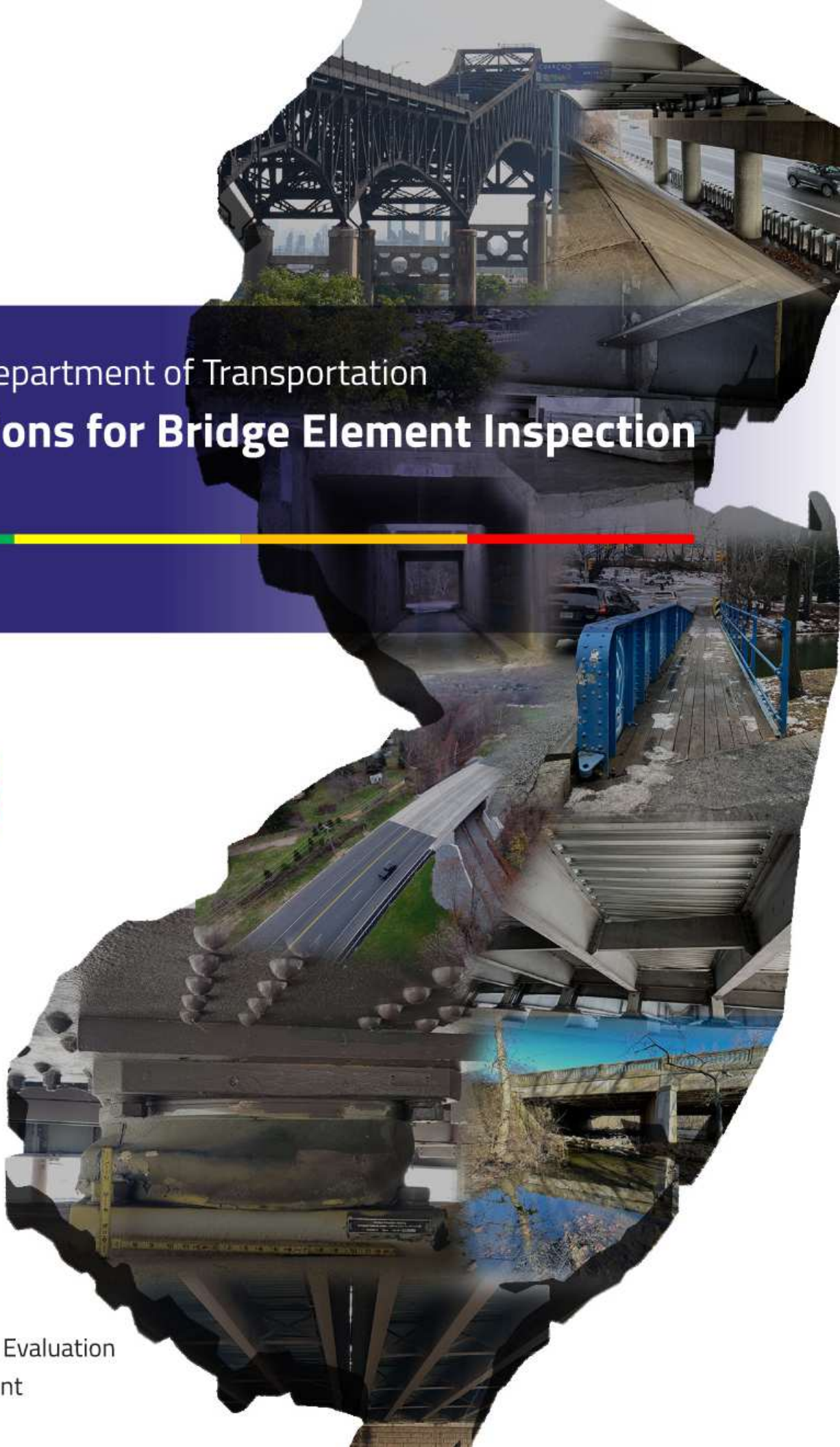
New Jersey Department of Transportation

Specifications for Bridge Element Inspection

Version 2.00

AUGUST 2025



Prepared By
Bureau of Structural Evaluation
& Bridge Management

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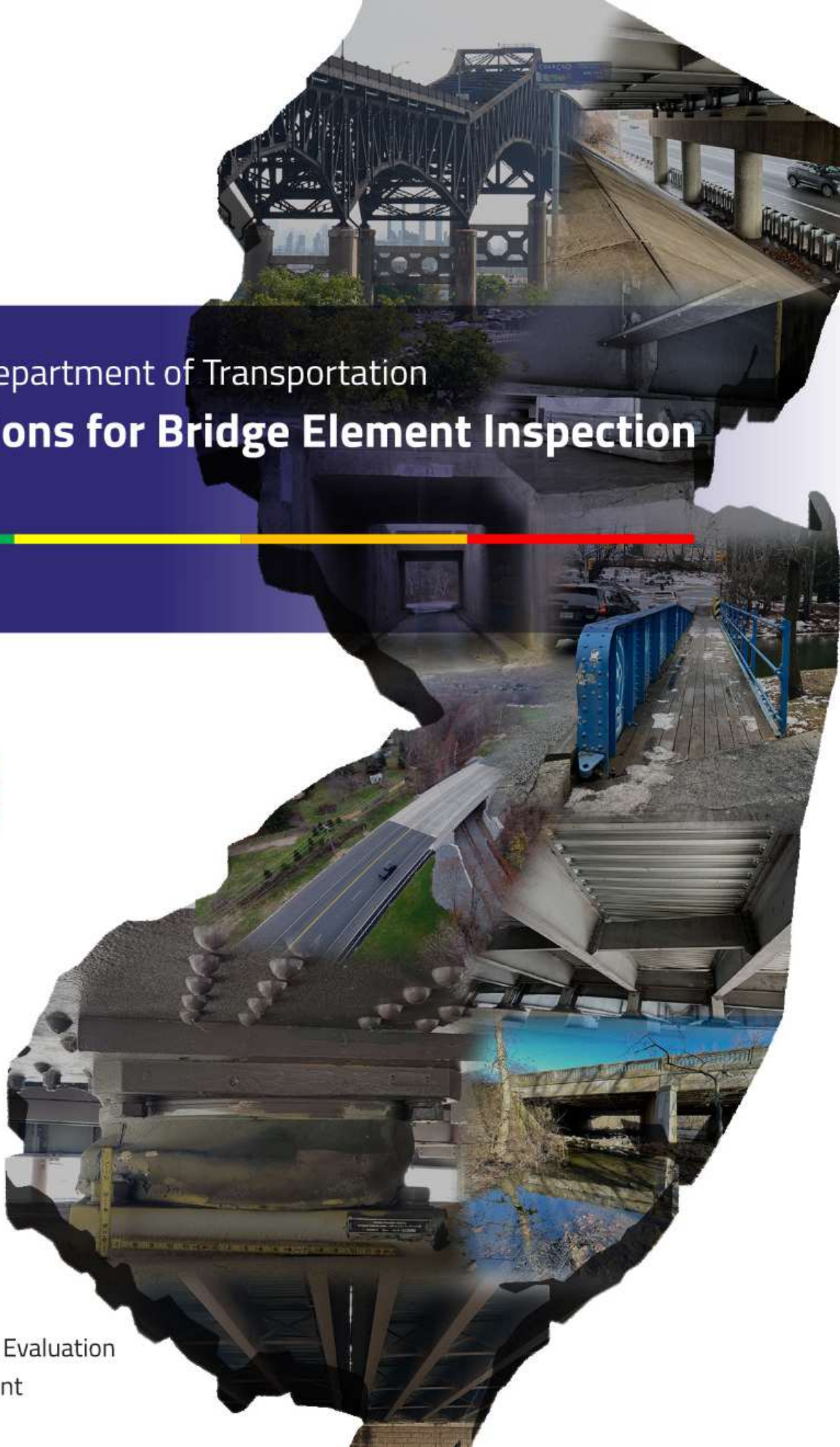

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Introduction

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 bridge inspection practice and has been adopted by most of the state transportation departments in the United States. Bridge Owners nationwide have recognized the benefits of detailed condition assessments using raw inspection information, expanded performance measures, and bridge management system deterioration forecasting and evaluation. As the use of bridge element-level inspection techniques has proliferated, the need for updates and enhancements to the standard bridge element specifications has been identified. The goal of this Specification is to completely capture the condition of bridges in a simple, effective way that can be standardized across New Jersey while providing the flexibility to be adapted to both large- and small-agency settings.

As a result of NCHRP 12-104, Guidelines to Improve the Quality of Element-Level Bridge Inspection, a new Manual for Bridge Element Inspection (MBEI), Second Edition was developed by AASHTO in 2019. In response, NJDOT created this Version 2.00 of their Specifications for Bridge Element Inspection (SBEI) (formerly entitled Bridge Element Inspection Manual (BEIM)) in 2025. One of most notable revisions was the reorganization of Section 3 in both publications to list the elements by material. Other revisions include:

- A new introduction was developed for Section 3.
- Visual guide sections were added to defect tables for Concrete, Prestressed Concrete, Steel, Joints, and Bearings.
- The “Condition State” header was removed from the tables and replaced with CS 1, CS 2, CS 3, and CS 4 nomenclature in the tables showing Defects and Defect Descriptions.
    - The Defect Descriptions themselves were not changed in any way.
- Crack pattern and crack width measurement guides were added to Article 3.2.1.3.
- Spatial estimating guides were added in Article 3.12. These guides provide assistance to an Inspector for estimating areas (ft^2) and length (ft) of damage.
- Element commentary (Article 3.2) was revised as follows:
    - The element commentary was previously included with each element, resulting in repetition. For example, every concrete element included commentary regarding the width of cracks, meaning the same element commentary appeared in at least 17 places in Section 3. Element commentary has been consolidated into a single section to reduce repetition. In some cases, this required minor rewording to make the element commentary more general. For example, the “Other” elements each had a unique description that indicates the element type (e.g., “other deck” or “other column”). This was reworded to remove the specific reference such that one explanation of the “other” materials was applicable to all elements so described.
    - The concrete and prestressed concrete commentary regarding crack widths were stated in a table to improve readability.
    - Element commentary that was unique to a single element was maintained with the element in the listing of Article 3.1 and stated as a note. Typically, these notes are enhancements to the element description.
    - There were no intentional changes to the element commentary, although some rewording was done for grammatical purposes.

- A single, comprehensive listing of all elements documenting the element description, quantity calculation, unit of measure, and classification was developed and included in Article 3.1. This section was organized by material. Within each material, components and subcomponents are identified (such as deck, railing, superstructure, substructure, joints, etc.)
    - Subsections within general classes of components that did not provide different information than the subsection heading were eliminated. For example, the subsection 3.5.1 Columns/pier walls read "(1) This article covers supporting elements of the structure. (2) These items include columns and pier walls." (1) is redundant with the main heading, and (2) is a repeat of the subsection heading. In cases like these, the subsection text was omitted. This included Articles 3.5.1, 3.5.2, 3.5.3, and others.
- Section 3 of NJDOT's SBEI (formally BEIM) has gone from 290 pages to 129 pages, even with the inclusion of visual guides. V2.00 is 228 pages shorter than the BEIM.
- Version 2.00 of this Specification includes 173 Elements in total: 84 NBEs, 27 BMEs (7 new in this version), and 62 ADEs (37 new in this version, and 2 previous ADEs were merged with new BMEs).

Version 2.00 of NJDOT's SBEI builds upon their BEIM (2014) by incorporating various revisions to and expansions of its existing content as needed to further support NJDOT's bridge management program. Additionally, the content from AASHTO's MBEI, Second Edition (2019) along with its associated 2022 and 2024 interim revisions have been incorporated. As such, this Specification shall be used exclusively for coding the National Bridge Elements (NBEs), Bridge Management Elements (BMEs), and Agency-Developed Elements (ADEs) for all of New Jersey's bridges. However, this Specification is not intended to supplant proper bridge and element inspection training or the exercise of engineering judgment by the Inspector or Professional Engineer.

1—Background

1.1—Condition Assessment Philosophy: Element Level and Condition Rating

This Version 2.00 Specification (modeled after AASHTO's Manual for Bridge Element Inspection, 2nd Edition, 2019 with all interim revisions) continues the bridge element-level condition assessment methods developed in the 1st Edition of NJDOT Bridge Element Inspection Manual (BEIM), and builds upon understanding and implementation of new concepts presented in Federal Highway Administration's (FHWA) Specifications for the National Bridge Inventory (SNBI), March 2022 with Errata #1 (03/24).

The bridge element set presented within includes three element types identified as National Bridge Elements (NBEs), Bridge Management Elements (BMEs), or Agency-Developed Elements (ADEs). The combination of these three element types comprises the full NJDOT element set. All the elements, whether they are NBEs, BMEs, or ADEs, have the same general condition assessment characteristics:

1. The standard number of condition states (CS) is four.
2. The standard condition states are Good (Condition State 1), Fair (Condition State 2), Poor (Condition State 3), and Severe (Condition State 4) general descriptions.
3. Units of measure are length in feet, area in square feet, and each for enumerated elements.

The proper assessment of element-level bridge conditions and the ability to use condition data to efficiently and effectively manage bridge inventories are cornerstones to providing a safe and efficient highway transportation system. Element level bridge inspection data is quantitative condition assessment data, collected during bridge inspections, which indicates the severity and extent of defects in bridge elements (23 CFR 650.305). The introduction of new guidelines for condition ratings in SNBI ties in the bridge element level data. Condition ratings indicate the existing field conditions of the bridge components and waterway(s) at the time of inspection. A condition rating code must therefore consider the type, location, and severity of the defects; the extent to which they exist throughout the item being evaluated; and the degree to which the defects affect strength and/or performance of the bridge or its component.

