as joints, wearing surfaces, and protective coating systems and deck/slab protection systems that are typically managed by agencies utilizing Bridge Management Systems. The BMEs are defined with a recommended set of condition assessment language that can be modified to suit the agencies needs as these elements are not intended to be utilized for the purposes of national policy making. The BMEs defined within this manual were purposefully left fairly general in nature to provide the flexibility to develop agency specific elements that best suit the local bridge management practices. Agencies may choose to develop additional BMEs as necessary following the agency-developed element conventions discussed in Appendix A. When considering additional elements, the agency should consider such factors as element performance, deterioration rates, feasible actions, and preservation costs, as well as the practical considerations of training and inspection costs.

1.4 - Agency Developed Elements (ADEs)

The elements presented within provide the flexibility for an agency to define custom elements in accordance with the defined element framework that may be sub-elements of NBEs or BMEs, or may be agency defined elements without ties to the elements defined in this manual.

By defining a comprehensive set of bridge elements necessary for robust bridge management and the minimum set of elements necessary to assess the condition of primary components of bridges, the Bridge Element Inspection Manual provides a flexible element set that can be tailored to the needs of all agencies. The identification numbers 800 and above are not used in this manual for any elements and are reserved for agency purposes.

1.5 - How to Use This Manual

Bridge inspection based on this manual consists of defining the elements (pieces of the bridge) and total quantities that exist at each bridge. The condition of each element is determined by performing a field inspection and recording quantities of the element that have identified defects that correlate to the severity of the defects defined in the particular condition state definition of this Manual. The condition assessment is complete when the appropriate portion of the total quantity is stratified over the defined condition states. For agencies utilizing bridge management systems, the appropriate element defects and environment shall be recorded for use in deterioration modeling.

In this manual, the element represents the aggregate condition of the defined element inclusive of all defects. The specific listing of all defects is optional; however the element condition must be inclusive of all defined defects. Element defects are typically to be used when the element's condition reaches state 2, 3 or 4 (with a few exceptions) and essentially act to break down the overall element condition into one or more specific observed problems. The defects defined within this manual shall always assume the units of the element that they are associated with. For example, the scour defect may be applied to a column or a pier wall. The defect language is the same for both elements, however the units for the column defect would be each and the units for the pier wall would be linear feet. In some cases, multiple defects may operate in the same defined space. In this case, the inspector shall report the defect in the most severe conditions state. If two defects in the same condition state operate in the same defined space, the inspector shall determine the predominate defect for reporting. For example, if a reinforced concrete bridge deck is cracked throughout and also has a spall in a portion of the deck, the spalling would likely be determined to be the predominate defect.

This manual attempts to cover the vast majority of all bridge elements found on highway bridges in the United States. An inspector may find materials or elements that are not defined during the course of their inspection. In these cases, the inspector should use judgment to select the closest element match or use the 'Other' element type. In a similar vein, the inspector should use judgment when utilizing the condition state defect definitions. There may be cases when the specific condition observed in the field is not defined in this manual. In these cases, the inspector should use the general description of the condition states to determine the appropriate condition.

The granularity of the defect details is typically not specified with defect descriptive language for condition state 4, as this state is reserved for severe conditions that are beyond the specific defects defined for states 1 through 3. Elements with a portion or all of the quantity in state 4 may often have load capacity implications warranting a structural review. Within this manual, the term structural review is defined as a review by a person qualified to evaluate the field observed conditions and make a determination of the impacts of the conditions on the performance of the element. Structural reviews may include a review of the field inspection notes and photographs, review of as-built plans or analysis as deemed appropriate to evaluate the performance of the element. Agencies may establish additional guidance to aid the inspector in determining the field circumstances where structural review is warranted taking into consideration the education, training and experience of their inspection staff.

1.6 - Organization

Section 2 of the manual presents a master location matrix of all the elements and identification numbers for quick reference. Each element is displayed within the NBE or BME category, then by major bridge assembly, element type, and material.

Section 3 of the manual presents a detailed definition of each element with its applicable defects. Guidelines for measurement and condition assessment are included where appropriate.

The appendix section provides additional guidance and background on the use of this manual. There are five appendices to aid an agency in the development of their data collection process.

These appendices are:

A. Element Groupings

B. List of Element Defects by Material Type

This page intentionally left blank.

Section 2 - Element Location Matrix

This section is designed to give inspectors a quick reference guide to the defined elements. The matrix of elements are grouped into National Bridge Elements (NBEs) and Bridge Management Elements (BMEs), then by general element type, material, and in accordance to their physical location on the bridge to facilitate ease of use by bridge inspectors in the field.

2.1 - National Bridge Elements

2.1.1 - Decks and Slabs

Element	Units	Decks	Slab	Other
Deck/Slab - Reinforced Concrete	Area (sq. ft.)	12	38	
Deck/Slab - Prestressed Concrete	Area (sq. ft.)	13	39	
Top Flange - Prestressed Concrete	Area (sq. ft.)	15		
Top Flange - Reinforced Concrete	Area (sq. ft.)	16		
Steel Deck—Open Grid	Area (sq. ft.)	28		
Steel Deck—Concrete Filled Grid	Area (sq. ft.)	29		
Steel Deck—Corrugated / Orthotropic/Etc.	Area (sq. ft.)	30		
Deck/Slab - Timber	Area (sq. ft.)	31	54	
Deck/Slab - Other	Area (sq. ft.)	60	65	

2.1.2 - Railings

Element	Units	Steel	Prestressed Concrete	Reinforced Concrete	Timber	Masonry	Other
Bridge Railing – Metal	Length (ft.)	330					
Bridge Railing - Reinforced Concrete	Length (ft.)			331			
Bridge Railing - Timber	Length (ft.)				332		
Bridge Railing - Other	Length (ft.)						333
Bridge Railing - Masonry	Length (ft.)					334	

2.1.3 - Superstructure

Element	Units	Steel	Prestressed Concrete	Reinforced Concrete	Timber	Masonry	Other
Closed Web/Box Girder	Length (ft.)	102	104	105			106
Girder / Beam	Length (ft.)	107	109	110	111		112
Truss	Length (ft.)	120			135		136
Arch	Length (ft.)	141	143	144	146	145	142
Stringer	Length (ft.)	113	115	116	117		118
Floor Beam	Length (ft.)	152	154	155	156		157
Cable - Main	Length (ft.)	147					
Cable – Secondary	Each	148					149
Pin and Pin & Hanger Assembly	Each	161					
Gusset Plate	Each	162					
Railroad Car Frame	Length	170					
Miscellaneous Steel Superstructure	Each	171					
EQ Restrainer Cables	Each	180-					

2.1.4 - Bearings

Element	Units	Steel	Prestressed Concrete	Reinforced Concrete	Timber	Masonry	Other
Elastomeric	Each						310
Moveable (roller, rocker, sliding)	Each						311
Enclosed / Concealed	Each						312
Fixed	Each						313
Pot	Each						314
Disk	Each						315
Other	Each						316

2.1.5 - Substructure

Element	Units	Steel	Prestressed Concrete	Reinforced Concrete	Timber	Masonry	Other
Abutment	Length (ft.)	219		215	216	217	218
Pier Cap	Length (ft.)	231	233	234	235		236
Columns	Each	202	204	205	206		203
Tower / Trestle	Length (ft.)	207			208		
Pier Wall	Length (ft.)			210	212	213	211
Pile Cap / Footing	Length (ft.)			220			
Pile	Each	225	226	227	228		229
Pile – Cast-In-Steel-Shell	Each	251					
Pile – Cast-In-Drilled-Hole	Each			252			
Seismic Column Shells (Full Height)	Each	254					
Seismic Column Shell (Partial Height)	Each	255					
Slope / Scour Protection	Each						256

2.1.6 - Culverts

Element	Units	Steel	Prestressed Concrete	Reinforced Concrete	Timber	Masonry	Other
Culvert	Length (ft.)	240	245	241	242	244	243
Tunnels	Length (ft.)						250

2.2 - Bridge Management Elements

2.2.1 - Joints

Element	Units	Element Number
Joint - Strip Seal Expansion	Length (ft.)	300
Joint - Pourable Seal	Length (ft.)	301
Joint - Compression Seal	Length (ft.)	302
Joint – Assembly with Seal	Length (ft.)	303
Joint - Open Expansion	Length (ft.)	304
Joint - Assembly without Seal	Length (ft.)	305
Joint - Other	Length (ft.)	306
Joint - Asphaltic Plug	Length (ft.)	307
Joint – Steel Sliding Plates	Length (ft.)	308
Joint - Steel Fingers	Length (ft.)	309

2.2.2 - Approach Slabs

Element	Units	Element Number
Approach Slab - Prestressed Concrete	Area (sq. ft.)	320
Approach Slab - Reinforced Concrete	Area (sq. ft.)	321

2.2.3- Wearing Surfaces, Protective Coatings and Concrete Reinforcing Steel Protective Systems

Element	Units	Element Number
Deck Wearing Surface - Asphaltic Concrete	Area (sq. ft.)	510
Deck Wearing Surface – Concrete (Polyester)	Area (sq. ft.)	511
Deck Wearing Surface - Epoxy	Area (sq. ft.)	512
Deck – Wearing Surface - Timber	Area (sq. ft.)	513
Steel Protective Coating - Paint	Area (sq. ft.)	515
Steel Protective Coating - Galvanization	Area (sq. ft.)	516
Steel Protective Coating - Weathering Steel	Area (sq. ft.)	517
Reinforcing Steel Protective System - Rebar Coating / Cathodic	Area (sq. ft.)	520
Concrete Protective Coating - Methacrylate / Sealer	Area (sq. ft.)	521
Deck Membrane	Area (sq. ft.)	522

This page intentionally left blank.

Section 3 - Detailed Element Descriptions

This section describes the elements used in inspection and bridge management in detail. Each detailed description for an element is broken down into three sub-sections:

1. **Description** — Detailed identification and classification of the element, including units of measurement, and guidelines on how to collect the quantity of the element in a consistent manner.
2. **Condition State Definitions —** Defect descriptions and severity, with guidelines to the inspector for determining defect severity.
3. **Element Commentary —** Additional instructions and considerations for the inspector to be aware of during data collection.

All the elements described in this chapter are included in the standard set of National Bridge Elements (NBEs), except where noted for Bridge Management Elements (BMEs) such as joints and approach slabs. The elements are organized by major groupings such as Decks and Slabs, Superstructure, Substructure, Joints, and Bearings. The defects identified for each element are further detailed in Appendix B.

This page intentionally left blank.

3.1 - Decks and Slabs

Deck and slab elements are defined as the primary structural components that transfer vehicular loads to the bridge. These do not include secondary deck elements such as joints, protective systems or wearing surfaces.

Deck elements transmit vehicular loads to superstructure elements.

Slab elements transmit vehicular loads to substructure elements. Structures that include slab elements typically do not have superstructure elements.

All deck and slab elements can be supplemented with one or more associated protection systems or wearing surface elements.

The condition of the deck area within 1-foot of all joints shall be recorded as part of the joint element.

Element # 12: Deck - Reinforced Concrete

Description: All reinforced concrete bridge decks regardless of the wearing surface or protection systems used.

Classification: NBE - National Bridge Element **Units of Measurement:** sq.ft.

Quantity Calculation: Area of the deck from edge to edge, including any median areas and accounting for any flares or ramps present.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Delamination/ Spall/ Patched Area (1080)	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Exposed Rebar (1090)	None	Present without measurable section loss.	Present with measurable section loss, but does not warrant structural review.	
Efflorescence/ Rust Staining (1120)	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
Cracking (RC and Other) (1130)	None or insignificant cracks.	Unsealed moderate width cracks or unsealed moderate pattern (map) cracking. Cracks from 0.012 to 0.05 inches wide.	Wide cracks or heavy pattern (map) cracking. Cracks greater than 0.05 inches wide.	
Abrasion/Wear (PSC/RC) (1190)	No abrasion or wearing.	Abrasion or wearing has exposed coarse aggregate but the aggregate remains secure in the concrete.	Coarse aggregate is loose or has popped out of the concrete matrix due to abrasion or wear.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

The condition of the deck area within 1 foot of all joints should be recorded as part of the joint element.

The deck evaluation is three dimensional in nature with the defects observed on the top surface, bottom surface, edges or all, and being captured using the defined condition states. Portions of the deck top or bottom surfaces that are not visible for inspection shall be assessed based on the available visible surface. If both top and bottom surfaces are not visible, the condition shall be assessed based on destructive and nondestructive testing or indicators in the materials covering the surfaces.

A sound patch is constructed of concrete and is functioning similar to the original overlay material. Patches in concrete consisting of AC or other unsuitable material shall be considered an unsound patch.

The inspector should use judgment when utilizing the condition state defect definitions, especially for concrete cracking. The crack defect description definitions describe generalized distress, but the inspector should consider width, spacing, location, orientation, and structural or non-structural nature of the cracking. The inspector should consider exposure and environment when evaluating crack width.

Reinforced concrete cracks less than 0.012 inches can be considered insignificant and a defect is not warranted. Insignificant cracks shall not be coded or quantified with the Cracking (1130) defect. General descriptions of insignificant cracks may be included under the parent element notes, if needed for tracking purposes.

Cracks ranging from 0.012 to 0.05 inches can be considered moderate, and cracks greater than 0.05 inches can be considered wide.

When cracks on the surface of this element have been treated with methacrylate or polyester concrete, the Cracking (1130) defect shall not be used. The appropriate protective coating or wearing surface element should be used and the date of application provided in the element notes.

Defects that are visible on the soffit of this element, such as cracking or efflorescence, shall be coded as they are observed regardless of any treatments applied to the top surface of this element, such as methacrylate or polyester concrete overlay.

The Abrasion/Wear (1190) defect shall not be used to report secure aggregate exposed by profile grinding.

Element # 13: Deck – Prestressed Concrete

Description: All prestressed concrete bridge decks regardless of the wearing surface or protection systems used.

Classification: NBE - National Bridge Element **Units of Measurement:** sq.ft.

Quantity Calculation: Area of the deck from edge to edge, including any median areas and accounting for any flares or ramps present.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Delamination/ Spall/ Patched Area (1080)	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Exposed Rebar (1090)	None	Present without measurable section loss.	Present with measurable section loss, but does not warrant structural review.	
Exposed Prestressing (1100)	None	Present without section loss.	Present with section loss, but does not warrant structural review.	
Cracking (PSC) (1110)	None or insignificant cracks.	Unsealed moderate width cracks or unsealed moderate pattern (map) cracking. Cracks from 0.004 to 0.009 inches wide.	Wide cracks or heavy pattern (map) cracking. Cracks greater than 0.009 inches wide.	
Efflorescence/ Rust Staining (1120)	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
Abrasion/Wear (PSC/RC) (1190)	No abrasion or wearing.	Abrasion or wearing has exposed coarse aggregate but the aggregate remains secure in the concrete.	Coarse aggregate is loose or has popped out of the concrete matrix due to abrasion or wear.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Prestressed concrete decks have prestressing systems separate from the superstructure girders. These prestressing systems typically stress in the transverse direction.

The condition of the deck area within 1 foot of all joints should be recorded as part of the joint element.

The deck evaluation is three dimensional in nature with the defects observed on the top surface, bottom surface, edges or all, and being captured using the defined condition states. Portions of the deck top or bottom surfaces that are not visible for inspection shall be assessed based on the available visible surface. If both top and bottom surfaces are not visible, the condition shall be assessed based on destructive and nondestructive testing or indicators in the materials covering the surfaces.

A sound patch is constructed of concrete and is functioning similar to the original overlay material. Patches in concrete consisting of AC or other unsuitable material shall be considered an unsound patch.

The inspector should use judgment when utilizing the condition state defect definitions, especially for concrete cracking. The crack defect description definitions describe generalized distress, but the inspector should consider width, spacing, location, orientation, and structural or non-structural nature of the cracking. The inspector should consider exposure and environment when evaluating crack width.

Prestressed concrete cracks less than 0.004 inches can be considered insignificant and a defect is not warranted. Insignificant cracks shall not be coded or quantified with the Cracking (1110) defect. General descriptions of insignificant cracks may be included under the parent element notes, if needed for tracking purposes.

Cracks ranging from 0.004 to 0.009 inches can be considered moderate, and cracks greater than 0.009 inches can be considered wide.

When cracks on the surface of this element have been treated with methacrylate or polyester concrete, the Cracking (1110) defect shall not be used. The appropriate protective coating or wearing surface element should be used and the date of application provided in the element notes.

Defects that are visible on the soffit of this element, such as cracking or efflorescence, shall be coded as they are observed regardless of any treatments applied to the top surface of this element, such as methacrylate or polyester concrete overlay.

The Abrasion/Wear (1190) defect shall not be used to report secure aggregate exposed by profile grinding.

Element # 15: Top Flange - Prestressed Concrete

Description: All prestressed bridge girder top flanges where traffic rides directly on the structural element regardless of the wearing surface or protection systems used. These bridge types include only concrete bulb-tees, box girders, and girders that require traffic to ride on the top flange. Use in conjunction with the appropriate girder element.

Classification: NBE - National Bridge Element **Units of Measurement:** sq.ft.

Quantity Calculation: Area of the top flange from edge to edge, including any median areas and accounting for any flares or ramps present. This quantity is for the top flange riding surface only. Girder web and bottom flange to be evaluated by the appropriate girder element.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Delamination/ Spall/ Patched Area (1080)	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Exposed Rebar (1090)	None	Present without measurable section loss.	Present with measurable section loss, but does not warrant structural review.	
Exposed Prestressing (1100)	None	Present without section loss.	Present with section loss, but does not warrant structural review.	
Cracking (PSC) (1110)	None or insignificant cracks.	Unsealed moderate width cracks or unsealed moderate pattern (map) cracking. Cracks from 0.004 to 0.009 inches wide.	Wide cracks or heavy pattern (map) cracking. Cracks greater than 0.009 inches wide.	
Efflorescence/ Rust Staining (1120)	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
Abrasion/Wear (PSC/RC) (1190)	No abrasion or wearing.	Abrasion or wearing has exposed coarse aggregate but the aggregate remains secure in the concrete.	Coarse aggregate is loose or has popped out of the concrete matrix due to abrasion or wear.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

A top flange element is appropriate when falsework is needed to support the girders in order to replace the deck (T-beams, box girders, or similar design types). Steel girders and precast concrete girders will always use the deck element regardless of composite nature.

For the typical post tensioned box girder in California, the top flange would NOT be considered prestressed ….. Element #16 should be used instead. Prestressed concrete top flanges have prestressing systems separate from the superstructure girders. These prestressing systems typically stress in the transverse direction.

The condition of the top flange area within 1 foot of all joints should be recorded as part of the joint element.

All top flange elements can be supplemented with one or more associated protection systems or wearing surface elements.

The flange evaluation is three dimensional in nature with the defects observed on the top surface, bottom surface, edges or all, and being captured using the defined condition states. Portions of the flange top or bottom surfaces that are not visible for inspection shall be assessed based on the available visible surface. If both top and bottom surfaces are not visible, the condition shall be assessed based on destructive and nondestructive testing or indicators in the materials covering the surfaces.

A sound patch is constructed of concrete and is functioning similar to the original overlay material. Patches in concrete consisting of AC or other unsuitable material shall be considered an unsound patch.

The inspector should use judgment when utilizing the condition state defect definitions, especially for concrete cracking. The crack defect description definitions describe generalized distress, but the inspector should consider width, spacing, location, orientation, and structural or non-structural nature of the cracking. The inspector should consider exposure and environment when evaluating crack width.

Prestressed concrete cracks less than 0.004 inches can be considered insignificant and a defect is not warranted. Insignificant cracks shall not be coded or quantified with the Cracking (1110) defect. General descriptions of insignificant cracks may be included under the parent element notes, if needed for tracking purposes.

Cracks ranging from 0.004 to 0.009 inches can be considered moderate, and cracks greater than 0.009 inches can be considered wide.

When cracks on the surface of this element have been treated with methacrylate or polyester concrete, the Cracking (1110) defect shall not be used. The appropriate protective coating or wearing surface element should be used and the date of application provided in the element notes.

Defects that are visible on the soffit of this element, such as cracking or efflorescence, shall be coded as they are observed regardless of any treatments applied to the top surface of this element, such as methacrylate or polyester concrete overlay.

The Abrasion/Wear (1190) defect shall not be used to report secure aggregate exposed by profile grinding.

Element # 16: Top Flange - Reinforced Concrete

Description: All reinforced concrete bridge girder top flanges where traffic rides directly on the structural element regardless of the wearing surface or protection systems used. These bridge types include only concrete tee-beams, box girders, and girders that require traffic to ride on the top flange. Use in conjunction with the appropriate girder element.

Classification: NBE - National Bridge Element **Units of Measurement:** sq.ft.

Quantity Calculation: Area of the top flange from edge to edge, including any median areas and accounting for any flares or ramps present. This quantity is for the top flange riding surface only. Girder web and bottom flange to be evaluated by the appropriate girder element.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Delamination/ Spall/ Patched Area (1080)	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Exposed Rebar (1090)	None	Present without measurable section loss.	Present with measurable section loss, but does not warrant structural review.	
Efflorescence/ Rust Staining (1120)	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
Cracking (RC and Other) (1130)	None or insignificant cracks.	Unsealed moderate width cracks or unsealed moderate pattern (map) cracking. Cracks from 0.012 to 0.05 inches wide.	Wide cracks or heavy pattern (map) cracking. Cracks greater than 0.05 inches wide.	
Abrasion/Wear (PSC/RC) (1190)	No abrasion or wearing.	Abrasion or wearing has exposed coarse aggregate but the aggregate remains secure in the concrete.	Coarse aggregate is loose or has popped out of the concrete matrix due to abrasion or wear.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

A top flange element is appropriate when false work is needed to support the girders in order to replace the deck (T-beams, box girders, or similar design types). Steel girders and precast concrete girders will always use the deck element regardless of composite nature.

The condition of the top flange area within 1 foot of all joints should be recorded as part of the joint element.

All top flange elements can be supplemented with one or more associated protection systems or wearing surface elements.

The flange evaluation is three dimensional in nature with the defects observed on the top surface, bottom surface, or both, and being captured using the defined condition states. Portions of the flange top or bottom surfaces that are not visible for inspection shall be assessed based on the available visible surface. If both top and bottom surfaces are not visible, the condition shall be assessed based on destructive and nondestructive testing or indicators in the materials covering the surfaces.

A sound patch is constructed of concrete and is functioning similar to the original overlay material. Patches in concrete consisting of AC or other unsuitable material shall be considered an unsound patch.

The inspector should use judgment when utilizing the condition state defect definitions, especially for concrete cracking. The crack defect description definitions describe generalized distress, but the inspector should consider width, spacing, location, orientation, and structural or non-structural nature of the cracking. The inspector should consider exposure and environment when evaluating crack width.

Reinforced concrete cracks less than 0.012 inches can be considered insignificant and a defect is not warranted. Insignificant cracks shall not be coded or quantified with the Cracking (1130) defect. General descriptions of insignificant cracks may be included under the parent element notes, if needed for tracking purposes.

Cracks ranging from 0.012 to 0.05 inches can be considered moderate, and cracks greater than 0.05 inches can be considered wide.

When cracks on the surface of this element have been treated with methacrylate or polyester concrete, the Cracking (1130) defect shall not be used. The appropriate protective coating or wearing surface element should be used and the date of application provided in the element notes.

Defects that are visible on the soffit of this element, such as cracking or efflorescence, shall be coded as they are observed regardless of any treatments applied to the top surface of this element, such as methacrylate or polyester concrete overlay.

The Abrasion/Wear (1190) defect shall not be used to report secure aggregate exposed by profile grinding.

Element # 28: Steel Deck - Open Grid

Description: All open grid steel bridge decks with no fill.

Classification: NBE - National Bridge Element **Units of Measurement:** sq.ft.

Quantity Calculation: Area of the deck from edge to edge, including any median areas and accounting for any flares or ramps present.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Fatigue Crack (Steel/Other) (1010)	None	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack exists that is not arrested but does not warrant structural review.	
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

The steel deck area within 1 foot of all joints shall be recorded as part of the joint element.

The deck evaluation is three dimensional in nature with the defects observed on the top surface, bottom surface, edges or all, and being captured using the defined condition states.

When the steel grid deck has concrete fill in the wheel tracks only, use Element #29 for the concrete filled portion and Element #28 for the unfilled portion of the deck.

Element # 29: Steel Deck - Concrete Filled Grid

Description: Steel bridge decks with concrete fill either in all of the openings or within the wheel tracks.

Classification: NBE - National Bridge Element **Units of Measurement:** sq.ft.

Quantity Calculation: Area of the deck from edge to edge, including any median areas and accounting for any flares or ramps present.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Fatigue Crack (Steel/Other) (1010)	None	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack exists that is not arrested but does not warrant structural review.	
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

The steel deck area within 1 foot of all joints shall be recorded as part of the joint element.

The deck evaluation is three dimensional in nature with the defects observed on the top surface, bottom surface, edges or all, and being captured using the defined condition states.

When the steel grid deck has concrete fill in the wheel tracks only, use Element #29 for the concrete filled portion and Element #28 for the unfilled portion of the deck.

Element # 30: Steel Deck - Corrugated/Orthotropic/Etc.

Description: Those bridge decks constructed of corrugated metal filled with portland cement, asphaltic concrete, or other riding surfaces. Orthotropic steel decks are also included.

Classification: NBE - National Bridge Element **Units of Measurement:** sq.ft.

Quantity Calculation: Area of the deck from edge to edge, including any median areas and accounting for any flares or ramps present.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Fatigue Crack (Steel/Other) (1010)	None	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack exists that is not arrested but does not warrant structural review.	
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Use this element for steel plates (bare or overlaid) and with railroad car frames consisting of a steel plate type deck.

This element is not intended for steel corrugated stay-in-place deck forms.

The steel deck area within 1 foot of all joints shall be recorded as part of the joint element.

The deck evaluation is three dimensional in nature with the defects observed on the top surface, bottom surface, edges or all, and being captured using the defined condition states. Materials added for riding surface is not part of the element condition.

For corrugated metal filled with portland cement, asphaltic concrete, or other wearing surface, all appropriate wearing surface elements shall be included.

Coatings systems for this element shall not be reported.

Element # 31: Deck - Timber

Description: All timber bridge decks regardless of the wearing surface or protection systems used.

Classification: NBE - National Bridge Element **Units of Measurement:** sq.ft.

Quantity Calculation: Area of the deck from edge to edge, including any median areas and accounting for any flares or ramps present.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Decay/Section Loss (1140)	None	Affects less than 10% of the member section.	Affects 10% or more of the member but does not warrant structural review.	
Check/Shake (1150)	Surface penetration less than 5% of the member thickness regardless of location.	Penetrates 5% - 50% of the thickness of the member and not in a tension zone.	Penetrates more than 50% of the thickness of the member or more than 5% of the member thickness in a tension zone. Does not warrant structural review.	
Crack (Timber) (1160)	None.	Crack that has been arrested through effective measures.	Identified crack exists that is not arrested, but does not require structural review	
Split/Delamination (Timber) (1170)	None	Length less than the member depth or arrested with effective actions taken to mitigate.	Length equal to or greater than the member depth, but does not require structural review.	
Abrasion/Wear (Timber) (1180)	None or no measurable section loss.	Section loss less than 10% of the member thickness.	Section loss 10% or more of the member thickness, but does not warrant structural review.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Timber running planks, Element #513, shall be included under the wearing surface assessment.

The condition of the deck area within 1 foot of all joints should be recorded as part of the joint element.

The deck evaluation is three dimensional in nature with the defects observed on the top and bottom surface, edges or all, and being captured using the defined condition states.

Element # 38: Slab - Reinforced Concrete

Description: All reinforced concrete bridge slabs regardless of the wearing surface or protection systems used.

Classification: NBE - National Bridge Element **Units of Measurement:** sq.ft.

Quantity Calculation: Area of the slab from edge to edge, including any median areas and accounting for any flares or ramps present.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Delamination/ Spall/ Patched Area (1080)	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Exposed Rebar (1090)	None	Present without measurable section loss.	Present with measurable section loss, but does not warrant structural review.	
Efflorescence/ Rust Staining (1120)	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
Cracking (RC and Other) (1130)	None or insignificant cracks.	Unsealed moderate width cracks or unsealed moderate pattern (map) cracking. Cracks from 0.012 to 0.05 inches wide.	Wide cracks or heavy pattern (map) cracking. Cracks greater than 0.05 inches wide.	
Abrasion/Wear (PSC/RC) (1190)	No abrasion or wearing.	Abrasion or wearing has exposed coarse aggregate but the aggregate remains secure in the concrete.	Coarse aggregate is loose or has popped out of the concrete matrix due to abrasion or wear.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

For slab bridges with hinges, see the commentary for Element #308 - Steel Sliding Plates and Element #312 – Bearing Concealed/Enclosed.

The condition of the deck area within 1 foot of all joints should be recorded as part of the joint element.

The slab evaluation is three dimensional in nature with the defects observed on the top surface, bottom surface, edges or all, and being captured using the defined condition states. Portions of the slab top or bottom surfaces that are not visible for inspection shall be assessed based on the available visible surface. If both top and bottom surfaces are not visible, the condition shall be assessed based on destructive and nondestructive testing or indicators in the materials covering the surfaces.

A sound patch is constructed of concrete and is functioning similar to the original overlay material. Patches in concrete consisting of AC or other unsuitable material shall be considered an unsound patch.

The inspector should use judgment when utilizing the condition state defect definitions, especially for concrete cracking. The crack defect description definitions describe generalized distress, but the inspector should consider width, spacing, location, orientation, and structural or non-structural nature of the cracking. The inspector should consider exposure and environment when evaluating crack width.

Reinforced concrete cracks less than 0.012 inches can be considered insignificant and a defect is not warranted. Insignificant cracks shall not be coded or quantified with the Cracking (1130) defect. General descriptions of insignificant cracks may be included under the parent element notes, if needed for tracking purposes.

Cracks ranging from 0.012 to 0.05 inches can be considered moderate, and cracks greater than 0.05 inches can be considered wide.

When cracks on the surface of this element have been treated with methacrylate or polyester concrete, the Cracking (1130) defect shall not be used. The appropriate protective coating or wearing surface element should be used and the date of application provided in the element notes.

Defects that are visible on the soffit of this element, such as cracking or efflorescence, shall be coded as they are observed regardless of any treatments applied to the top surface of this element, such as methacrylate or polyester concrete overlay.

The Abrasion/Wear (1190) defect shall not be used to report secure aggregate exposed by profile grinding.

Element # 39: Slab - Prestressed Concrete

Description: All prestressed concrete bridge slabs regardless of the wearing surface or protection systems used.

Classification: ADE – Agency Defined Element **Units of Measurement:** sq.ft.

Quantity Calculation: Area of the slab from edge to edge, including any median areas and accounting for any flares or ramps present.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Delamination/ Spall/ Patched Area (1080)	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Exposed Rebar (1090)	None	Present without measurable section loss.	Present with measurable section loss, but does not warrant structural review.	
Exposed Prestressing (1100)	None	Present without section loss.	Present with section loss, but does not warrant structural review.	
Cracking (PSC) (1110)	None or insignificant cracks.	Unsealed moderate width cracks or unsealed moderate pattern (map) cracking. Cracks from 0.004 to 0.009 inches wide.	Wide cracks or heavy pattern (map) cracking. Cracks greater than 0.009 inches wide.	
Efflorescence/ Rust Staining (1120)	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
Abrasion/Wear (PSC/RC) (1190)	No abrasion or wearing.	Abrasion or wearing has exposed coarse aggregate but the aggregate remains secure in the concrete.	Coarse aggregate is loose or has popped out of the concrete matrix due to abrasion or wear.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

For slab bridges with hinges, see the commentary for Element #308 - Steel Sliding Plates and Element #312 – Bearing Concealed/Enclosed.

The condition of the deck area within 1 foot of all joints should be recorded as part of the joint element.

The slab evaluation is three dimensional in nature with the defects observed on the top surface, bottom surface, edges or all, and being captured using the defined condition states. Portions of the slab top or bottom surfaces that are not visible for inspection shall be assessed based on the available visible surface. If both top and bottom surfaces are not visible, the condition shall be assessed based on destructive and nondestructive testing or indicators in the materials covering the surfaces.

A sound patch is constructed of concrete and is functioning similar to the original overlay material. Patches in concrete consisting of AC or other unsuitable material shall be considered an unsound patch.

The inspector should use judgment when utilizing the condition state defect definitions, especially for concrete cracking. The crack defect description definitions describe generalized distress, but the inspector should consider width, spacing, location, orientation, and structural or non-structural nature of the cracking. The inspector should consider exposure and environment when evaluating crack width.

Prestressed concrete cracks less than 0.004 inches can be considered insignificant and a defect is not warranted. Insignificant cracks shall not be coded or quantified with the Cracking (1110) defect. General descriptions of insignificant cracks may be included under the parent element notes, if needed for tracking purposes.

Cracks ranging from 0.004 to 0.009 inches can be considered moderate, and cracks greater than 0.009 inches can be considered wide.

When cracks on the surface of this element have been treated with methacrylate or polyester concrete, the Cracking (1110) defect shall not be used. The appropriate protective coating or wearing surface element should be used and the date of application provided in the element notes.

Defects that are visible on the soffit of this element, such as cracking or efflorescence, shall be coded as they are observed regardless of any treatments applied to the top surface of this element, such as methacrylate or polyester concrete overlay.

The Abrasion/Wear (1190) defect shall not be used to report secure aggregate exposed by profile grinding.

Element # 54: Slab - Timber

Description: All timber bridge slabs regardless of the wearing surface or protection systems used.

Classification: NBE - National Bridge Element **Units of Measurement:** sq.ft.

Quantity Calculation: Area of the slab from edge to edge, including any median areas and accounting for any flares or ramps present.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Decay/Section Loss (1140)	None	Affects less than 10% of the member section.	Affects 10% or more of the member but does not warrant structural review.	
Check/Shake (1150)	Surface penetration less than 5% of the member thickness regardless of location.	Penetrates 5% - 50% of the thickness of the member and not in a tension zone.	Penetrates more than 50% of the thickness of the member or more than 5% of the member thickness in a tension zone. Does not warrant structural review.	
Crack (Timber) (1160)	None.	Crack that has been arrested through effective measures.	Identified crack exists that is not arrested, but does not require structural review	
Split/Delamination (Timber) (1170)	None	Length less than the member depth or arrested with effective actions taken to mitigate.	Length equal to or greater than the member depth, but does not require structural review.	
Abrasion/Wear (Timber) (1180)	None or no measurable section loss.	Section loss less than 10% of the member thickness.	Section loss 10% or more of the member thickness, but does not warrant structural review.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Timber running planks, Element #513, shall be included under the wearing surface assessment.

Use this element for manufactured glue-lam slabs.

The condition of the deck area within 1 foot of all joints should be recorded as part of the joint element.

The slab evaluation is three dimensional in nature with the defects observed on the top and bottom surface, edges or all, and being captured using the defined condition states.

Element # 60: Deck - Other

Description: All bridge decks constructed of other materials not otherwise defined regardless of the wearing surface or protection systems used.

Classification: NBE - National Bridge Element **Units of Measurement:** sq.ft.

Quantity Calculation: Area of the deck from edge to edge, including any median areas and accounting for any flares or ramps present.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Fatigue Crack (Steel/Other) (1010)	None	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack exists that is not arrested but does not warrant structural review.	
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	
Delamination/ Spall/ Patched Area (1080)	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	
Efflorescence/ Rust Staining (1120)	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
Cracking (RC and Other) (1130)	None or insignificant cracks.	Unsealed moderate width cracks or unsealed moderate pattern (map) cracking. Cracks from 0.012 to 0.05 inches wide.	Wide cracks or heavy pattern (map) cracking. Cracks greater than 0.05 inches wide.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Deterioration (Other) (1220)	None	Initiated breakdown or deterioration.	Significant deterioration or breakdown, but does not warrant structural review.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

The other material deck is intended for decks constructed of composite materials, or other materials that cannot be classified using any other defined deck element.

The condition of the deck area within 1 foot of all joints should be recorded as part of the joint element.

The deck evaluation is three dimensional in nature with the defects observed on the top surface, bottom surface, edges or all, and being captured using the defined condition states. Portions of the deck top or bottom surfaces that are not visible for inspection shall be assessed based on the available visible surface. If both top and bottom surfaces are not visible, the condition shall be assessed based on destructive and nondestructive testing or indicators in the materials covering the surfaces.

A sound patch is constructed of concrete and is functioning similar to the original overlay material. Patches in concrete consisting of AC or other unsuitable material shall be considered an unsound patch.

The inspector should use judgment when utilizing the condition state defect definitions, especially for concrete cracking. The crack defect description definitions describe generalized distress, but the inspector should consider width, spacing, location, orientation, and structural or non-structural nature of the cracking. The inspector should consider exposure and environment when evaluating crack width.

Reinforced concrete cracks less than 0.012 inches can be considered insignificant and a defect is not warranted. Insignificant cracks shall not be coded or quantified with the Cracking (1130) defect. General descriptions of insignificant cracks may be included under the parent element notes, if needed for tracking purposes.

Cracks ranging from 0.012 to 0.05 inches can be considered moderate, and cracks greater than 0.05 inches can be considered wide.

When cracks on the surface of this element have been treated with methacrylate or polyester concrete, the Cracking (1130) defect shall not be used. The appropriate protective coating or wearing surface element should be used and the date of application provided in the element notes.

Defects that are visible on the soffit of this element, such as cracking or efflorescence, shall be coded as they are observed regardless of any treatments applied to the top surface of this element, such as methacrylate or polyester concrete overlay.

Element # 65: Slab - Other

Description: All slabs constructed of other materials not otherwise defined regardless of the wearing surface or protection systems used.

Classification: NBE - National Bridge Element **Units of Measurement:** sq.ft.

Quantity Calculation: Area of the slab from edge to edge, including any median areas and accounting for any flares or ramps present.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Fatigue Crack (Steel/Other) (1010)	None	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack exists that is not arrested but does not warrant structural review.	
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	
Delamination/Spall/ Patched Area (1080)	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	
Efflorescence/ Rust Staining (1120)	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
Cracking (RC and Other) (1130)	None or insignificant cracks.	Unsealed moderate width cracks or unsealed moderate pattern (map) cracking. Cracks from 0.012 to 0.05 inches wide.	Wide cracks or heavy pattern (map) cracking. Cracks greater than 0.05 inches wide.	
Deterioration (Other) (1220)	None	Initiated breakdown or deterioration.	Significant deterioration or breakdown, but does not warrant structural review.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

The other material slab is intended for slabs constructed of composite materials, or other materials that cannot be classified using any other defined slab element.