When assigning severity of a defect as used in the condition rating tables in SNBI Section 7.1: Component Condition Ratings, an inherent defect is not indicative of damage or deterioration but is characteristic of the material or results from normal construction practices. A minor defect is one where damage or deterioration has initiated but is not yet considered significant. A moderate defect is one where damage or deterioration are significant, but the strength and performance of the component are not affected. A major defect affects the strength and/or performance of the component, as determined by a structural and/or hydraulic review. For joints, bearings, railings, and railing transitions, a major defect prevents the component from functioning as intended. **Typically, an inherent defect will correlate with CS 1, a minor defect with CS 2, a moderate defect with CS 3, and a major defect with CS 4.**

As for the extent, a defect is considered widespread when it is present in many separate areas of the component, while an isolated defect occurs in one or a few concentrated locations. The term "some" is used when the defect prevalence is more than isolated and less than widespread. The bridge element level inspection data can be referenced when assigning a component condition rating, whereby quantities in each condition state are compared to the total quantity to determine the extent. Usually, an isolated defect would have less than 10% of the total quantity in a particular condition state. A defect could be considered widespread if it is present in over 40% of the total quantity in a particular condition state, and an extent of some would fall between 10% and 40%. **These orders of magnitudes are not meant to be prescriptive, but rather rough ideas to aid in comparing element level data to condition ratings.**

SNBI's Table 20 is used to determine component condition ratings as follows:

Code	Condition	Description
N	Not Applicable	Component does not exist.
9	Excellent	Isolated inherent defects.
8	Very Good	Some inherent defects.
7	Good	Some minor defects.
6	Satisfactory	Widespread minor or isolated moderate defects.
5	Fair	Some moderate defects; strength and performance of the component are not affected.
4	Poor	Widespread moderate or isolated major defects; strength and/or performance of the component is affected.
3	Serious	Major defects; strength and/or performance of the component is seriously affected. Condition typically necessitates more frequent monitoring, load restrictions, and/or corrective actions.
2	Critical	Major defects; component is severely compromised. Condition typically necessitates frequent monitoring, significant load restrictions, and/or corrective actions in order to keep the bridge open.
1	Imminent Failure	Bridge is closed to traffic due to component condition. Repair or rehabilitation may return the bridge to service.
0	Failed	Bridge is closed due to component condition, and is beyond corrective action. Replacement is required to restore service.

(Note, the entire code description must be satisfied for the code to apply)

Appendix A contains tables providing further NJDOT guidance for condition ratings based on defect severity and extent.

1.2—National Bridge Elements

The National Bridge Elements (NBEs) represent the primary structural components of bridges necessary to determine the overall condition and safety of the primary load carrying members. The NBEs correspond to the deck, superstructure, substructure, culvert, bridge railing, and bridge bearings condition ratings as defined in the SNBI. They are designed to remain consistent from agency to agency across the country to facilitate and standardize the capture of bridge element conditions at the national level. 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

Bridge Management Elements (BMEs) include components of bridges such as joints, wearing surfaces, and protective coating systems and deck/slab protective systems that are typically managed by agencies utilizing Bridge Management Systems (BMSs). The BMEs are defined with a recommended set of condition assessment language that has been 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 Specification were purposefully left general in nature to provide the flexibility to develop agency-specific elements that best suit the state bridge management practices. NJDOT has developed additional BMEs as necessary using agency-developed element conventions. When determining additional elements, NJDOT considered 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

The Agency-Developed Elements (ADEs) presented in this Specification provide the flexibility for NJDOT to define custom elements in accordance with the defined element framework that may be sub-elements of NBEs or BMEs or may be ADEs without ties to the elements defined in this Specification.

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, this Specification provides a flexible element set that has been tailored to the needs of NJDOT. The identification numbers 8000 and above are reserved for NJDOT ADEs.

NJDOT has carried over most of the ADEs from the 1st Edition of their BEIM. One original ADE has been transferred into a new AASHTO 2019 BME. Based on current and future inventory management needs, NJDOT has developed several new ADEs, as subsets of defined NBEs, subsets of defined BMEs, or as independently defined elements.

1.5—How to Use This Specification

Bridge inspection based on this Specification consists of identifying, defining, and quantifying the elements (i.e., pieces of the bridge) that exist at each bridge. The condition of each element is determined by performing a field inspection and recording the quantities of defects in the element as they correlate to the severity of that defect as defined in the particular condition state definition of this Specification. The condition assessment is complete when the appropriate portion of the total quantity is stratified over the defined condition states. The appropriate element defects and environment shall be recorded for use in deterioration modeling.

In this Specification, the element represents the aggregate condition of the defined element inclusive of all defects. Element defects are to be used when the element reaches CS 2 or worse and they essentially act to break down the overall element condition into one or more specific observed problems. The defects defined within this Specification shall always assume the units of the element with which they are associated. 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 exist 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 are present in the same defined space, the Inspector shall determine the predominate defect for reporting. For example, if a reinforced concrete bridge deck has a portion which exhibits both minor spalling and minor cracking, the spalling would likely be determined to be the predominate defect.

This Specification attempts to cover the majority of all bridge elements found on highway bridges in New Jersey. During the course of an inspection, the Inspector may find materials or elements that are not defined. 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 Specification. 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 CS 4, as this state is reserved for severe conditions that are beyond the specific defects defined for CS 1 through 3. Elements with a portion or all the quantity in CS 4 may often have load capacity implications warranting a structural review. Within this Specification, 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. NJDOT has established 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 1 of this Specification provides a brief background, philosophy, and application of the element-level inspection process. It also defines the relationship between the process and SNBI's new component condition rating procedure.

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

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

The Appendices provide additional guidance and background on the use of this Specification. There are six appendices to aid in the development of the data collection process, as follows:

Appendix A: NJDOT Bridge Element Level and Condition Ratings Relationship
Appendix B: NJDOT Guidelines for Quantity Measurement and Identifying Bearings and Joints
Appendix C: Inspection Examples
Appendix D: Materials and Feasible Actions by Material Type
Appendix E NJDOT Defined Agency-Developed Elements (ADEs)
Appendix F: NJDOT Defined Element Groupings

2—Element Location Matrix

This Section is designed to give Inspectors a quick reference guide to the defined elements. The location matrix of elements is grouped into National Bridge Elements (NBEs), Bridge Management Elements (BMEs), and Agency-Developed Elements (ADEs), then by general element type, material, and in accordance with 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	Element Number		
		Decks	Slab	Other
Reinforced Concrete Deck/Slab	area, ft^2	12	38	
Prestressed Concrete Deck/Slab	area, ft^2	13	39	
Prestressed Concrete Top Flange	area, ft^2	15		
Reinforced Concrete Top Flange	area, ft^2	16		
Steel Deck–Open Grid	area, ft^2	28		
Steel Deck–Concrete Filled Grid	area, ft^2	29		
Steel Deck–Corrugated/Orthotropic/Etc.	area, ft^2	30		
Timber Deck/Slab	area, ft^2	31	54	
Other Material Deck/Slab	area, ft^2	60	65	

2.1.2—Railings

Element	Units	Element Number					
		Steel	Prestressed Concrete	Reinforced Concrete	Timber	Masonry	Other
Metal Bridge Railing	length, ft	330					
Reinforced Concrete Bridge Railing	length, ft			331			
Timber Bridge Railing	length, ft				332		
Other Bridge Railing	length, ft						333
Masonry Bridge Railing	length, ft					334	

2.1.3—Superstructure

Element	Units	Element Number					
		Steel	Prestressed Concrete	Reinforced Concrete	Timber	Masonry	Other
Girder/Beam	length, ft	107	109	110	111		112
Closed Web/Box Girder	length, ft	102	104	105			106
Stringer	length, ft	113	115	116	117		118
Truss	length, ft	120			135		136
Arch	length, ft	141	143	144	146	145	142
Floor Beam	length, ft	152	154	155	156		157
Cable–Primary	length, ft	147					
Cable–Secondary	each	148					149
Gusset Plate	each	162					
Pin, Pin and Hanger Assembly, or Both	each	161					

2.1.4—Bearings

Element	Units	Element Number
Elastomeric	each	310
Movable (roller, sliding, etc.)	each	311
Enclosed/Concealed	each	312
Fixed	each	313
Pot	each	314
Disk	each	315
Other	each	316

2.1.5—Substructure

Element	Units	Element Number					
		Steel	Prestressed Concrete	Reinforced Concrete	Timber	Masonry	Other
Columns	each	202	204	205	206		203
Column Tower (Trestle)	length, ft	207			208		
Pier Wall	length, ft			210	212	213	211
Abutment	length, ft	219		215	216	217	218
Pile	each	225	226	227	228		229
Pier Cap	length, ft	231	233	234	235		236
Pile Cap/Footing	length, ft			220			

2.1.6—Culverts

Element	Units	Element Number					
		Steel	Prestressed Concrete	Reinforced Concrete	Timber	Masonry	Other
Culvert	length, ft	240	245	241	242	244	243

2.2—Bridge Management Elements

2.2.1—Joints

Element	Units	Element Number
Strip Seal Joint	length, ft	300
Pourable Joint Seal	length, ft	301
Poured-In-Place Plug Joint System*	length, ft	**301A**
Compression Joint Seal	length, ft	302
Bonded Preformed Joint Seal**	length, ft	**302A**
Bonded Foam Joint Seal	length, ft	**302B**
Assembly Joint with Seal	length, ft	303
Segmental Joint System	length, ft	**303A**
Modular Joint Assembly	length, ft	**303B**
Open Joint	length, ft	304
Assembly Joint without Seal	length, ft	305
Sliding Plate Joint Assembly	length, ft	**305A**
Finger (Tooth) Joint Assembly	length, ft	**305B**
Other Joint	length, ft	306

**Previous NJDOT ADE Asphaltic Plug Expansion Joint (862) is now Element 301A.*
***Previous NJDOT ADE Elastomeric Flex-Type Joint (861) is now Element 303A.*

2.2.2—Approach Slabs

Element	Units	Element Number
Prestressed Concrete Approach Slab	area, ft^2	320
Reinforced Concrete Approach Slab	area, ft^2	321

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

Element	Units	Element Number
Wearing Surfaces*	area, ft^2	510
Steel Protective Coating	area, ft^2	515
Concrete Reinforcing Steel Protective System	area, ft^2	520
Concrete Protective Coating	area, ft^2	521

**See Article 2.3.9 for Wearing Surface ADEs separated by material.*

2.3—Agency-Developed Elements

2.3.1—Decks and Slabs

Element	Units	Element Number	
		Decks	Slab
Underside of Reinforced Concrete Deck/Slab	area, ft^2	8012	8038
Underside of Prestressed Concrete Deck/Slab	area, ft^2	8013	8039
Underside of Steel Deck–Concrete Filled Grid	area, ft^2	8029	
Underside of Steel Deck–Corrugated/ Orthotropic/Etc.	area, ft^2	8030	
Underside of Timber Deck/Slab	area, ft^2	8031	8054
Underside of Other Material Deck/Slab	area, ft^2	8060	8065

2.3.2—Pedestrian Railings

Element	Units	Element Number					
		Steel	Prestressed Concrete	Reinforced Concrete	Timber	Masonry	Other
Metal Pedestrian Railing	length, ft	8330					
Reinforced Concrete Pedestrian Railing	length, ft			8331			
Timber Pedestrian Railing	length, ft				8332		
Other Pedestrian Railing	length, ft						8333
Masonry Pedestrian Railing	length, ft					8334	

2.3.3—Topside Elements

Element	Units	Element Number					
		Steel	Prestressed Concrete	Reinforced Concrete	Timber	Masonry	Other
Metal Curbs/Sidewalks	length, ft	8350					
Concrete Curbs/Sidewalks	length, ft			8351			
Timber Curbs/Sidewalks	length, ft				8352		
Other Curbs/Sidewalks	length, ft						8353
Masonry Curbs/Sidewalks	length, ft					**8354**	
Sound Barrier Wall	length, ft						8361
Chain Link Fencing	length, ft	**8362**					
Ornamental Railing	length, ft						**8363**
Ornamental Truss	length, ft						**8364**

2.3.4—Superstructure

Element	Units	Element Number					
		Steel	Prestressed Concrete	Reinforced Concrete	Timber	Masonry	Other
Diaphragm	each	**8121**	**8123**	**8122**	**8124**		**8125**

2.3.5—Miscellaneous

Element	Units	Element Number
Bridge Drainage	each	8170
Seismic Retrofit Components	each	8171
Fascia Mounted Sign Structures	each	8172
Temporary Support Structures	each	8173

2.3.6—Bearings

Element	Units	Element Number
Isolation Bearing	each	8310
Sliding Plate Bearing–Expansion/Movable	each	8311
Rocker Bearing–Expansion/Movable	each	8317
Spherical Bearing	each	8315
Bond Breaker Bearing–Expansion/Movable	each	8316

2.3.7—Substructure

Element	Units	Element Number					
		Steel	Prestressed Concrete	Reinforced Concrete	Timber	Masonry	Other
Columns (LF)	length, ft	**8202**	**8204**	**8205**	**8206**		**8203**
Web Wall, Strut, Lateral Bracing, etc. Between Columns	length, ft	**8250**	**8251**	**8252**	**8253**		**8254**
Slope Protection	**area, ft^2**						8261
Wingwalls	length, ft			8262	8263	8264	8265
Headwalls	length, ft			8266		8267	8268
Fender System	length, ft						8269
Bulkhead	length, ft						8270

2.3.8—Joints

Element	Units	Element Number
~~Elastomeric Flex-Type Joint~~	~~length, ft~~	~~861~~ Refer to Element 303A
~~Asphaltic Plug Expansion Joint~~	~~length, ft~~	~~862~~ Refer to Element 301A
Approach Slab Relief Joint	length, ft	**8308**

2.3.9—Wearing Surfaces and Protective Coatings

Element	Units	Element Number
Wearing Surfaces–Flexible Overlays	area, ft^2	**8511**
Wearing Surfaces–Rigid and Semi-Rigid Overlays	area, ft^2	**8512**
Concrete Encasement	length, ft	8516

3—Detailed Element Descriptions

Section 3 provides detailed element and defect descriptions. Article 3.1 provides a comprehensive listing of all elements. This listing is organized according to the material from which the element is formed. The element name, number, classification (NBE, BME, or ADE), and units of measure are shown. Guidance on the appropriate quantity calculation for each element is provided. Notes applying to specific elements are included in the element listing.

Article 3.2 provides element commentary that includes supplemental information for identifying elements and additional considerations for the Inspector to be aware of during data collection. The element commentary is organized according to bridge components and sub-components, i.e., decks and slabs, railings, superstructure, etc.

Articles 3.3 through 3.11 provide defect listings and guidance on how to determine the condition state (CS) for each defect. This section is organized according to the material from which an element is formed, listing appropriate defects for each material. Text descriptions defining each CS are provided. A visual guide is included for certain defects that provides a standard for determining the appropriate CS.

Article 3.12 provides visual guides for estimating area and length. These guides are intended to assist an Inspector in determining the quantity of damage in the field.

The elements described in this Section are included in the standard set of National Bridge Elements (NBEs), except when noted for Bridge Management Elements (BMEs), such as joints and approach slabs, and for Agency-Developed Elements (ADEs).

3.1—Element Listing by Material

3.1.1—Reinforced Concrete

DECKS AND SLABS					
12	**Reinforced Concrete Deck**	Classification:	**NBE**	Unit of Measure:	**ft²**
	Description:	All reinforced concrete bridge decks regardless of the wearing surface or protective systems used.			
	Quantity Calculation:	Area of the deck from edge to edge, including any median areas, areas obscured by sidewalks, barriers, etc., and accounting for any flares or ramps present.			
16	**Reinforced Concrete Top Flange**	Classification:	**NBE**	Unit of Measure:	**ft²**
	Description:	All reinforced concrete bridge girder top flanges where traffic rides directly on the structural element regardless of the wearing surface or protective systems used. These bridge types include tee-beams, box girders, and girders that require traffic to ride on the top flange.			
	Quantity Calculation:	Area of the top flange from edge to edge, including any median areas, areas obscured by sidewalks, barriers, etc., and accounting for any flares or ramps present. This quantity is for the top flange riding surface only. Girder web and bottom flange are to be evaluated by the appropriate girder element.			
38	**Reinforced Concrete Slab**	Classification:	**NBE**	Unit of Measure:	**ft²**
	Description:	All reinforced concrete bridge slabs regardless of the wearing surface or protective systems used.			
	Quantity Calculation:	Area of the slab from edge to edge, including any median areas, areas obscured by sidewalks, barriers, etc., and accounting for any flares or ramps present.			
8012	**Underside of Reinforced Concrete Deck**	Classification:	**ADE**	Unit of Measure:	**ft²**
	Description:	The underside of all reinforced concrete bridge decks regardless of the protective systems used.			
	Quantity Calculation:	Area of the deck from edge to edge, including any median areas, areas obscured by sidewalks, barriers, etc., and accounting for any flares or ramps present.			
8038	**Underside of Reinforced Concrete Slab**	Classification:	**ADE**	Unit of Measure:	**ft²**
	Description:	The underside of all reinforced concrete bridge slabs regardless of the protective systems used.			
	Quantity Calculation:	Area of the slab from edge to edge, including any median areas, areas obscured by sidewalks, barriers, etc., and accounting for any flares or ramps present.			
RAILINGS					
331	**Reinforced Concrete Bridge Railing**	Classification:	**NBE**	Unit of Measure:	**ft**
	Description:	All types and shapes of reinforced concrete bridge railing. All elements of the railing must be concrete.			
	Quantity Calculation:	Number of rows of bridge railing times the length of the bridge, includes only the railing on the bridge.			
8331	**Reinforced Concrete Pedestrian Railing**	Classification:	**ADE**	Unit of Measure:	**ft**
	Description:	All types and shapes of reinforced concrete bridge pedestrian railing. All elements of the railing must be concrete.			
	Quantity Calculation:	Number of rows of pedestrian railing times the length of the bridge, includes only the pedestrian railing on the bridge.			

TOPSIDE ELEMENTS						
8351	**Concrete Curbs/Sidewalks**		Classification:	**ADE**	Unit of Measure:	**ft**
	Description:	Curbs and/or sidewalks carried on the bridge that are constructed of reinforced or unreinforced concrete.				
	Quantity Calculation:	Sum of all the lengths of curbs and/or sidewalk, includes only the curb and/or sidewalk within the length of the bridge.				
SUPERSTRUCTURE						
105	**Reinforced Concrete Closed Web/Box Girder**		Classification:	**NBE**	Unit of Measure:	**ft**
	Description:	All reinforced concrete box girders or closed web girders. For all box girders regardless of protective system.				
	Quantity Calculation:	Sum of all the lengths of each box girder section. This quantity can be determined by counting the visible web faces, dividing by two, and then multiplying by the appropriate length of the box section. Elements such as adjacent box girders are considered individual girders.				
	Notes:	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 16.				
110	**Reinforced Concrete Open Girder/Beam**		Classification:	**NBE**	Unit of Measure:	**ft**
	Description:	Mild steel reinforced concrete open web girders regardless of protective system.				
	Quantity Calculation:	Sum of all the lengths of each girder.				
	Notes:	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 16.				
116	**Reinforced Concrete Stringer**		Classification:	**NBE**	Unit of Measure:	**ft**
	Description:	Mild steel reinforced concrete members that support the deck in a stringer floor beam system regardless of protective system.				
	Quantity Calculation:	Sum of all the lengths of each stringer.				
144	**Reinforced Concrete Arch**		Classification:	**NBE**	Unit of Measure:	**ft**
	Description:	Only mild steel reinforced concrete arches regardless of protective system.				
	Quantity Calculation:	Sum of all the lengths of each arch panel measured longitudinally along the travel way				
155	**Reinforced Concrete Floor Beam**		Classification:	**NBE**	Unit of Measure:	**ft**
	Description:	Mild steel reinforced concrete floor beams that typically support stringers regardless of protective system.				
	Quantity Calculation:	Sum of all the lengths of each floor beam.				
8122	**Reinforced Concrete Diaphragm**		Classification:	**ADE**	Unit of Measure:	**ea**
	Description:	All reinforced concrete diaphragms, excluding internal diaphragms present in closed web/box girders, regardless of protective system.				
	Quantity Calculation:	Sum of the number of diaphragms.				

SUBSTRUCTURE						
205	**Reinforced Concrete Column**		Classification:	**NBE**	Unit of Measure:	**ea**
	Description:	All reinforced concrete columns regardless of protective system.				
	Quantity Calculation:	Sum of the number of columns.				
8205	**Reinforced Concrete Column (LF)**		Classification:	**ADE**	Unit of Measure:	**ft**
	Description:	All reinforced concrete columns regardless of protective system.				
	Quantity Calculation:	Sum of the visible heights of the columns.				
8252	**Reinforced Concrete Web Wall, Strut, Lateral Bracing, etc. Between Columns**		Classification:	**ADE**	Unit of Measure:	**ft**
	Description:	Reinforced concrete bracing, including web walls, struts, lateral bracings, etc. between columns or bents, regardless of protective system.				
	Quantity Calculation:	Sum of the horizontal lengths, measured along the skew angle, of web wall, strut, and/or lateral bracing between columns or bents.				
210	**Reinforced Concrete Pier Wall**		Classification:	**NBE**	Unit of Measure:	**ft**
	Description:	Reinforced concrete pier walls regardless of protective systems.				
	Quantity Calculation:	Sum of the lengths of the pier walls measured along the skew angle.				
215	**Reinforced Concrete Abutment**		Classification:	**NBE**	Unit of Measure:	**ft**
	Description:	Reinforced concrete abutments, including the material retaining the embankment and monolithic wingwalls and abutment extensions. For all reinforced concrete abutments regardless of protective systems.				
	Quantity Calculation:	Sum of the widths of the abutments with monolithic wingwalls and abutment extensions measured along the skew angle.				
220	**Reinforced Concrete Pile Cap/Footing**		Classification:	**NBE**	Unit of Measure:	**ft**
	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.				
	Quantity Calculation:	Sum of the lengths of the footings or pile caps along the skew angle.				
227	**Reinforced Concrete Pile**		Classification:	**NBE**	Unit of Measure:	**ea**
	Description:	Reinforced concrete piles that are visible for inspection, including piles exposed from erosion or scour and piles visible during an underwater inspection. For all reinforced concrete piles regardless of protective system				
	Quantity Calculation:	Sum of the number of piles visible for inspection.				
234	**Reinforced Concrete Pier Cap**		Classification:	**NBE**	Unit of Measure:	**ft**
	Description:	Those reinforced concrete pier caps that support girders and transfer load into piles or columns. For all pier caps regardless of protective system.				
	Quantity Calculation:	Sum of the cap lengths measured along the skew angle.				

8262	**Reinforced Concrete Wingwall**		Classification:	**ADE**	Unit of Measure:	**ft**
	Description:	Reinforced concrete non-monolithic wingwall, including the material retaining the embankment. For all reinforced concrete non-monolithic wingwalls regardless of protective system.				
	Quantity Calculation:	Sum of the lengths of the non-monolithic wingwalls along the skew angle.				
8266	**Reinforced Concrete Headwall**		Classification:	**ADE**	Unit of Measure:	**ft**
	Description:	Reinforced concrete headwall, including the material retaining the embankment. For all reinforced concrete headwalls regardless of protective system.				
	Quantity Calculation:	Sum of the lengths of the headwalls along the skew angle.				
	CULVERTS					
241	**Reinforced Concrete Culvert**		Classification:	**NBE**	Unit of Measure:	**ft**
	Description:	Reinforced concrete culverts, including box, arched, round, or elliptical shapes.				
	Quantity Calculation:	Flow line length of the barrel times the number of the barrels.				
	APPROACH SLAB					
321	**Reinforced Concrete Approach Slab**		Classification:	**BME**	Unit of Measure:	**ft^2**
	Description:	Those structural sections between the abutment and the approach pavement that are constructed of mild steel reinforced concrete.				
	Quantity Calculation:	Area of the approach slab(s) from edge to edge including any median areas, areas obscured by sidewalks, barriers, etc., and accounting for any flares or ramps present.				

3.1.2—Prestressed Concrete

DECKS AND SLABS					
13	**Prestressed Concrete Deck**	Classification:	**NBE**	Unit of Measure:	**ft²**
	Description:	All prestressed concrete bridge decks regardless of the wearing surface or protective systems used.			
	Quantity Calculation:	Area of the deck from edge to edge, including any median areas, areas obscured by sidewalks, barriers, etc., and accounting for any flares or ramps present.			
15	**Prestressed Concrete Top Flange**	Classification:	**NBE**	Unit of Measure:	**ft²**
	Description:	All prestressed bridge girder top flanges where traffic rides directly on the structural element regardless of the wearing surface or protective systems used. These bridge types include bulb-tees, box girders, and girders that require traffic to ride on the top flange.			
	Quantity Calculation:	Area of the top flange from edge to edge including any median areas, areas obscured by sidewalks, barriers, etc., and accounting for any flares or ramps present. This quantity is for the top flange riding surface only. Girder web and bottom flange are to be evaluated by the appropriate girder element.			
39	**Prestressed Concrete Slab**	Classification:	**NBE**	Unit of Measure:	**ft²**
	Description:	All prestressed concrete bridge slabs regardless of the wearing surface or protective systems used.			
	Quantity Calculation:	Area of the slab from edge to edge, including any median areas, areas obscured by sidewalks, barriers, etc., and accounting for any flares or ramps present.			
8013	**Underside of Prestressed Concrete Deck**	Classification:	**ADE**	Unit of Measure:	**ft²**
	Description:	The underside of all prestressed concrete bridge decks regardless of the wearing surface or protective systems used.			
	Quantity Calculation:	Area of the deck from edge to edge, including any median areas, areas obscured by sidewalks, barriers, etc., and accounting for any flares or ramps present.			
8039	**Underside of Prestressed Concrete Slab**	Classification:	**ADE**	Unit of Measure:	**ft²**
	Description:	The underside of all prestressed concrete bridge slabs regardless of the wearing surface or protective systems used.			
	Quantity Calculation:	Area of the slab from edge to edge, including any median areas, areas obscured by sidewalks, barriers, etc., and accounting for any flares or ramps present.			
SUPERSTRUCTURE					
104	**Prestressed Concrete Closed Web/Box Girder**	Classification:	**NBE**	Unit of Measure:	**ft**
	Description:	All pretensioned or post-tensioned concrete closed web girders or box girders For all box girders regardless of protective system.			
	Quantity Calculation:	Sum of all the length of each box girder section. This quantity can be determined by counting the visible web faces, dividing by two, and then multiplying by the appropriate length of the box section. Elements such as adjacent box girders are considered individual girders.			
109	**Prestressed Concrete Open Girder/Beam**	Classification:	**NBE**	Unit of Measure:	**ft**
	Description:	Pretensioned or post-tensioned concrete open web girders regardless of protective system.			
	Quantity Calculation:	Sum of all the lengths of each girder.			
	Notes:	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.			