For slab bridges with hinges, see the commentary for Element #308 - Steel Sliding Plates and Element #312 – Bearing Concealed/Enclosed.

The condition of the deck area within 1 foot of all joints should be recorded as part of the joint element.

The slab evaluation is three dimensional in nature with the defects observed on the top surface, bottom surface, edges or all, and being captured using the defined condition states. Portions of the slab top or bottom surfaces that are not visible for inspection shall be assessed based on the available visible surface. If both top and bottom surfaces are not visible, the condition shall be assessed based on destructive and nondestructive testing or indicators in the materials covering the surfaces.

A sound patch is constructed of concrete and is functioning similar to the original overlay material. Patches in concrete consisting of AC or other unsuitable material shall be considered an unsound patch.

The inspector should use judgment when utilizing the condition state defect definitions, especially for concrete cracking. The crack defect description definitions describe generalized distress, but the inspector should consider width, spacing, location, orientation, and structural or non-structural nature of the cracking. The inspector should consider exposure and environment when evaluating crack width.

Reinforced concrete cracks less than 0.012 inches can be considered insignificant and a defect is not warranted. Insignificant cracks shall not be coded or quantified with the Cracking (1130) defect. General descriptions of insignificant cracks may be included under the parent element notes, if needed for tracking purposes. Cracks ranging from 0.012 to 0.05 inches can be considered moderate, and cracks greater than 0.05 inches can be considered wide.

When cracks on the surface of this element have been treated with methacrylate or polyester concrete, the Cracking (1130) defect shall not be used. The appropriate protective coating or wearing surface element should be used and the date of application provided in the element notes.

Defects that are visible on the soffit of this element, such as cracking or efflorescence, shall be coded as they are observed regardless of any treatments applied to the top surface of this element, such as methacrylate or polyester concrete overlay.

This page intentionally left blank.

3.2 - Superstructure

Superstructure elements described in this section transmit load from decks into the substructure. These elements include girders, trusses, arches, and floor systems. The floor systems include stringers and floor beams. Additional elements in this group include cables, gusset plates, and pin or pin and hanger assemblies. These elements do not include bracing members such as diaphragms, cross bracing, or portal sway bracing.

3.2.1 - Girders

These elements transmit the loads from the deck into the substructure. Elements listed include closed web (boxes) and open girders (I sections). The materials include steel, reinforced and prestressed concrete, and timber.

Element # 102: Closed Web/Box Girder - Steel

Description: All steel box girders or closed web girders. For all box girders regardless of protective system.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Sum of all the lengths of each box girder section; can be determined by counting the visible web faces, dividing by two, and then multiplying by the appropriate length.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Fatigue Crack (Steel/Other) (1010)	None	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack exists that is not arrested but does not warrant structural review.	
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	
Distortion (1900)	None	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed, but does not warrant structural review.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

The box girder evaluation is three dimensional in nature with the defects observed on exterior and interior surfaces being used to capture the condition states.

Any gouges in the steel element caused by impact damage shall be captured under the Distortion (1900) defect.

Element # 104: Closed Web/Box Girder - Prestressed Concrete

Description: All pretensioned or post-tensioned concrete closed web girders or box girders. For all box girders regardless of protective system.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Sum of all the lengths of each box girder section; can be determined by counting the visible web faces, dividing by two, and then multiplying by the appropriate length.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Delamination/ Spall/ Patched Area (1080)	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Exposed Rebar (1090)	None	Present without measurable section loss.	Present with measurable section loss, but does not warrant structural review.	
Exposed Prestressing (1100)	None	Present without section loss.	Present with section loss, but does not warrant structural review.	
Cracking (PSC) (1110)	None or insignificant cracks.	Unsealed moderate width cracks or unsealed moderate pattern (map) cracking. Cracks from 0.004 to 0.009 inches wide.	Wide cracks or heavy pattern (map) cracking. Cracks greater than 0.009 inches wide.	
Efflorescence/ Rust Staining (1120)	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Where traffic rides directly on the structural element, regardless of the wearing surface, evaluation of the top flange above the fillet is considered with Element #15 or Element #16.

The box girder evaluation is three dimensional in nature which includes defects observed on exterior and interior surfaces.

The inspector should use judgment when utilizing the condition state defect definitions, especially for concrete cracking. The crack defect description definitions describe generalized distress, but the inspector should consider width, spacing, location, orientation, and structural or non-structural nature of the cracking. The inspector should consider exposure and environment when evaluating crack width.

Prestressed concrete cracks less than 0.004 inches can be considered insignificant and a defect is not warranted. Insignificant cracks shall not be coded or quantified with the Cracking (1110) defect. General descriptions of insignificant cracks may be included under the parent element notes, if needed for tracking purposes.

Cracks ranging from 0.004 to 0.009 inches can be considered moderate, and cracks greater than 0.009 inches can be considered wide.

When cracks on the surface of this element have been treated with a sealant such as methacrylate, epoxy or silane, the Cracking (1110) defect shall not be used. The appropriate protective coating or wearing surface element should be used and the date of application provided in the element notes.

Element # 105: Closed Web/Box Girder - Reinforced Concrete

Description: All reinforced concrete box girders or closed web girders. For all box girders regardless of protective system.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Sum of all the lengths of each box girder section; can be determined by counting the visible web faces, dividing by two, and then multiplying by the appropriate length.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Delamination/ Spall/ Patched Area (1080)	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Exposed Rebar (1090)	None	Present without measurable section loss.	Present with measurable section loss, but does not warrant structural review.	
Efflorescence/ Rust Staining (1120)	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
Cracking (RC and Other) (1130)	None or insignificant cracks.	Unsealed moderate width cracks or unsealed moderate pattern (map) cracking. Cracks from 0.012 to 0.05 inches wide.	Wide cracks or heavy pattern (map) cracking. Cracks greater than 0.05 inches wide.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Where traffic rides directly on the structural element, regardless of the wearing surface, evaluation of the top flange above the fillet is considered with Element #15 or Element #16.

The box girder evaluation is three dimensional in nature which includes defects observed on exterior and interior surfaces.

The inspector should use judgment when utilizing the condition state defect definitions, especially for concrete cracking. The crack defect description definitions describe generalized distress, but the inspector should consider width, spacing, location, orientation, and structural or non-structural nature of the cracking. The inspector should consider exposure and environment when evaluating crack width.

Reinforced concrete cracks less than 0.012 inches can be considered insignificant and a defect is not warranted. Insignificant cracks shall not be coded or quantified with the Cracking (1130) defect. General descriptions of insignificant cracks may be included under the parent element notes, if needed for tracking purposes.

Cracks ranging from 0.012 to 0.05 inches can be considered moderate, and cracks greater than 0.05 inches can be considered wide.

When cracks on the surface of this element have been treated with a sealant such as methacrylate, epoxy or silane, the Cracking (1130) defect shall not be used. The appropriate protective coating element or wearing surface should be used and the date of application provided in the element notes.

Element # 106: Closed Web/Box Girder - Other

Description: All other material box girders or closed web girders. For all other material box girders regardless of protective system.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Sum of all the lengths of each box girder section; can be determined by counting the visible web faces, dividing by two, and then multiplying by the appropriate length.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Fatigue Crack (Steel/Other) (1010)	None	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack exists that is not arrested but does not warrant structural review.	
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	
Delamination/ Spall/ Patched Area (1080)	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	
Efflorescence/ Rust Staining (1120)	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
Cracking (RC and Other) (1130)	None or insignificant cracks.	Unsealed moderate width cracks or unsealed moderate pattern (map) cracking. Cracks from 0.012 to 0.05 inches wide.	Wide cracks or heavy pattern (map) cracking. Cracks greater than 0.05 inches wide.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Deterioration (Other) (1220)	None	Initiated breakdown or deterioration.	Significant deterioration or breakdown, but does not warrant structural review.	
Distortion (1900)	None	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed, but does not warrant structural review.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

The other material box girder is intended for box girders constructed of composite materials, or other materials that cannot be classified using any other defined box girder element.

The box girder evaluation is three dimensional in nature with the defects observed including exterior and interior surfaces being used to capture the condition states.

The inspector should use judgment when utilizing the condition state defect definitions, especially for concrete cracking. The crack defect description definitions describe generalized distress, but the inspector should consider width, spacing, location, orientation, and structural or non-structural nature of the cracking. The inspector should consider exposure and environment when evaluating crack width.

Reinforced concrete cracks less than 0.012 inches can be considered insignificant and a defect is not warranted. Insignificant cracks shall not be coded or quantified with the Cracking (1130) defect. General descriptions of insignificant cracks may be included under the parent element notes, if needed for tracking purposes.

Cracks ranging from 0.012 to 0.05 inches can be considered moderate, and cracks greater than 0.05 inches can be considered wide.

When cracks on the surface of this element have been treated with a sealant such as methacrylate, epoxy or silane, the Cracking (1130) defect shall not be used. The appropriate protective coating or wearing surface element should be used and the date of application provided in the element notes.

Any gouges in the steel element caused by impact damage shall be captured under the Distortion (1900) defect.

Element # 107: Open Girder/Beam - Steel

Description: All steel open girders regardless of protective system.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Sum of all the lengths of each girder.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Fatigue Crack (Steel/Other) (1010)	None	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack exists that is not arrested but does not warrant structural review.	
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	
Distortion (1900)	None	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed, but does not warrant structural review.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Girders are supported by substructure elements.

Condition evaluation for this element includes the web face and the top and bottom faces of the flange.

Any gouges in the steel element caused by impact damage shall be captured under the Distortion (1900) defect.

Element # 109: Open Girder/Beam - Prestressed Concrete

Description: Pretensioned or post-tensioned concrete open web girders regardless of protective system.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Sum of all the lengths of each girder.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Delamination/ Spall/ Patched Area (1080)	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Exposed Rebar (1090)	None	Present without measurable section loss.	Present with measurable section loss, but does not warrant structural review.	
Exposed Prestressing (1100)	None	Present without section loss.	Present with section loss, but does not warrant structural review.	
Cracking (PSC) (1110)	None or insignificant cracks.	Unsealed moderate width cracks or unsealed moderate pattern (map) cracking. Cracks from 0.004 to 0.009 inches wide.	Wide cracks or heavy pattern (map) cracking. Cracks greater than 0.009 inches wide.	
Efflorescence/ Rust Staining (1120)	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Girders are supported by substructure elements.

Where traffic rides directly on the structural element, regardless of the wearing surface, evaluation of the top flange above the fillet is considered with Element #15 or Element #16.

The inspector should use judgment when utilizing the condition state defect definitions, especially for concrete cracking. The crack defect description definitions describe generalized distress, but the inspector should consider width, spacing, location, orientation, and structural or non-structural nature of the cracking. The inspector should consider exposure and environment when evaluating crack width.

Prestressed concrete cracks less than 0.004 inches can be considered insignificant and a defect is not warranted. Insignificant cracks shall not be coded or quantified with the Cracking (1110) defect. General descriptions of insignificant cracks may be included under the parent element notes, if needed for tracking purposes.

Cracks ranging from 0.004 to 0.009 inches can be considered moderate, and cracks greater than 0.009 inches can be considered wide.

When cracks on the surface of this element have been treated with a sealant such as methacrylate, epoxy or silane, the Cracking (1110) defect shall not be used. The appropriate protective coating or wearing surface element should be used and the date of application provided in the element notes.

Element # 110: Open Girder/Beam - Reinforced Concrete

Description: Mild steel reinforced concrete open web girders regardless of protective system.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Sum of all of the lengths of each girder.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Delamination/ Spall/ Patched Area (1080)	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Exposed Rebar (1090)	None	Present without measurable section loss.	Present with measurable section loss, but does not warrant structural review.	
Efflorescence/ Rust Staining (1120)	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
Cracking (RC and Other) (1130)	None or insignificant cracks.	Unsealed moderate width cracks or unsealed moderate pattern (map) cracking. Cracks from 0.012 to 0.05 inches wide.	Wide cracks or heavy pattern (map) cracking. Cracks greater than 0.05 inches wide.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Girders are supported by substructure elements.

Condition evaluation for this element includes the web faces and the top and bottom flange surfaces. Where traffic rides directly on the structural element, regardless of the wearing surface, evaluation of the top flange above the fillet is considered with Element #15 or Element #16.

The inspector should use judgment when utilizing the condition state defect definitions, especially for concrete cracking. The crack defect description definitions describe generalized distress, but the inspector should consider width, spacing, location, orientation, and structural or non-structural nature of the cracking. The inspector should consider exposure and environment when evaluating crack width.

Reinforced concrete cracks less than 0.012 inches can be considered insignificant and a defect is not warranted. Insignificant cracks shall not be coded or quantified with the Cracking (1130) defect. General descriptions of insignificant cracks may be included under the parent element notes, if needed for tracking purposes.

Cracks ranging from 0.012 to 0.05 inches can be considered moderate, and cracks greater than 0.05 inches can be considered wide.

When cracks on the surface of this element have been treated with a sealant such as methacrylate, epoxy or silane, the Cracking (1130) defect shall not be used. The appropriate protective coating or wearing surface element should be used and the date of application provided in the element notes.

Element # 111: Open Girder/Beam - Timber

Description: All timber open girders regardless of protection system.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Sum of all the lengths of each girder/beam.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Decay/ Section Loss (1140)	None	Affects less than 10% of the member section.	Affects 10% or more of the member but does not warrant structural review.	
Check/Shake (1150)	Surface penetration less than 5% of the member thickness regardless of location.	Penetrates 5% - 50% of the thickness of the member and not in a tension zone.	Penetrates more than 50% of the thickness of the member or more than 5% of the member thickness in a tension zone. Does not warrant structural review.	
Crack (Timber) (1160)	None.	Crack that has been arrested through effective measures.	Identified crack exists that is not arrested, but does not require structural review	
Split/Delamination (Timber) (1170)	None	Length less than the member depth or arrested with effective actions taken to mitigate.	Length equal to or greater than the member depth, but does not require structural review.	
Abrasion/Wear (Timber) (1180)	None or no measurable section loss.	Section loss less than 10% of the member thickness.	Section loss 10% or more of the member thickness, but does not warrant structural review.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Timber girders are longitudinal members that are supported by substructure elements and are significantly greater in depth than other longitudinal members that frame into floor beams.

The typical timber girder element would be for glulam or built up timber longitudinal members.

Element # 112: Open Girder/Beam - Other

Description: All other material girders regardless of protection system.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Sum of all the lengths of each girder.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Fatigue Crack (Steel/Other) (1010)	None	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack exists that is not arrested but does not warrant structural review.	
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	
Delamination/ Spall/ Patched Area (1080)	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	
Efflorescence/ Rust Staining (1120)	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
Cracking (RC and Other) (1130)	None or insignificant cracks.	Unsealed moderate width cracks or unsealed moderate pattern (map) cracking. Cracks from 0.012 to 0.05 inches wide.	Wide cracks or heavy pattern (map) cracking. Cracks greater than 0.05 inches wide.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Deterioration (Other) (1220)	None	Initiated breakdown or deterioration.	Significant deterioration or breakdown, but does not warrant structural review.	
Distortion (1900)	None	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed, but does not warrant structural review.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Girders are supported by substructure elements.

The other material open girder is intended for open girders constructed of composite materials, or other materials that cannot be classified using any other defined open girder element.

Reinforced concrete cracks less than 0.012 inches can be considered insignificant and a defect is not warranted. Insignificant cracks shall not be coded or quantified with the Cracking (1130) defect. General descriptions of insignificant cracks may be included under the parent element notes, if needed for tracking purposes.

Cracks ranging from 0.012 to 0.05 inches can be considered moderate, and cracks greater than 0.05 inches can be considered wide.

When cracks on the surface of this element have been treated with a sealant such as methacrylate, epoxy or silane, the Cracking (1130) defect shall not be used. The appropriate protective coating or wearing surface element should be used and the date of application provided in the element notes.

Any gouges in the steel element caused by impact damage shall be captured under the Distortion (1900) defect.

This page intentionally left blank.

3.2.2 - Trusses/Arches

These superstructure elements include materials of steel, concrete, timber, and masonry, and are the main load carrying members for the span.

Element # 120: Truss - Steel

Description: All steel truss elements, including all tension and compression members for through and deck trusses. It is for all trusses regardless of protective system.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Sum of all of the lengths of each truss panel measured longitudinally along the travel way.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Fatigue Crack (Steel/Other) (1010)	None	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack exists that is not arrested but does not warrant structural review.	
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	
Distortion (1900)	None	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed, but does not warrant structural review.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Observed distress in truss vertical or diagonal members shall be reported as the length projected along the length of the truss.

Any gouges in the steel element caused by impact damage shall be captured under the Distortion (1900) defect.

Element # 135: Truss - Timber

Description: All timber truss elements, including all tension and compression members for through and deck trusses. It is for all trusses regardless of protective system.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Sum of all of the lengths of each truss panel measured longitudinally along the travel way.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Decay/ Section Loss (1140)	None	Affects less than 10% of the member section.	Affects 10% or more of the member but does not warrant structural review.	
Check/Shake (1150)	Surface penetration less than 5% of the member thickness regardless of location.	Penetrates 5% - 50% of the thickness of the member and not in a tension zone.	Penetrates more than 50% of the thickness of the member or more than 5% of the member thickness in a tension zone. Does not warrant structural review.	
Crack (Timber) (1160)	None.	Crack that has been arrested through effective measures.	Identified crack exists that is not arrested, but does not require structural review	
Split/Delamination (Timber) (1170)	None	Length less than the member depth or arrested with effective actions taken to mitigate.	Length equal to or greater than the member depth, but does not require structural review.	
Abrasion/Wear (Timber) (1180)	None or no measurable section loss.	Section loss less than 10% of the member thickness.	Section loss 10% or more of the member thickness, but does not warrant structural review.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Observed distress in truss vertical or diagonal members shall be reported as the length projected along the length of the truss.

Element # 136: Truss - Other

Description: All other material truss elements, including all tension and compression members, and through and deck trusses. It is for all other material trusses regardless of protective system.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Sum of all of the lengths of each truss panel measured longitudinally along the travel way.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Fatigue Crack (Steel/Other) (1010)	None	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack exists that is not arrested but does not warrant structural review.	
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	
Delamination/ Spall/ Patched Area (1080)	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	
Efflorescence/ Rust Staining (1120)	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
Cracking (RC and Other) (1130)	None or insignificant cracks.	Unsealed moderate width cracks or unsealed moderate pattern (map) cracking. Cracks from 0.012 to 0.05 inches wide.	Wide cracks or heavy pattern (map) cracking. Cracks greater than 0.05 inches wide.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Deterioration (Other) (1220)	None	Initiated breakdown or deterioration.	Significant deterioration or breakdown, but does not warrant structural review.	
Distortion (1900)	None	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed, but does not warrant structural review.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Observed distress in truss diagonal and vertical members shall be reported as the projected length along the length of the truss.

The other material open truss is intended for trusses constructed of composite materials, or other materials that cannot be classified using any other defined truss element.

The inspector should use judgment when utilizing the condition state defect definitions, especially for concrete cracking. The crack defect description definitions describe generalized distress, but the inspector should consider width, spacing, location, orientation, and structural or non-structural nature of the cracking. The inspector should consider exposure and environment when evaluating crack width.

Reinforced concrete cracks less than 0.012 inches can be considered insignificant and a defect is not warranted. Insignificant cracks shall not be coded or quantified with the Cracking (1130) defect. General descriptions of insignificant cracks may be included under the parent element notes, if needed for tracking purposes.

Cracks ranging from 0.012 to 0.05 inches can be considered moderate, and cracks greater than 0.05 inches can be considered wide.

When cracks on the surface of this element have been treated with a sealant such as methacrylate, epoxy or silane, the Cracking (1130) defect shall not be used. The appropriate protective coating or wearing surface element should be used and the date of application provided in the element notes.

Any gouges in the steel element caused by impact damage shall be captured under the Distortion (1900) defect.

Element # 141: Arch - Steel

Description: Steel arches regardless of type or protective system.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Sum of all of the lengths of each arch panel measured longitudinally along the travel way.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Fatigue Crack (Steel/Other) (1010)	None	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack exists that is not arrested but does not warrant structural review.	
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	
Distortion (1900)	None	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed, but does not warrant structural review.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

The portion of the arch below the spring lines shall be reported under the appropriate substructure element.

For filled arches, the arch quantity shall be measured from spring line to spring line; the length below the spring lines is considered substructure and shall be reported under the appropriate substructure element.

Monolithic wing walls on arches, up to the first construction joint (cold joint, felt paper, water stop or other break), shall be considered in the quantity and assessment of the substructure element below the spring line.

Observed distress in arch diagonals and vertical members (including spandrel columns) shall be reported as the projected length along the arch length.

Any gouges in the steel element caused by impact damage shall be captured under the Distortion (1900) defect.

Element # 142: Arch - Other

Description: Other material arches regardless of type or protective system.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Sum of all of the lengths of each arch panel measured longitudinally along the travel way.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Fatigue Crack (Steel/Other) (1010)	None	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack exists that is not arrested but does not warrant structural review.	
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	
Delamination/ Spall/ Patched Area (1080)	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	
Efflorescence/ Rust Staining (1120)	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
Cracking (RC and Other) (1130)	None or insignificant cracks.	Unsealed moderate width cracks or unsealed moderate pattern (map) cracking. Cracks from .012 to 0.05 inches wide.	Wide cracks or heavy pattern (map) cracking. Cracks greater than 0.05 inches wide.	
Deterioration (Other) (1220)	None	Initiated breakdown or deterioration.	Significant deterioration or breakdown, but does not warrant structural review.	
Distortion (1900)	None	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed, but does not warrant structural review.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary

The other material arch is intended for arches constructed of composite materials, or other materials that cannot be classified using any other defined arch element.

The portion of the arch below the spring lines shall be reported under the appropriate substructure element.

For filled arches**,** the arch quantity shall be measured from spring line to spring line; the length below the spring lines is considered substructure and shall be reported under the appropriate substructure element.

Monolithic wing walls on arches, up to the first construction joint (cold joint, felt paper, water stop or other break), shall be considered in the quantity and assessment of the substructure element below the spring line.

Observed distress in arch diagonals and verticals (including spandrel columns) shall be reported as the projected length along the arch length.

The inspector should use judgment when utilizing the condition state defect definitions, especially for concrete cracking. The crack defect description definitions describe generalized distress, but the inspector should consider width, spacing, location, orientation, and structural or non-structural nature of the cracking. The inspector should consider exposure and environment when evaluating crack width.

Reinforced concrete cracks less than 0.012 inches can be considered insignificant and a defect is not warranted. Insignificant cracks shall not be coded or quantified with the Cracking (1130) defect. General descriptions of insignificant cracks may be included under the parent element notes, if needed for tracking purposes.

Cracks ranging from 0.012 to 0.05 inches can be considered moderate, and cracks greater than 0.05 inches can be considered wide.

When cracks on the surface of this element have been treated with a sealant such as methacrylate, epoxy or silane, the Cracking (1130) defect shall not be used. The appropriate protective coating or wearing surface element should be used and the date of application provided in the element notes.

Any gouges in the steel element caused by impact damage shall be captured under the Distortion (1900) defect.

Element # 143: Arch - Prestressed Concrete

Description: Only pretensioned or post-tensioned concrete arches regardless of protective system.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Sum of the length of each arch panel measured longitudinally along the travel way.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Delamination/ Spall/ Patched Area (1080)	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Exposed Rebar (1090)	None	Present without measurable section loss.	Present with measurable section loss, but does not warrant structural review.	
Exposed Prestressing (1100)	None	Present without section loss.	Present with section loss, but does not warrant structural review.	
Cracking (PSC) (1110)	None or insignificant cracks.	Unsealed moderate width cracks or unsealed moderate pattern (map) cracking. Cracks from 0.004 to 0.009 inches wide.	Wide cracks or heavy pattern (map) cracking. Cracks greater than 0.009 inches wide.	
Efflorescence/ Rust Staining (1120)	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
Abrasion/Wear (PSC/RC) (1190)	No abrasion or wearing.	Abrasion or wearing has exposed coarse aggregate but the aggregate remains secure in the concrete.	Coarse aggregate is loose or has popped out of the concrete matrix due to abrasion or wear.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

The portion of the arch below the spring lines shall be reported under the appropriate substructure element.

For filled arches, the arch quantity shall be measured from spring line to spring line; the length below the spring lines is considered substructure and shall be reported under the appropriate substructure element.

Monolithic wing walls on arches, up to the first construction joint (cold joint, felt paper, water stop or other break), shall be considered in the quantity and assessment of the substructure element below the spring line.

Observed distress in arch diagonals and vertical members (including spandrel columns) shall be reported as the projected length along the arch length.

The inspector should use judgment when utilizing the condition state defect definitions, especially for concrete cracking. The crack defect description definitions describe generalized distress, but the inspector should consider width, spacing, location, orientation, and structural or non-structural nature of the cracking. The inspector should consider exposure and environment when evaluating crack width.

Prestressed concrete cracks less than 0.004 inches can be considered insignificant and a defect is not warranted. Insignificant cracks shall not be coded or quantified with the Cracking (1110) defect. General descriptions of insignificant cracks may be included under the parent element notes, if needed for tracking purposes.

Cracks ranging from 0.004 to 0.009 inches can be considered moderate, and cracks greater than 0.009 inches can be considered wide.

When cracks on the surface of this element have been treated with a sealant such as methacrylate, epoxy or silane, the Cracking (1110) defect shall not be used. The appropriate protective coating or wearing surface element should be used and the date of application provided in the element notes.

Element # 144: Arch - Reinforced Concrete

Description: Only mild steel reinforced concrete arches regardless of protective system.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Sum of all of the lengths of each arch panel measured longitudinally along the travel way.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Delamination/ Spall/ Patched Area (1080)	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Exposed Rebar (1090)	None	Present without measurable section loss.	Present with measurable section loss, but does not warrant structural review.	
Efflorescence/ Rust Staining (1120)	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
Cracking (RC and Other) (1130)	None or insignificant cracks.	Unsealed moderate width cracks or unsealed moderate pattern (map) cracking. Cracks from 0.012 to 0.05 inches wide.	Wide cracks or heavy pattern (map) cracking. Cracks greater than 0.05 inches wide.	
Abrasion/Wear (PSC/RC) (1190)	No abrasion or wearing.	Abrasion or wearing has exposed coarse aggregate but the aggregate remains secure in the concrete.	Coarse aggregate is loose or has popped out of the concrete matrix due to abrasion or wear.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

The portion of the arch below the spring lines shall be reported under the appropriate substructure element.

For filled arches, the arch quantity shall be measured from spring line to spring line; the length below the spring lines is considered substructure and shall be reported under the appropriate substructure element.

Monolithic wing walls on arches, up to the first construction joint (cold joint, felt paper, water stop or other break), shall be considered in the quantity and assessment of the substructure element below the spring line.

Observed distress in arch diagonals, vertical members (including spandrel columns) and spandrel walls shall be reported as the projected length along the arch length.

The inspector should use judgment when utilizing the condition state defect definitions, especially for concrete cracking. The crack defect description definitions describe generalized distress, but the inspector should consider width, spacing, location, orientation, and structural or non-structural nature of the cracking. The inspector should consider exposure and environment when evaluating crack width.

Reinforced concrete cracks less than 0.012 inches can be considered insignificant and a defect is not warranted. Insignificant cracks shall not be coded or quantified with the Cracking (1130) defect. General descriptions of insignificant cracks may be included under the parent element notes, if needed for tracking purposes.

Cracks ranging from 0.012 to 0.05 inches can be considered moderate, and cracks greater than 0.05 inches can be considered wide.

When cracks on the surface of this element have been treated with a sealant such as methacrylate, epoxy or silane, the Cracking (1130) defect shall not be used. The appropriate protective coating or wearing surface element should be used and the date of application provided in the element notes.

Element # 145: Arch - Masonry

Description: Masonry or stacked stone arches regardless of protective system.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Sum of all of the lengths of each arch section measured longitudinally along the travel way.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Efflorescence/ Rust Staining (1120)	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Mortar Breakdown (Masonry) (1610)	None	Cracking or voids in less than 10% of joints.	Cracking or voids in 10% or more of the of joints	
Split/Spall (Masonry) (1620)	None	Block or stone has split or spalled with no shifting.	Block or stone has split or spalled with shifting but does not warrant a structural review.	
Patched Area (Masonry) (1630)	None	Sound Patch	Unsound Patch	
Masonry Displacement (1640)	None	Block or stone has shifted slightly out of alignment.	Block or stone has shifted significantly out of alignment or is missing but does not warrant structural review.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

The portion of the arch below the spring lines shall be reported under the appropriate substructure element.

For filled arches, the arch quantity shall be measured from spring line to spring line; the length below the spring lines is considered substructure and shall be reported under the appropriate substructure element.

Monolithic wing walls on arches, up to the first construction joint (cold joint, felt paper, water stop or other break), shall be considered in the quantity and assessment of the substructure element below the spring line.

Observed distress in arch spandrel walls shall be reported as the projected length along the arch length.

Element # 146: Arch - Timber

Description: Only timber arches regardless of protective system.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Sum of all of the lengths of each arch panel measured longitudinally along the travel way.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Decay/Section Loss (1140)	None	Affects less than 10% of the member section.	Affects 10% or more of the member but does not warrant structural review.	
Check/Shake (1150)	Surface penetration less than 5% of the member thickness regardless of location.	Penetrates 5% - 50% of the thickness of the member and not in a tension zone.	Penetrates more than 50% of the thickness of the member or more than 5% of the member thickness in a tension zone. Does not warrant structural review.	
Crack (Timber) (1160)	None.	Crack that has been arrested through effective measures.	Identified crack exists that is not arrested, but does not require structural review	
Split/Delamination (Timber) (1170)	None	Length less than the member depth or arrested with effective actions taken to mitigate.	Length equal to or greater than the member depth, but does not require structural review.	
Abrasion/Wear (Timber) (1180)	None or no measurable section loss.	Section loss less than 10% of the member thickness.	Section loss 10% or more of the member thickness, but does not warrant structural review.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

The portion of the arch below the spring lines shall be reported under the appropriate substructure element.

For filled arches**,** the arch quantity shall be measured from spring line to spring line; the length below the spring lines is considered substructure and shall be reported under the appropriate substructure element.

Monolithic wing walls on arches, up to the first construction joint (cold joint, felt paper, water stop or other break), shall be considered in the quantity and assessment of the substructure element below the spring line.

Observed distress in arch diagonal and vertical members (including spandrel columns) shall be reported as the projected length along the arch. The portion of the arch below the spring line is considered substructure.

This page intentionally left blank.

3.2.3 - Stringers

These superstructure elements are part of a floor system, and transmit load from the deck into the floor system, such as floor beams.

Element # 113: Stringer - Steel

Description: Steel members that support the deck in a stringer floor beam system regardless of protective system.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Sum of all of the lengths of each stringer.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Fatigue Crack (Steel/Other) (1010)	None	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack exists that is not arrested but does not warrant structural review.	
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	
Distortion (1900)	None	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed, but does not warrant structural review.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Stringers are supported by other superstructure elements such as floor beams.

Condition evaluation for this element includes the web faces and the top and bottom faces of the flange.

Any gouges in the steel element caused by impact damage shall be captured under the Distortion (1900) defect.

Element # 115: Stringer - Prestressed Concrete

Description: Pretensioned or post-tensioned concrete members that support the deck in a stringer floor beam system regardless of protective system.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Sum of all of the lengths of each stringer.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Delamination/ Spall/ Patched Area (1080)	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Exposed Rebar (1090)	None	Present without measurable section loss.	Present with measurable section loss, but does not warrant structural review.	
Exposed Prestressing (1100)	None	Present without section loss.	Present with section loss, but does not warrant structural review.	
Cracking (PSC) (1110)	None or insignificant cracks.	Unsealed moderate width cracks or unsealed moderate pattern (map) cracking. Cracks from 0.004 to 0.009 inches wide.	Wide cracks or heavy pattern (map) cracking. Cracks greater than 0.009 inches wide.	
Efflorescence/ Rust Staining (1120)	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Stringers are supported by other superstructure elements such as floor beams.

Condition evaluation for this element includes the web faces and the top and bottom flange surfaces.

The inspector should use judgment when utilizing the condition state defect definitions, especially for concrete cracking. The crack defect description definitions describe generalized distress, but the inspector should consider width, spacing, location, orientation, and structural or non-structural nature of the cracking. The inspector should consider exposure and environment when evaluating crack width.

Prestressed concrete cracks less than 0.004 inches can be considered insignificant and a defect is not warranted. Insignificant cracks shall not be coded or quantified with the Cracking (1110) defect. General descriptions of insignificant cracks may be included under the parent element notes, if needed for tracking purposes.

Cracks ranging from 0.004 to 0.009 inches can be considered moderate, and cracks greater than 0.009 inches can be considered wide.

When cracks on the surface of this element have been treated with a sealant such as methacrylate, epoxy or silane, the Cracking (1110) defect shall not be used. The appropriate protective coating or wearing surface element should be used and the date of application provided in the element notes.

Element # 116: Stringer - Reinforced Concrete

Description: Mild steel reinforced concrete members that support the deck in a stringer floor beam system regardless of protective system.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Sum of all of the lengths of each stringer.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Delamination/ Spall/ Patched Area (1080)	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Exposed Rebar (1090)	None	Present without measurable section loss.	Present with measurable section loss, but does not warrant structural review.	
Efflorescence/ Rust Staining (1120)	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
Cracking (RC and Other) (1130)	None or insignificant cracks.	Unsealed moderate width cracks or unsealed moderate pattern (map) cracking. Cracks from 0.012 to 0.05 inches wide.	Wide cracks or heavy pattern (map) cracking. Cracks greater than 0.05 inches wide.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Stringers are supported by other superstructure elements such as floor beams.

The inspector should use judgment when utilizing the condition state defect definitions, especially for concrete cracking. The crack defect description definitions describe generalized distress, but the inspector should consider width, spacing, location, orientation, and structural or non-structural nature of the cracking. The inspector should consider exposure and environment when evaluating crack width.

Reinforced concrete cracks less than 0.012 inches can be considered insignificant and a defect is not warranted. Insignificant cracks shall not be coded or quantified with the Cracking (1130) defect. General descriptions of insignificant cracks may be included under the parent element notes, if needed for tracking purposes.

Cracks ranging from 0.012 to 0.05 inches can be considered moderate, and cracks greater than 0.05 inches can be considered wide.

When cracks on the surface of this element have been treated with a sealant such as methacrylate, epoxy or silane, the Cracking (1130) defect shall not be used. The appropriate protective coating or wearing surface element should be used and the date of application provided in the element notes.

Element # 117: Stringer - Timber

Description: Timber members that support the deck in a stringer floor beam system regardless of protective system.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Sum of all of the lengths of each stringer.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Decay/ Section Loss (1140)	None	Affects less than 10% of the member section.	Affects 10% or more of the member but does not warrant structural review.	
Check/Shake (1150)	Surface penetration less than 5% of the member thickness regardless of location.	Penetrates 5% - 50% of the thickness of the member and not in a tension zone.	Penetrates more than 50% of the thickness of the member or more than 5% of the member thickness in a tension zone. Does not warrant structural review.	
Crack (Timber) (1160)	None.	Crack that has been arrested through effective measures.	Identified crack exists that is not arrested, but does not require structural review	
Split/Delamination (Timber) (1170)	None	Length less than the member depth or arrested with effective actions taken to mitigate.	Length equal to or greater than the member depth, but does not require structural review.	
Abrasion/Wear (Timber) (1180)	None or no measurable section loss.	Section loss less than 10% of the member thickness.	Section loss 10% or more of the member thickness, but does not warrant structural review.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Timber stringers are longitudinal members that are typically sawn lumber supported by other superstructure members such as floor beams.

Element # 118: Stringer - Other

Description: All other material stringers regardless of protection system.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Sum of all the lengths of each stringer.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Fatigue Crack (Steel/Other) (1010)	None	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack exists that is not arrested but does not warrant structural review.	
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	
Delamination/ Spall/ Patched Area (1080)	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	
Efflorescence/ Rust Staining (1120)	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
Cracking (RC and Other) (1130)	None or insignificant cracks.	Unsealed moderate width cracks or unsealed moderate pattern (map) cracking. Cracks from 0.012 to 0.05 inches wide.	Wide cracks or heavy pattern (map) cracking. Cracks greater than 0.05 inches wide.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Deterioration (Other) (1220)	None	Initiated breakdown or deterioration.	Significant deterioration or breakdown, but does not warrant structural review.	
Distortion (1900)	None	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed, but does not warrant structural review.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Stringers are supported by other superstructure elements such as floor beams.

The other material stringer is intended for stringers constructed of composite materials, or other materials that cannot be classified using any other defined stringer element.

The inspector should use judgment when utilizing the condition state defect definitions, especially for concrete cracking. The crack defect description definitions describe generalized distress, but the inspector should consider width, spacing, location, orientation, and structural or non-structural nature of the cracking. The inspector should consider exposure and environment when evaluating crack width.

Reinforced concrete cracks less than 0.012 inches can be considered insignificant and a defect is not warranted. Insignificant cracks shall not be coded or quantified with the Cracking (1130) defect. General descriptions of insignificant cracks may be included under the parent element notes, if needed for tracking purposes.

Cracks ranging from 0.012 to 0.05 inches can be considered moderate, and cracks greater than 0.05 inches can be considered wide.

When cracks on the surface of this element have been treated with a sealant such as methacrylate, epoxy or silane, the Cracking (1130) defect shall not be used. The appropriate protective coating or wearing surface element should be used and the date of application provided in the element notes.

Any gouges in the steel element caused by impact damage shall be captured under the Distortion (1900) defect.

This page intentionally left blank.

3.2.4 - Floor Beams

These elements are the intermediate transverse load carrying members, and can be constructed from steel, concrete, and timber.

Element # 152: Floor Beam - Steel

Description: Steel floor beams that typically support stringers regardless of protective system.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Sum of all of the lengths of each floor beam.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Fatigue Crack (Steel/Other) (1010)	None	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack exists that is not arrested but does not warrant structural review.	
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	
Distortion (1900)	None	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed, but does not warrant structural review.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Floor beams are transverse members supported by superstructure elements.