115	**Prestressed Concrete Stringer**		Classification:	**NBE**	Unit of Measure:	**ft**
	Description:	Pretensioned or post-tensioned concrete members that support the deck in a stringer floor beam system regardless of protective system.				
	Quantity Calculation:	Sum of all-the lengths of each stringer.				
143	**Prestressed Concrete Arch**		Classification:	**NBE**	Unit of Measure:	**ft**
	Description:	Only pretensioned or post-tensioned concrete arches regardless of protective system.				
	Quantity Calculation:	Sum of the length of each arch panel measured longitudinally along the travel way.				
154	**Prestressed Concrete Floor Beam**		Classification:	**NBE**	Unit of Measure:	**ft**
	Description:	Prestressed concrete floor beams that typically support stringers regardless of protective system.				
	Quantity Calculation:	Sum of all-the lengths of each floor beam.				
8123	**Prestressed Concrete Diaphragm**		Classification:	**ADE**	Unit of Measure:	**ea**
	Description:	All prestressed concrete diaphragms, excluding internal diaphragms present in closed web/box girders, regardless of protective system.				
	Quantity Calculation:	Sum of the number of diaphragms.				
SUBSTRUCTURE						
204	**Prestressed Concrete Column**		Classification:	**NBE**	Unit of Measure:	**ea**
	Description:	All prestressed concrete columns regardless of protective system.				
	Quantity Calculation:	Sum of the number of columns.				
8204	**Prestressed Concrete Column (LF)**		Classification:	**ADE**	Unit of Measure:	**ft**
	Description:	All prestressed concrete columns regardless of protective system.				
	Quantity Calculation:	Sum of the visible heights of the columns.				
8251	**Prestressed Concrete Web Wall, Strut, Lateral Bracing, etc. Between Columns**		Classification:	**ADE**	Unit of Measure:	**ft**
	Description:	Prestressed concrete bracing, including web walls, struts, lateral bracings, etc. between columns or bents, regardless of protective system.				
	Quantity Calculation:	Sum of the horizontal lengths, measured along the skew angle, of web wall, strut, and/or lateral bracing between columns or bents.				
226	**Prestressed Concrete Pile**		Classification:	**NBE**	Unit of Measure:	**ea**
	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.				
	Quantity Calculation:	Sum of the number of piles visible for inspection.				

233	**Prestressed Concrete Pier Cap**	Classification:	**NBE**	Unit of Measure:	**ft**
	Description:	Those prestressed concrete pier caps that support girders and transfer load into piles or columns. For all caps regardless of protective system.			
	Quantity Calculation:	Sum of the cap lengths measured along the skew angle.			
CULVERTS					
245	**Prestressed Concrete Culvert**	Classification:	**NBE**	Unit of Measure:	**ft**
	Description:	All prestressed concrete culverts.			
	Quantity Calculation:	Flow line length of the barrel times the number of barrels.			
APPROACH SLAB					
320	**Prestressed Concrete Approach Slab**	Classification:	**BME**	Unit of Measure:	**ft^2**
	Description:	Those structural sections between the abutment and the approach pavement that are constructed of prestressed (post-tensioned) reinforced concrete.			
	Quantity Calculation:	Area of the approach slab(s) from edge to edge including any median areas, areas obscured by sidewalks, barriers, etc., and accounting for any flares or ramps present.			

3.1.3—Steel

DECKS AND SLABS					
28	**Steel Deck with Open Grid**	Classification:	**NBE**	Unit of Measure:	**ft²**
	Description:	All open grid steel bridge decks with no fill.			
	Quantity Calculation:	Area of the deck from edge to edge, including any median areas, areas obscured by sidewalks, barriers, etc., and accounting for any flares or ramps present.			
	Notes:	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.			
29	**Steel Deck with Concrete Filled Grid**	Classification:	**NBE**	Unit of Measure:	**ft²**
	Description:	Steel bridge decks with concrete fill either in all of the openings or within the wheel tracks.			
	Quantity Calculation:	Area of the deck from edge to edge, including any median areas, areas obscured by sidewalks, barriers, etc., and accounting for any flares or ramps present.			
	Notes:	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.			
30	**Steel Deck Corrugated/Orthotropic/Etc.**	Classification:	**NBE**	Unit of Measure:	**ft²**
	Description:	Those bridge decks constructed of corrugated metal filled with Portland cement, asphaltic concrete, or other riding surfaces. Orthotropic steel decks are also included.			
	Quantity Calculation:	Area of the deck from edge to edge, including any median areas, areas obscured by sidewalks, barriers, etc., and accounting for any flares or ramps present.			
	Notes:	Materials added for riding surface are not part of the element condition and shall be included under the wearing surface assessment.			
8029	**Underside of Steel Deck with Concrete Filled Grid**	Classification:	**ADE**	Unit of Measure:	**ft²**
	Description:	Underside of steel bridge decks with concrete fill either in all of the openings or within the wheel tracks.			
	Quantity Calculation:	Area of the deck from edge to edge, including any median areas, areas obscured by sidewalks, barriers, etc., and accounting for any flares or ramps present.			
8030	**Underside of Steel Deck Corrugated/Orthotropic/Etc.**	Classification:	**ADE**	Unit of Measure:	**ft²**
	Description:	Underside of those bridge decks constructed of corrugated metal filled with Portland cement, asphaltic concrete, or other riding surfaces. Orthotropic steel decks are also included.			
	Quantity Calculation:	Area of the deck from edge to edge, including any median areas, areas obscured by sidewalks, barriers, etc., and accounting for any flares or ramps present.			
	Notes:	This element does not include metal stay-in-place (SIP) forms for cast-in-place concrete decks.			
RAILINGS					
330	**Metal Bridge Railing**	Classification:	**NBE**	Unit of Measure:	**ft**
	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 posts of metal, timber, or concrete; blocking; and curb.			
	Quantity Calculation:	Number of rows of bridge railing times the length of the bridge, includes only the railing on the bridge.			

8330	**Metal Pedestrian Railing**		Classification:	**ADE**	Unit of Measure:	**ft**
	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 posts of metal, timber, or concrete; blocking; and all hardware.				
	Quantity Calculation:	Number of rows of pedestrian railing times the length of the bridge, includes only the pedestrian railing on the bridge.				
	Notes:	This element does not include chain link fencing or ornamental railing. Chain link fencing shall be captured using Element 8362 and ornamental railing using Element 8363.				
TOPSIDE ELEMENTS						
8350	**Steel Curbs/Sidewalks**		Classification:	**ADE**	Unit of Measure:	**ft**
	Description:	Steel curbs and/or sidewalks carried on the bridge, regardless of protective system.				
	Quantity Calculation:	Sum of all the lengths of curbs and/or sidewalk, includes only the curb and/or sidewalk within the length of the bridge.				
	Notes:	Do not use this element for reinforced concrete curbs/sidewalks with steel nose angles attached; instead use Element 8351.				
8362	**Chain Link Fencing**		Classification:	**ADE**	Unit of Measure:	**ft**
	Description:	All types of chain link fencing carried on or attached to the bridge, regardless of protective system.				
	Quantity Calculation:	Sum of all the lengths of chain link fencing, includes only the chain link fencing within the length of the bridge.				
	Notes:	This element includes chain link fencing atop bridges under fill (both mounted to the headwall and/or wingwall or simply carried across the bridge). This element does not include fencing located beneath the bridge (i.e., ROW or security fencing).				
SUPERSTRUCTURE						
102	**Steel Closed Web/Box Girder**		Classification:	**NBE**	Unit of Measure:	**ft**
	Description:	All steel box girders or closed web girders. For all box girders regardless of protective system.				
	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.				
107	**Steel Open Girder/Beam**		Classification:	**NBE**	Unit of Measure:	**ft**
	Description:	All steel open girders regardless of protective system.				
	Quantity Calculation:	Sum of all the lengths of each girder.				
113	**Steel Stringer**		Classification:	**NBE**	Unit of Measure:	**ft**
	Description:	Steel members that support the deck in a stringer floor beam system regardless of protective system				
	Quantity Calculation:	Sum of all the lengths of each stringer.				

120	**Steel Truss**		Classification:	**NBE**	Unit of Measure:	**ft**
	Description:	All steel truss elements, including all tension and compression members for through and deck trusses. For all trusses regardless of protective system.				
	Quantity Calculation:	Sum of all the lengths of each truss panel measured longitudinally along the travel way.				
141	**Steel Arch**		Classification:	**NBE**	Unit of Measure:	**ft**
	Description:	Steel arches regardless of type or protective system.				
	Quantity Calculation:	Sum of all the lengths of each arch panel measured longitudinally along the travel way.				
152	**Steel Floor Beam**		Classification:	**NBE**	Unit of Measure:	**ft**
	Description:	Steel floor beams that typically support stringers regardless of protective system.				
	Quantity Calculation:	Sum of all the lengths of each floor beam.				
147	**Steel Main Cables**		Classification:	**NBE**	Unit of Measure:	**ft**
	Description:	All steel main suspension or cable stay cables not embedded in concrete. For all cable groups regardless of protective systems.				
	Quantity Calculation:	Sum of all the lengths of each main cable measured longitudinally along the travel way.				
	Notes:	This element is intended for use on main cables in suspension bridges or main cable stays in cable stayed bridges. Suspender cables or other smaller cables shall be captured using Element 148.				
148	**Secondary Steel Cables**		Classification:	**NBE**	Unit of Measure:	**ft**
	Description:	All steel suspender cables not embedded in concrete. For all individual or cable groups regardless of protective systems.				
	Quantity Calculation:	Sum of the individual cable or cable groups carrying the load from the superstructure to the main cable/arch elements.				
	Notes:	This element is intended for use on suspender cables, other smaller cables, or groups of cables 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 Element 147.				
161	**Steel Pin and Pin & Hanger Assembly or both**		Classification:	**NBE**	Unit of Measure:	**ea**
	Description:	Steel pins and pin and hanger assemblies regardless of protective system.				
	Quantity Calculation:	Sum of the number of pins, pin and hanger assemblies, or both.				
	Notes:	Distress observed on either hanger assembly plate should be considered in the condition assessment.				

162	**Steel Gusset Plate**		Classification:	**NBE**	Unit of Measure:	**ea**
	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 systems.				
	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.				
8121	**Steel Diaphragm**		Classification:	**ADE**	Unit of Measure:	**ea**
	Description:	All steel diaphragms, excluding internal diaphragms present in closed web/box girders, regardless of protective system.				
	Quantity Calculation:	Sum of the number of diaphragms.				
	SUBSTRUCTURE					
202	**Steel Column**		Classification:	**NBE**	Unit of Measure:	**ea**
	Description:	All steel columns regardless of protective system.				
	Quantity Calculation:	Sum of the number of columns.				
8202	**Steel Column (LF)**		Classification:	**ADE**	Unit of Measure:	**ft**
	Description:	All steel columns regardless of protective system.				
	Quantity Calculation:	Sum of the visible heights of the columns.				
8250	**Steel Web Wall, Strut, Lateral Bracing, etc. Between Columns**		Classification:	**ADE**	Unit of Measure:	**ft**
	Description:	Steel bracing, including web walls, struts, lateral bracings, etc. between columns or bents, regardless of protective system.				
	Quantity Calculation:	Sum of the horizontal lengths, measured along the skew angle, of web wall, strut, and/or lateral bracing between columns or bents.				
207	**Steel Tower**		Classification:	**NBE**	Unit of Measure:	**ft**
	Description:	Steel built-up or framed tower supports regardless of protective system.				
	Quantity Calculation:	Sum of the heights of built-up or framed tower supports.				
	Notes:	This element is intended to be used for truss-framed tower supports or built-up steel towers. It is intended to capture large supports and towers associated with suspension bridges, cable stayed bridges, movable bridges, or similar structural configurations.				
219	**Steel Abutment**		Classification:	**NBE**	Unit of Measure:	**ft**
	Description:	Steel abutments, including the sheet material retaining the embankment, and monolithic wingwalls and abutment extensions. For all abutments regardless of protective systems.				
	Quantity Calculation:	Sum of the width of the abutment with monolithic wingwalls and abutment extensions measured along the skew angle.				

225	**Steel Pile**		Classification:	**NBE**	Unit of Measure:	**ea**
	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.				
	Quantity Calculation:	Sum of the number of piles visible for inspection.				
231	**Steel Pier Cap**		Classification:	**NBE**	Unit of Measure:	**ft**
	Description:	Those steel pier caps that support girders and transfer load into piles or columns. For all steel pier caps regardless of protective system.				
	Quantity Calculation:	Sum of the cap lengths measured along the skew angle.				
CULVERTS						
240	**Steel Culvert**		Classification:	**NBE**	Unit of Measure:	**ft**
	Description:	Steel culverts, including arched, round, or elliptical pipes.				
	Quantity Calculation:	Flow line length of the barrel times the number of barrels.				

3.1.4—Timber

DECKS AND SLABS					
31	**Timber Deck**	Classification:	**NBE**	Unit of Measure:	**ft²**
	Description:	All timber bridge decks, regardless of the wearing surface or protective systems used.			
	Quantity Calculation:	Area of the deck from edge to edge, including any median areas, areas obscured by sidewalks, barriers, etc., and accounting for any flares or ramps present.			
	Notes:	Timber running planks shall be included under the wearing surface assessment.			
54	**Timber Slab**	Classification:	**NBE**	Unit of Measure:	**ft²**
	Description:	All timber bridge slabs, regardless of the wearing surface or protective systems used.			
	Quantity Calculation:	Area of the slab from edge to edge, including any median areas, areas obscured by sidewalks, barriers, etc., and accounting for any flares or ramps present.			
8031	**Underside of Timber Deck**	Classification:	**ADE**	Unit of Measure:	**ft²**
	Description:	Underside of all timber bridge decks, regardless of the wearing surface or protective systems used.			
	Quantity Calculation:	Area of the deck from edge to edge, including any median areas, areas obscured by sidewalks, barriers, etc., and accounting for any flares or ramps present.			
8054	**Underside of Timber Slab**	Classification:	**ADE**	Unit of Measure:	**ft²**
	Description:	Underside of all timber bridge slabs, regardless of the wearing surface or protective systems used.			
	Quantity Calculation:	Area of the slab from edge to edge, including any median areas, areas obscured by sidewalks, barriers, etc., and accounting for any flares or ramps present.			
RAILINGS					
332	**Timber Bridge Railing**	Classification:	**NBE**	Unit of Measure:	**ft**
	Description:	All types and shapes of timber bridge railing. Included in this element are posts of timber, metal, or concrete; blocking; and curb.			
	Quantity Calculation:	Number of rows of bridge railing times the length of the bridge; includes only the railing on the bridge.			
8332	**Timber Pedestrian Railing**	Classification:	**ADE**	Unit of Measure:	**ft**
	Description:	All types and shapes of timber pedestrian railing. Included in this element are posts of timber, metal, or concrete; blocking; and curb.			
	Quantity Calculation:	Number of rows of pedestrian railing times the length of the bridge, includes only the pedestrian railing on the bridge.			
TOPSIDE ELEMENTS					
8352	**Timber Curbs/Sidewalks**	Classification:	**ADE**	Unit of Measure:	**ft**
	Description:	Curbs and/or sidewalks carried on the bridge that are constructed of timber.			
	Quantity Calculation:	Sum of all the lengths of curbs and/or sidewalk, includes only the curb and/or sidewalk within the length of the bridge.			

SUPERSTRUCTURE					
111	**Timber Open Girder/Beam**	Classification:	**NBE**	Unit of Measure:	**ft**
	Description:	All timber open girders, regardless of protective system.			
	Quantity Calculation:	Sum of all the lengths of each girder/beam.			
	Notes:	This element includes solid timbers, glue-lam timbers, nail-lam timbers, etc.			
117	**Timber Stringer**	Classification:	**NBE**	Unit of Measure:	**ft**
	Description:	Timber members that support the deck in a stringer floor beam system, regardless of protective system.			
	Quantity Calculation:	Sum of all the lengths of each stringer.			
135	**Timber Truss**	Classification:	**NBE**	Unit of Measure:	**ft**
	Description:	All timber truss elements, including all tension and compression members for through and deck trusses. For all trusses, regardless of protective system.			
	Quantity Calculation:	Sum of all the lengths of each truss panel measured longitudinally along the travel way.			
146	**Timber Arch**	Classification:	**NBE**	Unit of Measure:	**ft**
	Description:	Only timber arches, regardless of protective system.			
	Quantity Calculation:	Sum of all the lengths of each arch panel measured longitudinally along the travel way.			
156	**Timber Floor Beam**	Classification:	**NBE**	Unit of Measure:	**ft**
	Description:	Timber floor beams that typically support stringers, regardless of protective system.			
	Quantity Calculation:	Sum of all the lengths of each floor beam.			
8124	**Timber Diaphragm**	Classification:	**ADE**	Unit of Measure:	**ea**
	Description:	All timber diaphragms, regardless of protective system.			
	Quantity Calculation:	Sum of the number of diaphragms.			
SUBSTRUCTURE					
206	**Timber Column**	Classification:	**NBE**	Unit of Measure:	**ea**
	Description:	All timber columns, regardless of protective system.			
	Quantity Calculation:	Sum of the number of columns.			
8206	**Timber Column (LF)**	Classification:	**ADE**	Unit of Measure:	**ft**
	Description:	All timber columns, regardless of protective system.			
	Quantity Calculation:	Sum of the visible heights of the columns.			

8253	**Timber Web Wall, Strut, Lateral Bracing, etc. Between Columns**		Classification:	**ADE**	Unit of Measure:	**ft**
	Description:	Timber bracing, including web walls, struts, lateral bracings, etc. between columns or bents, regardless of protective system.				
	Quantity Calculation:	Sum of the horizontal lengths, measured along the skew angle, of web wall, strut, and/or lateral bracing between columns or bents.				
208	**Timber Trestle**		Classification:	**NBE**	Unit of Measure:	**ft**
	Description:	Framed timber supports. For all timber trestle/towers, regardless of protective system.				
	Quantity Calculation:	Sum of the heights of built-up or framed tower supports.				
	Notes:	This element is intended to be used for truss framed trestle or towers. It is intended to capture large supports and towers associated with large deck truss bridges.				
212	**Timber Pier Wall**		Classification:	**NBE**	Unit of Measure:	**ft**
	Description:	Those timber pier walls that include pile, timber sheet material, and filler. For all pier walls regardless of protective systems.				
	Quantity Calculation:	Sum of the length of the pier walls measured along the skew angle.				
216	**Timber Abutment**		Classification:	**NBE**	Unit of Measure:	**ft**
	Description:	Timber abutments, including the sheet material retaining the embankment, integral wingwalls, and abutment extensions. For all abutments, regardless of protective systems.				
	Quantity Calculation:	Sum of the width of the abutment with integral wingwalls and abutment extensions measured along the skew angle.				
228	**Timber Pile**		Classification:	**NBE**	Unit of Measure:	**ea**
	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				
	Quantity Calculation:	Sum of the number of piles visible for inspection.				
235	**Timber Pier Cap**		Classification:	**NBE**	Unit of Measure:	**ft**
	Description:	Those timber pier caps that support girders that transfer load into piles, or columns. For all timber pier caps, regardless of protective system.				
	Quantity Calculation:	Sum of the pier cap lengths measured along the skew angle.				
8263	**Timber Wingwall**		Classification:	**ADE**	Unit of Measure:	**ft**
	Description:	Timber non-monolithic wingwall. For all wingwalls regardless of protective system.				
	Quantity Calculation:	Sum of the lengths of the non-monolithic wingwalls along the skew angle.				
CULVERTS						
242	**Timber Culvert**		Classification:	**NBE**	Unit of Measure:	**ft**
	Description:	All timber culverts.				
	Quantity Calculation:	Flow line length of the barrel times the number of barrels.				

3.1.5—Masonry

RAILINGS					
334	**Masonry Bridge Railing**	Classification:	**NBE**	Unit of Measure:	**ft**
	Description:	All types and shapes of masonry block or stone bridge railing. All elements of the railing must be masonry block or stone.			
	Quantity Calculation:	Number of rows of bridge railing times the length of the bridge; includes only the railing on the bridge.			
8334	**Masonry Pedestrian Railing**	Classification:	**ADE**	Unit of Measure:	**ft**
	Description:	All types and shapes of masonry block or stone pedestrian railing. All elements of the railing must be masonry block or stone.			
	Quantity Calculation:	Number of rows of pedestrian railing times the length of the bridge, includes only the pedestrian railing on the bridge.			
TOPSIDE ELEMENTS					
8354	**Masonry Curbs/Sidewalks**	Classification:	**ADE**	Unit of Measure:	**ft**
	Description:	Curbs and/or sidewalks carried on the bridge that are constructed of masonry block or stone.			
	Quantity Calculation:	Sum of all the lengths of curbs and/or sidewalk, includes only the curb and/or sidewalk within the length of the bridge.			
SUPERSTRUCTURE					
145	**Masonry Arch**	Classification:	**NBE**	Unit of Measure:	**ft**
	Description:	Masonry or stacked stone arches, regardless of protective system.			
	Quantity Calculation:	Sum of all the lengths of each arch section measured longitudinally along the travel way.			
SUBSTRUCTURE					
213	**Masonry Pier Wall**	Classification:	**NBE**	Unit of Measure:	**ft**
	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.			
	Quantity Calculation:	Sum of the wall lengths measured along the skew angle.			
217	**Masonry Abutment**	Classification:	**NBE**	Unit of Measure:	**ft**
	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.			
	Quantity Calculation:	Sum of the width of the abutment with integral wingwalls and abutment extensions measured along the skew angle.			
8264	**Masonry Wingwall**	Classification:	**ADE**	Unit of Measure:	**ft**
	Description:	Non-monolithic wingwalls that are constructed of block or stone. The block or stone may be placed with or without mortar. For all wingwalls regardless of protective system.			
	Quantity Calculation:	Sum of the lengths of the non-monolithic wingwalls along the skew angle.			

8267	**Masonry Headwall**		Classification:	**ADE**	Unit of Measure:	**ft**
	Description:	Those headwalls that are constructed of block or stone. The block or stone may be placed with or without mortar. For all headwalls regardless of protective system.				
	Quantity Calculation:	Sum of the lengths of the non-monolithic headwalls along the skew angle.				
CULVERTS						
244	**Masonry Culvert**		Classification:	**NBE**	Unit of Measure:	**ft**
	Description:	Masonry block or stone culverts.				
	Quantity Calculation:	Flow line length of the barrel times the number of barrels.				

3.1.6—Other Materials

DECKS AND SLABS					
60	**Other Deck**	Classification:	**NBE**	Unit of Measure:	**ft²**
	Description:	All bridge decks constructed of materials not covered by other elements, regardless of the wearing surface or protective systems used.			
	Quantity Calculation:	Area of the deck from edge to edge, including any median areas, areas obscured by sidewalks, barriers, etc., and accounting for any flares or ramps present.			
65	**Other Slab**	Classification:	**NBE**	Unit of Measure:	**ft²**
	Description:	All slabs constructed of materials not covered by other elements, regardless of the wearing surface or protective systems used.			
	Quantity Calculation:	Area of the slab from edge to edge, including any median areas, areas obscured by sidewalks, barriers, etc., and accounting for any flares or ramps present.			
8060	**Underside of Other Deck**	Classification:	**ADE**	Unit of Measure:	**ft²**
	Description:	Underside of all bridge decks constructed of materials not covered by other elements, regardless of the wearing surface or protective systems used.			
	Quantity Calculation:	Area of the deck from edge to edge, including any median areas, areas obscured by sidewalks, barriers, etc., and accounting for any flares or ramps present.			
8065	**Underside of Other Slab**	Classification:	**ADE**	Unit of Measure:	**ft²**
	Description:	Underside of all slabs constructed of materials not covered by other elements, regardless of the wearing surface or protective systems used.			
	Quantity Calculation:	Area of the slab from edge to edge, including any median areas, areas obscured by sidewalks, barriers, etc., and accounting for any flares or ramps present.			
RAILINGS					
333	**Other Bridge Railing**	Classification:	**NBE**	Unit of Measure:	**ft**
	Description:	All types and shapes of bridge railing, except those defined as metal, concrete, timber, or masonry.			
	Quantity Calculation:	Number of rows of bridge railing times the length of the bridge; includes only the railing on the bridge.			
8333	**Other Pedestrian Railing**	Classification:	**ADE**	Unit of Measure:	**ft**
	Description:	All types and shapes of bridge railing, except those defined as metal, concrete, timber, or masonry.			
	Quantity Calculation:	Number of rows of pedestrian railing times the length of the bridge, includes only the pedestrian railing on the bridge.			
TOPSIDE ELEMENTS					
8353	**Other Curbs/Sidewalks**	Classification:	**ADE**	Unit of Measure:	**ft**
	Description:	Curbs and/or sidewalks carried on the bridge that are constructed of material other than steel, concrete, timber, or masonry.			
	Quantity Calculation:	Sum of all the lengths of curbs and/or sidewalk, includes only the curb and/or sidewalk within the length of the bridge.			