Condition evaluation for this element includes the web faces and the top and bottom faces of the flange.

Any gouges in the steel element caused by impact damage shall be captured under the Distortion (1900) defect.

Element # 154: Floor Beam - Prestressed Concrete

Description: Prestressed concrete floor beams that typically support stringers regardless of protective system.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Sum of all of the lengths of each floor beam.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Delamination/ Spall/ Patched Area (1080)	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Exposed Rebar (1090)	None	Present without measurable section loss.	Present with measurable section loss, but does not warrant structural review.	
Exposed Prestressing (1100)	None	Present without section loss.	Present with section loss, but does not warrant structural review.	
Cracking (PSC) (1110)	None or insignificant cracks.	Unsealed moderate width cracks or unsealed moderate pattern (map) cracking. Cracks from 0.004 to 0.009 inches wide.	Wide cracks or heavy pattern (map) cracking. Cracks greater than 0.009 inches wide.	
Efflorescence/ Rust Staining (1120)	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Floor beams are transverse members supported by superstructure elements.

The inspector should use judgment when utilizing the condition state defect definitions, especially for concrete cracking. The crack defect description definitions describe generalized distress, but the inspector should consider width, spacing, location, orientation, and structural or non-structural nature of the cracking. The inspector should consider exposure and environment when evaluating crack width.

Prestressed concrete cracks less than 0.004 inches can be considered insignificant and a defect is not warranted. Insignificant cracks shall not be coded or quantified with the Cracking (1110) defect. General descriptions of insignificant cracks may be included under the parent element notes, if needed for tracking purposes.

Cracks ranging from 0.004 to 0.009 inches can be considered moderate, and cracks greater than 0.009 inches can be considered wide.

When cracks on the surface of this element have been treated with a sealant such as methacrylate, epoxy or silane, the Cracking (1110) defect shall not be used. The appropriate protective coating or wearing surface element should be used and the date of application provided in the element notes.

Element # 155: Floor Beam - Reinforced Concrete

Description: Mild steel reinforced concrete floor beams that typically support stringers regardless of protective system.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Sum of all of the lengths of each floor beam

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Delamination/ Spall/ Patched Area (1080)	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Exposed Rebar (1090)	None	Present without measurable section loss.	Present with measurable section loss, but does not warrant structural review.	
Efflorescence/ Rust Staining (1120)	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
Cracking (RC and Other) (1130)	None or insignificant cracks.	Unsealed moderate width cracks or unsealed moderate pattern (map) cracking. Cracks from 0.012 to 0.05 inches wide.	Wide cracks or heavy pattern (map) cracking. Cracks greater than 0.05 inches wide.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Floor beams are transverse members supported by superstructure elements.

The inspector should use judgment when utilizing the condition state defect definitions, especially for concrete cracking. The crack defect description definitions describe generalized distress, but the inspector should consider width, spacing, location, orientation, and structural or non-structural nature of the cracking. The inspector should consider exposure and environment when evaluating crack width.

Reinforced concrete cracks less than 0.012 inches can be considered insignificant and a defect is not warranted. Insignificant cracks shall not be coded or quantified with the Cracking (1130) defect. General descriptions of insignificant cracks may be included under the parent element notes, if needed for tracking purposes.

Cracks ranging from 0.012 to 0.05 inches can be considered moderate, and cracks greater than 0.05 inches can be considered wide.

When cracks on the surface of this element have been treated with a sealant such as methacrylate, epoxy or silane, the Cracking (1130) defect shall not be used. The appropriate protective coating or wearing surface element should be used and the date of application provided in the element notes.

Element # 156: Floor Beam - Timber

Description: Timber floor beams that typically support stringers regardless of protective system.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Sum of all of the lengths of each floor beam.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Decay/ Section Loss (1140)	None	Affects less than 10% of the member section.	Affects 10% or more of the member but does not warrant structural review.	
Check/Shake (1150)	Surface penetration less than 5% of the member thickness regardless of location.	Penetrates 5% - 50% of the thickness of the member and not in a tension zone.	Penetrates more than 50% of the thickness of the member or more than 5% of the member thickness in a tension zone. Does not warrant structural review.	
Crack (Timber) (1160)	None.	Crack that has been arrested through effective measures.	Identified crack exists that is not arrested, but does not require structural review	
Split/Delamination (Timber) (1170)	None	Length less than the member depth or arrested with effective actions taken to mitigate.	Length equal to or greater than the member depth, but does not require structural review.	
Abrasion/Wear (Timber) (1180)	None or no measurable section loss.	Section loss less than 10% of the member thickness.	Section loss 10% or more of the member thickness, but does not warrant structural review.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Floor beams are transverse members supported by superstructure elements.

Element # 157: Floor Beam - Other

Description: Other material floor beams that typically support stringers regardless of protective system.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Sum of all of the lengths of each floor beam.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Fatigue Crack (Steel/Other) (1010)	None	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack exists that is not arrested but does not warrant structural review.	
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	
Delamination/ Spall/ Patched Area (1080)	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	
Efflorescence/ Rust Staining (1120)	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
Cracking (RC and Other) (1130)	None or insignificant cracks.	Unsealed moderate width cracks or unsealed moderate pattern (map) cracking. Cracks from 0.012 to 0.05 inches wide.	Wide cracks or heavy pattern (map) cracking. Cracks greater than 0.05 inches wide.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Deterioration (Other) (1220)	None	Initiated breakdown or deterioration.	Significant deterioration or breakdown, but does not warrant structural review.	
Distortion (1900)	None	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed, but does not warrant structural review.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Floor beams are transverse members supported by superstructure elements.

The other material floor beam is intended for floor beams constructed of composite materials, or other materials that cannot be classified using any other defined floor beam element.

The inspector should use judgment when utilizing the condition state defect definitions, especially for concrete cracking. The crack defect description definitions describe generalized distress, but the inspector should consider width, spacing, location, orientation, and structural or non-structural nature of the cracking. The inspector should consider exposure and environment when evaluating crack width.

Reinforced concrete cracks less than 0.012 inches can be considered insignificant and a defect is not warranted. Insignificant cracks shall not be coded or quantified with the Cracking (1130) defect. General descriptions of insignificant cracks may be included under the parent element notes, if needed for tracking purposes.

Cracks ranging from 0.012 to 0.05 inches can be considered moderate, and cracks greater than 0.05 inches can be considered wide.

When cracks on the surface of this element have been treated with a sealant such as methacrylate, epoxy or silane, the Cracking (1130) defect shall not be used. The appropriate protective coating or wearing surface element should be used and the date of application provided in the element notes.

Any gouges in the steel element caused by impact damage shall be captured under the Distortion (1900) defect.

This page intentionally left blank.

3.2.5 - Miscellaneous Superstructure Elements

Steel pin, pin and hanger assemblies, hanger rods, steel gusset plates, and main and secondary cables will be discussed in this section.

Element # 147: Cables - Main Steel

Description: All steel main suspension or cable stay cables not embedded in concrete.
For all cable groups regardless of protective systems.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Sum of all of the lengths of each main cable measured longitudinally along the travel way.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Fatigue Crack (Steel/Other) (1010)	None	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack exists that is not arrested but does not warrant structural review.	
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	
Distortion (1900)	None	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed, but does not warrant structural review.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

This element is intended for use on main cables in suspension bridges or main cable stays in cable stayed bridges.

Suspender cables, hanger rods, or other smaller cables shall be captured using the secondary cable element.

Any gouges in the steel element caused by impact damage shall be captured under the Distortion (1900) defect.

Element # 148: Cables - Secondary Steel

Description: All steel suspender cables not embedded in concrete.
For all individual or cable groups regardless of protective system.

Classification: NBE - National Bridge Element Units of Measurement: Each

Quantity Calculation: Sum of the individual cable or cable groups carrying the load from the superstructure to the main cable/arch elements.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Fatigue Crack (Steel/Other) (1010)	None	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack exists that is not arrested but does not warrant structural review.	
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	
Distortion (1900)	None	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed, but does not warrant structural review.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

This element is intended for use on suspender cables or rods, other smaller cables or groups of cables or rods in one location acting as a system to carry loads from the superstructure to the main cable/arch.

Suspension bridge main cables or cable stays shall be captured using the steel main cable element.

Protective coatings or systems shall not be used for this element.

Any gouges in the steel element caused by impact damage shall be captured under the Distortion (1900) defect.

Element # 149: Cables - Secondary Other

Description: All other material cables not embedded in concrete.
For all individual other material cables or cable groups regardless of protective systems.

Classification: NBE - National Bridge Element Units of Measurement: Each

Quantity Calculation: Sum of the individual cable or cable groups carrying the load from the superstructure to the main cable/arch elements.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Fatigue Crack (Steel/Other) (1010)	None	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack exists that is not arrested but does not warrant structural review.	
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	
Deterioration (Other) (1220)	None	Initiated breakdown or deterioration.	Significant deterioration or breakdown, but does not warrant structural review.	
Distortion (1900)	None	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed, but does not warrant structural review.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

The other material secondary cable is intended for cables constructed of composite materials, or other materials that cannot be classified using any other defined cable elements.

This element is intended for use on suspender cables or rods, other smaller cables or groups of cables or rods in one location acting as a system to carry loads from the superstructure to the main cable/arch.

Suspension bridge main cables or cable stays shall be captured using the steel main cable element.

Protective coatings or systems shall not be used for this element.

Any gouges in the steel element caused by impact damage shall be captured under the Distortion (1900) defect.

Element # 161: Steel Pin and Pin & Hanger Assembly

Description: Steel pins and pin and hanger assemblies regardless of protective system.

Classification: NBE - National Bridge Element Units of Measurement: Each

Quantity Calculation: Sum of the number of pins, pin and hanger assemblies.
Each assembly should be counted as one (eg. Two pins and two hanger plates are one assembly).

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Fatigue Crack (Steel/Other) (1010)	None	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack exists that is not arrested but does not warrant structural review.	
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	
Distortion (1900)	None	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed, but does not warrant structural review.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Use this element for girder link pins and pin & hanger assemblies only. This element should not be used for any other pins, such as on a pin connected truss.

Hanger rods shall use Elements #148-149.

Any applicable coating system quantity shall be captured along with the primary superstructure element coating. Protective coatings or systems shall not be used for this element.

Distress observed on any component of the assembly, i.e. the pin, hanger plate, or web plate, should be considered in the condition assessment.

Ultrasonic testing results should be taken into consideration in the condition assessment if available. Indications of distress found during ultrasonic testing would typically place the assembly in Condition State 4.

Any gouges in the steel element caused by impact damage shall be captured under the Distortion (1900) defect.

Element # 162: Steel Gusset Plate

Description: Only those steel gusset plate(s) connections that are on the main truss/arch panel(s). These connections can be constructed with one or more plates that may be bolted, riveted, or welded. For all gusset plates regardless of protective system.

Classification: NBE - National Bridge Element Units of Measurement: Each

Quantity Calculation: Sum of the number of primary load path gusset plate assemblies. For multiple plate gusset connections at a single panel point, the quantity shall be one gusset plate regardless of the number of individual plates at the single connection point.

Condition State Definitions

	Condition States			
	1	2	3	4
Defects	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Fatigue Crack (Steel/Other) (1010)	None	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack exists that is not arrested but does not warrant structural review.	
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	
Distortion (1900)	None	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed, but does not warrant structural review.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Used for gusset plates in the plane of the truss or arch, or connecting portal members to the truss or arch.

Gusset plates connecting bracing members, stringers, floor beams, etc. will be evaluated as part of their respective members.

Any applicable coating system quantity shall be captured along with the primary superstructure element coating. Protective coatings or systems shall not be used for this element.

For built-up gusset plates, distress observed on any plate should be considered in the condition assessment.

Any gouges in the steel element caused by impact damage shall be captured under the Distortion (1900) defect.

Element # 170: Railroad Car Frame

Description: This member defines all superstructures composed of railroad car frames.

Classification: ADE – Agency Defined Element Units of Measurement: ft.

Quantity Calculation: Sum of all of the lengths of each independent rail car regardless of the number of main members in the car.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Fatigue Crack (Steel/Other) (1010)	None	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack exists that is not arrested but does not warrant structural review.	
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	
Distortion (1900)	None	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed, but does not warrant structural review.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Condition evaluation for this element includes the web faces, top bottom faces of the flange of the main supporting members.

Any gouges in the steel element caused by impact damage shall be captured under the Distortion (1900) defect.

Element # 171: Miscellaneous Steel Superstructures

Description: This member is intended to be used for all other miscellaneous steel superstructure elements that were not previously defined.

Examples of such structures includes army steel tread way, boat hatch cover, army steel pontoon, etc. The entire superstructure area (equivalent deck area) composed of these miscellaneous elements will be treated as an each regardless of the number of spans.

Classification: ADE – Agency Defined Element Units of Measurement: Each

Quantity Calculation: The count of the miscellaneous superstructures.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Fatigue Crack (Steel/Other) (1010)	None	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack exists that is not arrested but does not warrant structural review.	
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	
Distortion (1900)	None	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed, but does not warrant structural review.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Condition evaluation for this element includes the web faces, top and bottom faces of the flange of the main supporting members.

Any gouges in the steel element caused by impact damage shall be captured under the Distortion (1900) defect.

Element # 180: EQ Restrainer Cables – Type II

Description: This member defines seismic restrainer cables used for hinges with long hinge seats (>9 inches) and occasionally in combination with pipe seat extenders. The standard length varies from fifteen to forty feet and the restrainer system at a hinge may consist of six to twelve cables.

Classification: ADE – Agency Defined Element Units of Measurement: Each Unit

Quantity Calculation: The count of units.
A unit includes all cables in or attached to a single girder or in a single bay.

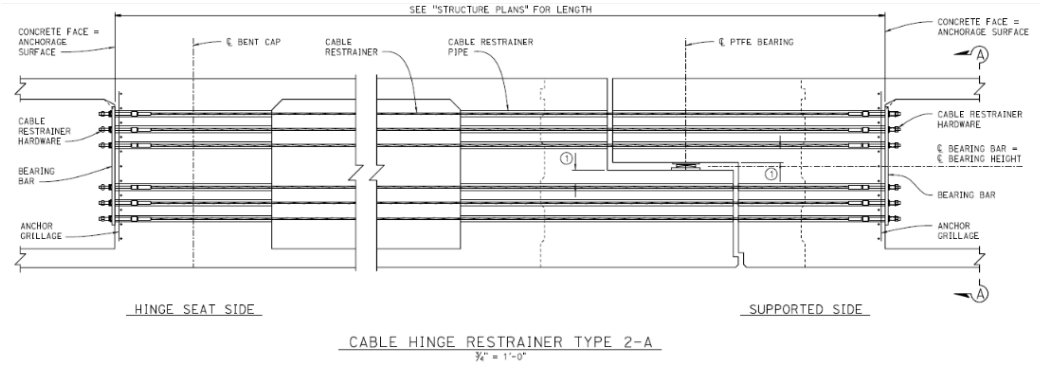
Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Fatigue Crack (Steel/Other) (1010)	None	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack exists that is not arrested but does not warrant structural review.	
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	
Distortion (1900)	None	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed, but does not warrant structural review.	
Cable Slack (1025)	Restraint system is functional and installed as designed.	Less than 20% of the restraint system is set improperly (excessive slack or tightness).	Between 20% and 50% of the restraint system is set improperly (excessive slack or tightness).	More than 50% of the restraint system is set improperly (excessive slack or tightness).

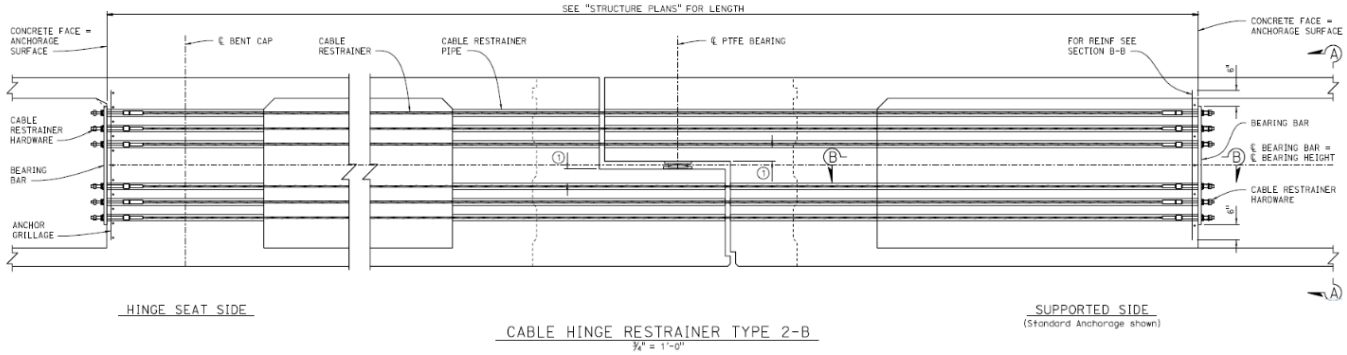
Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

The following detail represents typical Caltrans Type II cable earthquake restrainers that shall be coded under this element:



CABLE HINGE RESTRAINER TYPE 2-A



CABLE HINGE RESTRAINER TYPE 2-B

The element should be in Condition State 1 if not visible.

Protective coatings or systems shall not be used for this element.

Any gouges in the steel element caused by impact damage shall be captured under the Distortion (1900) defect.

Element # 181: EQ Restrainer Cables – C1

Description: This member defines seismic restrainer cables used for hinges with short hinge seats (<9 inches). The current standard number of cables per drum is five. The original systems consisted of seven cables per drum.

Classification: ADE – Agency Defined Element Units of Measurement: Each Unit

Quantity Calculation: A unit consists of a single drum and the cables wrapped around it.

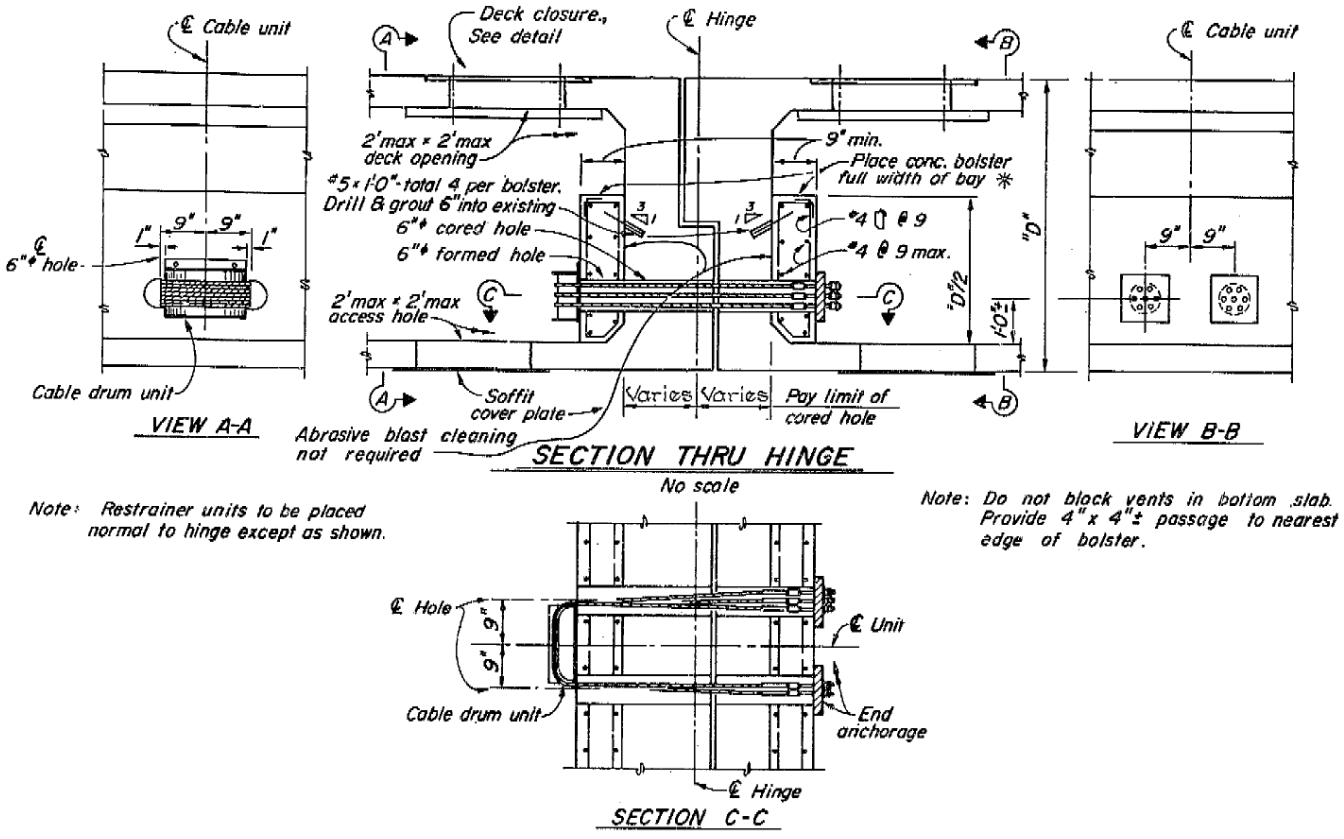
Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Fatigue Crack (Steel/Other) (1010)	None	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack exists that is not arrested but does not warrant structural review.	
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	
Distortion (1900)	None	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed, but does not warrant structural review.	
Cable Slack (1025)	Restraint system is functional and installed as designed.	Less than 20% of the restraint system is set improperly (excessive slack or tightness).	Between 20% and 50% of the restraint system is set improperly (excessive slack or tightness).	More than 50% of the restraint system is set improperly (excessive slack or tightness).

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

The following detail represents typical Caltrans Type C1 cable earthquake restrainers that shall be coded under this element:



The element should be in Condition State 1 if not visible.

Protective coatings or systems shall not be used for this element.

Any gouges in the steel element caused by impact damage shall be captured under the Distortion (1900) defect.

Element # 182: EQ Restrainer Cables - Other

Description: This element defines Seismic restrainer cables systems that are not Type II or C-1 restrainer cable systems.

Classification: ADE – Agency Defined Element Units of Measurement: Each Unit

Quantity Calculation: Each independent unit restraining the superstructure horizontally and/or vertically.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Fatigue Crack (Steel/Other) (1010)	None	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack exists that is not arrested but does not warrant structural review.	
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	
Distortion (1900)	None	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed, but does not warrant structural review.	
Cable Slack (1025)	Restraint system is functional and installed as designed.	Less than 20% of the restraint system is set improperly (excessive slack or tightness).	Between 20% and 50% of the restraint system is set improperly (excessive slack or tightness).	More than 50% of the restraint system is set improperly (excessive slack or tightness).

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

The element should be in condition state 1 if not visible.

Protective coatings or systems shall not be used for this element.

Any gouges in the steel element caused by impact damage shall be captured under the Distortion (1900) defect.

This page intentionally left blank.

3.3 - Substructure Elements

Substructure elements described in this section transmit the load from the superstructure into the ground. These elements include columns, piles, pile caps/footings, pile extensions, pier/bent caps, pier walls, and abutments. These elements include elements of steel, concrete, timber, masonry, and other materials.

3.3.1 - Abutments

This section covers the abutment elements for the structure. Abutments may be constructed of steel, concrete, masonry, and other materials.

Element # 215: Abutment - Reinforced Concrete

Description: Reinforced concrete abutments. This includes the material retaining the embankment and monolithic wingwalls and abutment extensions. For all reinforced concrete abutments regardless of protective systems.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Sum of the width of the abutment with monolithic wingwalls and abutment extensions measured along the skew angle.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Delamination/ Spall/ Patched Area (1080)	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Exposed Rebar (1090)	None	Present without measurable section loss.	Present with measurable section loss, but does not warrant structural review.	
Efflorescence/ Rust Staining (1120)	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
Cracking (RC and Other) (1130)	None or insignificant cracks.	Unsealed moderate width cracks or unsealed moderate pattern (map) cracking. Cracks from 0.012 to 0.05 inches wide.	Wide cracks or heavy pattern (map) cracking. Cracks greater than 0.05 inches wide.	
Abrasion/Wear (PSC/RC) (1190)	No abrasion or wearing.	Abrasion or wearing has exposed coarse aggregate but the aggregate remains secure in the concrete.	Coarse aggregate is loose or has popped out of the concrete matrix due to abrasion or wear.	
Settlement (4000)	None	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits, but does not warrant structural review.	
Scour (6000)	None	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits, but is less than the critical limits determined by scour evaluation and does not warrant structural review.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Abutments constructed of piles/columns and lagging should be coded using both an appropriate material abutment element for the lagging and appropriate material column/piles/cap elements.

Monolithic wingwalls, up to the first construction joint (cold joint, felt paper, water stop or other break), shall be considered in the quantity and assessment of the abutment element. Wingwalls that are not monolithic with the abutment shall not be included in the quantity or assessment of the abutment element.

When abutment backwall deterioration affects both the abutment and joint, it is appropriate to capture the deterioration under both elements.

The inspector should use judgment when utilizing the condition state defect definitions, especially for concrete cracking. The crack defect description definitions describe generalized distress, but the inspector should consider width, spacing, location, orientation, and structural or non-structural nature of the cracking. The inspector should consider exposure and environment when evaluating crack width.

Reinforced concrete cracks less than 0.012 inches can be considered insignificant and a defect is not warranted. Insignificant cracks shall not be coded or quantified with the Cracking (1130) defect. General descriptions of insignificant cracks may be included under the parent element notes, if needed for tracking purposes.

Cracks ranging from 0.012 to 0.05 inches can be considered moderate, and cracks greater than 0.05 inches can be considered wide.

When cracks on the surface of this element have been treated with a sealant such as methacrylate, epoxy or silane, the Cracking (1130) defect shall not be used. The appropriate protective coating element should be used and the date of application provided in the element notes.

Scour is defined as erosion or removal of streambed or bank material around substructure or foundation elements due to river or stream flow. Scour defect elements shall only be applied to river or stream flow scour, not to erosion caused by roadway runoff.

Distress to an element resulting from erosion other than scour shall be captured with the appropriate defect element that reflects the distress, such as cracking, settlement, etc.

Element # 216: Abutment - Timber

Description: Timber abutments, including the sheet material retaining the embankment, integral wingwalls, and abutment extensions. For all abutments regardless of protective systems.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Sum of the width of the abutment with integral wingwalls and abutment extensions measured along the skew angle.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Decay/ Section Loss (1140)	None	Affects less than 10% of the member section.	Affects 10% or more of the member but does not warrant structural review.	
Check/Shake (1150)	Surface penetration less than 5% of the member thickness regardless of location.	Penetrates 5% - 50% of the thickness of the member and not in a tension zone.	Penetrates more than 50% of the thickness of the member or more than 5% of the member thickness in a tension zone. Does not warrant structural review.	
Crack (Timber) (1160)	None.	Crack that has been arrested through effective measures.	Identified crack exists that is not arrested, but does not require structural review	
Split/Delamination (Timber) (1170)	None	Length less than the member depth or arrested with effective actions taken to mitigate.	Length equal to or greater than the member depth, but does not require structural review.	
Abrasion/Wear (Timber) (1180)	None or no measurable section loss.	Section loss less than 10% of the member thickness.	Section loss 10% or more of the member thickness, but does not warrant structural review.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Settlement (4000)	None	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits, but does not warrant structural review.	
Scour (6000)	None	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits, but is less than the critical limits determined by scour evaluation and does not warrant structural review.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Abutments constructed of piles/columns and lagging should be coded using both an appropriate material abutment element for the lagging and appropriate material column/piles/cap elements.

Integral wingwalls, up to the first break in the lagging shall be considered in the quantity and assessment of the abutment element. Wing walls that are not integral with the abutment shall not be included in the quantity or assessment of the abutment element.

Scour is defined as erosion or removal of streambed or bank material around substructure or foundation elements due to river or stream flow. Scour defect elements shall only be applied to river or stream flow scour, not to erosion caused by roadway runoff.

Distress to an element resulting from erosion other than scour shall be captured with the appropriate defect element that reflects the distress, such as cracking, settlement, etc.

Element # 217: Abutment - Masonry

Description: Those abutments constructed of block or stone, including integral wingwalls and abutment extensions. The block or stone may be placed with or without mortar. For all abutments regardless of protective systems.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Sum of the width of the abutment with integral wingwalls and abutment extensions measured along the skew angle.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Efflorescence/ Rust Staining (1120)	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Mortar Breakdown (Masonry) (1610)	None	Cracking or voids in less than 10% of joints.	Cracking or voids in 10% or more of the of joints	
Split/Spall (Masonry) (1620)	None	Block or stone has split or spalled with no shifting.	Block or stone has split or spalled with shifting but does not warrant a structural review.	
Patched Area (Masonry) (1630)	None	Sound Patch	Unsound Patch	
Masonry Displacement (1640)	None	Block or stone has shifted slightly out of alignment.	Block or stone has shifted significantly out of alignment or is missing but does not warrant structural review.	
Settlement (4000)	None	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits, but does not warrant structural review.	
Scour (6000)	None	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits, but is less than the critical limits determined by scour evaluation and does not warrant structural review.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Abutments constructed of piles/columns and lagging should be coded using both an appropriate material abutment element for the lagging and appropriate material column/piles/cap elements.

Integral wingwalls, up to the first construction joint (cold joint, water stop etc.), shall be considered in the quantity and assessment of the abutment element. Wingwalls that are not monolithic with the abutment shall not be included in the quantity or assessment of the abutment element.

When abutment backwall deterioration affects both the abutment and joint, it is appropriate to capture the deterioration under both elements.

Scour is defined as erosion or removal of streambed or bank material around substructure or foundation elements due to river or stream flow. Scour defect elements shall only be applied to river or stream flow scour, not to erosion caused by roadway runoff.

Distress to an element resulting from erosion other than scour shall be captured with the appropriate defect element that reflects the distress, such as cracking, settlement, etc.

Element # 218: Abutment - Other

Description: Other material abutment systems, including the sheet material retaining the embankment, and integral wingwalls and abutment extensions. For all abutments regardless of protective systems.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Sum of the width of the abutment with integral wingwalls and abutment extensions measured along the skew angle.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Fatigue Crack (Steel/Other) (1010)	None	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack exists that is not arrested but does not warrant structural review.	
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	
Delamination/ Spall/ Patched Area (1080)	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	
Efflorescence/ Rust Staining (1120)	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
Cracking (RC and Other) (1130)	None or insignificant cracks.	Unsealed moderate width cracks or unsealed moderate pattern (map) cracking. Cracks from 0.012 to 0.05 inches wide.	Wide cracks or heavy pattern (map) cracking. Cracks greater than 0.05 inches wide.	
Deterioration (Other) (1220)	None	Initiated breakdown or deterioration.	Significant deterioration or breakdown, but does not warrant structural review.	
Distortion (1900)	None	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed, but does not warrant structural review.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Settlement (4000)	None	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits, but does not warrant structural review.	
Scour (6000)	None	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits, but is less than the critical limits determined by scour evaluation and does not warrant structural review.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

This element should be used for abutments constructed of materials not otherwise defined.

Abutments constructed of piles/columns and lagging should be coded using both an appropriate material abutment element for the lagging and appropriate material column/piles/cap elements.

When abutment backwall deterioration affects both the abutment and joint, it is appropriate to capture the deterioration under both elements.

The inspector should use judgment when utilizing the condition state defect definitions, especially for concrete cracking. The crack defect description definitions describe generalized distress, but the inspector should consider width, spacing, location, orientation, and structural or non-structural nature of the cracking. The inspector should consider exposure and environment when evaluating crack width.

Reinforced concrete cracks less than 0.012 inches can be considered insignificant and a defect is not warranted. Insignificant cracks shall not be coded or quantified with the Cracking (1130) defect. General descriptions of insignificant cracks may be included under the parent element notes, if needed for tracking purposes.

Cracks ranging from 0.012 to 0.05 inches can be considered moderate, and cracks greater than 0.05 inches can be considered wide.

When cracks on the surface of this element have been treated with a sealant such as methacrylate, epoxy or silane, the Cracking (1130) defect shall not be used. The appropriate protective coating element should be used and the date of application provided in the element notes.

Any gouges in the steel element caused by impact damage shall be captured under the Distortion (1900) defect.

Scour is defined as erosion or removal of streambed or bank material around substructure or foundation elements due to river or stream flow. Scour defect elements shall only be applied to river or stream flow scour, not to erosion caused by roadway runoff.

Distress to an element resulting from erosion other than scour shall be captured with the appropriate defect element that reflects the distress, such as cracking, settlement, etc.

Element # 219: Abutment - Steel

Description: Steel abutments, including the sheet material retaining the embankment, and integral wingwalls and abutment extensions. For all abutments regardless of protective systems.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Sum of the width of the abutment with integral wingwalls and abutment extensions measured along the skew angle.

Condition State Definitions

	Condition States			
	1	2	3	4
Defects	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Fatigue Crack (Steel/Other) (1010)	None	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack exists that is not arrested but does not warrant structural review.	
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	
Distortion (1900)	None	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed, but does not warrant structural review.	
Settlement (4000)	None	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits, but does not warrant structural review.	
Scour (6000)	None	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits, but is less than the critical limits determined by scour evaluation and does not warrant structural review.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Abutments constructed of piles/columns and lagging should be coded using both an appropriate material abutment element for the lagging and appropriate material column/piles/cap elements.

Integral wingwalls, up to the first construction joint (sheet pile joint etc.), shall be considered in the quantity and assessment of the abutment element. Wingwalls that are not integral with the abutment shall not be included in the quantity or assessment of the abutment element.

Any gouges in the steel element caused by impact damage shall be captured under the Distortion (1900) defect.

Scour is defined as erosion or removal of streambed or bank material around substructure or foundation elements due to river or stream flow. Scour defect elements shall only be applied to river or stream flow scour, not to erosion caused by roadway runoff.

Distress to an element resulting from erosion other than scour shall be captured with the appropriate defect element that reflects the distress, such as cracking, settlement, etc.

This page intentionally left blank.

3.3.2 - Pier Caps

This section covers bent and pier caps of all materials that support girders and transfer load into columns, pier walls or piles.

Element # 231: Pier Cap - Steel

Description: Those steel pier caps that support girders and transfer load into piles or columns. For all steel pier caps regardless of protective system.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Sum of the cap lengths measured along the skew angle.

Condition State Definitions

	Condition States			
	1	2	3	4
Defects	**GOOD**	**FAIR**	**POOR**	**SEVERE**
Corrosion (1000)	None	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Fatigue Crack (Steel/Other) (1010)	None	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack exists that is not arrested but does not warrant structural review.	
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	
Distortion (1900)	None	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed, but does not warrant structural review.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Pier caps that are visible for inspection shall be coded. These include drop caps on box girders and slab bridges, integral bent caps on RC T Beam bridges, “hammerhead” caps on single columns or pier walls, etc.

Integral pier caps that are not drop caps or otherwise not visible for inspection shall not be coded.

Any gouges in the steel element caused by impact damage shall be captured under the Distortion (1900) defect.

Element # 233: Pier Cap - Prestressed Concrete

Description: Those prestressed concrete pier caps that support girders and transfer load into piles or columns. For all caps regardless of protective system.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Sum of the cap lengths measured along the skew angle.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Delamination/ Spall/ Patched Area (1080)	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Exposed Rebar (1090)	None	Present without measurable section loss.	Present with measurable section loss, but does not warrant structural review.	
Exposed Prestressing (1100)	None	Present without section loss.	Present with section loss, but does not warrant structural review.	
Cracking (PSC) (1110)	None or insignificant cracks.	Unsealed moderate width cracks or unsealed moderate pattern (map) cracking. Cracks from 0.004 to 0.009 inches wide.	Wide cracks or heavy pattern (map) cracking. Cracks greater than 0.009 inches wide.	
Efflorescence/ Rust Staining (1120)	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

When deciding between the use of a pier wall or column, pier walls are assumed for 10 feet wide or wider elements.

Pier caps that are visible for inspection shall be coded. These include drop caps on box girders and slab bridges, integral bent caps on RC T Beam bridges, “hammerhead” caps on single columns or pier walls, etc.

Integral pier caps that are not drop caps or otherwise not visible for inspection shall not be coded.

The inspector should use judgment when utilizing the condition state defect definitions, especially for concrete cracking. The crack defect description definitions describe generalized distress, but the inspector should consider width, spacing, location, orientation, and structural or non-structural nature of the cracking. The inspector should consider exposure and environment when evaluating crack width.

Prestressed concrete cracks less than 0.004 inches can be considered insignificant and a defect is not warranted. Insignificant cracks shall not be coded or quantified with the Cracking (1110) defect. General descriptions of insignificant cracks may be included under the parent element notes, if needed for tracking purposes.

Cracks ranging from 0.004 to 0.009 inches can be considered moderate, and cracks greater than 0.009 inches can be considered wide.

When cracks on the surface of this element have been treated with a sealant such as methacrylate, epoxy or silane, the Cracking (1110) defect shall not be used. The appropriate protective coating element should be used and the date of application provided in the element notes.

Element # 234: Pier Cap - Reinforced Concrete

Description: Those reinforced concrete pier caps that support girders and transfer load into piles or columns. For all pier caps regardless of protective system.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Sum of the cap length measured along the skew angle.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Delamination/ Spall/ Patched Area (1080)	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Exposed Rebar (1090)	None	Present without measurable section loss.	Present with measurable section loss, but does not warrant structural review.	
Efflorescence/ Rust Staining (1120)	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
Cracking (RC and Other) (1130)	None or insignificant cracks.	Unsealed moderate width cracks or unsealed moderate pattern (map) cracking. Cracks from .012 to 0.05 inches wide.	Wide cracks or heavy pattern (map) cracking. Cracks greater than 0.05 inches wide.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

When deciding between the use of a pier wall or column, pier walls are assumed for 10 feet wide or wider elements.

Pier caps that are visible for inspection shall be coded. These include drop caps on box girders and slab bridges, integral bent caps on RC T Beam bridges, “hammerhead” caps on single columns or pier walls, etc.

Integral pier caps that are not drop caps or otherwise not visible for inspection shall not be coded.

The inspector should use judgment when utilizing the condition state defect definitions, especially for concrete cracking. The crack defect description definitions describe generalized distress, but the inspector should consider width, spacing, location, orientation, and structural or non-structural nature of the cracking. The inspector should consider exposure and environment when evaluating crack width.