8361	**Sound Barrier Wall**	Classification:	**ADE**	Unit of Measure:	**ft**
	Description:	Sound barrier wall carried on or attached to the structure, which may be constructed of any material.			
	Quantity Calculation:	Sum of all the lengths of sound wall, includes only the sound barrier walls within the length of the bridge.			
	Notes:	See Appendix Article E1.1 for additional guidance.			
8363	**Ornamental Railing**	Classification:	**ADE**	Unit of Measure:	**ft**
	Description:	All types of ornamental railing carried on or attached to the bridge, regardless of material or protective system.			
	Quantity Calculation:	Sum of all the lengths of ornamental railing, includes only the ornamental railing within the length of the bridge.			
	Notes:	This element includes only those railings, standalone or mounted to a parapet or similar, that are not required to meet the crash test level of the system (as reported in SNBI Item B.RH.01 (Bridge Railings)), and whose removal would not impact the crash test level of the bridge railing.			
8364	**Ornamental Truss**	Classification:	**ADE**	Unit of Measure:	**ft**
	Description:	All types of ornamental trusses carried on or attached to the bridge, regardless of material or protective system.			
	Quantity Calculation:	Sum of all the lengths of each ornamental truss panel measured longitudinally along the travel way.			
	Notes:	This element includes only those trusses that do not provide any structural support to the bridge. That is, the structure would still function in the same manner with or without the presence of the truss.			
	SUPERSTRUCTURE				
106	**Other Closed Web/Box Girder**	Classification:	**NBE**	Unit of Measure:	**ft**
	Description:	All box girders or closed web girders constructed of materials not covered by other elements. For all other material box girders, regardless of protective system.			
	Quantity Calculation:	Sum of all the length of each box girder section. This quantity can be determined by counting the visible web faces, dividing by two, and then multiplying by the appropriate length of the box section. Elements such as adjacent box girders are considered individual girders.			
112	**Other Open Girder/Beam**	Classification:	**NBE**	Unit of Measure:	**ft**
	Description:	All girders constructed of materials not covered by other elements, regardless of protective system.			
	Quantity Calculation:	Sum of all the lengths of each girder.			
118	**Other Stringer**	Classification:	**NBE**	Unit of Measure:	**ft**
	Description:	All stringers constructed of materials not covered by other elements, regardless of protective system.			
	Quantity Calculation:	Sum of all the lengths of each stringer.			
136	**Other Truss**	Classification:	**NBE**	Unit of Measure:	**ft**
	Description:	All truss elements constructed of materials not covered by other elements, including all tension and compression members, and through and deck trusses. For all other material trusses, regardless of protective system.			
	Quantity Calculation:	Sum of all the lengths of each truss panel measured longitudinally along the travel way.			

142	**Other Arch**		Classification:	**NBE**	Unit of Measure:	**ft**
	Description:	Arches constructed of materials not covered by other elements, regardless of type or protective system.				
	Quantity Calculation:	Sum of all the lengths of each arch panel measured longitudinally along the travel way.				
149	**Other Secondary Cable**		Classification:	**NBE**	Unit of Measure:	**ft**
	Description:	All cables constructed of materials not covered by other elements and not embedded in concrete. For all individual other material cables or cable groups, regardless of protective systems.				
	Quantity Calculation:	Sum of the individual cable or cable groups carrying the load from the superstructure to the main cable/arch elements.				
	Notes:	This element is intended for use on suspender cables, other smaller cables, or groups of cables 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 Element 147.				
157	**Other Floor Beam**		Classification:	**NBE**	Unit of Measure:	**ft**
	Description:	Floor beams constructed of materials not covered by other elements, that typically support stringers, regardless of protective system.				
	Quantity Calculation:	Sum of all the lengths of each floor beam.				
8125	**Other Diaphragm**		Classification:	**ADE**	Unit of Measure:	**ea**
	Description:	All diaphragms constructed of materials not covered by other elements, excluding internal diaphragms present in closed web/box girders, regardless of protective system.				
	Quantity Calculation:	Sum of the number of diaphragms.				
	SUBSTRUCTURE					
203	**Other Column**		Classification:	**NBE**	Unit of Measure:	**ea**
	Description:	All columns constructed of materials not covered by other elements, regardless of protective system.				
	Quantity Calculation:	Sum of the number of columns.				
	Notes:	This element is intended for columns constructed of composite materials, or other materials that cannot be classified using any other elements.				
8203	**Other Column (LF)**		Classification:	**ADE**	Unit of Measure:	**ft**
	Description:	All columns constructed of materials not covered by other elements, regardless of protective system.				
	Quantity Calculation:	Sum of the visible heights of the columns.				
8254	**Other Web Wall, Strut, Lateral Bracing, etc. Between Columns**		Classification:	**ADE**	Unit of Measure:	**ft**
	Description:	Bracing, including web walls, struts, lateral bracings, etc. between columns or bents, constructed of materials not covered by other elements, regardless of protective system.				
	Quantity Calculation:	Sum of the horizontal lengths, measured along the skew angle, of web wall, strut, and/or lateral bracing between columns or bents.				

211	**Other Pier Wall**		Classification:	**NBE**	Unit of Measure:	**ft**
	Description:	Those pier walls constructed of materials not covered by other elements, regardless of protective systems.				
	Quantity Calculation:	Sum of the lengths of the pier walls measured along the skew angle.				
218	**Other Abutment**		Classification:	**NBE**	Unit of Measure:	**ft**
	Description:	Abutment systems, including the sheet material retaining the embankment, and integral wingwalls and abutment extensions, constructed of materials not covered by other elements. For all abutments, regardless of protective systems.				
	Quantity Calculation:	Sum of the width of the abutment with integral wingwalls and abutment extensions measured along the skew angle.				
229	**Other Pile**		Classification:	**NBE**	Unit of Measure:	**ea**
	Description:	Piles that are visible for inspection, including piles exposed from erosion or scour and piles visible during an underwater inspection, constructed of materials not covered by other elements. For all other material piles, regardless of protective system.				
	Quantity Calculation:	Sum of the number of piles visible for inspection.				
236	**Other Pier Cap**		Classification:	**NBE**	Unit of Measure:	**ft**
	Description:	Pier caps constructed of materials not covered by other elements that support girders that transfer load into piles or columns. For all such pier caps, regardless of protective system.				
	Quantity Calculation:	Sum of the pier cap lengths measured along the skew angle.				
8261	**Slope Protection**		Classification:	**ADE**	Unit of Measure:	**ft^2**
	Description:	Slope (embankment or fill) protection under the bridge				
	Quantity Calculation:	Sum of the visible areas of slope protection, measured from the toe of slope to the base of the abutment stem, along the incline of the slope, for the average width at the toe and top of the slope.				
8265	**Other Wingwall**		Classification:	**ADE**	Unit of Measure:	**ft**
	Description:	Other material wingwall systems, including the material retaining the embankment. For all wingwalls regardless of protective system.				
	Quantity Calculation:	Sum of the lengths of the non-monolithic wingwalls along the skew angle.				
8268	**Other Headwall**		Classification:	**ADE**	Unit of Measure:	**ft**
	Description:	Other material headwall systems, including the material retaining the embankment. For all headwalls regardless of protective system.				
	Quantity Calculation:	Sum of the length of the headwall.				
8269	**Fender System**		Classification:	**ADE**	Unit of Measure:	**ft**
	Description:	Fender System of any material regardless of protective system, if any.				
	Quantity Calculation:	Sum of the length of each Fender System.				
	Notes:	See Appendix Article E.3 for additional guidance.				

8270	**Bulkhead**	Classification:	**ADE**	Unit of Measure:	**ft**
	Description:	Bulkhead constructed of any material, including the material retaining the embankment, regardless of protective system.			
	Quantity Calculation:	Sum of the length of all bulkheads.			
	CULVERTS				
243	**Other Culvert**	Classification:	**NBE**	Unit of Measure:	**ft**
	Description:	Culverts constructed of materials not covered by other elements, including arches, or round or elliptical pipes.			
	Quantity Calculation:	Flow line length of the barrel times the number of barrels.			
	MISCELLANEOUS				
8170	**Bridge Drainage**	Classification:	**ADE**	Unit of Measure:	**ea**
	Description:	Bridge Drainage units installed on deck and/or superstructure that include open scuppers, inlets, downspouts, etc.			
	Quantity Calculation:	Sum of all bridge drainage units.			
8171	**Seismic Retrofit Components**	Classification:	**ADE**	Unit of Measure:	**ea**
	Description:	Seismic Retrofits are designed to improve the expected seismic performance of the existing bridge through the addition of systems and components.			
	Quantity Calculation:	Sum of the number of retrofits installed on any component of the existing bridge.			
	Notes:	This element includes a range of seismic retrofits that have been employed to improve structural performance, such as: column and pier cap enhancements (i.e., concrete, steel, or FRP shells for additional confinement, continuity and ductility), restrainers and lock-up devices (to prevent superstructure unseating), hysteretic dampers (to reduce seismic response), and foundation enhancements. Though isolation bearings can be a seismic retrofit, they should only be coded as Element 8310. For seismic retrofits on pin and hanger assemblies, both this element and Element 161 should be used.			
8172	**Fascia Mounted Sign Structures**	Classification:	**ADE**	Unit of Measure:	**ea**
	Description:	Sign structure attached and/or mounted on the bridge fascia.			
	Quantity Calculation:	Sum of the number each sign structure with a separate truss attached to the existing bridge fascia.			
	Notes:	This element includes: bridge fascia mounted signs hanging from parapet or mounted on the fascia (with an actual mounting structure), which are intended to be viewed by traffic traveling under that bridge, and any bridge-mounted sign structure (with an actual mounting structure) physically mounted to a bridge through-truss portal, and viewable by traffic traveling on the bridge. This element does <u>not</u> include overhead span bridge mounted sign structures which are included in the routine Sign Structure Inspection program, such as sign structures mounted on pier caps. See Appendix Article E.2 for additional guidance.			
8173	**Temporary Support Structures**	Classification:	**ADE**	Unit of Measure:	**ea**
	Description:	Temporary support structures installed on the bridge.			
	Quantity Calculation:	Sum of the count of all temporary support structures.			

3.1.7—Bearings

Refer to Appendix Article B.4 for visual guides to aid in identifying bearing types.

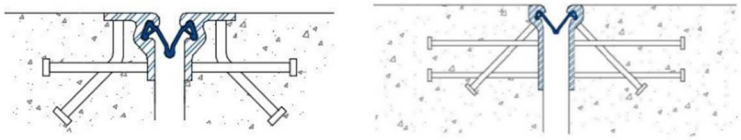
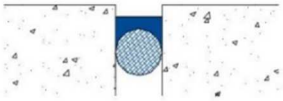
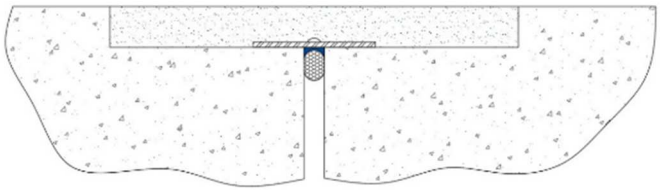
310	**Elastomeric Bearing**	Classification:	**NBE**	Unit of Measure:	**ea**
	Description:	Bridge bearings that are constructed primarily of elastomers, with or without fabric or metal reinforcement.			
	Quantity Calculation:	Sum of each bearing of this type.			
	Notes:	This element includes bearings constructed primarily of elastomers, with or without fabric or metal reinforcement in the elastomeric pads, which have a metal sole plate with a Polytetrafluoroethylene (PTFE) (Teflon) sliding surface. This element should be used for expansion (movable) or fixed elastomeric bearings. Use Element 313 for steel fixed bearings that have a small elastomeric pad.			
8310	**Isolation Bearing**	Classification:	**ADE**	Unit of Measure:	**ea**
	Description:	Bridge bearings that provide for deflection and horizontal movement by the following means: use a flexible mounting so that the period of vibration of the total system is lengthened sufficiently to reduce the force response of a seismic event; use a damper or energy dissipater so that the relative deflections across the flexible mounting can be limited to a practical design level; provide rigidity under low service load levels, such as wind loads and braking forces. These bearings may be used in both fixed and expansion (movable) applications.			
	Quantity Calculation:	Sum of each bearing of this type.			
	Notes:	This element is a sub-element of Element 310.			
311	**Movable Bearing**	Classification:	**NBE**	Unit of Measure:	**ea**
	Description:	Bridge bearings that provide for both rotation and longitudinal movement by means of roller, rocker, or sliding mechanisms.			
	Quantity Calculation:	Sum of each bearing of this type.			
	Notes:	This element does not include the following types of expansion (movable bearings): bond breaker bearings, elastomeric bearings, pot bearings, disk bearings, spherical bearings, enclosed/concealed bearings, and isolation bearings.			
8311	**Sliding Plate Bearing–Expansion/Movable**	Classification:	**ADE**	Unit of Measure:	**ea**
	Description:	Bridge bearings that provide for both rotational and longitudinal movement by means of plates that slide relative to each other. Longitudinal movements between the two plates is accomplished by providing slotted holes in the top (sole) plate which allows the plates to slide over each other. These bearings may be lubricated or non-lubricated. These plates may be flat in short spans (less than 50 ft in length), or concave and convex in longer spans to allow for rotation due to deflection.			
	Quantity Calculation:	Sum of each bearing of this type.			
	Notes:	This element is a sub-element of Element 311.			

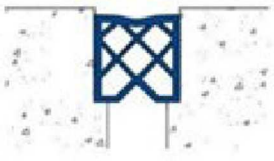
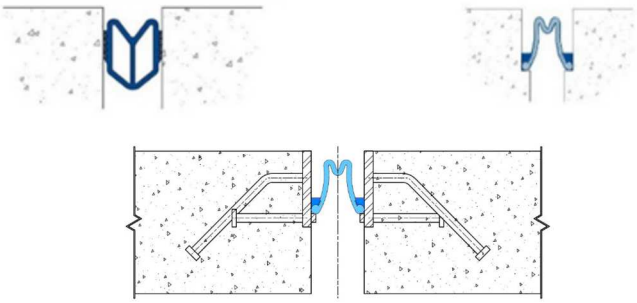
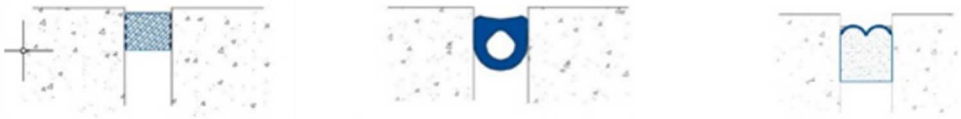
8317	**Rocker Bearing–Expansion/Movable**	Classification:	**ADE**	Unit of Measure:	**ea**
	Description:	Bridge bearings that provide for both deflection and longitudinal movement by means of a steel plate resting on a steel pin and steel rocker, held in place by a pintle. Expansion (movement) is accomplished by allowing the location of the pin to move relative to the center of the masonry plate.			
	Quantity Calculation:	Sum of each bearing of this type.			
	Notes:	This element is a sub-element of Element 311.			
312	**Enclosed/Concealed Bearing**	Classification:	**NBE**	Unit of Measure:	**ea**
	Description:	Bridge bearings that are enclosed so that they are not open for detailed inspection.			
	Quantity Calculation:	Sum of each bearing of this type.			
	Notes:	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. Also, the potential for catastrophic failure due to reduction of bearing area because of prestress shortening should be considered when rating this element.			
313	**Fixed Bearing**	Classification:	**NBE**	Unit of Measure:	**ea**
	Description:	Bridge bearings that provide for rotation only (no longitudinal movement).			
	Quantity Calculation:	Sum of each bearing of this type.			
	Notes:	This element does not include the following types of fixed bearings: elastomeric bearings, pot bearings, disk bearings, spherical bearings, enclosed/concealed bearings, and isolation bearings. This element does include pinned bearings.			
314	**Pot Bearing**	Classification:	**NBE**	Unit of Measure:	**ea**
	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.			
	Quantity Calculation:	Sum of each bearing of this type.			
	Notes:	These bearings may be used in both fixed and expansion (movable) applications. In this type of bearing, rotation about any plane can be accommodated with a large round elastomeric disk that is confined within a thick steel ring or cylinder (the "pot"). This bearing accommodates rotations by deformations of the disk. Because the elastomer is confined, it is able to carry more load than if it was allowed to bulge out in the unconfined state.			
315	**Disk Bearing**	Classification:	**NBE**	Unit of Measure:	**ea**
	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			
	Quantity Calculation:	Sum of each bearing of this type.			

8315	**Spherical Bearing**		Classification:	**ADE**	Unit of Measure:	**ea**
	Description:	Bridge bearings that provide for both deflection and longitudinal movement by means of matching spherical surfaces in a ball-and-socket type arrangement. The bearing may be fixed against horizontal movement, guided to allow movement in one direction, or floating to allow movement in any direction. Therefore, these bearings may be used in both fixed and expansion (movable) applications.				
	Quantity Calculation:	Sum of each bearing of this type.				
	Notes:	This element is a sub-element of element 315.				
316	**Other Bearing**		Classification:	**NBE**	Unit of Measure:	**ea**
	Description:	All bridge bearings constructed of materials not covered by other elements, regardless of translation or rotation constraints.				
	Quantity Calculation:	Sum of each bearing of this type.				
	Notes:	This element is intended for bearings constructed of materials that cannot be classified using any other bearing element.				
8316	**Bond Breaker Bearing– Expansion/Movable**		Classification:	**ADE**	Unit of Measure:	**ea**
	Description:	Bridge bearings that provide for longitudinal movement by means of membrane such as oil-soaked felt or tar paper that separates a concrete bridge seat from the concrete stringer or slab it supports. These bearings are used primarily for short spans and are not designed to allow for rotation caused by deflection.				
	Quantity Calculation:	Sum of each bearing of this type.				
	Notes:	This element is a sub-element of element 316. This type of bearing is inspected by examining the area at the interface between the superstructure and substructure.				

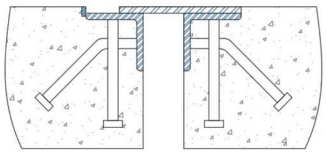
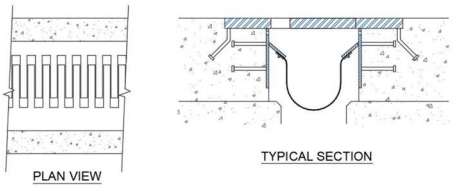
3.1.8—Joints

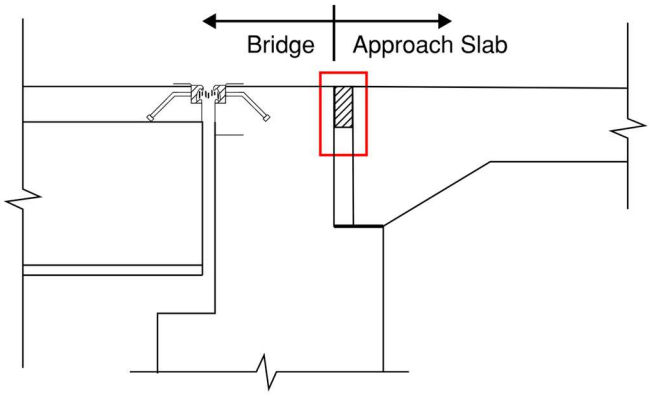
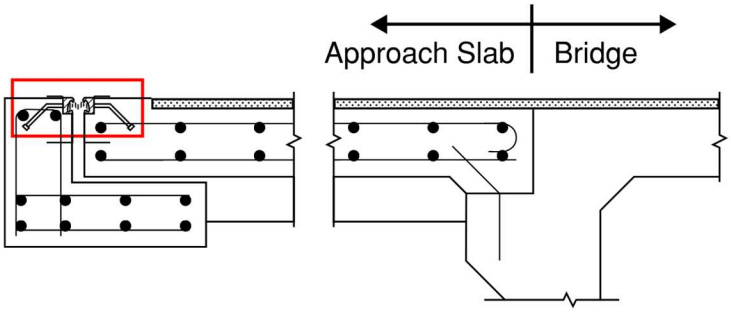
This Article covers all joint elements. Refer to Article 3.2.10 for definitions of SMJ, MMJ, and LMJ. Refer to Appendix Article B.5 for visual guides to aid in identifying joint types.

300	**Strip Seal Joint**		Classification:	**BME**	Unit of Measure:	**ft**
	Description:	Systems comprised of a cast-in-place structural steel shape that is designed with a cavity to accept a continuously extruded elastomeric seal with corresponding ears on each side that fit into steel cavities. This is a Medium Movement Joint (MMJ). 				
	Quantity Calculation:	Sum of all the lengths of the joint measured along the skew angle.				
301	**Pourable Joint Seal**		Classification:	**BME**	Unit of Measure:	**ft**
	Description:	Poured-in-place expansion joint seal installed with or without a backer rod designed to accommodate compression and tension throughout movement range. This is a Small Movement Joint (SMJ). 				
	Quantity Calculation:	Sum of all the lengths of the joint measured along the skew angle.				
301A	**Poured-ln-Place Plug Joint System**		Classification:	**BME**	Unit of Measure:	**ft**
	Description:	Poured-in-place expansion joint system designed to accommodate compression and tension throughout movement range. System can be installed with or without a centering/spanning traffic plate. This is a Small Movement Joint (SMJ). 				
	Quantity Calculation:	Sum of all the lengths of the joint measured along the skew angle.				
	Notes:	Previous NJDOT ADE Asphaltic Plug Expansion Joint (862) is now Element 301A.				

302	**Compression Joint Seal**	Classification:	**BME**	Unit of Measure:	**ft**
	Description:	Elastomeric preformed polychloroprene expansion joint seal installed with an adhesive designed to stay in compression throughout movement range. Seal can be installed with or without structural streel armor. This is a Small Movement Joint (SMJ). 			
	Quantity Calculation:	Sum of all the lengths of the joint measured along the skew angle.			
302A	**Bonded Preformed Joint Seal**	Classification:	**BME**	Unit of Measure:	**ft**
	Description:	Preformed elastomeric or preformed silicone expansion joints seal designed to accommodate compression and tension throughout the movement range and installed with an adhesive. Seal can be installed with or without structural steel armor. This can be a Small Movement Joint (SMJ) or a Medium Movement Joint (MMJ). 			
	Quantity Calculation:	Sum of all the lengths of the joint measured along the skew angle.			
302B	**Bonded Foam Joint Seal**	Classification:	**BME**	Unit of Measure:	**ft**
	Description:	Uncompressed closed-cell foam joint seal or pre-compressed open cell foam supported silicone joint seals with an adhesive designed to accommodate compression and tension throughout movement range. Seal can be installed with or without structural steel armor. This can be a Small Movement Joint (SMJ) or a Medium Movement Joint (MMJ). 			
	Quantity Calculation:	Sum of all the lengths of the joint measured along the skew angle.			

303	**Assembly Joint with Seal**		Classification:	**BME**	Unit of Measure:	**ft**
	Description:	Those joints filled with an assembly mechanism that has a seal.				
	Quantity Calculation:	Sum of all the lengths of the joint measured along the skew angle.				
	Notes:	This element is intended to encompass all other assembly joints with seals that are not covered by elements 303A and 303B.				
303A	**Segmental Joint System**		Classification:	**BME**	Unit of Measure:	**ft**
	Description:	Systems comprised of low-height monolithic segmental rubber panels spanning the joint opening and anchored rigidly to the bridge deck on both sides of the gap through the use of threaded rods or other mechanical means. Panels are steel reinforced. This can be a Medium Movement Joint (MMJ) or a Large Movement Joint (LMJ). 				
	Quantity Calculation:	Sum of all the lengths of the joint measured along the skew angle.				
	Notes:	Previous NJDOT ADE Elastomeric Flex-Type Joint (861) is now Element 303A.				
303B	**Modular Joint Assembly**		Classification:	**BME**	Unit of Measure:	**ft**
	Description:	Systems comprised of a series of steel shapes that are rigidly connected to a series of neoprene glands which are mechanically locked to steel side extrusions. The system must be rigidly anchored or cast into the bridge deck and supported longitudinally by at least one support bar that rests inside of a support box structure that is rigidly anchored or cast into the bridge deck. This is a Large Movement Joint (LMJ). 				
	Quantity Calculation:	Sum of all the lengths of the joint measured along the skew angle.				
304	**Open Joint**		Classification:	**BME**	Unit of Measure:	**ft**
	Description:	Those joints that are open and not sealed, with or without structural steel armor. This is a Small Movement Joint (SMJ).				
	Quantity Calculation:	Sum of all the lengths of the joint measured along the skew angle.				
	Notes:	This element is intended for joints designed as open joints, not for those joints that were designed to have a seal that is currently missing.				

305	**Assembly Joint without Seal**		Classification:	**BME**	Unit of Measure:	**ft**
	Description:	Those assembly joints that are open and not sealed.				
	Quantity Calculation:	Sum of all the lengths of the joint measured along the skew angle.				
	Notes:	This element is intended for joints designed as open joints, not for those joints that were designed to have a seal that is currently missing. This element is intended to encompass all other assembly joints without seals that are not described by elements 305A or 305B.				
305A	**Sliding Plate Joint Assembly**		Classification:	**BME**	Unit of Measure:	**ft**
	Description:	Systems comprised of a plate sliding across the joint opening. The plate is attached to one side of the assembly which is rigidly anchored or cast into the bridge deck. The assembly may or may not require a drainage trough system. This can be a Small Movement Joint (SMJ) or a Medium Movement Joint (MMJ). 				
	Quantity Calculation:	Sum of all the lengths of the joint measured along the skew angle.				
305B	**Finger (Tooth) Joint Assembly**		Classification:	**BME**	Unit of Measure:	**ft**
	Description:	An open steel plate expansion joint system with interlocking steel fingers that are rigidly anchored or cast into the bridge deck, which may or may not have a drainage trough system. This can be a Medium Movement Joint (MMJ) or a Large Movement Joint (LMJ). 				
	Quantity Calculation:	Sum of all the lengths of the joint measured along the skew angle.				
306	**Other Joint**		Classification:	**BME**	Unit of Measure:	**ft**
	Description:	Those joints that are not defined by any other joint element.				
	Quantity Calculation:	Sum of all the lengths of the joint measured along the skew angle.				
	Notes:	Include detailed description of the joint in the inspection report.				

8308	**Approach Slab Relief Joint**	Classification:	**ADE**	Unit of Measure:	**ft**
	Description:	Relief joints at the ends of approach slabs provided to accommodate the thermal movement between bridge decks and the approach roadway pavement.  Approach Slab Relief Joint at Abutment Headblock  Integral Abutment Approach Slab Relief Joint				
	Quantity Calculation:	Sum of all the lengths of the joint measured along the skew angle.			
	Notes:	This element is intended for approach slab relief joints along the back edge of abutment headblocks or at bridges with integral abutments, not for hot pour-sealed seams along the back edge of abutment headblocks.			