Reinforced concrete cracks less than 0.012 inches can be considered insignificant and a defect is not warranted. Insignificant cracks shall not be coded or quantified with the Cracking (1130) defect. General descriptions of insignificant cracks may be included under the parent element notes, if needed for tracking purposes.

Cracks ranging from 0.012 to 0.05 inches can be considered moderate, and cracks greater than 0.05 inches can be considered wide.

When cracks on the surface of this element have been treated with a sealant such as methacrylate, epoxy or silane, the Cracking (1130) defect shall not be used. The appropriate protective coating element should be used and the date of application provided in the element notes.

Element # 235: Pier Cap - Timber

Description: Those timber pier caps that support girders that transfer load into piles, or columns. For all timber pier caps regardless of protective system.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Sum of the pier cap lengths measured along the skew angle.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Decay/ Section Loss (1140)	None	Affects less than 10% of the member section.	Affects 10% or more of the member but does not warrant structural review.	
Check/Shake (1150)	Surface penetration less than 5% of the member thickness regardless of location.	Penetrates 5% - 50% of the thickness of the member and not in a tension zone.	Penetrates more than 50% of the thickness of the member or more than 5% of the member thickness in a tension zone. Does not warrant structural review.	
Crack (Timber) (1160)	None.	Crack that has been arrested through effective measures.	Identified crack exists that is not arrested, but does not require structural review	
Split/Delamination (Timber) (1170)	None	Length less than the member depth or arrested with effective actions taken to mitigate.	Length equal to or greater than the member depth, but does not require structural review.	
Abrasion/Wear (Timber) (1180)	None or no measurable section loss.	Section loss less than 10% of the member thickness.	Section loss 10% or more of the member thickness, but does not warrant structural review.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

When deciding between the use of a pier wall or column, pier walls are assumed for 10 feet wide or wider elements.

Pier caps that are visible for inspection shall be coded. These include drop caps on box girders and slab bridges, integral bent caps on RC T Beam bridges, “hammerhead” caps on single columns or pier walls, etc.

Integral pier caps that are not drop caps or otherwise not visible for inspection shall not be coded.

Element # 236: Pier Cap - Other

Description: Other material pier caps that support girders that transfer load into piles or columns. For all other material pier caps regardless of protective system.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Sum of the pier cap lengths measured along the skew angle.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Fatigue Crack (Steel/Other) (1010)	None	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack exists that is not arrested but does not warrant structural review.	
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	
Delamination/ Spall/ Patched Area (1080)	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	
Efflorescence/ Rust Staining (1120)	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
Cracking (RC and Other) (1130)	None or insignificant cracks.	Unsealed moderate width cracks or unsealed moderate pattern (map) cracking. Cracks from 0.012 to 0.05 inches wide.	Wide cracks or heavy pattern (map) cracking. Cracks greater than 0.05 inches wide.	
Deterioration (Other) (1220)	None	Initiated breakdown or deterioration.	Significant deterioration or breakdown, but does not warrant structural review.	
Distortion (1900)	None	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed, but does not warrant structural review.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

The other material pier cap element is intended for pier caps constructed of composite materials, or other materials that cannot be classified using any other defined pier cap element.

When deciding between the use of a pier wall or column, pier walls are assumed for 10 feet wide or wider elements.

Pier caps that are visible for inspection shall be coded. These include drop caps on box girders and slab bridges, integral bent caps on RC T Beam bridges, “hammerhead” caps on single columns or pier walls, etc.

Integral pier caps that are not drop caps or otherwise not visible for inspection shall not be coded.

The inspector should use judgment when utilizing the condition state defect definitions, especially for concrete cracking. The crack defect description definitions describe generalized distress, but the inspector should consider width, spacing, location, orientation, and structural or non-structural nature of the cracking. The inspector should consider exposure and environment when evaluating crack width.

Reinforced concrete cracks less than 0.012 inches can be considered insignificant and a defect is not warranted. Insignificant cracks shall not be coded or quantified with the Cracking (1130) defect. General descriptions of insignificant cracks may be included under the parent element notes, if needed for tracking purposes.

Cracks ranging from 0.012 to 0.05 inches can be considered moderate, and cracks greater than 0.05 inches can be considered wide.

When cracks on the surface of this element have been treated with a sealant such as methacrylate, epoxy or silane, the Cracking (1130) defect shall not be used. The appropriate protective coating element should be used and the date of application provided in the element notes.

Any gouges in the steel element caused by impact damage shall be captured under the Distortion (1900) defect.

This page intentionally left blank.

3.3.3 - Columns / Pier Walls

This section covers elements between the superstructure and the ground or footings that support the structure.

These items include columns, pier walls, towers & trestles.

Element # 202: Column - Steel

Description: All steel columns regardless of protective system.

Classification: NBE - National Bridge Element Units of Measurement: Each

Quantity Calculation: Sum of the number of columns.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Fatigue Crack (Steel/Other) (1010)	None	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack exists that is not arrested but does not warrant structural review.	
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	
Distortion (1900)	None	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed, but does not warrant structural review.	
Settlement (4000)	None	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits, but does not warrant structural review.	
Scour (6000)	None	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits, but is less than the critical limits determined by scour evaluation and does not warrant structural review.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Columns are defined as any substructure element between the ground, pile cap or obvious construction break distinguishing it from a pile, and the superstructure.

Use this element for concrete columns with cast in steel shells, where the steel shell is required for the structural capacity of the column.

In cases of single element substructure supports, columns shall be coded if the width of the single element is less than ten feet. If the width of the element is greater than ten feet, it shall be coded as a pier wall element (Elements #210-213).

For single element substructure supports with variable widths, such as flared columns, the minimum width of the element shall be used to determine if it is a column element or pier wall element.

Any gouges in the steel element caused by impact damage shall be captured under the Distortion (1900) defect.

Scour is defined as erosion or removal of streambed or bank material around substructure or foundation elements due to river or stream flow. Scour defect elements shall only be applied to river or stream flow scour, not to erosion caused by roadway runoff.

Distress to an element resulting from erosion other than scour shall be captured with the appropriate defect element that reflects the distress, such as cracking, settlement, etc.

Element # 203: Column - Other

Description: All other material columns regardless of protective system.

Classification: NBE - National Bridge Element Units of Measurement: Each

Quantity Calculation: Sum of the number of columns.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Fatigue Crack (Steel/Other) (1010)	None	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack exists that is not arrested but does not warrant structural review.	
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	
Delamination/ Spall/ Patched Area (1080)	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	
Efflorescence/ Rust Staining (1120)	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
Cracking (RC and Other) (1130)	None or insignificant cracks.	Unsealed moderate width cracks or unsealed moderate pattern (map) cracking. Cracks from 0.012 to 0.05 inches wide.	Wide cracks or heavy pattern (map) cracking. Cracks greater than 0.05 inches wide.	
Deterioration (Other) (1220)	None	Initiated breakdown or deterioration.	Significant deterioration or breakdown, but does not warrant structural review.	
Distortion (1900)	None	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed, but does not warrant structural review.	
Settlement (4000)	None	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits, but does not warrant structural review.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Scour (6000)	None	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits, but is less than the critical limits determined by scour evaluation and does not warrant structural review.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

The other material column is intended for columns constructed of composite materials, or other materials that cannot be classified using any other defined column elements.

Columns are defined as any substructure element between the ground, pile cap or obvious construction break distinguishing it from a pile, and the superstructure.

In cases of single element substructure supports, columns shall be coded if the width of the single element is less than ten feet. If the width of the element is greater than ten feet, it shall be coded as a pier wall element (Elements #210-213).

For single element substructure supports with variable widths, such as flared columns, the minimum width of the element shall be used to determine if it is a column element or pier wall element.

Reinforced concrete cracks less than 0.012 inches can be considered insignificant and a defect is not warranted. Insignificant cracks shall not be coded or quantified with the Cracking (1130) defect. General descriptions of insignificant cracks may be included under the parent element notes, if needed for tracking purposes.

Cracks ranging from 0.012 to 0.05 inches can be considered moderate, and cracks greater than 0.05 inches can be considered wide.

When cracks on the surface of this element have been treated with a sealant such as methacrylate, epoxy or silane, the Cracking (1130) defect shall not be used. The appropriate protective coating element should be used and the date of application provided in the element notes.

Any gouges in the steel element caused by impact damage shall be captured under the Distortion (1900) defect.

Scour is defined as erosion or removal of streambed or bank material around substructure or foundation elements due to river or stream flow. Scour defect elements shall only be applied to river or stream flow scour, not to erosion caused by roadway runoff.

Distress to an element resulting from erosion other than scour shall be captured with the appropriate defect element that reflects the distress, such as cracking, settlement, etc.

Element # 204: Column - Prestressed Concrete

Description: All prestressed concrete columns regardless of protective system.

Classification: NBE - National Bridge Element Units of Measurement: Each

Quantity Calculation: Sum of the number of columns.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Delamination/ Spall/ Patched Area (1080)	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Exposed Rebar (1090)	None	Present without measurable section loss.	Present with measurable section loss, but does not warrant structural review.	
Exposed Prestressing (1100)	None	Present without section loss.	Present with section loss, but does not warrant structural review.	
Cracking (PSC) (1110)	None or insignificant cracks.	Unsealed moderate width cracks or unsealed moderate pattern (map) cracking. Cracks from 0.004 to 0.009 inches wide.	Wide cracks or heavy pattern (map) cracking. Cracks greater than 0.009 inches wide.	
Efflorescence/ Rust Staining (1120)	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
Abrasion/Wear (PSC/RC) (1190)	No abrasion or wearing.	Abrasion or wearing has exposed coarse aggregate but the aggregate remains secure in the concrete.	Coarse aggregate is loose or has popped out of the concrete matrix due to abrasion or wear.	
Settlement (4000)	None	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits, but does not warrant structural review.	
Scour (6000)	None	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits, but is less than the critical limits determined by scour evaluation and does not warrant structural review.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Columns are defined as any substructure element between the ground, pile cap or obvious construction break distinguishing it from a pile, and the superstructure.

In cases of single element substructure supports, columns shall be coded if the width of the single element is less than ten feet. If the width of the element is greater than ten feet, it shall be coded as a pier wall element (Elements #210-213).

For single element substructure supports with variable widths, such as flared columns, the minimum width of the element shall be used to determine if it is a column element or pier wall element.

The inspector should use judgment when utilizing the condition state defect definitions, especially for concrete cracking. The crack defect description definitions describe generalized distress, but the inspector should consider width, spacing, location, orientation, and structural or non-structural nature of the cracking. The inspector should consider exposure and environment when evaluating crack width.

Prestressed concrete cracks less than 0.004 inches can be considered insignificant and a defect is not warranted. Insignificant cracks shall not be coded or quantified with the Cracking (1110) defect. General descriptions of insignificant cracks may be included under the parent element notes, if needed for tracking purposes.

Cracks ranging from 0.004 to 0.009 inches can be considered moderate, and cracks greater than 0.009 inches can be considered wide.

When cracks on the surface of this element have been treated with a sealant such as methacrylate, epoxy or silane, the Cracking (1110) defect shall not be used. The appropriate protective coating element should be used and the date of application provided in the element notes.

Scour is defined as erosion or removal of streambed or bank material around substructure or foundation elements due to river or stream flow. Scour defect elements shall only be applied to river or stream flow scour, not to erosion caused by roadway runoff.

Distress to an element resulting from erosion other than scour shall be captured with the appropriate defect element that reflects the distress, such as cracking, settlement, etc.

Element # 205: Column - Reinforced Concrete

Description: All reinforced concrete columns regardless of protective system.

Classification: NBE - National Bridge Element Units of Measurement: Each

Quantity Calculation: Sum of the number of columns.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Delamination/ Spall/ Patched Area (1080)	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Exposed Rebar (1090)	None	Present without measurable section loss.	Present with measurable section loss, but does not warrant structural review.	
Efflorescence/ Rust Staining (1120)	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
Cracking (RC and Other) (1130)	None or insignificant cracks.	Unsealed moderate width cracks or unsealed moderate pattern (map) cracking. Cracks from 0.012 to 0.05 inches wide.	Wide cracks or heavy pattern (map) cracking. Cracks greater than 0.05 inches wide.	
Abrasion/Wear (PSC/RC) (1190)	No abrasion or wearing.	Abrasion or wearing has exposed coarse aggregate but the aggregate remains secure in the concrete.	Coarse aggregate is loose or has popped out of the concrete matrix due to abrasion or wear.	
Settlement (4000)	None	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits, but does not warrant structural review.	
Scour (6000)	None	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits, but is less than the critical limits determined by scour evaluation and does not warrant structural review.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Columns are defined as any substructure element between the ground, pile cap or obvious construction break distinguishing it from a pile, and the superstructure.

Reinforced concrete columns constructed using the stay in place steel shell forms should use this element rather than Element #202, Steel Column if the column is fully reinforced and not reliant on the steel shell for capacity. When the steel shell is intact the RC column will be coded in CS 1.

In cases of single element substructure supports, columns shall be coded if the width of the single element is less than ten feet. If the width of the element is greater than ten feet, it shall be coded as a pier wall element (Elements #210-213).

For single element substructure supports with variable widths, such as flared columns, the minimum width of the element shall be used to determine if it is a column element or pier wall element.

The inspector should use judgment when utilizing the condition state defect definitions, especially for concrete cracking. The crack defect description definitions describe generalized distress, but the inspector should consider width, spacing, location, orientation, and structural or non-structural nature of the cracking. The inspector should consider exposure and environment when evaluating crack width.

Reinforced concrete cracks less than 0.012 inches can be considered insignificant and a defect is not warranted. Insignificant cracks shall not be coded or quantified with the Cracking (1130) defect. General descriptions of insignificant cracks may be included under the parent element notes, if needed for tracking purposes.

Cracks ranging from 0.012 to 0.05 inches can be considered moderate, and cracks greater than 0.05 inches can be considered wide.

When cracks on the surface of this element have been treated with a sealant such as methacrylate, epoxy or silane, the Cracking (1130) defect shall not be used. The appropriate protective coating element should be used and the date of application provided in the element notes.

Scour is defined as erosion or removal of streambed or bank material around substructure or foundation elements due to river or stream flow. Scour defect elements shall only be applied to river or stream flow scour, not to erosion caused by roadway runoff.

Distress to an element resulting from erosion other than scour shall be captured with the appropriate defect element that reflects the distress, such as cracking, settlement, etc.

Element # 206: Column - Timber

Description: All timber columns regardless of protective system.

Classification: NBE - National Bridge Element Units of Measurement: Each

Quantity Calculation: Number of columns.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Decay/ Section Loss (1140)	None	Affects less than 10% of the member section.	Affects 10% or more of the member but does not warrant structural review.	
Check/Shake (1150)	Surface penetration less than 5% of the member thickness regardless of location.	Penetrates 5% - 50% of the thickness of the member and not in a tension zone.	Penetrates more than 50% of the thickness of the member or more than 5% of the member thickness in a tension zone. Does not warrant structural review.	
Crack (Timber) (1160)	None.	Crack that has been arrested through effective measures.	Identified crack exists that is not arrested, but does not require structural review	
Split/Delamination (Timber) (1170)	None	Length less than the member depth or arrested with effective actions taken to mitigate.	Length equal to or greater than the member depth, but does not require structural review.	
Abrasion/Wear (Timber) (1180)	None or no measurable section loss.	Section loss less than 10% of the member thickness.	Section loss 10% or more of the member thickness, but does not warrant structural review.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Settlement (4000)	None	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits, but does not warrant structural review.	
Scour (6000)	None	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits, but is less than the critical limits determined by scour evaluation and does not warrant structural review.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Columns are defined as any substructure element between the ground, pile cap or obvious construction break distinguishing it from a pile, and the superstructure.

In cases of single element substructure supports, columns shall be coded if the width of the single element is less than ten feet. If the width of the element is greater than ten feet, it shall be coded as a pier wall element (Elements #210-213).

For single element substructure supports with variable widths, such as flared columns, the minimum width of the element shall be used to determine if it is a column element or pier wall element.

Scour is defined as erosion or removal of streambed or bank material around substructure or foundation elements due to river or stream flow. Scour defect elements shall only be applied to river or stream flow scour, not to erosion caused by roadway runoff.

Distress to an element resulting from erosion other than scour shall be captured with the appropriate defect element that reflects the distress, such as cracking, settlement, etc.

Element # 207: Tower - Steel

Description: Steel built up or framed tower supports regardless of protective system.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Sum of the heights of built up or framed tower supports.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Fatigue Crack (Steel/Other) (1010)	None	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack exists that is not arrested but does not warrant structural review.	
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	
Distortion (1900)	None	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed, but does not warrant structural review.	
Settlement (4000)	None	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits, but does not warrant structural review.	
Scour (6000)	None	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits, but is less than the critical limits determined by scour evaluation and does not warrant structural review.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

This element is intended to be used for truss framed tower supports or built up steel towers. This element is intended to capture large supports and towers associated with suspension bridges, cable stayed bridges, moveable bridges, or similar structural configurations.

Any gouges in the steel element caused by impact damage shall be captured under the Distortion (1900) defect.

Scour is defined as erosion or removal of streambed or bank material around substructure or foundation elements due to river or stream flow. Scour defect elements shall only be applied to river or stream flow scour, not to erosion caused by roadway runoff.

Distress to an element resulting from erosion other than scour shall be captured with the appropriate defect element that reflects the distress, such as cracking, settlement, etc.

Element # 208: Trestle - Timber

Description: Framed timber supports. For all timber trestle/towers regardless of protective system.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Sum of the heights of built up or framed tower supports.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Decay/ Section Loss (1140)	None	Affects less than 10% of the member section.	Affects 10% or more of the member but does not warrant structural review.	
Check/Shake (1150)	Surface penetration less than 5% of the member thickness regardless of location.	Penetrates 5% - 50% of the thickness of the member and not in a tension zone.	Penetrates more than 50% of the thickness of the member or more than 5% of the member thickness in a tension zone. Does not warrant structural review.	
Crack (Timber) (1160)	None.	Crack that has been arrested through effective measures.	Identified crack exists that is not arrested, but does not require structural review	
Split/Delamination (Timber) (1170)	None	Length less than the member depth or arrested with effective actions taken to mitigate.	Length equal to or greater than the member depth, but does not require structural review.	
Abrasion/Wear (Timber) (1180)	None or no measurable section loss.	Section loss less than 10% of the member thickness.	Section loss 10% or more of the member thickness, but does not warrant structural review.	
Settlement (4000)	None	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits, but does not warrant structural review.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Scour (6000)	None	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits, but is less than the critical limits determined by scour evaluation and does not warrant structural review.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

This element is intended to be used for truss framed trestle or towers. This element is intended to capture large supports and towers associated with large deck truss bridges.

Scour is defined as erosion or removal of streambed or bank material around substructure or foundation elements due to river or stream flow. Scour defect elements shall only be applied to river or stream flow scour, not to erosion caused by roadway runoff.

Distress to an element resulting from erosion other than scour shall be captured with the appropriate defect element that reflects the distress, such as cracking, settlement, etc.

Element # 210: Pier Wall - Reinforced Concrete

Description: Reinforced concrete pier walls regardless of protective systems.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Sum of the lengths of the pier walls measured along the skew angle.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Delamination/ Spall/ Patched Area (1080)	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Exposed Rebar (1090)	None	Present without measurable section loss.	Present with measurable section loss, but does not warrant structural review.	
Efflorescence/ Rust Staining (1120)	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
Cracking (RC and Other) (1130)	None or insignificant cracks.	Unsealed moderate width cracks or unsealed moderate pattern (map) cracking. Cracks from .012 to 0.05 inches wide.	Wide cracks or heavy pattern (map) cracking. Cracks greater than 0.05 inches wide.	
Abrasion/Wear (PSC/RC) (1190)	No abrasion or wearing.	Abrasion or wearing has exposed coarse aggregate but the aggregate remains secure in the concrete.	Coarse aggregate is loose or has popped out of the concrete matrix due to abrasion or wear.	
Settlement (4000)	None	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits, but does not warrant structural review.	
Scour (6000)	None	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits, but is less than the critical limits determined by scour evaluation and does not warrant structural review.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Pier walls are defined as continuous full height substructure components that are designed to transfer loads from superstructure elements to foundation elements.

In cases of single element substructure supports, pier walls shall be coded if the width of the single element is greater than ten feet. If the width of the element is less than ten feet, it shall be coded as a column element (EL# 202-206).

For single element substructure supports with variable widths, such as flared columns, the minimum width of the element shall be used to determine if it is a column element or pier wall element.

Full or partial height infill walls (seismic, debris, collision etc.) are not considered to be pier wall elements. For substructure supports that have infill walls, code only columns/caps/piles etc. Any defects associated with infill walls will not be associated with an element, but shall be fully described in the inspection commentary under a SUBSTRUCTURE heading.

The inspector should use judgment when utilizing the condition state defect definitions, especially for concrete cracking. The crack defect description definitions describe generalized distress, but the inspector should consider width, spacing, location, orientation, and structural or non-structural nature of the cracking. The inspector should consider exposure and environment when evaluating crack width.

Reinforced concrete cracks less than 0.012 inches can be considered insignificant and a defect is not warranted. Insignificant cracks shall not be coded or quantified with the Cracking (1130) defect. General descriptions of insignificant cracks may be included under the parent element notes, if needed for tracking purposes.

Cracks ranging from 0.012 to 0.05 inches can be considered moderate, and cracks greater than 0.05 inches can be considered wide.

When cracks on the surface of this element have been treated with a sealant such as methacrylate, epoxy or silane, the Cracking (1130) defect shall not be used. The appropriate protective coating element should be used and the date of application provided in the element notes.

Scour is defined as erosion or removal of streambed or bank material around substructure or foundation elements due to river or stream flow. Scour defect elements shall only be applied to river or stream flow scour, not to erosion caused by roadway runoff.

Distress to an element resulting from erosion other than scour shall be captured with the appropriate defect element that reflects the distress, such as cracking, settlement, etc.

Element # 211: Pier Wall - Other

Description: Those pier walls constructed of other materials regardless of protective systems.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Sum of the lengths of the pier walls measured along the skew angle.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Fatigue Crack (Steel/Other) (1010)	None	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack exists that is not arrested but does not warrant structural review.	
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	
Delamination/ Spall/ Patched Area (1080)	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	
Efflorescence/ Rust Staining (1120)	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
Cracking (RC and Other) (1130)	None or insignificant cracks.	Unsealed moderate width cracks or unsealed moderate pattern (map) cracking. Cracks from 0.012 to 0.05 inches wide.	Wide cracks or heavy pattern (map) cracking. Cracks greater than 0.05 inches wide.	
Deterioration (Other) (1220)	None	Initiated breakdown or deterioration.	Significant deterioration or breakdown, but does not warrant structural review.	
Distortion (1900)	None	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed, but does not warrant structural review.	
Settlement (4000)	None	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits, but does not warrant structural review.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Scour (6000)	None	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits, but is less than the critical limits determined by scour evaluation and does not warrant structural review.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Pier walls are defined as continuous full height substructure components that are designed to transfer loads from superstructure elements to foundation elements. This element should be used for materials not otherwise defined.

In cases of single element substructure supports, pier walls shall be coded if the width of the single element is greater than ten feet. If the width of the element is less than ten feet, it shall be coded as a column element (EL# 202-206).

For single element substructure supports with variable widths, such as flared columns, the minimum width of the element shall be used to determine if it is a column element or pier wall element.

Full or partial height infill walls (seismic, debris, collision etc.) are not considered to be pier wall elements. For substructure supports that have infill walls, code only columns/caps/piles etc. Any defects associated with infill walls will not be associated with an element, but shall be fully described in the inspection commentary under a SUBSTRUCTURE heading.

The inspector should use judgment when utilizing the condition state defect definitions, especially for concrete cracking. The crack defect description definitions describe generalized distress, but the inspector should consider width, spacing, location, orientation, and structural or non-structural nature of the cracking. The inspector should consider exposure and environment when evaluating crack width.

Reinforced concrete cracks less than 0.012 inches can be considered insignificant and a defect is not warranted. Insignificant cracks shall not be coded or quantified with the Cracking (1130) defect. General descriptions of insignificant cracks may be included under the parent element notes, if needed for tracking purposes.

Cracks ranging from 0.012 to 0.05 inches can be considered moderate, and cracks greater than 0.05 inches can be considered wide.

When cracks on the surface of this element have been treated with a sealant such as methacrylate, epoxy or silane, the Cracking (1130) defect shall not be used. The appropriate protective coating element should be used and the date of application provided in the element notes.

Any gouges in the steel element caused by impact damage shall be captured under the Distortion (1900) defect.

Scour is defined as erosion or removal of streambed or bank material around substructure or foundation elements due to river or stream flow. Scour defect elements shall only be applied to river or stream flow scour, not to erosion caused by roadway runoff. Distress to an element resulting from erosion other than scour shall be captured with the appropriate defect element that reflects the distress, such as cracking, settlement, etc.

Element # 212: Pier Wall - Timber

Description: Those timber pier walls that include pile, timber sheet material, and filler. For all pier walls regardless of protective systems.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Sum of the length of the pier walls measured along the skew angle

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Decay/ Section Loss (1140)	None	Affects less than 10% of the member section.	Affects 10% or more of the member but does not warrant structural review.	
Check/Shake (1150)	Surface penetration less than 5% of the member thickness regardless of location.	Penetrates 5% - 50% of the thickness of the member and not in a tension zone.	Penetrates more than 50% of the thickness of the member or more than 5% of the member thickness in a tension zone. Does not warrant structural review.	
Crack (Timber) (1160)	None.	Crack that has been arrested through effective measures.	Identified crack exists that is not arrested, but does not require structural review	
Split/Delamination (Timber) (1170)	None	Length less than the member depth or arrested with effective actions taken to mitigate.	Length equal to or greater than the member depth, but does not require structural review.	
Abrasion/Wear (Timber) (1180)	None or no measurable section loss.	Section loss less than 10% of the member thickness.	Section loss 10% or more of the member thickness, but does not warrant structural review.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Settlement (4000)	None	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits, but does not warrant structural review.	
Scour (6000)	None	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits, but is less than the critical limits determined by scour evaluation and does not warrant structural review.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Pier walls are defined as continuous full height substructure components that are designed to transfer loads from superstructure elements to foundation elements.

In cases of single element substructure supports, pier walls shall be coded if the width of the single element is greater than ten feet. If the width of the element is less than ten feet, it shall be coded as a column element (EL# 202-206).

For single element substructure supports with variable widths, such as flared columns, the minimum width of the element shall be used to determine if it is a column element or pier wall element.

Full or partial height infill walls (seismic, debris, collision etc.) are not considered to be pier wall elements. For substructure supports that have infill walls, code only columns/caps/piles etc. Any defects associated with infill walls will not be associated with an element, but shall be fully described in the inspection commentary under a SUBSTRUCTURE heading.

Scour is defined as erosion or removal of streambed or bank material around substructure or foundation elements due to river or stream flow. Scour defect elements shall only be applied to river or stream flow scour, not to erosion caused by roadway runoff.

Distress to an element resulting from erosion other than scour shall be captured with the appropriate defect element that reflects the distress, such as cracking, settlement, etc.

Element # 213: Pier Wall - Masonry

Description: Those pier walls constructed of block or stone. The block or stone may be placed with or without mortar. For all pier walls regardless of protective systems.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Sum of the wall lengths measured along the skew angle.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Efflorescence/ Rust Staining (1120)	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Mortar Breakdown (Masonry) (1610)	None	Cracking or voids in less than 10% of joints.	Cracking or voids in 10% or more of the of joints	
Split/Spall (Masonry) (1620)	None	Block or stone has split or spalled with no shifting.	Block or stone has split or spalled with shifting but does not warrant a structural review.	
Patched Area (Masonry) (1630)	None	Sound Patch	Unsound Patch	
Masonry Displacement (1640)	None	Block or stone has shifted slightly out of alignment.	Block or stone has shifted significantly out of alignment or is missing but does not warrant structural review.	
Settlement (4000)	None	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits, but does not warrant structural review.	
Scour (6000)	None	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits, but is less than the critical limits determined by scour evaluation and does not warrant structural review.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Pier walls are defined as continuous full height substructure components that are designed to transfer loads from superstructure elements to foundation elements.

In cases of single element substructure supports, pier walls shall be coded if the width of the single element is greater than ten feet. If the width of the element is less than ten feet, it shall be coded as a column element (EL# 202-206).

For single element substructure supports with variable widths, such as flared columns, the minimum width of the element shall be used to determine if it is a column element or pier wall element.

Full or partial height infill walls (seismic, debris, collision etc.) are not considered to be pier wall elements. For substructure supports that have infill walls, code only columns/caps/piles etc. Any defects associated with infill walls will not be associated with an element, but shall be fully described in the inspection commentary under a SUBSTRUCTURE heading.

Scour is defined as erosion or removal of streambed or bank material around substructure or foundation elements due to river or stream flow. Scour defect elements shall only be applied to river or stream flow scour, not to erosion caused by roadway runoff.

Distress to an element resulting from erosion other than scour shall be captured with the appropriate defect element that reflects the distress, such as cracking, settlement, etc.

This page intentionally left blank.

3.3.4 - Pile Caps / Footings / Piles

This section covers pile caps, footings and piling of all materials.

Element # 220: Pile Cap/Footing - Reinforced Concrete

Description: Reinforced concrete pile caps/footings that are visible for inspection, including pile caps/footings exposed from erosion or scour or visible during an underwater inspection. The exposure may be intentional or caused by erosion or scour.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Sum of the length of footings or pile caps along the skew angle.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Delamination/ Spall/ Patched Area (1080)	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Exposed Rebar (1090)	None	Present without measurable section loss.	Present with measurable section loss, but does not warrant structural review.	
Efflorescence/ Rust Staining (1120)	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
Cracking (RC and Other) (1130)	None or insignificant cracks.	Unsealed moderate width cracks or unsealed moderate pattern (map) cracking. Cracks from .012 to 0.05 inches wide.	Wide cracks or heavy pattern (map) cracking. Cracks greater than 0.05 inches wide.	
Abrasion/Wear (PSC/RC) (1190)	No abrasion or wearing.	Abrasion or wearing has exposed coarse aggregate but the aggregate remains secure in the concrete.	Coarse aggregate is loose or has popped out of the concrete matrix due to abrasion or wear.	
Settlement (4000)	None	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits, but does not warrant structural review.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Scour (6000)	None	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits, but is less than the critical limits determined by scour evaluation and does not warrant structural review.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

The inspector should use judgment when utilizing the condition state defect definitions, especially for concrete cracking. The crack defect description definitions describe generalized distress, but the inspector should consider width, spacing, location, orientation, and structural or non-structural nature of the cracking. The inspector should consider exposure and environment when evaluating crack width.

Reinforced concrete cracks less than 0.012 inches can be considered insignificant and a defect is not warranted. Insignificant cracks shall not be coded or quantified with the Cracking (1130) defect. General descriptions of insignificant cracks may be included under the parent element notes, if needed for tracking purposes.

Cracks ranging from 0.012 to 0.05 inches can be considered moderate, and cracks greater than 0.05 inches can be considered wide.

When cracks on the surface of this element have been treated with a sealant such as methacrylate, epoxy or silane, the Cracking (1130) defect shall not be used. The appropriate protective coating element should be used and the date of application provided in the element notes.

Scour is defined as erosion or removal of streambed or bank material around substructure or foundation elements due to river or stream flow. Scour defect elements shall only be applied to river or stream flow scour, not to erosion caused by roadway runoff.

Distress to an element resulting from erosion other than scour shall be captured with the appropriate defect element that reflects the distress, such as cracking, settlement, etc.

Element # 225: Pile - Steel

Description: Steel piles that are visible for inspection, including piles exposed from erosion or scour and piles visible during an underwater inspection. For all steel piles regardless of protective system.

Classification: NBE - National Bridge Element Units of Measurement: Each

Quantity Calculation: Sum of the number of piles visible for inspection. If no piles are visible, report a quantity of one for the appropriate pile type.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Fatigue Crack (Steel/Other) (1010)	None	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack exists that is not arrested but does not warrant structural review.	
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion but does not warrant a structural review.	
Distortion (1900)	None	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed, but does not warrant structural review.	
Settlement (4000)	None	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits, but does not warrant structural review.	
Scour (6000)	None	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits, but is less than the critical limits determined by scour evaluation and does not warrant structural review.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

A pile is always below a pile cap or at a significant change in material type, cross section or other obvious construction break that would distinguish the pile from a column.

The term “visible for inspection” as noted under the Element Quantity Calculation shall be interpreted to mean as exposed and available for inspection.

Any gouges in the steel element caused by impact damage shall be captured under the Distortion (1900) defect.

Scour is defined as erosion or removal of streambed or bank material around substructure or foundation elements due to river or stream flow. Scour defect elements shall only be applied to river or stream flow scour, not to erosion caused by roadway runoff.

Distress to an element resulting from erosion other than scour shall be captured with the appropriate defect element that reflects the distress, such as cracking, settlement, etc.

Element # 226: Pile - Prestressed Concrete

Description: Prestressed concrete piles that are visible for inspection, including piles exposed from erosion or scour and piles visible during an underwater inspection. For all prestressed concrete piles regardless of protective system.

Classification: NBE - National Bridge Element Units of Measurement: Each

Quantity Calculation: Sum of the number of piles visible for inspection. If no piles are visible, report a quantity of one for the appropriate pile type.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Delamination/ Spall/ Patched Area (1080)	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Exposed Rebar (1090)	None	Present without measurable section loss.	Present with measurable section loss, but does not warrant structural review.	
Exposed Prestressing (1100)	None	Present without section loss.	Present with section loss, but does not warrant structural review.	
Cracking (PSC) (1110)	None or insignificant cracks.	Unsealed moderate width cracks or unsealed moderate pattern (map) cracking. Cracks from 0.004 to 0.009 inches wide.	Wide cracks or heavy pattern (map) cracking. Cracks greater than 0.009 inches wide.	
Efflorescence/ Rust Staining (1120)	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
Abrasion/Wear (PSC/RC) (1190)	No abrasion or wearing.	Abrasion or wearing has exposed coarse aggregate but the aggregate remains secure in the concrete.	Coarse aggregate is loose or has popped out of the concrete matrix due to abrasion or wear.	
Settlement (4000)	None	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits, but does not warrant structural review.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Scour (6000)	None	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits, but is less than the critical limits determined by scour evaluation and does not warrant structural review.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

A pile is always below a pile cap or at a significant change in material type, cross section or other obvious construction break that would distinguish the pile from a column.

The term “visible for inspection” as noted under the Element Quantity Calculation shall be interpreted to mean as exposed and available for inspection.

The inspector should use judgment when utilizing the condition state defect definitions, especially for concrete cracking. The crack defect description definitions describe generalized distress, but the inspector should consider width, spacing, location, orientation, and structural or non-structural nature of the cracking. The inspector should consider exposure and environment when evaluating crack width.

Prestressed concrete cracks less than 0.004 inches can be considered insignificant and a defect is not warranted. Insignificant cracks shall not be coded or quantified with the Cracking (1110) defect. General descriptions of insignificant cracks may be included under the parent element notes, if needed for tracking purposes.

Cracks ranging from 0.004 to 0.009 inches can be considered moderate, and cracks greater than 0.009 inches can be considered wide.

When cracks on the surface of this element have been treated with a sealant such as methacrylate, epoxy or silane, the Cracking (1110) defect shall not be used. The appropriate protective coating element should be used and the date of application provided in the element notes.

Scour is defined as erosion or removal of streambed or bank material around substructure or foundation elements due to river or stream flow. Scour defect elements shall only be applied to river or stream flow scour, not to erosion caused by roadway runoff.

Distress to an element resulting from erosion other than scour shall be captured with the appropriate defect element that reflects the distress, such as cracking, settlement, etc.

Element # 227: Pile - Reinforced Concrete

Description: Reinforced concrete piles that are visible for inspection, including piles exposed from erosion or scour and piles visible during an underwater inspection are included. For all reinforced concrete piles regardless of protective system.

Classification: NBE - National Bridge Element Units of Measurement: Each

Quantity Calculation: Sum of the number of piles visible for inspection. If no piles are visible, report a quantity of one for the appropriate pile type.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Delamination/ Spall/ Patched Area (1080)	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Exposed Rebar (1090)	None	Present without measurable section loss.	Present with measurable section loss, but does not warrant structural review.	
Efflorescence/ Rust Staining (1120)	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
Cracking (RC and Other) (1130)	None or insignificant cracks.	Unsealed moderate width cracks or unsealed moderate pattern (map) cracking. Cracks from 0.012 to 0.05 inches wide.	Wide cracks or heavy pattern (map) cracking. Cracks greater than 0.05 inches wide.	
Abrasion/Wear (PSC/RC) (1190)	No abrasion or wearing.	Abrasion or wearing has exposed coarse aggregate but the aggregate remains secure in the concrete.	Coarse aggregate is loose or has popped out of the concrete matrix due to abrasion or wear.	
Settlement (4000)	None	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits, but does not warrant structural review.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Scour (6000)	None	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits, but is less than the critical limits determined by scour evaluation and does not warrant structural review.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

A pile is always below a pile cap or at a significant change in material type, cross section or other obvious construction break that would distinguish the pile from a column.

The term “visible for inspection” as noted under the Element Quantity Calculation shall be interpreted to mean as exposed and available for inspection.

The inspector should use judgment when utilizing the condition state defect definitions, especially for concrete cracking. The crack defect description definitions describe generalized distress, but the inspector should consider width, spacing, location, orientation, and structural or non-structural nature of the cracking. The inspector should consider exposure and environment when evaluating crack width.

Reinforced concrete cracks less than 0.012 inches can be considered insignificant and a defect is not warranted. Insignificant cracks shall not be coded or quantified with the Cracking (1130) defect. General descriptions of insignificant cracks may be included under the parent element notes, if needed for tracking purposes.

Cracks ranging from 0.012 to 0.05 inches can be considered moderate, and cracks greater than 0.05 inches can be considered wide.

When cracks on the surface of this element have been treated with a sealant such as methacrylate, epoxy or silane, the Cracking (1130) defect shall not be used. The appropriate protective coating element should be used and the date of application provided in the element notes.

Scour is defined as erosion or removal of streambed or bank material around substructure or foundation elements due to river or stream flow. Scour defect elements shall only be applied to river or stream flow scour, not to erosion caused by roadway runoff.

Distress to an element resulting from erosion other than scour shall be captured with the appropriate defect element that reflects the distress, such as cracking, settlement, etc.

Element # 228: Pile - Timber

Description: Timber piles that are visible for inspection, including piles exposed from erosion or scour and piles visible during an underwater inspection. For all timber piles regardless of protective system.

Classification: NBE - National Bridge Element Units of Measurement: Each

Quantity Calculation: Sum of the number of piles visible for inspection. If no piles are visible, report a quantity of one for the appropriate pile type.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Decay/ Section Loss (1140)	None	Affects less than 10% of the member section.	Affects 10% or more of the member but does not warrant structural review.	
Check/Shake (1150)	Surface penetration less than 5% of the member thickness regardless of location.	Penetrates 5% - 50% of the thickness of the member and not in a tension zone.	Penetrates more than 50% of the thickness of the member or more than 5% of the member thickness in a tension zone. Does not warrant structural review.	
Crack (Timber) (1160)	None.	Crack that has been arrested through effective measures.	Identified crack exists that is not arrested, but does not require structural review	
Split/Delamination (Timber) (1170)	None	Length less than the member depth or arrested with effective actions taken to mitigate.	Length equal to or greater than the member depth, but does not require structural review.	
Abrasion/Wear (Timber) (1180)	None or no measurable section loss.	Section loss less than 10% of the member thickness.	Section loss 10% or more of the member thickness, but does not warrant structural review.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Settlement (4000)	None	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits, but does not warrant structural review.	
Scour (6000)	None	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits, but is less than the critical limits determined by scour evaluation and does not warrant structural review.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

A pile is always below a pile cap or at a significant change in material type, cross section or other obvious construction break that would distinguish the pile from a column.

The term “visible for inspection” as noted under the Element Quantity Calculation shall be interpreted to mean as exposed and available for inspection.

Scour is defined as erosion or removal of streambed or bank material around substructure or foundation elements due to river or stream flow. Scour defect elements shall only be applied to river or stream flow scour, not to erosion caused by roadway runoff.

Distress to an element resulting from erosion other than scour shall be captured with the appropriate defect element that reflects the distress, such as cracking, settlement, etc.

Element # 229: Pile - Other

Description: Other material piles that are visible for inspection, including piles exposed from erosion or scour and piles visible during an underwater inspection. For all other material piles regardless of protective system.

Classification: NBE - National Bridge Element Units of Measurement: Each

Quantity Calculation: Sum of the number of piles visible for inspection. If no piles are visible, report a quantity of one for the appropriate pile type.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Fatigue Crack (Steel/Other) (1010)	None	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack exists that is not arrested but does not warrant structural review.	
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	
Delamination/ Spall/ Patched Area (1080)	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	
Efflorescence/ Rust Staining (1120)	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
Cracking (RC and Other) (1130)	None or insignificant cracks.	Unsealed moderate width cracks or unsealed moderate pattern (map) cracking. Cracks from 0.012 to 0.05 inches wide.	Wide cracks or heavy pattern (map) cracking. Cracks greater than 0.05 inches wide.	
Deterioration (Other) (1220)	None	Initiated breakdown or deterioration.	Significant deterioration or breakdown, but does not warrant structural review.	
Distortion (1900)	None	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed, but does not warrant structural review.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Settlement (4000)	None	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits, but does not warrant structural review.	
Scour (6000)	None	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits, but is less than the critical limits determined by scour evaluation and does not warrant structural review.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

The other material pile element is intended for pile constructed of composite materials, or other materials that cannot be classified using any other defined pile element.

A pile is always below a pile cap or at a significant change in material type, cross section or other obvious construction break that would distinguish the pile from a column.

The term “visible for inspection” as noted under the Element Quantity Calculation shall be interpreted to mean as exposed and available for inspection.

The inspector should use judgment when utilizing the condition state defect definitions, especially for concrete cracking. The crack defect description definitions describe generalized distress, but the inspector should consider width, spacing, location, orientation, and structural or non-structural nature of the cracking. The inspector should consider exposure and environment when evaluating crack width.

Reinforced concrete cracks less than 0.012 inches can be considered insignificant and a defect is not warranted. Insignificant cracks shall not be coded or quantified with the Cracking (1130) defect. General descriptions of insignificant cracks may be included under the parent element notes, if needed for tracking purposes.

Cracks ranging from 0.012 to 0.05 inches can be considered moderate, and cracks greater than 0.05 inches can be considered wide.

When cracks on the surface of this element have been treated with a sealant such as methacrylate, epoxy or silane, the Cracking (1130) defect shall not be used. The appropriate protective coating element should be used and the date of application provided in the element notes.

Any gouges in the steel element caused by impact damage shall be captured under the Distortion (1900) defect.

Scour is defined as erosion or removal of streambed or bank material around substructure or foundation elements due to river or stream flow. Scour defect elements shall only be applied to river or stream flow scour, not to erosion caused by roadway runoff. Distress to an element resulting from erosion other than scour shall be captured with the appropriate defect element that reflects the distress, such as cracking, settlement, etc.

Element # 251: Pile - Cast in Steel Shell

Description: Steel piles filled with concrete. Not for use with steel forms for fully reinforced columns/piles.

Classification: ADE – Agency Defined Element Units of Measurement: Each

Quantity Calculation: Sum of the number of piles visible for inspection. If no piles are visible, report a quantity of one for the appropriate pile type.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Fatigue Crack (Steel/Other) (1010)	None	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack exists that is not arrested but does not warrant structural review.	
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	
Distortion (1900)	None	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed, but does not warrant structural review.	
Settlement (4000)	None	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits, but does not warrant structural review.	
Scour (6000)	None	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits, but is less than the critical limits determined by scour evaluation and does not warrant structural review.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

A pile is always below a pile cap or at a significant change in material type, cross section or other obvious construction break that would distinguish the pile from a column.

This element should be used for Raymond step taper piles.

For steel pile extensions and steel piles extensions filled with concrete, use Element 202. Use Element 254 or 255 for seismic steel column jackets.

This element is used for piles where the steel shell is required for the pile to act as a reinforced concrete pile. This is typical of steel shell filled with un-reinforced concrete or steel shell with limited reinforcing that connects the pile to the structure. Assume steel is required if plans are not available.

The term “visible for inspection” as noted under the Element Quantity Calculation shall be interpreted to mean as exposed and available for inspection.

Any gouges in the steel element caused by impact damage shall be captured under the Distortion (1900) defect.

Scour is defined as erosion or removal of streambed or bank material around substructure or foundation elements due to river or stream flow. Scour defect elements shall only be applied to river or stream flow scour, not to erosion caused by roadway runoff.

Distress to an element resulting from erosion other than scour shall be captured with the appropriate defect element that reflects the distress, such as cracking, settlement, etc.

Element # 252: Pile - Cast-In-Drilled-Hole (CIDH)

Description: Reinforced concrete piles that are visible for inspection. The exposure may be intentional or caused by scour.

Classification: ADE – Agency Defined Element Units of Measurement: Each

Quantity Calculation: Sum of the number of piles visible for inspection. If no piles are visible, report a quantity of one for the appropriate pile type.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Cracking (RC and Other) (1130)	None or insignificant cracks.	Unsealed moderate width cracks or unsealed moderate pattern (map) cracking. Cracks from 0.012 to 0.05 inches wide.	Wide cracks or heavy pattern (map) cracking. Cracks greater than 0.05 inches wide.	
Distortion (1900)	None	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed, but does not warrant structural review.	
Settlement (4000)	None	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits, but does not warrant structural review.	
Scour (6000)	None	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits, but is less than the critical limits determined by scour evaluation and does not warrant structural review.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

A pile is always below a pile cap or at a significant change in material type, cross section or other obvious construction break that would distinguish the pile from a column.

The term “visible for inspection” as noted under the Element Quantity Calculation shall be interpreted to mean as exposed and available for inspection.

The inspector should use judgment when utilizing the condition state defect definitions, especially for concrete cracking. The crack defect description definitions describe generalized distress, but the inspector should consider width, spacing, location, orientation, and structural or non-structural nature of the cracking. The inspector should consider exposure and environment when evaluating crack width.

Reinforced concrete cracks less than 0.012 inches can be considered insignificant and a defect is not warranted. Insignificant cracks shall not be coded or quantified with the Cracking (1130) defect. General descriptions of insignificant cracks may be included under the parent element notes, if needed for tracking purposes.

Cracks ranging from 0.012 to 0.05 inches can be considered moderate, and cracks greater than 0.05 inches can be considered wide.

When cracks on the surface of this element have been treated with a sealant such as methacrylate, epoxy or silane, the Cracking (1130) defect shall not be used. The appropriate protective coating element should be used and the date of application provided in the element notes.

Scour is defined as erosion or removal of streambed or bank material around substructure or foundation elements due to river or stream flow. Scour defect elements shall only be applied to river or stream flow scour, not to erosion caused by roadway runoff.

Distress to an element resulting from erosion other than scour shall be captured with the appropriate defect element that reflects the distress, such as cracking, settlement, etc.

This page intentionally left blank.

3.3.5 Seismic Shells / Slope & Scour Protection

This section covers seismic column casings, slope and scour protection.

Element # 254: Steel Seismic Column Shells (Full Height)

Description: Seismic steel confinement shells that are full height.

Classification: ADE – Agency Defined Element Units of Measurement: Each

Quantity Calculation: Sum of the number of seismic confinement shells.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Fatigue Crack (Steel/Other) (1010)	None	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack exists that is not arrested but does not warrant structural review.	
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	
Distortion (1900)	None	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed, but does not warrant structural review.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Columns with full height shells, will not use an associated column Element #204 or #205.

Capture painted coatings only for this element, using element #515.

Any gouges in the steel element caused by impact damage shall be captured under the Distortion (1900) defect.

Scour is defined as erosion or removal of streambed or bank material around substructure or foundation elements due to river or stream flow. Scour defect elements shall only be applied to river or stream flow scour, not to erosion caused by roadway runoff.

Distress to an element resulting from erosion other than scour shall be captured with the appropriate defect element that reflects the distress, such as cracking, settlement, etc.

Element # 255: Steel Seismic Column Shells (Partial Height)

Description: Seismic steel confinement shells that are partial height.

Classification: ADE – Agency Defined Element Units of Measurement: Each

Quantity Calculation: Sum of the number of partial height seismic column shells.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Fatigue Crack (Steel/Other) (1010)	None	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack exists that is not arrested but does not warrant structural review.	
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	
Distortion (1900)	None	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed, but does not warrant structural review.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Record the condition state of the visible portion of the column as the appropriate column Element #204 or #205 in addition to the partial shell element.

Capture painted coatings only for this element, using Element #515.

Any gouges in the steel element caused by impact damage shall be captured under the Distortion (1900) defect.

Scour is defined as erosion or removal of streambed or bank material around substructure or foundation elements due to river or stream flow. Scour defect elements shall only be applied to river or stream flow scour, not to erosion caused by roadway runoff.

Distress to an element resulting from erosion other than scour shall be captured with the appropriate defect element that reflects the distress, such as cracking, settlement, etc.

Element # 256: Slope/Scour Protection

Description: All types of erosion/scour protection for the supports; including grouted or ungrouted riprap and concrete paving under the bridge.

Classification: ADE – Agency Defined Element Units of Measurement: EA

Quantity Calculation: The quantity of this element is a count of each support/abutment protected.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Delamination/ Spall/ Patched Area (1080)	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Exposed Rebar (1090)	None	Present without measurable section loss.	Present with measurable section loss, but does not warrant structural review.	
Deterioration (Other) (1220)	None	Initiated breakdown or deterioration.	Significant deterioration or breakdown, but does not warrant structural review.	
Cracking (RC and Other) (1130)	None or insignificant cracks.	Unsealed moderate width cracks or unsealed moderate pattern (map) cracking. Cracks from 0.012 to 0.05 inches wide.	Wide cracks or heavy pattern (map) cracking. Cracks greater than 0.05 inches wide.	
Settlement (4000)	None	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits, but does not warrant structural review.	
Scour (6000)	None	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits, but is less than the critical limits determined by scour evaluation and does not warrant structural review.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Record the one each for each location protected. Use the element commentary to describe the location.

This element is not for use with continuously lined concrete channels. For channels lined with rock riprap, any portion protecting the slope around the foundation of a bridge element shall be listed and rated.

The inspector should use judgment when utilizing the condition state defect definitions, especially for concrete cracking. The crack defect description definitions describe generalized distress, but the inspector should consider width, spacing, location, orientation, and structural or non-structural nature of the cracking. The inspector should consider exposure and environment when evaluating crack width.

Reinforced concrete cracks less than 0.012 inches can be considered insignificant and a defect is not warranted. Insignificant cracks shall not be coded or quantified with the Cracking (1130) defect. General descriptions of insignificant cracks may be included under the parent element notes, if needed for tracking purposes.

Cracks ranging from 0.012 to 0.05 inches can be considered moderate, and cracks greater than 0.05 inches can be considered wide.

When cracks on the surface of this element have been treated with a sealant such as methacrylate, epoxy or silane, the Cracking (1130) defect shall not be used. The appropriate protective coating element should be used and the date of application provided in the element notes.

Scour is defined as erosion or removal of streambed or bank material around substructure or foundation elements due to river or stream flow. Scour defect elements shall only be applied to river or stream flow scour, not to erosion caused by roadway runoff.

Distress to an element resulting from erosion other than scour shall be captured with the appropriate defect element that reflects the distress, such as cracking, settlement, etc.

This page intentionally left blank.

3.4 - Culverts

This section covers steel, prestressed and reinforced concrete, timber, masonry, and other types of culverts.

Culverts are structures that convey water where the structural section encompasses the entire perimeter of the barrel. Arch structures with paved inverts are not culverts.

Element # 240: Culvert - Steel

Description: Steel culverts, including arched, round, or elliptical pipes.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Flow line length of the barrel times the number of barrels.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Fatigue Crack (Steel/Other) (1010)	None	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack exists that is not arrested but does not warrant structural review.	
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	
Distortion (1900)	None	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed, but does not warrant structural review.	
Settlement (4000)	None	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits, but does not warrant structural review.	
Scour (6000)	None	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits, but is less than the critical limits determined by scour evaluation and does not warrant structural review.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Culverts are defined as structures that convey water where the structural section encompasses the entire perimeter of the barrel. Arch structures with paved or natural inverts are not culverts.

Culvert wingwalls are not considered a part of a culvert element. Any defects associated with culvert wingwalls shall not be coded, but should be fully described in the inspection commentary under the CULVERT heading.

Paved channels or aprons adjacent to culvert barrels are not considered part of a culvert element. Any defects associated with paved channels or aprons adjacent to culvert barrels shall be fully described in the inspection commentary under a WATERWAY heading, and coded appropriately under NBI Item 61.

The Distortion (1900) defect is contingent on a number of factors such as site, wall thickness, fill depth, etc. The inspector shall use such factors to assess the proper condition state.

Any gouges in the steel element caused by impact damage shall be captured under the Distortion (1900) defect.

Scour is defined as erosion or removal of streambed or bank material around substructure or foundation elements due to river or stream flow. Scour defect elements shall only be applied to river or stream flow scour, not to erosion caused by roadway runoff.

Distress to an element resulting from erosion other than scour shall be captured with the appropriate defect element that reflects the distress, such as cracking, settlement, etc.

Element # 241: Culvert - Reinforced Concrete

Description: Reinforced concrete culverts, including box, arched, round, or elliptical shapes.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Flow line length of the barrel times the number of the barrels.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Delamination/ Spall/ Patched Area (1080)	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Exposed Rebar (1090)	None	Present without measurable section loss.	Present with measurable section loss, but does not warrant structural review.	
Efflorescence/ Rust Staining (1120)	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
Cracking (RC and Other) (1130)	None or insignificant cracks.	Unsealed moderate width cracks or unsealed moderate pattern (map) cracking. Cracks from 0.012 to 0.05 inches wide.	Wide cracks or heavy pattern (map) cracking. Cracks greater than 0.05 inches wide.	
Abrasion/Wear (PSC/RC) (1190)	No abrasion or wearing.	Abrasion or wearing has exposed coarse aggregate but the aggregate remains secure in the concrete.	Coarse aggregate is loose or has popped out of the concrete matrix due to abrasion or wear.	
Distortion (1900)	None	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed, but does not warrant structural review.	
Settlement (4000)	None	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits, but does not warrant structural review.	
Scour (6000)	None	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits, but is less than the critical limits determined by scour evaluation and does not warrant structural review.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Culverts are defined as structures that convey water where the structural section encompasses the entire perimeter of the barrel. Arch structures with paved or natural inverts are not culverts.

Culvert wingwalls are not considered a part of a culvert element. Any defects associated with culvert wingwalls shall not be coded, but should be fully described in the inspection commentary under the CULVERT heading.

Paved channels or aprons adjacent to culvert barrels are not considered part of a culvert element. Any defects associated with paved channels or aprons adjacent to culvert barrels shall be fully described in the inspection commentary under a WATERWAY heading, and coded appropriately under NBI Item 61.

The inspector should use judgment when utilizing the condition state defect definitions, especially for concrete cracking. The crack defect description definitions describe generalized distress, but the inspector should consider width, spacing, location, orientation, and structural or non-structural nature of the cracking. The inspector should consider exposure and environment when evaluating crack width.

Reinforced concrete cracks less than 0.012 inches can be considered insignificant and a defect is not warranted. Insignificant cracks shall not be coded or quantified with the Cracking (1130) defect. General descriptions of insignificant cracks may be included under the parent element notes, if needed for tracking purposes.

Cracks ranging from 0.012 to 0.05 inches can be considered moderate, and cracks greater than 0.05 inches can be considered wide.

When cracks on the surface of this element have been treated with a sealant such as methacrylate, epoxy or silane, the Cracking (1130) defect shall not be used. The appropriate protective coating or wearing surface element should be used and the date of application provided in the element notes.

The Distortion (1900) defect is contingent on a number of factors such as site, wall thickness, fill depth, etc. The inspector shall use such factors to assess the proper condition state.

Scour is defined as erosion or removal of streambed or bank material around substructure or foundation elements due to river or stream flow. Scour defect elements shall only be applied to river or stream flow scour, not to erosion caused by roadway runoff.

Distress to an element resulting from erosion other than scour shall be captured with the appropriate defect element that reflects the distress, such as cracking, settlement, etc.

Element # 242: Culvert - Timber

Description: All timber culverts.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Flow line length of the barrel times the number of barrels.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Decay/ Section Loss (1140)	None	Affects less than 10% of the member section.	Affects 10% or more of the member but does not warrant structural review.	
Check/Shake (1150)	Surface penetration less than 5% of the member thickness regardless of location.	Penetrates 5% - 50% of the thickness of the member and not in a tension zone.	Penetrates more than 50% of the thickness of the member or more than 5% of the member thickness in a tension zone. Does not warrant structural review.	
Crack (Timber) (1160)	None.	Crack that has been arrested through effective measures.	Identified crack exists that is not arrested, but does not require structural review	
Split/Delamination (Timber) (1170)	None	Length less than the member depth or arrested with effective actions taken to mitigate.	Length equal to or greater than the member depth, but does not require structural review.	
Abrasion/Wear (Timber) (1180)	None or no measurable section loss.	Section loss less than 10% of the member thickness.	Section loss 10% or more of the member thickness, but does not warrant structural review.	
Distortion (1900)	None	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed, but does not warrant structural review.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Settlement (4000)	None	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits, but does not warrant structural review.	
Scour (6000)	None	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits, but is less than the critical limits determined by scour evaluation and does not warrant structural review.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Culverts are defined as structures that convey water where the structural section encompasses the entire perimeter of the barrel. Arch structures with paved or natural inverts are not culverts.

Culvert wingwalls are not considered a part of a culvert element. Any defects associated with culvert wingwalls shall not be coded, but should be fully described in the inspection commentary under the CULVERT heading.

Paved channels or aprons adjacent to culvert barrels are not considered part of a culvert element. Any defects associated with paved channels or aprons adjacent to culvert barrels shall be fully described in the inspection commentary under a WATERWAY heading, and coded appropriately under NBI Item 61.

The Distortion (1900) defect is contingent on a number of factors such as site, wall thickness, fill depth, etc. The inspector shall use such factors to assess the proper condition state.

Scour is defined as erosion or removal of streambed or bank material around substructure or foundation elements due to river or stream flow. Scour defect elements shall only be applied to river or stream flow scour, not to erosion caused by roadway runoff.

Distress to an element resulting from erosion other than scour shall be captured with the appropriate defect element that reflects the distress, such as cracking, settlement, etc.

Element # 243: Culvert - Other

Description: Other material type culverts, including arches, round, or elliptical pipes. These culverts are not included in steel, concrete, or timber material types.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Flow line length of the barrel times the number of barrels.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Fatigue Crack (Steel/Other) (1010)	None	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack exists that is not arrested but does not warrant structural review.	
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	
Delamination/ Spall/ Patched Area (1080)	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	
Efflorescence/ Rust Staining (1120)	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
Cracking (RC and Other) (1130)	None or insignificant cracks.	Unsealed moderate width cracks or unsealed moderate pattern (map) cracking. Cracks from 0.012 to 0.05 inches wide.	Wide cracks or heavy pattern (map) cracking. Cracks greater than 0.05 inches wide.	
Deterioration (Other) (1220)	None	Initiated breakdown or deterioration.	Significant deterioration or breakdown, but does not warrant structural review.	
Distortion (1900)	None	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed, but does not warrant structural review.	
Settlement (4000)	None	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits, but does not warrant structural review.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Scour (6000)	None	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits, but is less than the critical limits determined by scour evaluation and does not warrant structural review.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Culverts are defined as structures that convey water where the structural section encompasses the entire perimeter of the barrel. Arch structures with paved or natural inverts are not culverts.

Culvert wingwalls are not considered a part of a culvert element. Any defects associated with culvert wingwalls shall not be coded, but should be fully described in the inspection commentary under the CULVERT heading.

Paved channels or aprons adjacent to culvert barrels are not considered part of a culvert element. Any defects associated with paved channels or aprons adjacent to culvert barrels shall be fully described in the inspection commentary under a WATERWAY heading, and coded appropriately under NBI Item 61.

The inspector should use judgment when utilizing the condition state defect definitions, especially for concrete cracking. The crack defect description definitions describe generalized distress, but the inspector should consider width, spacing, location, orientation, and structural or non-structural nature of the cracking. The inspector should consider exposure and environment when evaluating crack width.

Reinforced concrete cracks less than 0.012 inches can be considered insignificant and a defect is not warranted. Insignificant cracks shall not be coded or quantified with the Cracking (1130) defect. General descriptions of insignificant cracks may be included under the parent element notes, if needed for tracking purposes. Cracks ranging from 0.012 to 0.05 inches can be considered moderate, and cracks greater than 0.05 inches can be considered wide.

When cracks on the surface of this element have been treated with a sealant such as methacrylate, epoxy or silane, the Cracking (1130) defect shall not be used. The appropriate protective coating or wearing surface element should be used and the date of application provided in the element notes.

The Distortion (1900) defect is contingent on a number of factors such as site, wall thickness, fill depth, etc. The inspector shall use such factors to assess the proper condition state.

Any gouges in the steel element caused by impact damage shall be captured under the Distortion (1900) defect.

Scour is defined as erosion or removal of streambed or bank material around substructure or foundation elements due to river or stream flow. Scour defect elements shall only be applied to river or stream flow scour, not to erosion caused by roadway runoff. Distress to an element resulting from erosion other than scour shall be captured with the appropriate defect element that reflects the distress, such as cracking, settlement, etc.

Element # 244: Culvert - Masonry

Description: Masonry block or stone culverts.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Flow line length of the barrel times the number of barrels.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Efflorescence/ Rust Staining (1120)	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Mortar Breakdown (Masonry) (1610)	None	Cracking or voids in less than 10% of joints.	Cracking or voids in 10% or more of the of joints	
Split/Spall (Masonry) (1620)	None	Block or stone has split or spalled with no shifting.	Block or stone has split or spalled with shifting but does not warrant a structural review.	
Patched Area (Masonry) (1630)	None	Sound Patch	Unsound Patch	
Masonry Displacement (1640)	None	Block or stone has shifted slightly out of alignment.	Block or stone has shifted significantly out of alignment or is missing but does not warrant structural review.	
Distortion (1900)	None	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed, but does not warrant structural review.	
Settlement (4000)	None	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits, but does not warrant structural review.	
Scour (6000)	None	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits, but is less than the critical limits determined by scour evaluation and does not warrant structural review.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Culverts are defined as structures that convey water where the structural section encompasses the entire perimeter of the barrel. Arch structures with paved or natural inverts are not culverts.

Culvert wingwalls are not considered a part of a culvert element. Any defects associated with culvert wingwalls shall not be coded, but should be fully described in the inspection commentary under the CULVERT heading.

Paved channels or aprons adjacent to culvert barrels are not considered part of a culvert element. Any defects associated with paved channels or aprons adjacent to culvert barrels shall be fully described in the inspection commentary under a WATERWAY heading, and coded appropriately under NBI Item 61.

The Distortion (1900) defect is contingent on a number of factors such as site, wall thickness, fill depth, etc. The inspector shall use such factors to assess the proper condition state.

Scour is defined as erosion or removal of streambed or bank material around substructure or foundation elements due to river or stream flow. Scour defect elements shall only be applied to river or stream flow scour, not to erosion caused by roadway runoff.

Distress to an element resulting from erosion other than scour shall be captured with the appropriate defect element that reflects the distress, such as cracking, settlement, etc.

Element # 245: Culvert - Prestressed Concrete

Description: All prestressed concrete culverts.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Flow line length of the barrel times the number of barrels.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Delamination/ Spall/ Patched Area (1080)	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Exposed Rebar (1090)	None	Present without measurable section loss.	Present with measurable section loss, but does not warrant structural review.	
Exposed Prestressing (1100)	None	Present without section loss.	Present with section loss, but does not warrant structural review.	
Cracking (PSC) (1110)	None or insignificant cracks.	Unsealed moderate width cracks or unsealed moderate pattern (map) cracking. Cracks from 0.004 to 0.009 inches wide.	Wide cracks or heavy pattern (map) cracking. Cracks greater than 0.009 inches wide.	
Efflorescence/ Rust Staining (1120)	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
Abrasion/Wear (PSC/RC) (1190)	No abrasion or wearing.	Abrasion or wearing has exposed coarse aggregate but the aggregate remains secure in the concrete.	Coarse aggregate is loose or has popped out of the concrete matrix due to abrasion or wear.	
Distortion (1900)	None	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed, but does not warrant structural review.	
Settlement (4000)	None	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits, but does not warrant structural review.	
Scour (6000)	None	Exists within tolerable limits or has been arrested with effective countermeasures.	Exceeds tolerable limits, but is less than the critical limits determined by scour evaluation and does not warrant structural review.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Culverts are defined as structures that convey water where the structural section encompasses the entire perimeter of the barrel. Arch structures with paved or natural inverts are not culverts.

Culvert wingwalls are not considered a part of a culvert element. Any defects associated with culvert wingwalls shall not be coded, but should be fully described in the inspection commentary under the CULVERT heading.

Paved channels or aprons adjacent to culvert barrels are not considered part of a culvert element. Any defects associated with paved channels or aprons adjacent to culvert barrels shall be fully described in the inspection commentary under a WATERWAY heading, and coded appropriately under NBI Item 61.

The inspector should use judgment when utilizing the condition state defect definitions, especially for concrete cracking. The crack defect description definitions describe generalized distress, but the inspector should consider width, spacing, location, orientation, and structural or non-structural nature of the cracking. The inspector should consider exposure and environment when evaluating crack width.

Prestressed concrete cracks less than 0.004 inches can be considered insignificant and a defect is not warranted. Insignificant cracks shall not be coded or quantified with the Cracking (1110) defect. General descriptions of insignificant cracks may be included under the parent element notes, if needed for tracking purposes.

Cracks ranging from 0.004 to 0.009 inches can be considered moderate, and cracks greater than 0.009 inches can be considered wide.

When cracks on the surface of this element have been treated with a sealant such as methacrylate, epoxy or silane, the Cracking (1110) defect shall not be used. The appropriate protective coating or wearing surface element should be used and the date of application provided in the element notes.

The Distortion (1900) defect is contingent on a number of factors such as site, wall thickness, fill depth, etc. The inspector shall use such factors to assess the proper condition state.

Scour is defined as erosion or removal of streambed or bank material around substructure or foundation elements due to river or stream flow. Scour defect elements shall only be applied to river or stream flow scour, not to erosion caused by roadway runoff.

Distress to an element resulting from erosion other than scour shall be captured with the appropriate defect element that reflects the distress, such as cracking, settlement, etc.

Element # 250: Tunnel

This element has been removed from the **Caltrans Bridge Element Inspection Manual** as of May 2017. This Agency Defined Element has been superseded by the National Tunnel Inspection Standards (NTIS) requirements for the tunnel element level inspection.

3.5 - Joints

This section covers expansion joints, pourable joints, compression joints, and assembly joints.

Element # 300: Joint - Strip Seal Expansion

Description: Those expansion joint devices which utilize a neoprene type waterproof gland with some type of metal extrusion or other system to anchor the gland.

Classification: BME - Bridge Management Element Units of Measurement: ft.

Quantity Calculation: Sum of all the lengths of the joint measured along the skew angle.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Leakage (2310)	None	Minimal. Minor dripping through the joint.	Moderate. More than a drip and less than free flow of water.	Free flow of water through the joint.
Seal Adhesion (2320)	Fully Adhered	Adhered for more than 50% of the joint height.	Adhered 50% or less of joint height but still some adhesion	Complete loss of adhesion
Seal Damage (2330)	None	Seal abrasion without punctures.	Punctured or ripped or partially pulled out.	Punctured completely through, pulled out, or missing.
Seal Cracking (2340)	None	Surface crack	Crack that partially penetrates the seal.	Crack that fully penetrates the seal.
Debris Impaction (2350)	No debris to a shallow cover of loose debris may be evident but does not affect the performance of the joint.	Partially filled with hard-packed material, but still allowing free movement.	Completely filled and impacts joint movement.	Completely filled and prevents joint movement.
Adjacent Deck or Header (2360)	Sound. No spall, delamination or unsound patch.	Edge delamination or spall 1 in. or less deep or 6 in. or less in diameter. No exposed rebar. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Exposed rebar. Delamination or unsound patched area that makes the joint loose.	Spall, delamination, unsound patched area or loose joint anchor that prevents the joint from functioning as intended.

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Metal Deterioration or Damage (2370)	None	Freckled rust, metal has no cracks or impact damage. Connection may be loose but functioning as intended.	Section loss, missing or broken fasteners, cracking of the metal or impact damage but joint still functioning	Metal cracking, section loss, damage or connection failure that prevents the joint from functioning as intended.
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

The deck area within 1 foot of all joints shall be recorded as part of the joint element.

Element # 301: Joint - Pourable Seal

Description: Those joints filled with a pourable seal with or without a backer.

Classification: BME - Bridge Management Element Units of Measurement: ft.

Quantity Calculation: Sum of all the lengths of the joint measured along the skew angle.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Leakage (2310)	None	Minimal. Minor dripping through the joint.	Moderate. More than a drip and less than free flow of water.	Free flow of water through the joint.
Seal Adhesion (2320)	Fully Adhered	Adhered for more than 50% of the joint height.	Adhered 50% or less of joint height but still some adhesion	Complete loss of adhesion
Seal Damage (2330)	None	Seal abrasion without punctures.	Punctured or ripped or partially pulled out.	Punctured completely through, pulled out, or missing.
Seal Cracking (2340)	None	Surface crack	Crack that partially penetrates the seal.	Crack that fully penetrates the seal.
Debris Impaction (2350)	No debris to a shallow cover of loose debris may be evident but does not affect the performance of the joint.	Partially filled with hard-packed material, but still allowing free movement.	Completely filled and impacts joint movement.	Completely filled and prevents joint movement.
Adjacent Deck or Header (2360)	Sound. No spall, delamination or unsound patch.	Edge delamination or spall 1 in. or less deep or 6 in. or less in diameter. No exposed rebar. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Exposed rebar. Delamination or unsound patched area that makes the joint loose.	Spall, delamination, unsound patched area or loose joint anchor that prevents the joint from functioning as intended.

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

The deck area within 1 foot of all joints shall be recorded as part of the joint element.

Include approach slab expansion joints adjacent to the abutment.

Joints not visible for inspection and felt paper filled joints (under wearing surfaces) shall be ignored.

Element # 302: Joint - Compression Seal

Description: Only those joints filled with a preformed compression type seal. This joint may or may not have an anchor system to confine the seal.

Classification: BME - Bridge Management Element Units of Measurement: ft.

Quantity Calculation: Sum of all the lengths of the joint measured along the skew angle

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Leakage (2310)	None	Minimal. Minor dripping through the joint.	Moderate. More than a drip and less than free flow of water.	Free flow of water through the joint.
Seal Adhesion (2320)	Fully Adhered	Adhered for more than 50% of the joint height.	Adhered 50% or less of joint height but still some adhesion	Complete loss of adhesion
Seal Damage (2330)	None	Seal abrasion without punctures.	Punctured or ripped or partially pulled out.	Punctured completely through, pulled out, or missing.
Seal Cracking (2340)	None	Surface crack	Crack that partially penetrates the seal.	Crack that fully penetrates the seal.
Debris Impaction (2350)	No debris to a shallow cover of loose debris may be evident but does not affect the performance of the joint.	Partially filled with hard-packed material, but still allowing free movement.	Completely filled and impacts joint movement.	Completely filled and prevents joint movement.
Adjacent Deck or Header (2360)	Sound. No spall, delamination or unsound patch.	Edge delamination or spall 1 in. or less deep or 6 in. or less in diameter. No exposed rebar. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Exposed rebar. Delamination or unsound patched area that makes the joint loose.	Spall, delamination, unsound patched area or loose joint anchor that prevents the joint from functioning as intended.

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

The deck area within 1 foot of all joints shall be recorded as part of the joint element.

Include approach slab expansion joints adjacent to the abutment.

Element # 303: Joint - Assembly with Seal

Description: Only those joints filled with an assembly mechanism that has a seal.

Classification: BME - Bridge Management Element Units of Measurement: ft.

Quantity Calculation: Sum of all the lengths of the joint measured along the skew angle.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Leakage (2310)	None	Minimal. Minor dripping through the joint.	Moderate. More than a drip and less than free flow of water.	Free flow of water through the joint.
Seal Adhesion (2320)	Fully Adhered	Adhered for more than 50% of the joint height.	Adhered 50% or less of joint height but still some adhesion	Complete loss of adhesion
Seal Damage (2330)	None	Seal abrasion without punctures.	Punctured or ripped or partially pulled out.	Punctured completely through, pulled out, or missing.
Seal Cracking (2340)	None	Surface crack	Crack that partially penetrates the seal.	Crack that fully penetrates the seal.
Debris Impaction (2350)	No debris to a shallow cover of loose debris may be evident but does not affect the performance of the joint.	Partially filled with hard-packed material, but still allowing free movement.	Completely filled and impacts joint movement.	Completely filled and prevents joint movement.
Adjacent Deck or Header (2360)	Sound. No spall, delamination or unsound patch.	Edge delamination or spall 1 in. or less deep or 6 in. or less in diameter. No exposed rebar. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Exposed rebar. Delamination or unsound patched area that makes the joint loose.	Spall, delamination, unsound patched area or loose joint anchor that prevents the joint from functioning as intended.

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Metal Deterioration or Damage (2370)	None	Freckled rust, metal has no cracks or impact damage. Connection may be loose but functioning as intended.	Section loss, missing or broken fasteners, cracking of the metal or impact damage but joint still functioning	Metal cracking, section loss, damage or connection failure that prevents the joint from functioning as intended.
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

The deck area within 1 foot of all joints shall be recorded as part of the joint element.

Element # 304: Joint - Open Expansion

Description: Only those joints that are open and not sealed.

Classification: BME - Bridge Management Element Units of Measurement: ft.

Quantity Calculation: Sum of all the lengths of the joint measured along the skew angle.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Debris Impaction (2350)	No debris to a shallow cover of loose debris may be evident but does not affect the performance of the joint.	Partially filled with hard-packed material, but still allowing free movement.	Completely filled and impacts joint movement.	Completely filled and prevents joint movement.
Adjacent Deck or Header (2360)	Sound. No spall, delamination or unsound patch.	Edge delamination or spall 1 in. or less deep or 6 in. or less in diameter. No exposed rebar. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Exposed rebar. Delamination or unsound patched area that makes the joint loose.	Spall, delamination, unsound patched area or loose joint anchor that prevents the joint from functioning as intended.
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

This element is intended for joints designed as open joints, not those joints that were designed to have a seal that is currently missing.

The deck area within 1 foot of all joints shall be recorded as part of the joint element.

Felt paper filled joints shall be ignored.

Element # 305: Joint - Assembly Without Seal

Description: Only those assembly joints that are open and not sealed, excluding steel finger and sliding plate joints.

Classification: BME - Bridge Management Element Units of Measurement: ft.

Quantity Calculation: Sum of all the lengths of the joint measured along the skew angle.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Debris Impaction (2350)	No debris to a shallow cover of loose debris may be evident but does not affect the performance of the joint.	Partially filled with hard-packed material, but still allowing free movement.	Completely filled and impacts joint movement.	Completely filled and prevents joint movement.
Adjacent Deck or Header (2360)	Sound. No spall, delamination or unsound patch.	Edge delamination or spall 1 in. or less deep or 6 in. or less in diameter. No exposed rebar. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Exposed rebar. Delamination or unsound patched area that makes the joint loose.	Spall, delamination, unsound patched area or loose joint anchor that prevents the joint from functioning as intended.
Metal Deterioration or Damage (2370)	None	Freckled rust, metal has no cracks or impact damage. Connection may be loose but functioning as intended.	Section loss, missing or broken fasteners, cracking of the metal or impact damage but joint still functioning	Metal cracking, section loss, damage or connection failure that prevents the joint from functioning as intended.
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

This element shall include open joints with or without a drainage trough below the joint.

The deck area within 1 foot of all joints shall be recorded as part of the joint element.

Element # 306: Joint - Other

Description: Only those other joints that are not defined by any other joint element.

Classification: BME - Bridge Management Element Units of Measurement: ft.

Quantity Calculation: Sum of all the lengths of the joint measured along the skew angle.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Leakage (2310)	None	Minimal. Minor dripping through the joint.	Moderate. More than a drip and less than free flow of water.	Free flow of water through the joint.
Debris Impaction (2350)	No debris to a shallow cover of loose debris may be evident but does not affect the performance of the joint.	Partially filled with hard-packed material, but still allowing free movement.	Completely filled and impacts joint movement.	Completely filled and prevents joint movement.
Adjacent Deck or Header (2360)	Sound. No spall, delamination or unsound patch.	Edge delamination or spall 1 in. or less deep or 6 in. or less in diameter. No exposed rebar. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Exposed rebar. Delamination or unsound patched area that makes the joint loose.	Spall, delamination, unsound patched area or loose joint anchor that prevents the joint from functioning as intended.
Metal Deterioration or Damage (2370)	None	Freckled rust, metal has no cracks or impact damage. Connection may be loose but functioning as intended.	Section loss, missing or broken fasteners, cracking of the metal or impact damage but joint still functioning	Metal cracking, section loss, damage or connection failure that prevents the joint from functioning as intended.
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

The other material joint element is intended for joints constructed of materials that cannot be classified using any other defined joint element.

The deck area within 1 foot of all joints shall be recorded as part of the joint element.

Felt paper filled joints shall be ignored.

Element # 307: Joint - Asphaltic Plug

Description: Only those joints with a standard asphaltic plug and shall not be used for joints paved over.

Classification: ADE – Agency Defined Element Units of Measurement: ft.

Quantity Calculation: Sum of all the lengths of the joint measured along the skew angle.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Leakage (2310)	None	Minimal. Minor dripping through the joint.	Moderate. More than a drip and less than free flow of water.	Free flow of water through the joint.
Seal Adhesion (2320)	Fully Adhered	Adhered for more than 50% of the joint height.	Adhered 50% or less of joint height but still some adhesion	Complete loss of adhesion
Seal Adhesion (2320)	Fully Adhered	Adhered for more than 50% of the joint height.	Adhered 50% or less of joint height but still some adhesion	Complete loss of adhesion
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

The deck area within 1 foot of all joints shall be recorded as part of the joint element.

Element # 308: Joint - Steel Sliding Plates

Description: Only those joints that are open and constructed as sliding plate type joints.

Classification: ADE – Agency Defined Element Units of Measurement: ft.

Quantity Calculation: Sum of all the lengths of the joint measured along the skew angle.

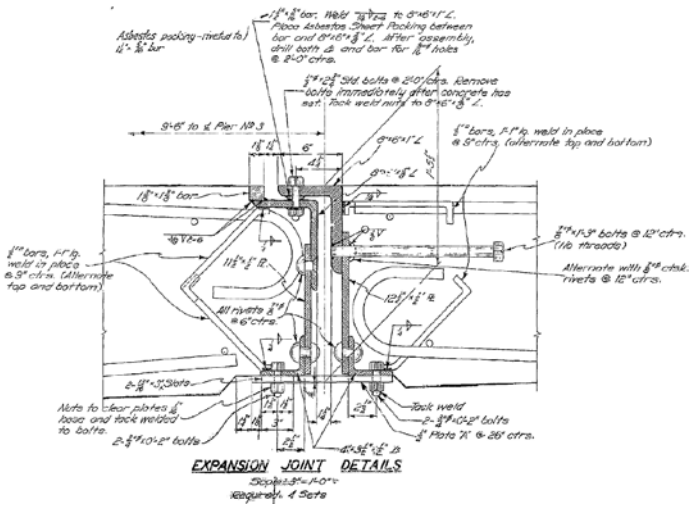
Condition State Definitions

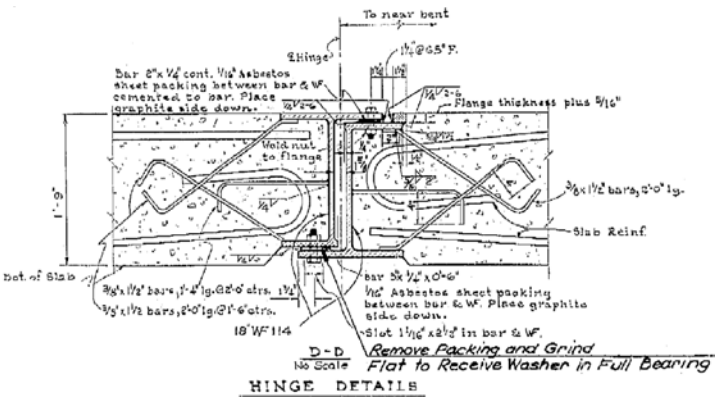
Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Debris Impaction (2350)	No debris to a shallow cover of loose debris may be evident but does not affect the performance of the joint.	Partially filled with hard-packed material, but still allowing free movement.	Completely filled and impacts joint movement.	Completely filled and prevents joint movement.
Adjacent Deck or Header (2360)	Sound. No spall, delamination or unsound patch.	Edge delamination or spall 1 in. or less deep or 6 in. or less in diameter. No exposed rebar. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Exposed rebar. Delamination or unsound patched area that makes the joint loose.	Spall, delamination, unsound patched area or loose joint anchor that prevents the joint from functioning as intended.
Metal Deterioration or Damage (2370)	None	Freckled rust, metal has no cracks or impact damage. Connection may be loose but functioning as intended.	Section loss, missing or broken fasteners, cracking of the metal or impact damage but joint still functioning	Metal cracking, section loss, damage or connection failure that prevents the joint from functioning as intended.
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

The deck area within 1 foot of all joints shall be recorded as part of the joint element.

California slab bridge hinges consist of transverse steel sections embedded in the slab that transfer shear forces, but no moment forces. The steel sections may consist of rolled wide flange members, riveted steel angles, or welded steel plates. For slab bridges consistent with the following details:





This element shall be used to address visible distress on the exterior surfaces of the hinge components.

Element # 309: Joint - Steel Fingers

Description: Only those joints that are steel finger joints.

Classification: ADE – Agency Defined Element Units of Measurement: ft.

Quantity Calculation: Sum of all the lengths of the joint measured along the skew angle.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Debris Impaction (2350)	No debris to a shallow cover of loose debris may be evident but does not affect the performance of the joint.	Partially filled with hard-packed material, but still allowing free movement.	Completely filled and impacts joint movement.	Completely filled and prevents joint movement.
Adjacent Deck or Header (2360)	Sound. No spall, delamination or unsound patch.	Edge delamination or spall 1 in. or less deep or 6 in. or less in diameter. No exposed rebar. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Exposed rebar. Delamination or unsound patched area that makes the joint loose.	Spall, delamination, unsound patched area or loose joint anchor that prevents the joint from functioning as intended.
Metal Deterioration or Damage (2370)	None	Freckled rust, metal has no cracks or impact damage. Connection may be loose but functioning as intended.	Section loss, missing or broken fasteners, cracking of the metal or impact damage but joint still functioning	Metal cracking, section loss, damage or connection failure that prevents the joint from functioning as intended.
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

The deck area within 1 foot of all joints shall be recorded as part of the joint element.

This page intentionally left blank.

3.6 - Bearings

This section covers fixed, movable, and specialty bearings.

Element # 310: Bearing - Elastomeric

Description: Only those bridge bearings that are constructed primarily of elastomers, with or without fabric or metal reinforcement.

Classification: NBE - National Bridge Element Units of Measurement: Each

Quantity Calculation: Sum of each bearing of this type.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	
Movement (2210)	Free to Move.	Minor Restriction	Restricted, but not warranting structural review.	
Alignment (2220)	Lateral and vertical alignment is as expected for the temperature conditions.	Tolerable lateral or vertical alignment that is inconsistent with the temperature conditions.	Approaching the limits of lateral or vertical alignment for the bearing, but does not warrant a structural review.	
Bulging, Splitting or Tearing (2230)	None	Bulging less than 15% of the thickness.	Bulging 15% or more of the thickness. Splitting or tearing. Bearing's surfaces are not parallel. Does not warrant structural review.	
Loss of Bearing Area (2240)	None	Less than 10%	10% or more, but does not warrant structural review.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Use enclosed/concealed bearing (Element 312) for elastomeric pads at box girder hinges, abutments, and bents that cannot be visually inspected.

Element # 311: Bearing - Movable

Description: Only those bridge bearings which provide for both rotation and longitudinal movement by means of roller, rocker, or sliding mechanisms.

Classification: NBE - National Bridge Element Units of Measurement: Each

Quantity Calculation: Sum of each bearing of this type.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	
Movement (2210)	Free to Move.	Minor Restriction	Restricted, but not warranting structural review.	
Alignment (2220)	Lateral and vertical alignment is as expected for the temperature conditions.	Tolerable lateral or vertical alignment that is inconsistent with the temperature conditions.	Approaching the limits of lateral or vertical alignment for the bearing, but does not warrant a structural review.	
Loss of Bearing Area (2240)	None	Less than 10%	10% or more, but does not warrant structural review.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Protective coatings or systems shall not be used for this element.

Element # 312: Bearing - Enclosed/Concealed

Description: Only those bridge bearings that are enclosed so that they are not open for detailed inspection.

Classification: NBE - National Bridge Element Units of Measurement: Each

Quantity Calculation: Sum of each bearing of this type.

Condition State Definitions

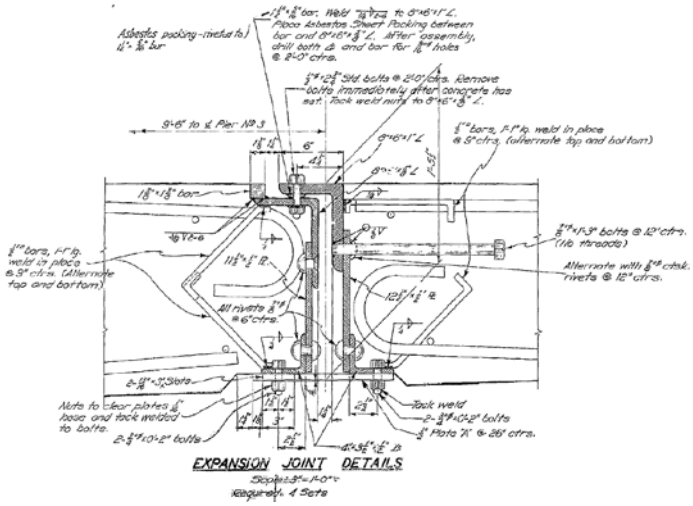
Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	
Movement (2210)	Free to Move.	Minor Restriction	Restricted, but not warranting structural review.	
Alignment (2220)	Lateral and vertical alignment is as expected for the temperature conditions.	Tolerable lateral or vertical alignment that is inconsistent with the temperature conditions.	Approaching the limits of lateral or vertical alignment for the bearing, but does not warrant a structural review.	
Loss of Bearing Area (2240)	None	Less than 10%	10% or more, but does not warrant structural review.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

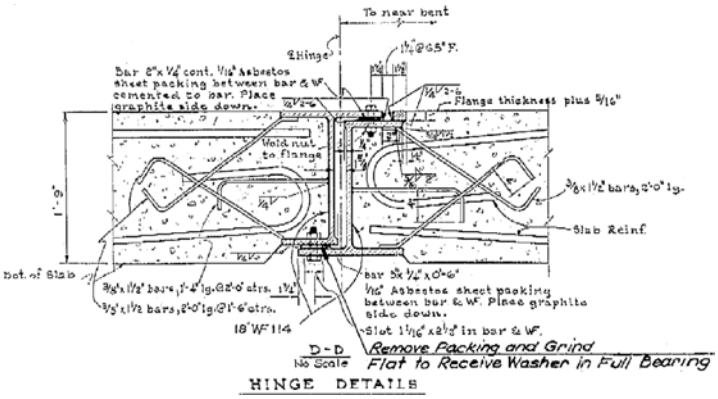
Element Commentary:

This element should be used for the typical box girder hinge or for bearings at abutments that cannot be inspected. This element should be used for box girder hinges. In cases where the bearing material is not visible, the inspector shall assess the condition based on alignment, grade across the joint, persistence of debris, or other indirect indicators of the condition. Record each bearing system consisting of the entire bridge width (i.e., quantity would be two for a bridge with 2 hinges).

In some widening cases, the enclosed bearing may exist in distinct sections along the width of the joint, hinge or abutment. Regardless of the number of sections, each support shall be counted as one each.

California slab bridge hinges consist of transverse steel sections embedded in the slab that transfer shear forces, but no moment forces. The steel sections may consist of rolled wide flange members, riveted steel angles, or welded steel plates. For slab bridges consistent with the following details:





This element shall be used to address general global distress with the hinge assembly, such as grade differential and any defects visible from beneath the structure.

Protective coatings or systems shall not be used for this element.

Element # 313: Bearing - Fixed

Description: Only those bridge bearings that provide for rotation only (no longitudinal movement.

Classification: NBE - National Bridge Element Units of Measurement: Each

Quantity Calculation: Sum of each bearing of this type.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	
Movement (2210)	Free to Move.	Minor Restriction	Restricted, but not warranting structural review.	
Alignment (2220)	Lateral and vertical alignment is as expected for the temperature conditions.	Tolerable lateral or vertical alignment that is inconsistent with the temperature conditions.	Approaching the limits of lateral or vertical alignment for the bearing, but does not warrant a structural review.	
Loss of Bearing Area (2240)	None	Less than 10%	10% or more, but does not warrant structural review.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Protective coatings or systems shall not be used for this element.

Element # 314: Bearing - Pot

Description: Those high load bearings with confined elastomer. The bearing may be fixed against horizontal movement, guided to allow sliding in one direction, or floating to allow sliding in any direction.

Classification: NBE - National Bridge Element Units of Measurement: Each

Quantity Calculation: Sum of each bearing of this type.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	
Movement (2210)	Free to Move.	Minor Restriction	Restricted, but not warranting structural review.	
Alignment (2220)	Lateral and vertical alignment is as expected for the temperature conditions.	Tolerable lateral or vertical alignment that is inconsistent with the temperature conditions.	Approaching the limits of lateral or vertical alignment for the bearing, but does not warrant a structural review.	
Bulging, Splitting or Tearing (2230)	None	Bulging less than 15% of the thickness.	Bulging 15% or more of the thickness. Splitting or tearing. Bearing's surfaces are not parallel. Does not warrant structural review.	
Loss of Bearing Area (2240)	None	Less than 10%	10% or more, but does not warrant structural review.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Protective coatings or systems shall not be used for this element.

Element # 315: Bearing - Disk

Description: Those high load bearings with a hard plastic disk. This bearing may be fixed against horizontal movement, guided to allow movement in one direction, or floating to allow sliding in any direction.

Classification: NBE - National Bridge Element Units of Measurement: Each

Quantity Calculation: Sum of each bearing of this type.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	
Movement (2210)	Free to Move.	Minor Restriction	Restricted, but not warranting structural review.	
Alignment (2220)	Lateral and vertical alignment is as expected for the temperature conditions.	Tolerable lateral or vertical alignment that is inconsistent with the temperature conditions.	Approaching the limits of lateral or vertical alignment for the bearing, but does not warrant a structural review.	
Loss of Bearing Area (2240)	None	Less than 10%	10% or more, but does not warrant structural review.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Protective coatings or systems shall not be used for this element.

Element # 316: Bearing - Other

Description: All other material bridge bearings regardless of translation or rotation constraints.

Classification: NBE - National Bridge Element Units of Measurement: Each

Quantity Calculation: Sum of each bearing of this type.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	
Movement (2210)	Free to Move.	Minor Restriction	Restricted, but not warranting structural review.	
Alignment (2220)	Lateral and vertical alignment is as expected for the temperature conditions.	Tolerable lateral or vertical alignment that is inconsistent with the temperature conditions.	Approaching the limits of lateral or vertical alignment for the bearing, but does not warrant a structural review.	
Loss of Bearing Area (2240)	None	Less than 10%	10% or more, but does not warrant structural review.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

The other material bearing element is intended for bearings constructed of materials that cannot be classified using any other defined bearing element.

Protective coatings or systems shall not be used for this element.

This page intentionally left blank.

3.7 - Approach Slabs

This section will cover bridge approach slabs. These slabs will be constructed with concrete and mild or prestressed (post-tension) reinforcement. Approach slabs are Bridge Management Elements (BMEs) and are not included in the standard set of National Bridge Elements.

Element # 320: Approach Slab - Prestressed Concrete

Description: Those structural sections, between the abutment and the approach pavement that are constructed of prestressed (post-tensioned) reinforced concrete.

Classification: BME - Bridge Management Element Units of Measurement: sq.ft.

Quantity Calculation: Should include the area of the approach slab(s) from edge to edge including any median areas and accounting for any flares or ramps present.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Delamination/ Spall/ Patched Area (1080)	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Exposed Rebar (1090)	None	Present without measurable section loss.	Present with measurable section loss, but does not warrant structural review.	
Exposed Prestressing (1100)	None	Present without section loss.	Present with section loss, but does not warrant structural review.	
Cracking (PSC) (1110)	None or insignificant cracks.	Unsealed moderate width cracks or unsealed moderate pattern (map) cracking. Cracks from 0.004 to 0.009 inches wide.	Wide cracks or heavy pattern (map) cracking. Cracks greater than 0.009 inches wide.	
Abrasion/Wear (PSC/RC) (1190)	No abrasion or wearing.	Abrasion or wearing has exposed coarse aggregate but the aggregate remains secure in the concrete.	Coarse aggregate is loose or has popped out of the concrete matrix due to abrasion or wear.	
Settlement (4000)	None	Exists within tolerable limits (<0.75 inches) or arrested with no observed structural distress.	Exceeds tolerable limits (>0.75 inches) but does not warrant structural review.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Each approach slab element should consist of the portion from the bridge to the 1st joint, not to exceed a distance of 45 feet.

The inspector should use judgment when utilizing the condition state defect definitions, especially for concrete cracking. The crack defect description definitions describe generalized distress, but the inspector should consider width, spacing, location, orientation, and structural or non-structural nature of the cracking. The inspector should consider exposure and environment when evaluating crack width.

Prestressed concrete cracks less than 0.004 inches can be considered insignificant and a defect is not warranted. Insignificant cracks shall not be coded or quantified with the Cracking (1110) defect. General descriptions of insignificant cracks may be included under the parent element notes, if needed for tracking purposes.

Cracks ranging from 0.004 to 0.009 inches can be considered moderate, and cracks greater than 0.009 inches can be considered wide.

When cracks on the surface of this element have been treated with a sealant such as methacrylate, epoxy or silane, the Cracking (1110) defect shall not be used. The appropriate protective coating or wearing surface element should be used and the date of application provided in the element notes.

The Abrasion/Wear (1190) defect shall not be used to report secure aggregate exposed by profile grinding.

Any settlement up to ¾ of an inch is within tolerable limits. Settlement of ¾ inch or more are considered to have exceeded tolerable limits and should be addressed through appropriate work recommendations.

Element # 321: Approach Slab - Reinforced Concrete

Description: Those structural sections between the abutment and the approach pavement that are constructed of mild steel reinforced concrete.

Classification: BME - Bridge Management Element Units of Measurement: sq.ft.

Quantity Calculation: Should include the area of the approach slab(s) from edge to edge including any median areas and accounting for any flares or ramps present.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Delamination/ Spall/ Patched Area (1080)	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Exposed Rebar (1090)	None	Present without measurable section loss.	Present with measurable section loss, but does not warrant structural review.	
Cracking (RC and Other) (1130)	None or insignificant cracks.	Unsealed moderate width cracks or unsealed moderate pattern (map) cracking. Cracks from 0.012 to 0.05 inches wide.	Wide cracks or heavy pattern (map) cracking. Cracks greater than 0.05 inches wide.	
Abrasion/Wear (PSC/RC) (1190)	No abrasion or wearing.	Abrasion or wearing has exposed coarse aggregate but the aggregate remains secure in the concrete.	Coarse aggregate is loose or has popped out of the concrete matrix due to abrasion or wear.	
Settlement (4000)	None	Exists within tolerable limits (<0.75 inches) or arrested with no observed structural distress.	Exceeds tolerable limits (>0.75 inches) but does not warrant structural review.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Each approach slab element should consist of the portion from the bridge to the 1st joint, not to exceed a distance of 45 feet.

The inspector should use judgment when utilizing the condition state defect definitions, especially for concrete cracking. The crack defect description definitions describe generalized distress, but the inspector should consider width, spacing, location, orientation, and structural or non-structural nature of the cracking. The inspector should consider exposure and environment when evaluating crack width.

Reinforced concrete cracks less than 0.012 inches can be considered insignificant and a defect is not warranted. Insignificant cracks shall not be coded or quantified with the Cracking (1130) defect. General descriptions of insignificant cracks may be included under the parent element notes, if needed for tracking purposes.

Cracks ranging from 0.012 to 0.05 inches can be considered moderate, and cracks greater than 0.05 inches can be considered wide.

When cracks on the surface of this element have been treated with a sealant such as methacrylate, epoxy or silane, the Cracking (1130) defect shall not be used. The appropriate protective coating or wearing surface element should be used and the date of application provided in the element notes.

The Abrasion/Wear (1190) defect shall not be used to report secure aggregate exposed by profile grinding.

Any settlement up to ¾ of an inch is within tolerable limits. Settlement of ¾ inch or more are considered to have exceeded tolerable limits and should be addressed through appropriate work recommendations.

This page intentionally left blank.

3.8 - Railings

This section covers bridge rail, which may be fabricated from steel, other metal, concrete, masonry, and other materials.

Element # 330: Bridge Railing - Metal

Description: All types and shapes of metal bridge railing. Steel, aluminum, metal beam, rolled shapes, etc. will all be considered part of this element. Included in this element are the posts of metal, timber or concrete, blocking, and curb.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Number of rows of bridge rail times the length of the bridge. The element quantity includes only the rail on the bridge. Exclude pedestrian fencing or chain link fencing.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Fatigue Crack (Steel/Other) (1010)	None	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack exists that is not arrested but does not warrant structural review.	
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	
Distortion (1900)	None	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed, but does not warrant structural review.	
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Rails with any combination of metal and concrete should be recorded as Elements #331 or #333.

This element may use Element #515, Steel Protective Coating-Paint, when applicable. No other protective coating or protective system shall be used.

The number of rows of rail on a bridge is commonly two, one on each side of the traveled way. In some cases there may be more than two rows when the bridge has a center median or protected pedestrian/bicycle lanes. Refer to the other bridge rail material elements (concrete, timber, masonry, other) for specific defects for assessing the condition of posts, blocking and curbs that may be constructed of materials other than metal.

Any gouges in the steel element caused by impact damage shall be captured under Defect #1900 – Distortion.

Element # 331: Bridge Railing - Reinforced Concrete

Description: All types and shapes of reinforced concrete bridge railing. All elements of the railing must be concrete.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Number of rows of bridge rail times the length of the bridge; includes only the rail on the bridge. Exclude pedestrian fencing or chain link fencing.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Delamination/ Spall/ Patched Area (1080)	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Exposed Rebar (1090)	None	Present without measurable section loss.	Present with measurable section loss, but does not warrant structural review.	
Efflorescence/ Rust Staining (1120)	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
Cracking (RC and Other) (1130)	None or insignificant cracks.	Unsealed moderate width cracks or unsealed moderate pattern (map) cracking. Cracks from .012 to 0.05 inches wide.	Wide cracks or heavy pattern (map) cracking. Cracks greater than 0.05 inches wide.	
Abrasion/Wear (PSC/RC) (1190)	No abrasion or wearing.	Abrasion or wearing has exposed coarse aggregate but the aggregate remains secure in the concrete.	Coarse aggregate is loose or has popped out of the concrete matrix due to abrasion or wear.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Element #520 Reinforcing Steel Protective System will not be used for bridge rail elements.

The number of rows of rail on a bridge is commonly two, one on each side of the traveled way. In some cases, there may be more than two rows when the bridge has a center median or protected pedestrian/bicycle lanes.

The inspector should use judgment when utilizing the condition state defect definitions, especially for concrete cracking. The crack defect description definitions describe generalized distress, but the inspector should consider width, spacing, location, orientation, and structural or non-structural nature of the cracking. The inspector should consider exposure and environment when evaluating crack width.

Reinforced concrete cracks less than 0.012 inches can be considered insignificant and a defect is not warranted. Insignificant cracks shall not be coded or quantified with the Cracking (1130) defect. General descriptions of insignificant cracks may be included under the parent element notes, if needed for tracking purposes.

Cracks ranging from 0.012 to 0.05 inches can be considered moderate, and cracks greater than 0.05 inches can be considered wide.

When cracks on the surface of this element have been treated with a sealant such as methacrylate, epoxy or silane, the Cracking (1130) defect shall not be used. The appropriate protective coating or wearing surface element should be used and the date of application provided in the element notes.

Element # 332: Bridge Railing - Timber

Description: All types and shapes of timber bridge railing. Included in this element are posts of timber, metal, or concrete, blocking, and curb.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Number of rows of bridge rail times the length of the bridge; includes only the rail on the bridge. Exclude pedestrian fencing or chain link fencing.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Decay/Section Loss (1140)	None	Affects less than 10% of the member section.	Affects 10% or more of the member but does not warrant structural review.	
Check/Shake (1150)	Surface penetration less than 5% of the member thickness regardless of location.	Penetrates 5% - 50% of the thickness of the member and not in a tension zone.	Penetrates more than 50% of the thickness of the member or more than 5% of the member thickness in a tension zone. Does not warrant structural review.	
Crack (Timber) (1160)	None.	Crack that has been arrested through effective measures.	Identified crack exists that is not arrested, but does not require structural review	
Split/Delamination (Timber) (1170)	None	Length less than the member depth or arrested with effective actions taken to mitigate.	Length equal to or greater than the member depth, but does not require structural review.	
Abrasion/Wear (Timber) (1180)	None or no measurable section loss.	Section loss less than 10% of the member thickness.	Section loss 10% or more of the member thickness, but does not warrant structural review.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Protective coatings or system shall not be used for this element.

The number of rows of rail on a bridge is commonly two, one on each side of the traveled way. In some cases there may be more than two rows when the bridge has a center median or protected pedestrian/bicycle lanes. Refer to the other bridge rail material elements (metal, concrete, masonry, other) for specific defects for assessing the condition of posts, blocking and curbs that may be constructed of materials other than timber.

Element # 333: Bridge Railing - Other

Description: All types and shapes of bridge railing except those defined as metal, concrete, timber, or masonry. Use this element for combination rails that have concrete parapets and metal top sections attached.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Number of rows of bridge rail times the length of the bridge. The element quantity includes only the rail on the bridge.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None	Freckled Rust. Corrosion of the steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Fatigue Crack (Steel/Other) (1010)	None	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack exists that is not arrested but does not warrant structural review.	
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	
Delamination/ Spall/ Patched Area (1080)	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	
Exposed Rebar (1090)	None	Present without measurable section loss.	Present with measurable section loss, but does not warrant structural review.	
Efflorescence/ Rust Staining (1120)	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
Cracking (RC and Other) (1130)	None or insignificant cracks.	Unsealed moderate width cracks or unsealed moderate pattern (map) cracking. Cracks from 0.012 to 0.05 inches wide.	Wide cracks or heavy pattern (map) cracking. Cracks greater than 0.05 inches wide.	
Abrasion/Wear (PSC/RC) (1190)	No abrasion or wearing.	Abrasion or wearing has exposed coarse aggregate but the aggregate remains secure in the concrete.	Coarse aggregate is loose or has popped out of the concrete matrix due to abrasion or wear.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Deterioration (Other) (1220)	None	Initiated breakdown or deterioration.	Significant deterioration or breakdown, but does not warrant structural review.	
Distortion (1900)	None	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed, but does not warrant structural review.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

This element should be used for materials not otherwise defined.

Concrete bridge rails with tubular hand railing shall use this element. However, this element should not be used for rails with pedestrian or chain link fencing and no distinct tubular hand railing.

This element may use Element #515, Steel Protective Coating-Paint, when applicable. No other protective coating or protective system shall be used.

The number of rows of rail on a bridge is commonly two, one on each side of the traveled way. In some cases there may be more than two rows when the bridge has a center median or protected pedestrian/bicycle lanes.

The inspector should use judgment when utilizing the condition state defect definitions, especially for concrete cracking. The crack defect description definitions describe generalized distress, but the inspector should consider width, spacing, location, orientation, and structural or non-structural nature of the cracking. The inspector should consider exposure and environment when evaluating crack width.

Reinforced concrete cracks less than 0.012 inches can be considered insignificant and a defect is not warranted. Insignificant cracks shall not be coded or quantified with the Cracking (1130) defect. General descriptions of insignificant cracks may be included under the parent element notes, if needed for tracking purposes.

Cracks ranging from 0.012 to 0.05 inches can be considered moderate, and cracks greater than 0.05 inches can be considered wide.

When cracks on the surface of this element have been treated with a sealant such as methacrylate, epoxy or silane, the Cracking (1130) defect shall not be used. The appropriate protective coating or wearing surface element should be used and the date of application provided in the element notes.

Any gouges in the steel element caused by impact damage shall be captured under Defect #1900 – Distortion.

Element # 334: Bridge Railing - Masonry

Description: All types and shapes of masonry block or stone bridge railing. All elements of the railing must be masonry block or stone.

Classification: NBE - National Bridge Element Units of Measurement: ft.

Quantity Calculation: Number of rows of bridge rail times the length of the bridge; includes only the rail on the bridge.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Delamination/ Spall/ Patched Area (1080)	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Efflorescence/ Rust Staining (1120)	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
Mortar Breakdown (Masonry) (1610)	None	Cracking or voids in less than 10% of joints.	Cracking or voids in 10% or more of the of joints	
Split/Spall (Masonry) (1620)	None	Block or stone has split or spalled with no shifting.	Block or stone has split or spalled with shifting but does not warrant a structural review.	
Patched Area (Masonry) (1630)	None	Sound Patch	Unsound Patch	
Masonry Displacement (1640)	None	Block or stone has shifted slightly out of alignment.	Block or stone has shifted significantly out of alignment or is missing but does not warrant structural review.	
Distortion (1900)	None	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed, but does not warrant structural review.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

The number of rows of rail on a bridge is commonly two, one on each side of the bridge. In some cases there may be more than two rows when you have a center median or protected pedestrian/bicycle lanes.

This page intentionally left blank.

3.9 - Wearing Surfaces, Protective Coatings, and Concrete Reinforcing Steel Protective Systems

The elements in this section are wearing surfaces, steel and concrete protective coatings, and concrete reinforcing steel protection systems such as cathodic protection. These systems will influence the deterioration and condition of the underlying structural element.

Element # 510: Deck Wearing Surface – Asphaltic Concrete

Description: All decks/slabs that have overlays made with flexible (asphaltic concrete).

Classification: BME - Bridge Management Element Units of Measurement: sq. ft.

Quantity Calculation: Should include the area of the deck/slab that is protected by this wearing surface.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Delamination/ Patched Area/ Pothole (Wearing Surfaces) (3210)	None	Patched area that is sound. Partial depth pothole.	Patched area that is unsound or showing distress. Full depth pothole.	The wearing surface is no longer effective.
Crack (Wearing Surface) (3220)	Sealed Cracks	Crack width 0.25–0.5 inches wide.	Width of more than 0.5 in. wide	
Effectiveness (Wearing Surface) (3230)	Fully effective. No evidence of leakage or further deterioration of the protected element.	Substantially effective. Deterioration of the protected element has slowed.	Limited effectiveness. Deterioration of the protected element has progressed.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Chip seals should be captured using this element.

Element notes should contain the type of overlay, when it was placed and minimum and maximum thickness, if the thickness varies.

A sound patch is constructed of AC and is functioning similar to the original overlay material. An unsound patch is one constructed of AC that is no longer sound or unsuitable material.

Element # 511: Deck Wearing Surface – Concrete (Polyester)

Description: This element is for all decks/slabs that have overlays made with rigid (portland cement) materials or polyester concrete.

Classification: ADE – Agency Defined Element Units of Measurement: sq. ft.

Quantity Calculation: Should include the area of the deck/slab that is protected by this wearing surface.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Delamination/ Patched Area/ Pothole (Wearing Surfaces) (3210)	None	Patched area that is sound. Partial depth pothole.	Patched area that is unsound or showing distress. Full depth pothole.	The wearing surface is no longer effective.
Crack (Wearing Surface) (3220)	Sealed Cracks	Crack width 0.012–0.05 inches wide.	Width of more than 0.05 in. wide	
Effectiveness (Wearing Surface) (3230)	Fully effective. No evidence of leakage or further deterioration of the protected element.	Substantially effective. Deterioration of the protected element has slowed.	Limited effectiveness. Deterioration of the protected element has progressed.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Element notes should contain the type of overlay, when it was placed and minimum and maximum thickness, if the thickness varies.

A sound patch is constructed of concrete and is functioning similar to the original overlay material. An unsound patch is one constructed of AC or other unsuitable material or a concrete patch that is no longer sound.

Element # 512: Deck Wearing Surface - Epoxy

Description: This element is for all decks/slabs that have overlays made with epoxy materials.

Classification: ADE – Agency Defined Element Units of Measurement: sq. ft.

Quantity Calculation: Should include the area of the deck/slab that is protected by this wearing surface.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Delamination/ Patched Area/ Pothole (Wearing Surfaces) (3210)	None	Patched area that is sound. Partial depth pothole.	Patched area that is unsound or showing distress. Full depth pothole.	The wearing surface is no longer effective.
Crack (Wearing Surface) (3220)	Sealed Cracks	Crack width 0.012–0.05 inches wide.	Width of more than 0.05 in. wide	
Effectiveness (Wearing Surface) (3230)	Fully effective. No evidence of leakage or further deterioration of the protected element.	Substantially effective. Deterioration of the protected element has slowed.	Limited effectiveness. Deterioration of the protected element has progressed.	
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Element notes should contain the type of overlay, when it was placed and minimum and maximum thickness, if the thickness varies.

A sound patch is constructed of epoxy and is functioning similar to the original overlay material. An unsound patch is one constructed of AC or other unsuitable material or an epoxy patch that is no longer sound.

Element # 513: Deck Wearing Surface - Timber

Description: All timber wearing surfaces

Classification: ADE – Agency Defined Element Units of Measurement: sq. ft.

Quantity Calculation: Area of the wearing surface.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Connection (1020)	Connection is in place and functioning as intended.	Loose fasteners or pack rust without distortion is present, but the connection is in place and functioning as intended.	Missing bolts, rivets, broken welds, fasteners or pack rust with distortion, but does not warrant a structural review.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge. OR A structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Decay/ Section Loss (1140)	None	Affects less than 10% of the member section.	Affects 10% or more of the member but does not warrant structural review.	
Check/Shake (1150)	Surface penetration less than 5% of the member thickness regardless of location.	Penetrates 5% - 50% of the thickness of the member and not in a tension zone.	Penetrates more than 50% of the thickness of the member or more than 5% of the member thickness in a tension zone. Does not warrant structural review.	
Crack (Timber) (1160)	None.	Crack that has been arrested through effective measures.	Identified crack exists that is not arrested, but does not require structural review	
Split/Delamination (Timber) (1170)	None	Length less than the member depth or arrested with effective actions taken to mitigate.	Length equal to or greater than the member depth, but does not require structural review.	
Abrasion/Wear (Timber) (1180)	None or no measurable section loss.	Section loss less than 10% of the member thickness.	Section loss 10% or more of the member thickness, but does not warrant structural review.	

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

Timber running planks shall be captured with this element.

Element # 515: Steel Protective Coating - Paint

Description: Steel elements that have a protective coating such as paint, or other top coat steel corrosion inhibitor.

Classification: BME - Bridge Management Element Units of Measurement: sq. ft. (surface)

Quantity Calculation: Should include the entire protected surface of the steel element.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Chalking (Steel Protective Coatings) (3410)	None	Surface Dulling	Loss of Pigment	Not Applicable
Peeling/Bubbling/Cracking (Steel Protective Coatings) (3420)	None	Finish coats only.	Finish and primer coats	Exposure of bare metal
Effectiveness (Steel Protective Coatings) (3440)	Fully effective	Substantially effective	Limited effectiveness	Failed, no protection of the underlying metal
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

This element shall describe all painted coating systems.

This protective coating is to be used on all painted steel elements including rails. Paint area on bracing and portals is not counted, but is quantified as the projected length along the primary element and the condition described in the element text.

Elements NOT requiring this coating system to be reported: Bearings (311,313,314,315, 316), Restrainer Cables (180-182), Gusset Plates (162), Pin and Hanger Assemblies (161), and Secondary Cables (148-149).

Calculating Coating Areas:

Metal Bridge Rails = 0.15x projected area
W shape guardrail = 3 SF/LF or 0.95 Sq. Meters per linear meter
Thrie Beam guardrail = 4.5 SF/LF or 1.38 Sq. Meters per linear meter
Girders, stringers and floor beams with top flange embedded = 3x flange width + 2x girder depth
Girders, stringers and floor beams with top flange not embedded = 4x flange width + 2x girder depth
Trusses = 1.3x projected area of truss
Box girders = use flat plate areas for decks, girders, and soffits; count both faces; exclude diaphragms, and secondary members.

Element # 516: Steel Protective Coating - Galvanization

Description: The element is for steel elements that have a protective galvanized coating system.

Classification: ADE – Agency Defined Element Units of Measurement: sq ft. (surface)

Quantity Calculation: Should include the entire protected surface of the steel element.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Peeling/Bubbling/Cracking (Steel Protective Coatings) (3420)	None	Finish coats only.	Finish and primer coats	Exposure of bare metal
Oxide Film Degradation Color/ Texture Adherence (Steel Protective Coatings) (3430)	Tightly adhered, capable of withstanding hammering or vigorous wire brushing.	Granular texture.	Small flakes, less than 1/2 in. diameter.	Large flakes, 1/2 in. diameter or greater or laminar sheets or nodules.
Effectiveness (Steel Protective Coatings) (3440)	Fully effective	Substantially effective	Limited effectiveness	Failed, no protection of the underlying metal
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

This element shall describe all galvanized coating systems.

This protective coating shall only be captured when the primary structural members are protected with galvanization.

Elements NOT requiring this coating system to be reported: Bearings (311,313,314,315, 316), Restrainer Cables (180-182), Gusset Plates (162), Pin and Hanger Assemblies (161), Secondary Cables (148-149), Bridge Railing (330-334).

Calculating Coating Areas:

Girders, stringers and floor beams with top flange embedded = 3x flange width + 2x girder depth
Girders, stringers and floor beams with top flange not embedded = 4x flange width + 2x girder depth
Trusses = 1.3x projected area of truss
Box girders = use flat plate areas for decks, girders, and soffits; count both faces; exclude diaphragms, and secondary members.

Element # 517: Steel Protective Coating - Weathering Steel

Description: Steel elements that have a protective weathering steel coating.

Classification: ADE – Agency Defined Element Units of Measurement: sq.ft. (surface)

Quantity Calculation: Should include the entire protected surface of the steel element.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Peeling/Bubbling/Cracking (Steel Protective Coatings) (3420)	None	Finish coats only.	Finish and primer coats	Exposure of bare metal
Oxide Film Degradation Color/ Texture Adherence (Steel Protective Coatings) (3430)	Yellow-orange or light brown for early development. Chocolate-brown to purple-brown for fully developed.	Granular texture.	Small flakes, less than 1/2 in. diameter.	Dark black color.
Effectiveness (Steel Protective Coatings) (3440)	Fully effective	Substantially effective	Limited effectiveness	Failed, no protection of the underlying metal
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

This element shall describe all weathering steel coating systems.

This protective coating shall only be captured when the primary structural members are protected with weathering steel.

Elements NOT requiring this coating system to be reported: Bearings (311,313,314,315, 316), Restrainer Cables (180-182), Gusset Plates (162), Pin and Hanger Assemblies (161), Secondary Cables (148-149), Bridge Railing (330-334).

Calculating Coating Areas:

Girders, stringers and floor beams with top flange embedded = 3x flange width + 2x girder depth
Girders, stringers and floor beams with top flange not embedded = 4x flange width + 2x girder depth
Trusses = 1.3x projected area of truss
Box girders = use flat plate areas for decks, girders, and soffits; count both faces; exclude diaphragms, and secondary members.

Element # 520: Reinforcing Steel Protective System (Rebar Coating/Cathodic)

Description: All types of protective systems used to protect reinforcing steel in concrete elements from corrosion.

Classification: BME - Bridge Management Element Units of Measurement: sq.ft.

Quantity Calculation: Should include the entire surface area of the protected element.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Effectiveness (Rebar Protective System-Coating/Cathodic) (3600)	Fully effective	Substantially effective	Limited effectiveness	The protective system has failed or is no longer effective.
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

This element will be used for all deck, slab, superstructure and substructure components.

This element will not be used for bridge rail elements.

This protection system element is intended to capture situations where the concrete element may be expected to deteriorate at a rate that is slower than unprotected situations. Protection systems may include ***rebar coatings, cathodic protection, or other similar protection methods***. Wearing surfaces are addressed under the appropriate wearing surface element and not this element.

Element # 521: Concrete Protective Coating (Methacrylate/Sealer)

Description: Concrete elements that have a penetrating sealer applied to them. These coatings include silane/siloxane water proofers, crack sealers such as High Molecular Weight Methacrylate (HMWM), or any top coat barrier that protects concrete from deterioration and reinforcing steel from corrosion.

Classification: BME - Bridge Management Element Units of Measurement: sq.ft. (surface)

Quantity Calculation: Should include the entire protected surface of the concrete element.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Wear (Concrete Protective Coatings) (3510)	None	Underlying concrete not exposed. Coating showing wear from UV exposure. Friction course missing	Underlying concrete is not exposed. Thickness of the coating is reduced.	Underlying concrete exposed. Protective coating no longer effective.
Effectiveness (Concrete Protective Coatings) (3540)	Fully effective	Substantially effective	Limited effectiveness	The protective system has failed or is no longer effective.
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

This element is NOT to be used for painted concrete unless the paint was specifically placed to protect the concrete from water, salts, or similar.

Bridge decks that have been treated with methacrylate, but have no defects shall be quantified and reported in Condition State 1.

Element # 522: Deck Membrane

Description: Concrete elements that have a protective membrane applied to the member. The typical configuration is a waterproofing membrane under the AC overlay that protects the concrete from deterioration and reinforcing steel from corrosion.

Classification: ADE – Agency Defined Element Units of Measurement: sq.ft. (surface)

Quantity Calculation: Should include the entire protected surface of the concrete element.

Condition State Definitions

Defects	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Wear (Concrete Protective Coatings) (3510)	None	Underlying concrete not exposed. Coating showing wear from UV exposure. Friction course missing	Underlying concrete is not exposed. Thickness of the coating is reduced.	Underlying concrete exposed. Protective coating no longer effective.
Effectiveness (Concrete Protective Coatings) (3540)	Fully effective	Substantially effective	Limited effectiveness	The protective system has failed or is no longer effective.
Damage (7000)	Not applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate material defect entry.

Element Commentary:

The element notes shall include the installation date and type of membrane.

This page intentionally left blank.

3.10 - Environmental Factors (Service Conditions)

Elements exposed to different environmental factors and service conditions deteriorate differently. These factors may include:

- Operational activities from traffic volumes and truck movements
- Exposure to water, road salt, and other corrosive materials
- Condition of protective and water proofing systems
- Temperature extremes, either from nature or human activity

When inventorying and assessing the condition of the elements, an inspector should consider the environment in which the element is operating. The environment designation of an element can change over time; as it would, for example, if operating policies were changed to reduce the use of road salt. However, by definition, the environment designation for any element cannot change as the result of maintenance work or deterioration.

Environment	Description
1—Benign	Neither environmental factors nor operating practices are likely to significantly change the condition of the element over time, or their effects have been mitigated by the presence of highly effective protective systems.
2—Low	Environmental factors, operating practices, or both either do not adversely influence the condition of the element, or their effects are substantially lessened by the application of effective protective systems.
3—Moderate	Any change in the condition of the element is likely to be quite normal as measured against the environmental factors, operating practices, or both that are considered typical by the agency.
4—Severe	Environmental factors, operating practices, or both, contribute to the rapid decline in the condition of the element. Protective systems are not in place or are ineffective.

Examples of factors that could increase the severity of the environment rating for various types of elements may include any of the following.

The inspector would record the predominant environment factor affecting an element.

Element	Example Environmental Factors
Timber Elements	High moisture content Pest infestation Ice flow impacts
Steel Elements	Distance from salt air Water wet/dry cycles Exposure to corrosive soils and liquids
Concrete Elements	Freeze-thaw cycles Tire chain wear Deck salting
Petroleum Based	High temperatures
Joints and Bearings	Extreme temperature ranges
Operating Practices	High traffic and/or truck volume

This page intentionally left blank.

Appendix A —Element Groupings

The charts on the following pages organize the elements defined in Chapter 3 of this manual into National Bridge Elements and Bridge Management Elements. For each element, the name, identifier and units of measure are shown, and elements are grouped by major bridge assembly and material type.

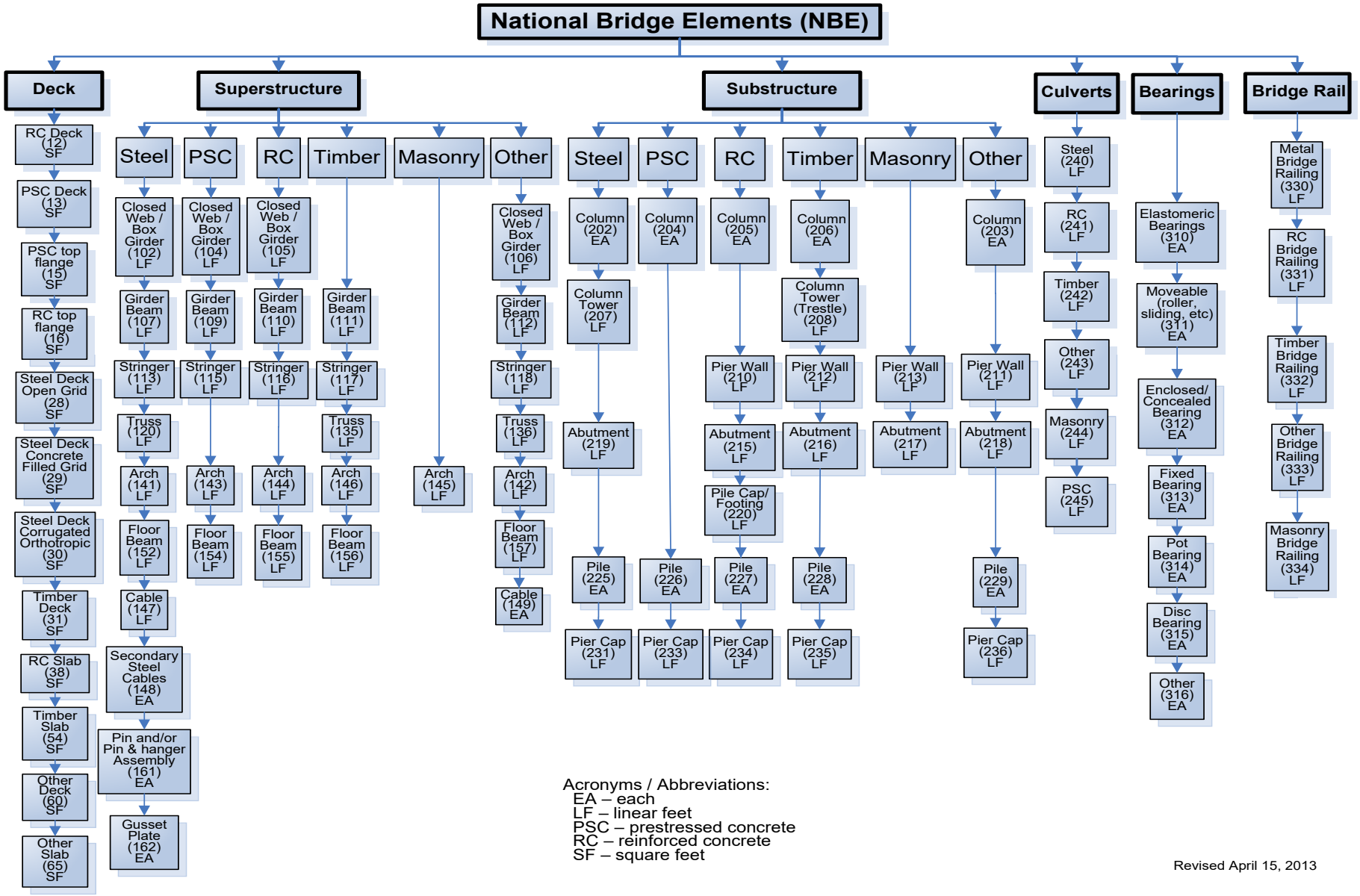
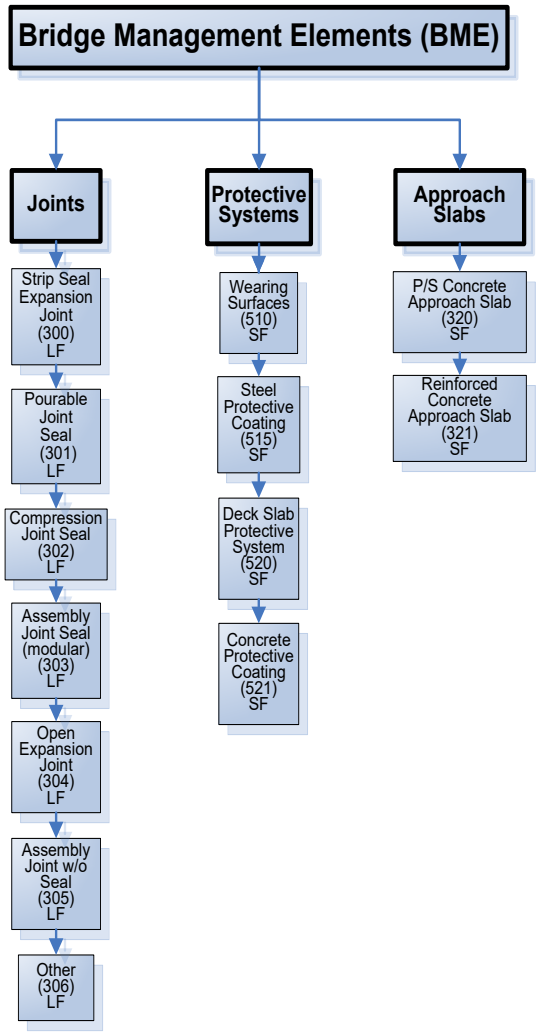


Figure A-1 – National Bridge Elements



Acronyms / Abbreviations:
LF – linear feet
P/S – prestressed
SF – square feet

Revised April 15, 2013

Figure A-2 - Bridge Management Elements

This page intentionally left blank.

Appendix B —Materials and Defects

This appendix describes the element materials defined for this specification and the defects that may be observed for each condition state. The materials include reinforced and prestressed concrete, steel, timber, masonry, other materials, and element types that are made of mixed materials or are not material based including joints, protective coatings, wearing surfaces, and deck protection systems. For each of these, the defects are identified with a unique defect code and conditions are described for each state. The primary intention of this appendix is to provide a roadmap of defined defects for each material, without considering the specific elements constructed of the material. Defect identification codes are provided for reference consistent with Appendix E. Section D.1 provides a list of the defects cross-tabulated with the materials for which the defects are defined. Defect condition state descriptions are detailed in section D.2. Figure D.1 presents the information in graphical form. The purpose of material defects is to detail the type of distress to the parent element for management and tracking purposes. Listing material defects is optional for the bridge owner. Because Condition State 1 quantifies the portion of the element in good condition, material defects for this condition state typically are not recorded.

B1 - Defect Definitions and Materials

Defect names and ID numbers in the following table correspond to the defects associated with each element definition in Chapter 3.

Defect	Definition	Materials
Corrosion (1000)	This defect is used to report corrosion of metal and other material elements	Steel/Metal Other Materials
Fatigue Crack (Steel/Other) (1010)	This defect is used to report fatigue cracking in metal and other material elements	Steel/Metal Other Materials
Connection (1020)	This defect is used to report connection distress in metal and other material elements. The connection defect should be applied to the member with the actual distress. For example, a crack in the web stiffener connecting a floor beam to a girder (not in the girder) would be associated with the floor beam. If the crack was located in the girder then the defect would be reported in the girder element. If the connection defect is in a bolted connection, report the defect on the element whose load path is interrupted.	Steel/Metal, Timber Other Materials
Cable Slack (1025)	This defect is used to report differential cable tension (slack or tightness) between individual cables that comprise a multiple cable EQ restrainer system. This shall not be used for any other cable element other than EQ restrainer cables.	Agency defined EQ restrainer cable regardless of material type.

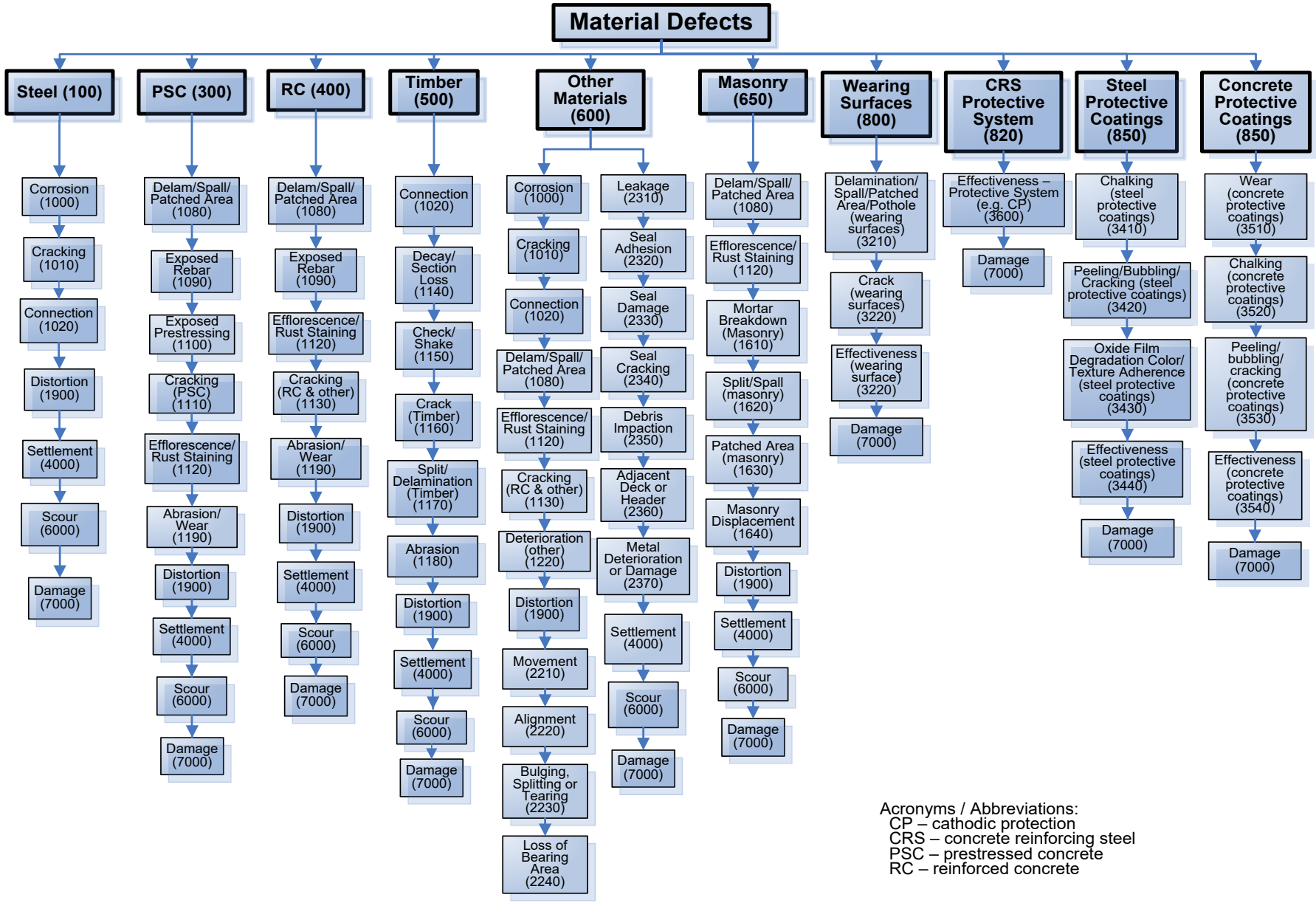
Defect	Definition	Materials
Delamination/Spall/ Patched Area (1080)	This defect is used to report spalls, delamination and patched areas in concrete, masonry and other material elements	PSC, RC Masonry Other Materials
Exposed Rebar (1090)	This defect is used to report exposed conventional reinforcing steel in reinforced and prestressed concrete elements	PSC, RC
Exposed Prestressing (1100)	This defect is used to report exposed prestressing steel in concrete elements	PSC
Cracking (PSC) (1110)	This defect is used to report cracking in prestressed concrete elements	PSC
Efflorescence/ Rust Staining (1120)	This defect is used to report efflorescence/rust staining in concrete and masonry elements	PSC, RC Masonry Other Materials
Cracking (RC and Other) (1130)	This defect is used to report cracking in reinforced concrete and other material elements	RC Other Materials
Decay/Section Loss (1140)	This defect is used to report decay (section loss) in timber elements	Timber
Check/Shake (1150)	This defect is used to report checks and shakes in timber elements	Timber
Crack (Timber) (1160)	This defect is used to report cracking in timber elements	Timber
Split/Delamination (Timber) (1170)	This defect is used to report splits / delaminations in timber elements	Timber
Abrasion/Wear (Timber) (1180)	This defect is used to report abrasion in timber elements	Timber

Defect	Definition	Materials
Abrasion/Wear (PSC/RC) (1190)	This defect is used to report abrasion/wear in PSC and RC elements	PSC, RC
Deterioration (Other) (1220)	This defect is used to report general deterioration in elements constructed of other materials such as fiber reinforced plastics or similar	Other Materials
Mortar Breakdown (Masonry) (1610)	This defect is used to report breakdown of masonry mortar between brick, block or stone	Masonry
Split/Spall (Masonry) (1620)	This defect is used to report splits or spalls in brick, block or stone	Masonry
Patched Area (Masonry) (1630)	This defect is used to report masonry patched areas	Masonry
Masonry Displacement (1640)	This defect is used to report displaced brick, block or stone	Masonry
Distortion (1900)	This defect is used to report distortion from the original line or grade of the element. It is used to capture all distortion regardless of cause. This defect can be used for members that have settled (ie culverts), impacted distorted elements, compression members that are out of alignment or warped or bowed members.	Steel/Metal PSC, RC Masonry Timber Other Materials
Movement (2210)	This defect is used to report movement of bridge bearing elements	Other Materials
Alignment (2220)	This defect is used to report alignment of bridge bearing elements	Other Materials
Bulging, Splitting or Tearing (2230)	This defect is used to report bulging, splitting or tearing of elastomeric bearing elements	Other Materials
Loss of Bearing Area (2240)	This defect is used to report the loss of bearing area for bridge bearing elements	Other Materials

Defect	Definition	Materials
Leakage (2310)	This defect is used to report leakage through or around sealed bridge joints.	Other Materials
Seal Adhesion (2320)	This defect is used to report loss of adhesion in sealed bridge joints.	Other Materials
Seal Damage (2330)	This defect is used to report damage to the rubber in bridge joint seals.	Other Materials
Seal Cracking (2340)	This defect is used to report cracking in the rubber in bridge joint seals.	Other Materials
Debris Impaction (2350)	This defect is used to report the accumulation of debris in bridge joint seals that may or may not affect the performance of the joints.	Other Materials
Adjacent Deck or Header (2360)	This defect is used to report concrete deck damage in the area anchoring the bridge joint.	Other Materials
Metal Deterioration or Damage (2370)	This defect is used to report metal damage or deterioration in the bridge joint.	Other Materials
Delamination/Patched Area/ Pothole (AC Wearing Surfaces) (3210)	This defect is used to report spalls, delaminations, patched areas and potholes in wearing surface elements	Wearing Surfaces
Delamination/Spall/ Patched Area (Concrete Wearing Surfaces) (3211)	This defect is used to report spalls, delaminations, patched areas in wearing surface elements	Wearing Surfaces
Delamination/Spall/ Patched Area (Epoxy Wearing Surfaces) (3212)	This defect is used to report spalls, delaminations, patched areas in wearing surface elements	Wearing Surfaces
Crack (AC Wearing Surface) (3220)	This defect is used to report cracking in wearing surface elements	Wearing Surfaces

Defect	Definition	Materials
Crack (Concrete Wearing Surface) (3221)	This defect is used to report cracking in wearing surface elements	Wearing Surfaces
Crack (Epoxy Wearing Surface) (3222)	This defect is used to report cracking in wearing surface elements	Wearing Surfaces
Effectiveness (Wearing Surface) (3230)	This defect is used to the loss of effectiveness in the protection provided to the deck by the wearing surface elements	Wearing Surfaces
Chalking (Steel Protective Coatings) (3410)	This defect is used to report chalking in metal protective coatings	Steel/Metal Protective Coatings
Peeling/Bubbling/Cracking (Steel Protective Coatings) (3420)	This defect is used to report peeling, bubbling or cracking in metal protective coatings	Steel/Metal Protective Coatings
Oxide Film Degradation Color/ Texture Adherence (Steel Protective Coatings) (3430)	This defect is used to report oxide film degradation of texture in metal protective coatings	Steel/Metal Protective Coatings
Effectiveness (Steel Protective Coatings) (3440)	This defect is used to report the loss of effectiveness of metal protective coatings	Steel/Metal Protective Coatings
Wear (Concrete Protective Coatings) (3510)	This defect is used to report the wearing of concrete protective coatings	Concrete Protective Coatings
Chalking (Concrete Protective Coatings) (3520)	This defect is used to report chalking of concrete protective coatings	Concrete Protective Coatings
Peeling/ Bubbling/ Cracking (Concrete Protective Coatings) (3530)	This defect is used to report peeling/bubbling/cracking of concrete protective coatings	Concrete Protective Coatings

Defect	Definition	Materials
Effectiveness (Concrete Protective Coatings) (3540)	This defect is used to report the effectiveness of concrete protective coatings	Concrete Protective Coatings
Effectiveness (Rebar Protective System Coating/Cathodic) (3600)	This defect is used to report the effectiveness of internal concrete protective systems (epoxy rebar, cathodic protection etc.)	Reinforcing Steel Protective Systems
Settlement (4000)	This defect is used to report settlement in substructure elements	Steel/Metal PSC, RC Masonry Timber Other Materials
Scour (6000)	This defect is used to report scour in substructure elements. The scour should be reported for the lowest elevation element only. For example, scoured channel elevations within the piles should have scour on the pile element but not the pile cap. Guidance on determining tolerable scour limits can be found in the SM&I Procedures Manual. When in doubt, consult the SM&I Hydraulic Unit for a bridge specific determination.	Steel/Metal PSC, RC Masonry Timber Other Materials
Damage (7000)	This defect is used to capture impact damage that has occurred. This defect is unique in that its purpose is to signify that conditions captured using another defect are the result of damage and not deterioration. For example, a high load hit causes a spall in a concrete girder. Record the damaged limits of the girder and include the damage defect with a matching quantity to indicate it is impact damage caused. In the above example, the engineer should determine the length requiring repair when setting both quantities. In some cases such as a timber stringer, this may be the entire element length.	Steel/Metal, PSC, RC, Masonry, Timber, Other Materials, Wearing Surfaces, Steel/Metal Protective Coatings, Concrete Protective Coatings, Concrete Reinforcing Steel Protective Systems



Acronyms / Abbreviations:
CP – cathodic protection
CRS – concrete reinforcing steel
PSC – prestressed concrete
RC – reinforced concrete

Revised April 15, 2013

This page intentionally left blank.

Column & Pile

Supplement to the Caltrans Element Inspection Manual

Guidelines to provide additional direction for coding column and pile elements.

Column and Pile Element Guidelines

These guidelines are intended to clarify element recording of columns and piles. Columns are defined as any substructure element between the ground, pile cap or obvious construction break distinguishing it from a pile, and the superstructure.

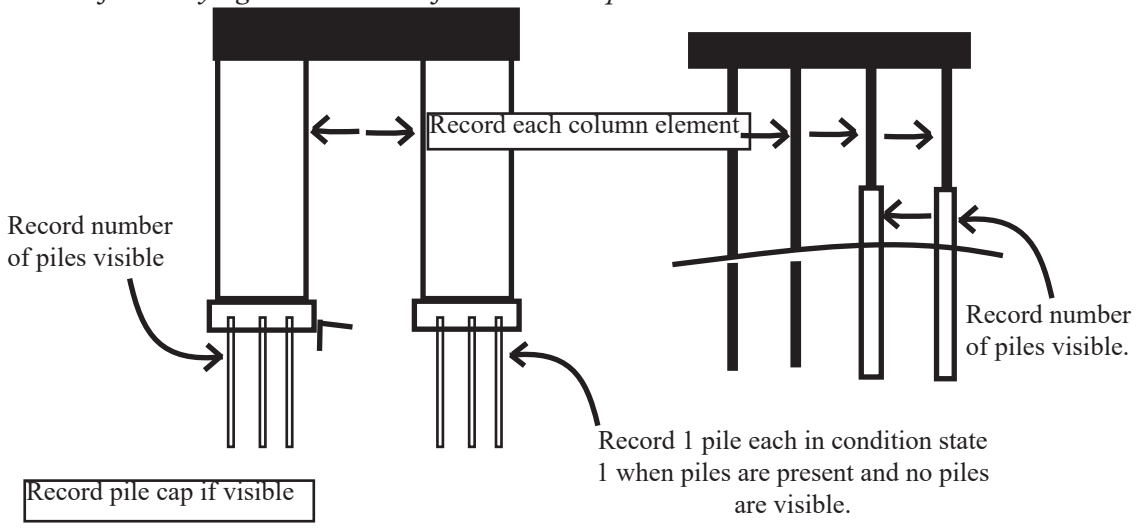
While there is no distinct criteria to distinguish a column from a pier wall, there will typically be multiple columns at a support vs. a single element at a pier wall. A pier wall typically has a dimension transverse to the structure that is much greater than that the dimension parallel to the structure. A pier wall also typically has its own single footing that approximates the width of the structure. When further guidance is needed use the column element when a single or multiple elements are a support location and the dimension transverse to the structure is less than 10 feet. Use the pier wall element when there is a single element and the transverse dimension is over 10 feet.

Full or partial height infill walls (seismic, debris, collision etc.) are not considered to be pier wall elements. For substructure supports that have infill walls, code only columns/caps/piles etc. Any defects associated with infill walls will not be associated with an element, but shall be fully described in the inspection commentary under a SUBSTRUCTURE heading.

The upper portion of non-continuous elements is a column and the lower portion is a pile. This is typical of a driven or CISS pile with a cast in place extension.

Piles that are completely submerged in soil and not visible for inspection are recorded as quantity 1 EA in Condition State 1 for each type of pile present at the structure. If the foundation piles are partially visible for inspection, record the actual number of inspected piles and the corresponding condition states.

Reinforced concrete columns or piles using various types of stay in place steel shell forms should use Element 205 and 227 rather than Element 251 if the column is fully reinforced and not reliant on the shell for capacity. The following illustrations of pages 2-5 are guidelines for the element selection of the varying combinations of columns and piles.



Full length H-type or hollow pipe steel elements

Column Element:
Record the total number of column element 202.

Defects and Protection:
Defects and protection system for the steel columns are recorded per the element manual.

Pile Element:
1 each of pile element 225 in condition state 1 is recorded.

Full length Timber elements

Column Element:
Record the total number of column element 206.

Defects:
Defects for the timber columns are recorded per the element manual.

Pile Element:
1 each of pile element 228 in condition state 1 is recorded.

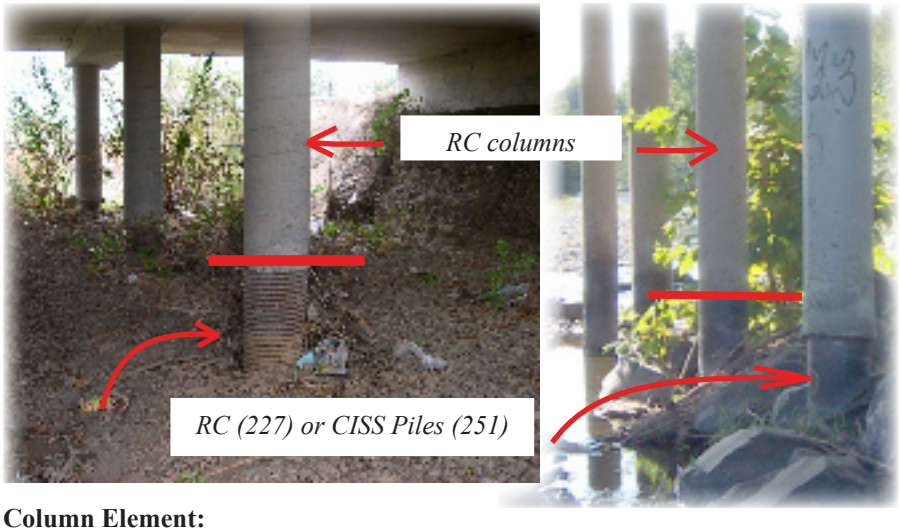
Full length Prestressed or RC elements

Column Element:
Record the total number of column elements 204 or 205.

Defects and Protection:
Defects for the columns are recorded per the element manual.

Pile Element:
1 each of pile element 226 or 227 in condition state 1 is recorded.

RC column with exposed Raymond can piles or pipe piles.



Column Element:
Record the total number of column elements 205.

Defects and Protection:
Defects for the columns are recorded per the element manual.

Pile Element:
When the exposed portion of the pile **does not** rely on the steel shell for capacity record the RC element 227 for each exposed pile.

When the exposed portion of the pile **does** rely on the steel shell for capacity, record the CISS element 251 for each exposed pile.

Pile Defects and Protection:
The RC pile element (227) is always in CS 1 unless the steel shell has corroded to the point where the concrete is sufficiently visible for evaluation. Defects and protection system for the steel shell are not recor - ed but general notes regarding the condition of the steel shell may be included in the RC element text.

Defects and protection systems for pile element 251 are recorded per the element manual.

*Steel elements such as Raymond cans and various other steel pipes and shells filled with **partially** or **un-reinforced** concrete where the steel casing is relied on for capacity.*

Column Element:
The total number of visible columns is recorded.

Use the Steel Column element (202) when the column element **relies** on the steel shell for capacity. Conservatively use this element if the function of the steel shell has not been determined. In cases where the function has not been determined and there is significant corrosion of the steel, a structural review is needed to determine the function of the steel shell and the serviceability of the column.

See the RC element 205 (next page) when it has been determined that the column element **does not** rely on the steel shell for any capacity.

Defects and Protection:
Defects and protection system for the steel column is recorded per the element manual.

Continuous Pile Elements:
For full length continuous steel casing elements the Cast in Steel Shell Pile element (251) is recorded as 1 each in condition state 1.

Discontinuous Pile Elements:
Visible piles:
For discontinuous steel column elements which are on visible piles (either by ABME or UW Inspection), record the appropriate pile type with the number of visible piles with the appropriate defects.

Piles Not Visible:
The appropriate pile type is recorded as 1 each in condition state 1.

*A full length continuous steel casing element containing **fully reinforced** concrete pile. (Per review of Structure Plans)*

Column Element:
The total number of visible columns is recorded.

Use the RC column element (205) when the column element **does not** rely on the steel shell for any capacity.

Defects and Protection:
When it is determined that the element **does not** rely on the steel shell for capacity and the RC Element 205 is used, the RC column is always in CS 1 unless the steel shell has corroded to the point where the concrete is sufficiently visible for evaluation. Defects and protection system for the steel shell are not recorded but general notes regarding the condition of the steel shell may be included in the RC element text.

Pile Element:
The pile element is recorded as 1 each in condition state 1.

Use the RC Pile element (227) when the pile element does not rely on the steel shell for any capacity.

Use the Cast in Steel Shell Pile element (251) when the pile element relies on the steel shell for capacity. Conservatively use this element if the function of the shell has not been determined. In this case when the condition of the steel shell is adversely affecting the substructure rating, a structural review is needed to determine the function of the shell.

Scour Defect

Supplement to the Caltrans Element Inspection Manual

Guidelines to provide additional instruction for using and coding the scour defect to substructure elements.

Coding the Scour defect

Scour is defined as erosion or removal of streambed or bank material around substructure or foundation elements due to river or stream flo . Erosion of embankment material due to roadway runoff is not scour, and will not carry a scour defect.

The scour defect is only applied to the lowest exposed element at a support.

Tolerable limits for unbraced column lengths and maximum lengths of exposed piles below pile caps are noted in table "E" of Section 5.9 of the SM&I Inspection Procedures Manual. Use this information as the basis for coding the scour defect.

The following are definitions for condition states 1-4 using Attachment E:

Conditions for which the scour defect is not used - Minor observed local scour around supports, typical of supports with silt and sand soils.
The channel bed elevations are close to as-built conditions.
There are no exposed footings or the exposed footings are founded on non-erodable bedrock as determined by a structural review.
The scour defect is not applied in condition state 1.

Condition State 2 - Observed scour is greater that the minor conditions noted above but less than the maximum column or pile lengths noted in attachment "E" of Section 5.9.
Scour is within the limits of a spread footing.
Scour has been arrested with effective countermeasures.

Condition State 3 - Scour exceeds the maximum lengths noted in attachment "E" or is undermining a spread footing but a structural review has found that the conditions does not affect the strength or serviceability of the structure.

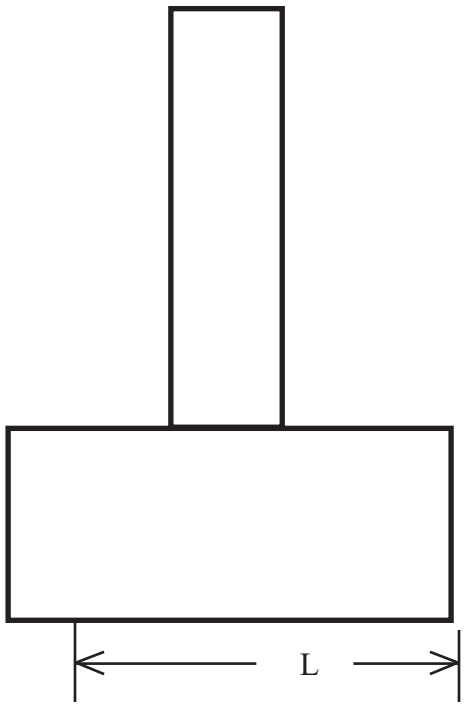
Condition State 4 - Scour exceeds the maximum lengths noted in attachment "E" and a structural review is not yet completed or, a structural review has been completed and the scour impacts the strength or serviceability of the structure.

Structural Review Guidelines- When scour conditions are found which warrant a structural review the inspector will request a hydraulics review via a work request. Hydraulics will then work with the load ratings branch to jointly determine the stability of the structure.

The structural review shall recommend the appropriate mitigation and condition state, either 3 or 4 when no countermeasures are in place or CS 2 when effective scour countermeasures are in place. When the structural review is not completed prior to the required time frame for report transmittal, condition state 4 shall be used until the review has been completed.

The structural review findings and appropriate condition state shall be documented in the element notes.

Scour defect coding for Spread Footings



Scour defect not applied to minor local scour

Applied to column or pier wall

CS 2

Applied to footing

CS 3 When structural review indicated strength or serviceability not affected

CS 4 When structural review indicates strength or serviceability affected

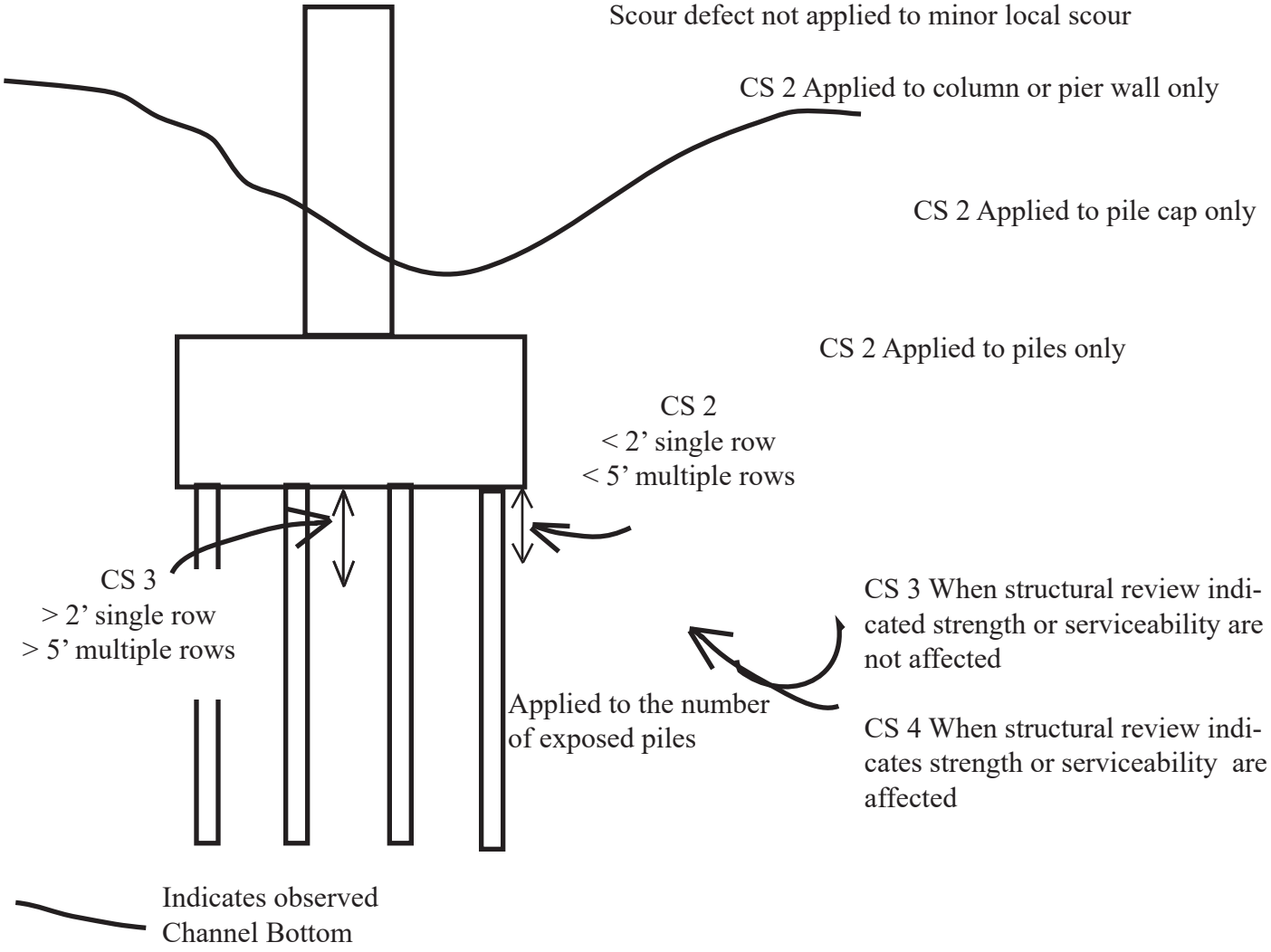
Indicates observed Channel Bottom

Any undermined spread footing requires a structural review.

The scour defect is not used for an exposed footing founded on non-erodable rock with no or insignificant undermining. A structural review should determine that the rock is non-erodable.

The scour defect is applied to the length of undermined footing.

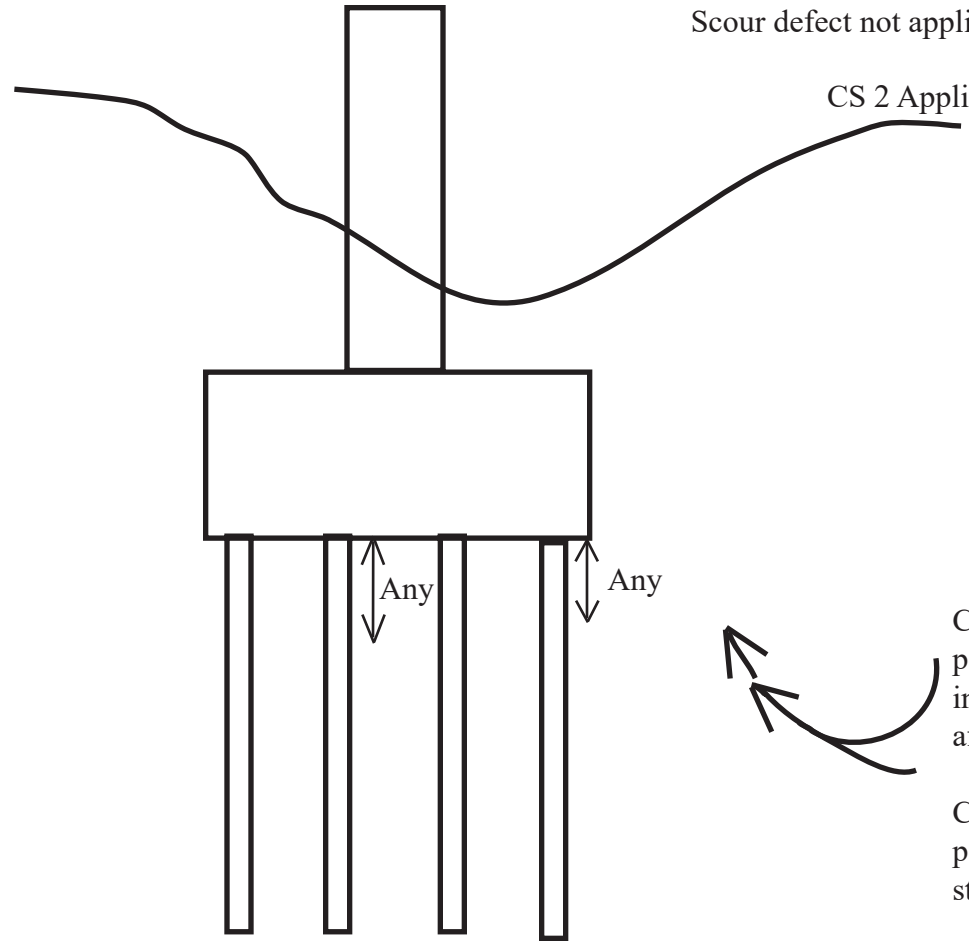
Scour defect coding for Steel and Concrete Piles Under Pile Cap



Steel or concrete piles under a pile cap with an exposed length greater than 2 feet for a single row or 5 feet for multiple rows require a structural review.

The scour defect is applied to the length of affected exposed pile cap or the number of exposed piles.

Scour defect coding for Timber Piles Under Pile Cap



Scour defect not applied to minor local scour

CS 2 Applied to column or pier wall only

CS 2 Applied to pile cap only

CS 3 When any timber pile is exposed and the structural review indicate strength or serviceability not affected

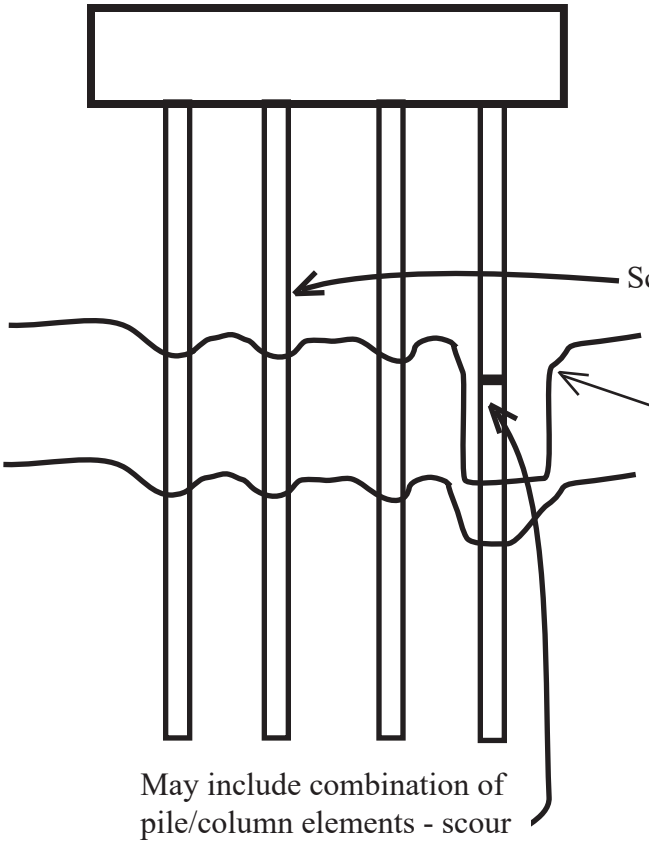
CS 4 When any timber pile is exposed and structural review indicates strength or serviceability affected

Indicates observed Channel Bottom

Any exposed timber pile under a pile cap requires a structural review.

The scour defect is applied to the length of affected footing or the number of exposed piles.

Scour defect coding for Steel and Concrete Bents.

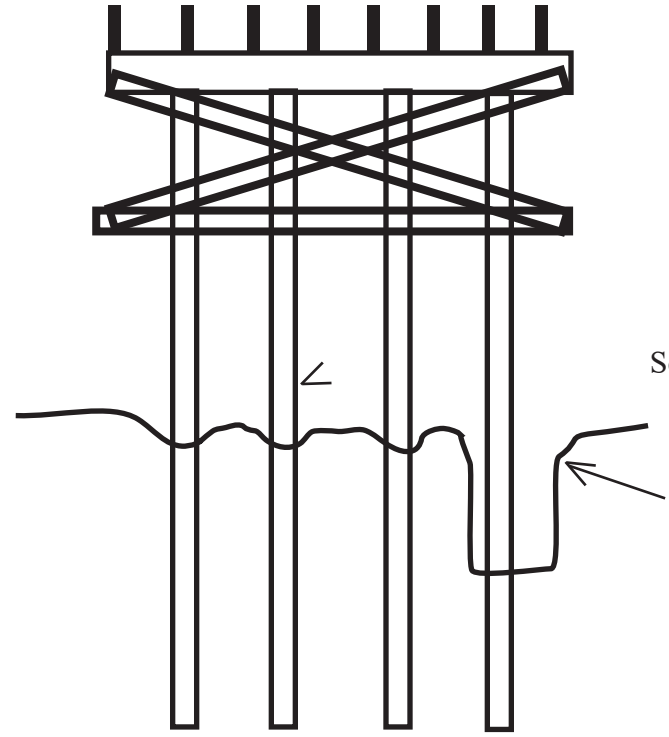


Steel or concrete piles, pile extensions, and CISS piles with exposed pile lengths exceeding those shown below require a structural review.

The scour defect is applied to the number of piles in each condition state.

Maximum exposed Length of Steel and Concrete columns or combined pile/column length when a pile has been extended with a column.	
Column Diameter (Inches)	Maximum Observed Unbraced Length (feet)
12	22
15	26
18	34
20	38

Scour defect coding for Timber Pile Bents



Scour defect not applied to minor local scour

CS 2 is applied to scour with observed exposed pile lengths up to the amounts noted in the table below

CS 3 is used when channel degradation or local scour exceeds the values noted in the table below but the results of the structural review found it not structurally significan

CS 4 is used when the exposed pile length exceeds the values noted below and a structural review has found the condition to be structurally significant

Indicates observed Channel Bottom

Timber piles with exposed pile lengths exceeding those shown below require a structural review.

The scour defect is applied to the number of piles in each condition state.

Maximum exposed Length of Timber Piles in Bents	
Column Diameter (Inches)	Maximum Unbraced Length (feet)
12	13
15	17

Concrete Crack Quantification

Supplement to the Caltrans Element Inspection Manual

Guidelines to provide instruction for calculating and reporting quantities for the concrete crack defect.

Determining Crack Defect Quantities
Defect quantities for cracks are based on the definition that each crack a fects the element 6 inches on either side of each crack for a total width of 1 foot. Inspectors determine the total quantity of all cracks in condition state 2, 3 and 4 and provide a crack defect description in the ELI table describing crack sizes, types, locations and orientations. Inspections are performed utilizing English measurement units with the final result converted to metric units rounded to the nearest whole number. Single cracks are counted as a minimum of 1 meter or 1 square meter. In anticipation of the future use of English measurement units in the element table, the examples in this supplement have not been converted to metric units.

When cracks coexist with other defects such as efflorescence, spalls, delaminations, abrasion etc., the most s - vere defect is recorded in the element table and all other coexisting defects are quantified in the parent element narrative. When coexisting defects of the same condition state are present, the defect that is recorded should be prioritized on the following general guidelines:

1) Defects that require a repair
2) The most prevalent defect
3) Remaining defects are prioritized by the inspector.

All other coexisting defects are quantified in the parent element narrative. The cracking defect is not used for insignificant cracks in Condition State 1

Condition state determination: The crack width determines the condition state in accordance with the defect language for each element. Crack widths should represent the average width and not a localized non-representative width. Crack widths should not be measured at locations along the crack where edge spalling has occurred, however the width of the edge spalling shall be described in the narrative for the cracking defect.

Crack quantities for elements quantified by "area": The sum of crack lengths times affected width (1 foot) for each crack in CS 2, 3, and 4 condition state is the quantity recorded in the ELI table. There are two acceptable methods of determining this sum.

Method 1: For cracks or groups of cracks that can easily be quantified individuall , determine the total length of cracks and multiply by one foot width. The area where intersecting cracks meet is only counted once.

Method 2: For large areas of cracking, determine the gross area or element length affected by typical cracking and apply the Crack Area Factor (CAF) shown in this supplement corresponding to the average crack spacing of that affected area. Each element typically contains more than one area affected by cracks with a unique CAF for each affected area. These CAFs for regularly spaced and pattern cracks are included in the Method 2 table. These CAFs should be used for regular repeating cracks occurring over a large area, such as a deck surface, and are not appropriate for intermittent or singular cracks. See Method 1 above for cracks that can be easily counted. The smallest dimension of a pattern is used when the pattern is not square.

Crack quantities for elements quantified by "length": For elements quantified by length such as abutments, piers, girders, the defect quantity is the projected length of that defect over the length of the element. For example a vertical crack would be equal to a one foot width. A horizontal crack 10 feet long would be equal to 10 feet. Diagonal crack are quantified by the projected length of the crack over the length of the element

Crack quantities for elements quantified by "each": For elements quantified as a single unit, the element condition state is equal to the worse case of any single defect.

Recording defects:
When using Method 1, the location and dimensions of each crack is described in the defect condition text noting the size, type and orientation of the crack. When using Method 2, the location and dimensions of each affected area is noted. The size and type and average spacing used is also noted.

See the following pages for examples of quantifying defects.

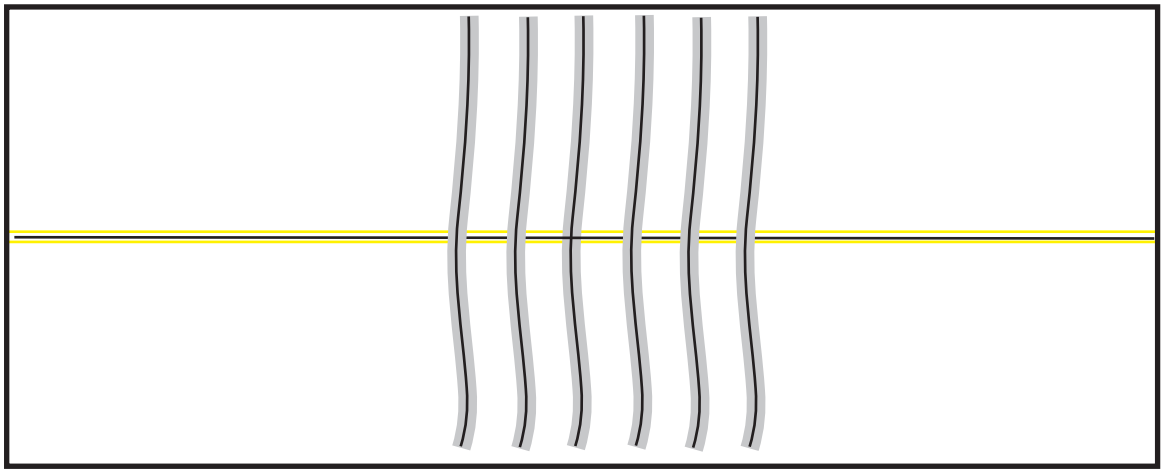
METHOD 2:			
Crack Area Factors (CAF) for Repeating Spacing and Pattern Cracks			
Regularly Spaced*		Pattern Cracks	
Spacing in feet	Calculated CAF	Spacing in feet	Calculated CAF
1 or less	1.00	1 x 1 or less	1.00
2	0.50	2 x 2	0.75
3	0.33	3 x 3	0.56
4	0.25	4 x 4	0.45
5	0.20	5 x 5	0.37
6	0.17	6 x 6	0.32
7	0.14	7 x 7	0.28
8	0.13	8 x 8	0.25
9	0.11	9 x 9	0.23
10	0.10	10 x 10	0.21
* Theses cracks are typically longitudinal or transverse. Cracks that can easily be counted should be directly quantified			

Deck Crack Example Number 1.

Structure Type: RC Box girder with RC Top Flange - Element 16.

Deck Area out to out is 24 feet wide by 120 feet long = 2880 square feet.

OBSERVED CRACKS:
6 Transverse Cracks at 6 foot spacings over Bent 2. Crack range: 0.012 to 0.05 inches wide. (CS 2)
Remainder of bridge has insignificant cracks. No defect applied



DETERMINE CRACKING QUANTITIES

Method 1: 6 cracks x 24 feet x 1 foot width = **144 square feet, CS 2**

ELEMENT INSPECTION RATINGS AND NOTES

Elem No.	Defect/Defect Prot.	Element Description	Env	Total Qty	Units	Qty in each Condition State St. 1	St. 2	St. 3	St. 4
16		Top Flange (RC)	2	2880	sq.ft.	2736	144	0	0
	1130	Cracking (RC and Other)	2	144		0	144	0	0

(16)

(16-1130)
There are 6 full width transverse deck cracks in the range of 0.012 to 0.05 inches wide across both the NB and SB lanes over Bent 2. The cracks are spaced at approximately 6 feet and are 24 feet long. (6 x 24 feet x 1 foot = 144 square feet, CS 2)*

* Quantity calculation recommended but not required.

Method 2 should not be used for these cracks.

Deck Crack Example Number 2.

Structure Type: RC Slab - Element 38.

Slab Area out to out is 30 feet wide by 60 feet long = 1800 square feet.

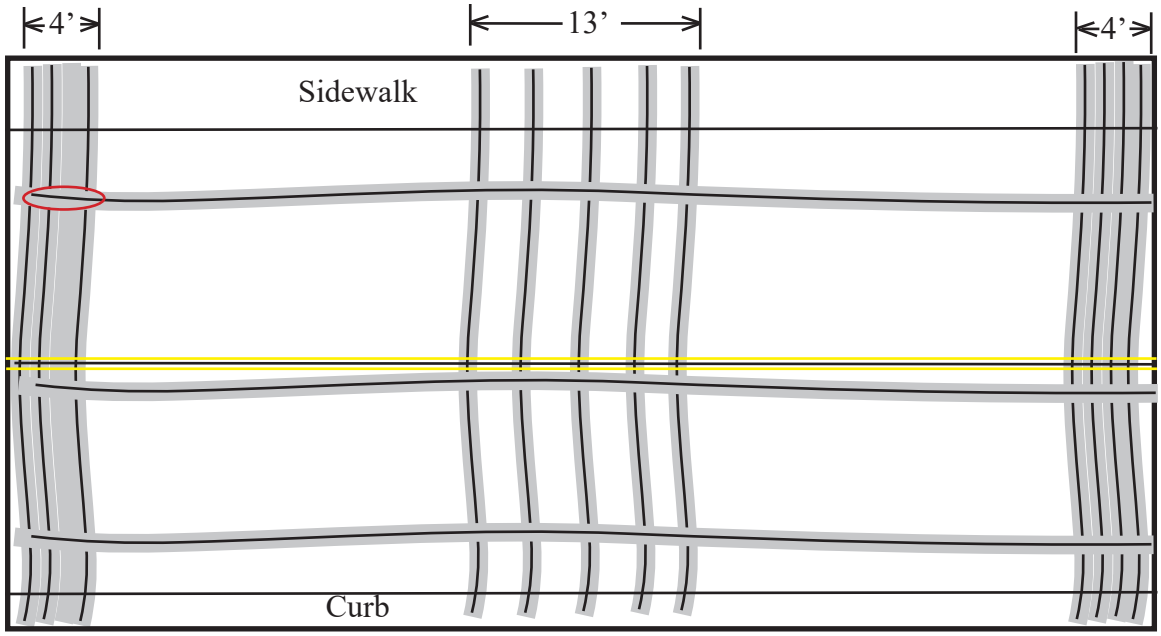
OBSERVED CRACKS:

5 transverse cracks over bent at 3 foot spacing. Crack width: approximately 0.08 inches wide. (CS 3)

4 transverse cracks at each abutment at 1 foot spacing. Crack width: approximately 0.08 inches wide. (CS 3) These cracks are also visible on the slab soffit including the portion of the slab u - der the curb and sidewalk.

3 full length longitudinal cracks at 10 foot spacing. Crack range: 0.012 to 0.05 inches wide. Predominant width 0.03 (CS 2)

Remainder of bridge has insignificant cracks. No defect applied



DETERMINE CRACKING QUANTITIES

Method 1: CS 3 Transverse Cracks (Abutments and Over Bent) - 13 cracks x 30 feet x 1 foot width = **390 square feet, CS 3**

CS 2 Longitudinal Cracks - 3 cracks x 47 feet x 1 foot width = **141 square feet, CS 2**

Note: Use 47 feet rather than 60 feet so overlapping cracks are not double counted.

Method 2: Method 2 is not used for cracks that can easily be counted.

Deck Crack Example Number 2.

ELEMENT INSPECTION RATINGS AND NOTES

Elem No.	Defect/Defect Prot.	Element Description	Env	Total Qty	Units	Qty in each Condition State St. 1	St. 2	St. 3	St. 4
38		Slab (RC)	2	1880	Sq.ft.	1349	141	390	0
	1130	Cracking (RC and Other)	2	531		0	141	390	0

(38)

(38-1130) Cracking (RC and Other)

CS 2 cracks: There are 3 full length longitudinal cracks that are in the range of 0.012 to 0.05 inches wide with the predominant width approximately 0.03 inches. One crack coincided with the construction joint and the others were spaced approximately 10 feet on either side. (3 x 47 feet x 1 foot = 141 square feet, CS 2).

CS 3 cracks: There are 4 full width transverse deck cracks at each abutment spaced at approximately 1 foot. There are also 5 full width deck cracks over the bent spaced at approximately 3 feet. All transverse cracks were approximately 0.080 inches wide.(13 x 30 feet x 1 foot = 390 square feet, CS 2).

Deck Crack Example Number 3.

4 Girder RC T Beam with RC Top Flange - Element 16.

Deck Area out to out is 52 feet wide by 120 feet long = 6240 square feet. Assume no cracks under curbs.

OBSERVED CRACKS:

Top Surface:

Pattern cracking on average 2 feet x 2 feet spacing in Lane 2 both directions. Crack width: ranges 0.012 to 0.05 inches wide. (CS 2)

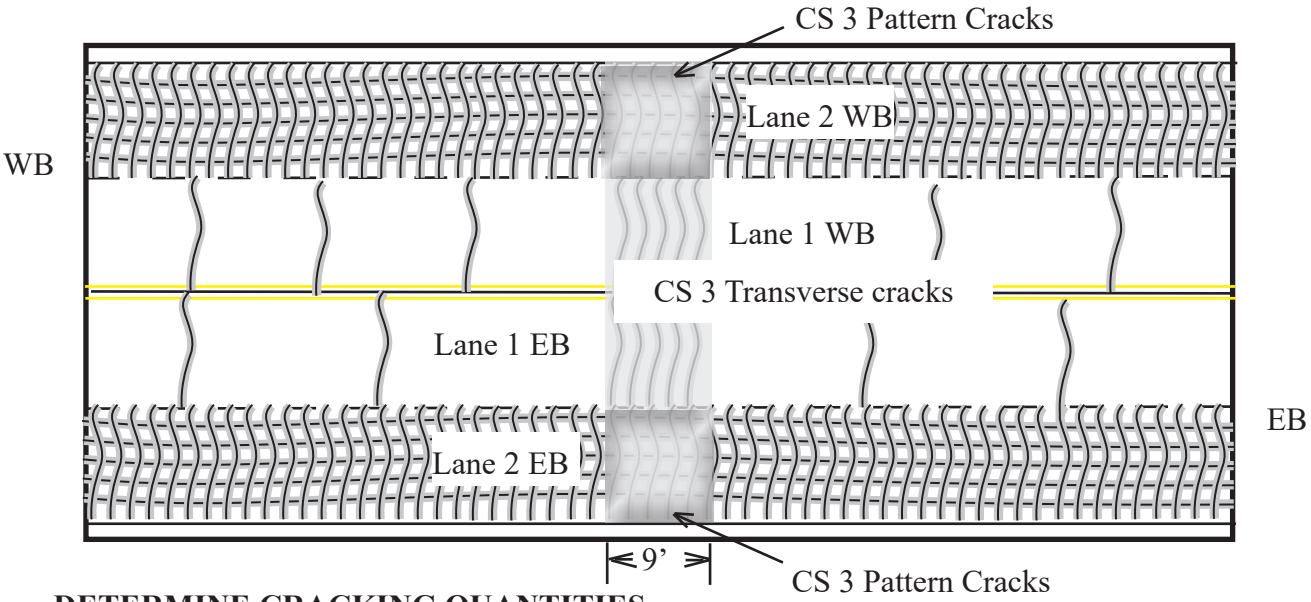
5 Transverse cracks at 2 foot spacing over Bent 2 in both directions of Lanes 1 and 2. Crack width greater than 0.05 (CS3).

9 random cracks full width Lane 1. 2 Span 1 EB, 2 Span 2 EB, 3 Span 1 WB and 2 Span 2 WB Crack width ranges: 0.012 to 0.05 inches wide. (CS 2)

Remainder of bridge has insignificant cracks. No defect applied

Soffit:

In Spans 1 and 2 there are 2-3 transverse soffit cracks with white efflorescence without rust sta - ing in girder bays 2 and 3. It appears that these cracks are in the same locations as the 9 random transverse deck cracks noted above.



DETERMINE CRACKING QUANTITIES

CS 2 Pattern cracks Lane 2 both directions: 12 feet x 111 feet x 2 lanes x 0.75 CAF = 1998 square feet.

CS 2 Random transverse cracks in Lane 1 both directions: 9 cracks x 12' x 1' = 108 square feet.

Total CS 2 = 1980 + 108 = **2106 square feet**

CS 3 Transverse cracks over Bent 2 in Lane 1 both directions:
5 cracks x 12 feet x 1 foot x 2 lanes = 120 square feet, CS 3 (60 square feet each lane)

CS 3 Pattern cracks over Bent 2 in Lane 2 both directions:
9 feet x 24 feet x 0.75 CAF = 162 square feet, CS 3 (81 square feet each lane)

Total CS 3 = 120 + 162 = **282 square feet**

Deck Crack Example Number 3.

ELEMENT INSPECTION RATINGS AND NOTES

Elem No.	Defect/Defect Prot.	Element Description	Env	Total Qty	Units	Qty in each Condition State St. 1	St. 2	St. 3	St. 4
16		Top Flange (RC)	2	6240	Sq.ft.	3852	2106	282	0
	1130	Cracking (RC and Other)	2	2388		0	2106	282	0

(16)
In Spans 1 and 2 there are 2-3 transverse soffit cracks with white efflorescence with no rust staining in the mi span areas of each girder Bays 2 and 3. It appears that these cracks are in the same locations as the 9 transverse deck cracks noted under the 16-1130 defect. (Coexisting defect)

(16-1130)
The following CS 2 cracks were observed:
There are pattern cracks on average 2 foot x 2 foot spacing in Lane 2 both directions. Crack width range: 0.012 to 0.05 inches wide with the predominate size approximately 0.03 inches wide. A CAF of 0.75 was applied to this area. (12 feet x 111 feet x 2 lanes x CAF 0.75 = 1998 square feet, CS 2)

There are 9 random transverse cracks full width in Lane 1. 2 in Span 1 EB, 2 in Span 2 EB, 3 in Span 1 WB and 2 in Span 2 WB Crack width range: 0.012 to 0.05 inches wide. (9 cracks x 12 feet x 1 foot = 108 square feet, CS2)

The following CS 3 cracks were observed:
There are 5 transverse cracks at 2 foot spacings over Bent 2 in both directions of Lane 1. Crack widths are between 0.05 and 0.08 inches. (5 x 24 feet. x 1 feet. = 120 square feet, CS 3)

There is a combination of 2 foot x 2 foot pattern cracks in CS 2 and transverse cracks on 2 foot spacing in CS 3 in both directions of Lane 2 over Bent 2. The transverse crack widths are between 0.05 and 0.08 inches. The pattern crack widths range 0.012 to 0.05 inches wide with the predominate size approximately 0.03 inches wide. The cracks in this area were quantified as CS 3 pattern cracks on a 2 foot by 2 foot spacing. A CAF of 0.75 was applied to this area. (9 feet x 12 feet x 2 lanes x CAF 0.75 = 162 square feet, CS 3)

Example Number 4: Treated Deck Cracks

Refer to example 3 for the description and sketch of crack locations. This example shows the element table text for that bridge after methacrylate treatment.

ELEMENT INSPECTION RATINGS AND NOTES

Elem No.	Defect/Defect Prot.	Element Description	Env	Total Qty	Units	Quantity in each Condition State St. 1	St. 2	St. 3	St. 4
16		Top Flange (RC)	2	6240	Sq.ft.	6132	108	0	0
	1120	Efflorescence/Rust Stainin	2	108		0	108	0	0
	521	Concrete Coat. (Meth/Paint/Seal)	2	6240	Sq.ft.	6240	0	0	0

(16)

(16-1120)
In Spans 1 and 2 there are 2-3 transverse soffit cracks with white efflorescence with no rust staining in girder Bay 2 and 3. It appears that these cracks are in the same locations as the 9 sealed transverse deck cracks noted in the 16-521 protection element. (9 cracks x 12 feet x 1 foot = 108 square feet, CS2)

(16-521)
The top flange has been treated with methacrylate in 2015

There are treated pattern cracks on average 2 foot x 2 foot spacing in Lane 2 both directions. Prior to treatment the crack width range was 0.012 to 0.05 inches wide with the predominate size approximately 0.03 inches wide.

There are 9 treated random transverse cracks full width in Lane 1. 2 in Span 1 EB, 2 in Span 2 EB, 3 in Span 1 WB and 2 in Span 2 WB. Prior to treating the crack width range was 0.012 to 0.05 inches wide.

Example Number 5: Box Girder Cracks.

One Span RC Box Girder - Element 105. Girder Length 60 feet.

OBSERVED CRACKS:

Exterior Girder faces:

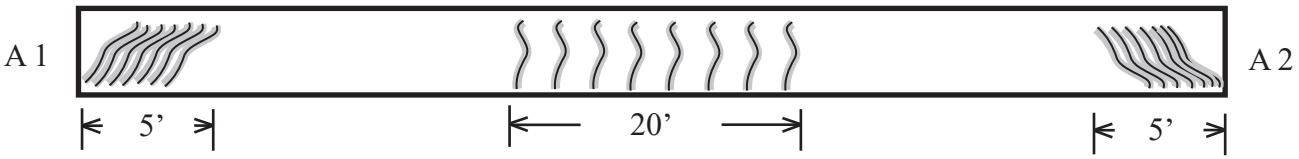
At Abutments 1 and 2 there are overlapping diagonal cracks 0.03 inches wide spaced between 6 inches and 1 feet. (CS 2) The cracks transition to insignificant size 5 feet from each abutment.

Near mid span there are vertical cracks 0.07 inches wide spaced at 3 feet over a 20 foot long area. (CS 3)

Remainder of girder has insignificant cracks. No defect applied

Girder Soffit:

Transverse cracks near abutments, up to 0.03 inches wide. (CS 2) Transverse cracks up to 0.04 inches wide near mid span over 20 foot length. (CS 2)



DETERMINE CRACKING QUANTITIES

CS 2 Diagonal Cracks at 6 inch to 1 foot spacing at Abutments: The entire width is counted for overlapping cracks. 5 feet + 5 feet = **10 feet, CS 2**

CS 3 Vertical cracks at 3 feet spacing mid span:

Method 1: 7 cracks X 1 foot/crack = **7 feet, CS 3**

Method 2: 20 feet x 0.33 CAF = **6.6 feet, CS 3**

ELEMENT INSPECTION RATINGS AND NOTES

Elem No.	Defect/Defect Prot.	Element Description	Env	Total Qty	Units	Qty in each Condition State St. 1	St. 2	St. 3	St. 4
105		Box Girder - RC	2	60	ft.	43	10	7	0
	1130	Cracking (RC and Other)	2	17		0	10	7	0

(105)

(105-1130)

The portion of the box girder near Abutments 1 and 2 has overlapping diagonal cracks 0.03 inches wide spaced between 6 inches and 1 foot. The cracks transition to insignificant size 5 feet from each abutment. (10 feet x 1.0 CAF = 10 feet, CS 2)

Near mid span there are vertical cracks 0.07 inches wide spaced at 3 feet over a 20 foot long area. (20 feet x 0.33 CAF = 6.6 feet, CS 3)

On the girder soffit there are transverse cracks near the abutments, up to 0.03 inches wide corresponding to the locations of the diagonal cracks in the girder faces. There are also transverse soffit cracks up to 0.04 inches wide near mid span over 20 foot length corresponding to the cracks in the girder faces.

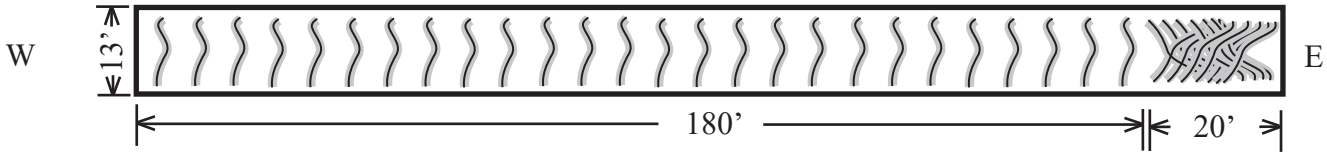
Example Number 7: Vertical and Pattern Abutment Cracks

RC Abutment - Element 215. Length 200 feet.

OBSERVED CRACKS:

At Abutment 1, there are vertical cracks spaced at average 6 foot intervals. The crack sizes vary from 0.03 to 0.07 inches. Half the cracks are in CS 2 and half are in CS 3.

At the east end of the Abutment 1 there is a 20 foot wide area of heavy pattern cracking with white efflorescence. The pattern cracks are spaced between 2 and 4 feet and the crack width is 0.1 in. (CS 3)



DETERMINE CRACKING QUANTITIES

Vertical cracks at 6 feet spacing:
Method 1: 30 cracks X 1 feet/crack = 30 feet, **15 feet CS 2, 15 feet CS 3**

Method 2: 180 feet X 0.17 CAF = 30.6 feet, **15 feet CS 2, 15 feet CS 3**

Pattern Cracks at East End: **20 feet, CS 3**

Total CS 3 Cracks = 15 feet + 20 feet = **35 feet, CS 3**

ELEMENT INSPECTION RATINGS AND NOTES

Elem No.	Defect/Defect Prot.	Element Description	Env	Total Qty	Units	Qty in each Condition State St. 1	St. 2	St. 3	St. 4
215		Abutment - RC	2	200	ft.	150	15	35	0
	1130	Cracking (RC and Other)	2	50		0	15	35	0

(215)
The 20 foot area near the east end of Abutment 1 was sounded with a geology pick with the use of a ladder. No delaminations were found. This area and the vertical cracks have been in the same condition since first noted in the 5/15/2001 BIR. With the exception of the cracks and efflorescence noted under the 130 defect, no significant defects were noted.

(215-1130)
Abutment 1 has full height vertical cracks spaced at average 6 foot intervals. The crack sizes vary randomly from 0.03 to 0.07 inches. Half the cracks are CS 2 and half are CS 3. (180 feet X 0.17 CAF = 30.6 feet, 50% CS 2, 50% CS 3)

At the east end of the abutment there is a 20 foot wide area of heavy pattern cracking with white efflorescence. These pattern cracks cover the entire area between the ground line and the top of the abutment and are spaced between 2 and 4 feet and the average crack width is 0.1 inches. (20 feet, CS 3)

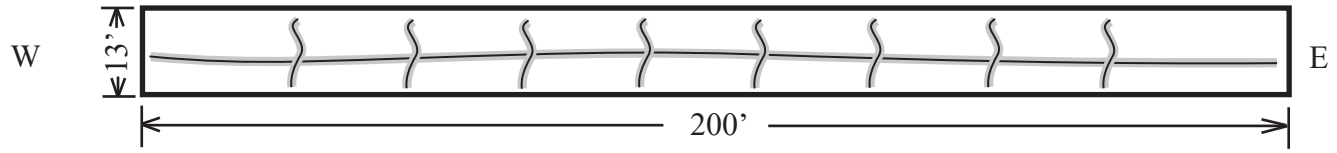
Example Number 8: Horizontal And Vertical Abutment Cracks

RC Abutment - Element 215. Length 200 feet.

OBSERVED CRACKS:

At Abutment 1, there is a single horizontal crack the entire width of the abutment approximately 6 feet above the ground line. The crack size varies from 0.03 to 0.05 inches. (CS 2)

At Abutment 1 there are also full height vertical cracks spaced at 20 feet. There are a total of 8 cracks with a width of 0.06 in. (CS 3)



DETERMINE CRACKING QUANTITIES

When an element is quantified by length the worse defect over that length is the prevailing defect.

Vertical cracks at 6 feet spacing:
8 vertical cracks X 1 feet/crack = **8 feet, CS 3**

Horizontal crack: 200 feet - 8 feet of CS 3 cracks = **192 feet, CS 2**

ELEMENT INSPECTION RATINGS AND NOTES

Elem No.	Defect/Defect Prot.	Element Description	Env	Total Qty	Units	Qty in each Condition State St. 1	St. 2	St. 3	St. 4
215		Abutment - RC	2	200	ft.	0	192	8	0
	1130	Cracking (RC and Other)	2	200		0	192	8	0

(215)
The vertical and horizontal cracks have been in the same condition since first noted in the 5/15/2001 BIR. No other significant defects were noted.

(215-1130)
Abutment 1 has full height vertical cracks spaced at average 20 foot intervals. There are a total of 8 cracks. The crack sizes average 0.06 inches. (8 x 1 foot = 8 feet, CS 3)

At Abutment 1, there is a single horizontal crack the entire width of the abutment approximately 6 feet above the ground line. The crack size varies from 0.03 to 0.05 inches. (192 feet, CS 2)