3.1.9—Wearing Surfaces, Protective Coatings, and Concrete Reinforcing Steel Protective Systems

510	**Wearing Surfaces**	Classification:	**BME**	Unit of Measure:	**ft²**
	Description:	All decks/slabs that have overlays made with timber running planks and materials other than flexible (asphaltic concrete), semi-rigid (epoxy and polyester material), and rigid (Portland cement) materials.			
	Quantity Calculation:	Should include the area of the deck/slab that is protected by this wearing surface.			
	Notes:	Refer to Element 8511 for overlays made with flexible (asphaltic concrete), and Element 8512 for semi-rigid (epoxy and polyester material) and rigid (Portland cement) materials.			
8511	**Wearing Surfaces–Flexible Overlays**	Classification:	**ADE**	Unit of Measure:	**ft²**
	Description:	All decks/slabs that have overlays made with flexible (asphaltic concrete) materials.			
	Quantity Calculation:	Should include the area of the deck/slab that is protected by this wearing surface.			
	Notes:	This element is a sub-element of Element 510.			
8512	**Wearing Surfaces–Rigid and Semi-Rigid Overlays**	Classification:	**ADE**	Unit of Measure:	**ft²**
	Description:	All decks/slabs that have overlays made with semi-rigid (epoxy and polyester material), and rigid (Portland cement) materials.			
	Quantity Calculation:	Should include the area of the deck/slab that is protected by this wearing surface.			
	Notes:	This element is a sub-element of Element 510.			
515	**Steel Protective Coating**	Classification:	**BME**	Unit of Measure:	**ft²**
	Description:	Steel elements that have a protective coating such as paint, galvanization, weathering steel patina, or other topcoat steel corrosion inhibitor.			
	Quantity Calculation:	Should include the entire protected surface of the steel element.			
	Notes:	This element shall describe all coating systems. This includes paint systems, oxide on weathering steel, and galvanization. Assess protective coatings based upon the defects that would apply.			
521	**Concrete Protective Coating**	Classification:	**BME**	Unit of Measure:	**ft²**
	Description:	Concrete elements that have a protective coating applied to them. These coatings include silane/siloxane water proofers, crack sealers such as High Molecular Weight Methacrylate (HMWM), or any topcoat barrier that protects concrete from deterioration and reinforcing steel from corrosion.			
	Quantity Calculation:	Should include the entire protected surface of the concrete element.			

520	**Concrete Reinforcing Steel Protective System**		Classification:	**BME**	Unit of Measure:	**ft^2**
	Description:	All types of protective systems used to protect reinforcing steel in concrete elements from corrosion.				
	Quantity Calculation:	Should include the entire surface area of the protected element.				
	Notes:	This protective 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 Element 510 and not this element.				
8516	**Concrete Encasement**		Classification:	**ADE**	Unit of Measure:	**ft**
	Description:	Concrete Encasement that may be on steel girders, stringers, floor beams, truss members or any other superstructure or substructure element.				
	Quantity Calculation:	Sum of the lengths of the concrete encased members.				
	Notes:	This element should not be used when all of the concrete encasement has been removed from a member. The encased steel member is to be coded consistent with the Condition State of the concrete encasement for the following defects: Delamination/Spall/Patched Area (1080), Efflorescence/Rust Staining (1120) and Cracking (1130). For other defects that are not indicative of any distress to the underlying steel, the Condition State would typically not be reduced. If any encasement reinforcing steel is exposed or corroded, it should only be considered as it relates to the condition of the concrete encasement and not the condition of the underlying structural steel member.				

3.2—Element Commentary

3.2.1—General Commentary

3.2.1.1
Condition evaluation for open elements includes the web face and the top and bottom faces of the flange.

3.2.1.2
Box girder evaluation is three-dimensional in nature, with the defects observed including exterior and interior surfaces being used to capture the condition states.

3.2.1.3
Cracking in Reinforced and Prestressed Concrete 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 nonstructural nature of the cracking. The Inspector should consider exposure and environment when evaluating crack width. Table 3.2.1.3-1 provides quantitative crack widths describing insignificant, medium, and wide cracking.

Table 3.2.1.3-1
Crack width commentary for reinforced and prestressed concrete elements.

Material	Insignificant cracking, defect not warranted (inch)	Medium cracking (inch)	Wide cracking (inch)
Reinforced Concrete	Less than 0.012 wide	0.012 to 0.05 wide	Greater than 0.05 wide
Prestressed Concrete	Less than 0.004 wide	0.004 to 0.009 wide	Greater than 0.009 wide

3.2.1.4
Elements identified as “other” materials are intended for elements formed of composite materials or other materials that cannot be classified using any other defined element or material.

3.2.1.5
For elements that have a veneer formed from a different material than the element (i.e., decorative masonry), refer to the appropriate material elements (i.e., masonry) for specific defects.

3.2.1.6
Condition State 4 typically refers to "warrants structural review...”. For this condition code, if a steel member has 10% or more section loss, consider that portion to be in Condition State 4. Also, guidelines for meeting this condition are when reinforcing bars or prestressing strands are exposed and there is greater than 10% section loss of the steel.

3.2.2—Decks and Slabs

These elements describe the component that is transferring load from the vehicle to the bridge. This does not include secondary deck elements such as joints, deck/slab protective systems, or wearing surfaces. Deck elements transmit the loads into superstructure elements. Slab elements transmit the load into the substructure elements. Structures that include slab elements typically do not have superstructure elements. These elements transmit traffic loads directly into the substructure. All deck or slab elements can be supplemented with one or more associated protective systems or wearing surface elements.

3.2.2.1
Deck, slab, and flange evaluation is three-dimensional in nature with the defects observed on the top and bottom surface, edges, or all; and captured using the condition states defined. 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.

3.2.2.2
Underside of deck/slab element evaluation is not three-dimensional in nature. The bottom surface that is visible for inspection shall be assessed based on the available visible surface. If the surface is not visible, the condition shall be assessed based on indicators in the materials covering the surface (i.e., SIP forms) combined with destructive and/or nondestructive testing as necessary. The underside of deck/slab must be evaluated in both the deck/slab element and the underside of deck/slab element. The total quantity should be the same, though the quantities of defects in various condition states will vary. Care must be taken to ensure that defects that overlap between the top and bottom surfaces are captured correctly in the deck/slab NBE, and only defects on the underside are included in the underside of deck/slab ADE.

3.2.2.3
Where traffic rides directly on the structural element regardless of the wearing surface, evaluation of the top flange above the fillet is considered with the appropriate deck element.

3.2.2.4
When calculating the total quantity for a deck, slab, or flange, the total area of the deck from edge to edge is to be captured. This includes areas of the deck that are not visible, such as median areas or sidewalks that do not overhang the edge of the deck.

3.2.2.5
Defects present on stay-in-place (SIP) forms can indicate the condition of the deck and should be captured as is appropriate. Typical corrosion and deterioration of SIP forms can be captured using Defect 1120-Efflorescence/Rust Staining. If the SIP forms are missing (due to corrosion or otherwise), the condition of the revealed, visible deck underside should be assessed.

3.2.3—Bridge Railings

These elements cover bridge rail, which may be fabricated from steel, other metal, concrete, masonry, and other materials.

3.2.3.1
The number of rows of railing 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 of certain configurations. Refer to Article 3.2.4 for coding guidance for a bridge with protected pedestrian/bicycle lanes.

3.2.3.2
For assessing the condition of posts, blocking, and curbs that are formed from a different material than the railing, refer to the appropriate bridge railing material elements (i.e., metal, concrete, timber, masonry, or other) for specific defects.

3.2.3.3
In the case of a through-girder that extends above the roadway, the member should be coded using the appropriate superstructure element (i.e., its primary structural purpose). Any attachments to that member that function as a railing (i.e., W-beam or a metal railing mounted atop) can be coded using their respective railing (bridge or pedestrian) element.

In the case of a headwall that extends above the roadway, the member should only be evaluated as a bridge railing if there is no other bridge railings present. In this situation, the headwall can be imagined to be divided in two parts: the portion of the member above the roadway would be considered the bridge railing (and coded as such) and the portion retaining the fill would be considered headwall.

3.2.4—Pedestrian Railings

These elements cover bridge pedestrian rail, which may be fabricated from steel, other metal, concrete, masonry, and other materials. This does not include chain link or ornamental fencing.

3.2.4.1
Pedestrian railings are the most external layer of railing on a bridge, typically along a fascia, and are only present when there is a walkway, bike path, or other nonvehicular lane which is divided from highway traffic. The railing dividing the walkway from the highway traffic is to be coded as bridge railing.

3.2.5—Topside Elements

These elements are found on the topside of bridges and include sidewalks/curbs and sound barrier walls, chain link fencing, and ornamental fencing that are carried on or attached to the bridge.

3.2.5.1
Sidewalks and curbs that are contiguous and comprised of the same material shall be considered one "length" and the element level evaluation should include defects present in both the curb and sidewalk using the proper element for the shared material.

Sidewalks and curbs that are (1) contiguous and comprised of differing materials, (2) noncontiguous and comprised of differing materials, and (3) noncontiguous and comprised of the same material shall be considered separate "lengths." The element level evaluation for the sidewalk should include defects present in the sidewalk using the proper element for the sidewalk material. The element level evaluation for the curb should include defects present in the curb using the proper element for the curb material. For example, if there are noncontiguous concrete curbs and sidewalks present on each side of the bridge for the full length, the total quantity of Element 8351 would be four times the length of the bridge.

3.2.6—Superstructure

Superstructure elements transmit load from decks into the substructure. These elements include girders, trusses, arches, and floor systems. The floor systems include floor beams and stringers. 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 as NBEs; however, NJDOT has added diaphragms as ADEs for all superstructures, regardless of their geometry.

3.2.6.1
Where traffic rides directly on the structural element regardless of the wearing surface, evaluation of the top flange above the fillet is considered with the appropriate deck element. See Article Description and Notes for Elements 15 and 109 for reference.

3.2.6.2—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.

Condition evaluation for closed web/box girder elements is three dimensional in nature with the defects observed on exterior and interior surfaces being used to capture the condition states. Condition evaluation for open girder/beam elements include the web face and the top and bottom faces of the flanges.

3.2.6.3—Stringers

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

3.2.6.4—Trusses and Arches

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

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

For filled arches, the arch quantity shall be measured from spring line to spring line. The length below the spring line is considered substructure.

3.2.6.5—Floor Beams

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

3.2.6.6—Diaphragms

These elements are transverse members placed within a superstructure system to distribute stresses and improve strength and rigidity. Diaphragms internal to closed web/box girder members are not included in these elements.

There can be confusion about whether a transverse concrete member is a floor beam or a diaphragm. Design drawings, if available, should be consulted. Typically, concrete diaphragms are minimally reinforced while floor beams will have more steel reinforcement. Without plans, compare the spacing of the deck girders and the transverse members. If the transverse member spacing is greater than the deck girder spacing, the deck is probably supported by the girders and the transverse member is a diaphragm. If stringers are present, the transverse members should be considered floor beams. Refer to the Bridge Inspector's Reference Manual for more information.

Steel diaphragms are typically present between beams, girders, or stringers and are usually rolled shapes (i.e., I-beams and channels). They are usually attached to vertical web stiffeners.

3.2.6.7—Miscellaneous Superstructure Elements

These superstructure elements include steel pin or pin and hanger assemblies, steel gusset plates, and main and secondary cables.

3.2.6.8—Gusset Plates

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

3.2.7—Bearings

The protective coating systems are not applicable to bearing elements with metal parts.

3.2.8—Substructure Elements

Substructure elements 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.

3.2.8.1

Monolithic wingwalls, up to the first construction joint (cold joint, water stop, plank butt joint, steel pile joint, 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.

3.2.8.2

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. Masonry wingwalls are to be considered non-integral.

3.2.8.3

The height of a column to be included in the element level evaluation is the visible height. This would be measured from the top of the footing (if exposed) or ground level to the underside of the pier cap or top face of the column. The evaluation is three-dimensional in nature, with defects on all sides of the column captured using the condition states defined. Defects on the top face shall be reported in the uppermost linear foot of the column height.

3.2.8.4

The evaluation of bridge seats and bearing pedestals should be included in the substructure element upon which they are present.

3.2.8.5—Web Wall, Strut, Lateral Bracing, etc. Between Columns

These elements are only present when columns or bents are present and are not to be used for a solid wall type pier. These elements do not transmit load; they are secondary members that are used to reduce the unbraced length of compression members in piers/bents.

Observed distress in diagonal and vertical members (including lateral bracing and walls) shall be reported as the projected length along the element length.

3.2.9—Culverts

These elements cover steel, prestressed and reinforced concrete, timber, masonry, and other types of culverts. Wingwalls or headwalls are not included in these elements.

3.2.9.1

The distortion defect is contingent on several factors such as site, wall thickness, and fill depth. The Inspector shall use such factors to assess the proper condition state.

3.2.10—Joints

These elements are bridge joints of various design characteristics. The elements cover joint movement types as described below. Non-movement deck joints (for example, joints used for crack control or construction staging) are not an element defined in this Article. Pavement expansion joints between pavement and a bridge approach slab are also included in these elements as ADEs. See Article 3.1.8 for detailed descriptions and cross sections for each joint element. Depending on design, some joints allow for beam/girder rotation only and not longitudinal movement.

Bridge joint types are defined as follows:

SMJ: Small Movement Joint – An SMJ is defined as a seal and system that can accommodate movements less than or equal to 2 inches.

MMJ: Medium Movement Joint – An MMJ is defined as a seal and system that can accommodate movements greater than 2 inches and less than or equal to 4 inches.

LMJ: Large Movement Joint – An LMJ is defined as a system that can accommodate movements greater than 4 inches.

3.2.11—Wearing Surfaces, Protective Coatings, and Concrete Reinforcing Steel Protective Systems

3.2.11.1

These elements are wearing surfaces, steel and concrete protective coatings, and concrete reinforcing steel protective systems such as cathodic protection. These systems will influence the deterioration and condition of the underlying structure element. *For wearing surfaces, the crack defect description definitions describe generalized distress, but the Inspector should consider width, spacing, location, and orientation of the cracking. The Inspector should consider exposure and environment when evaluating crack width. Table 3.2.11-1 provides quantitative crack widths describing insignificant, medium, and wide cracking for rigid and semi-rigid wearing surfaces.*

Table 3.2.11.1-1
Crack width commentary for wearing surface elements.

Material	Insignificant cracking, defect not warranted (inch)	Medium cracking (inch)	Wide cracking (inch)
Flexible Wearing Surfaces	Less than 0.125 wide	0.125 to 0.25 wide	Greater than 0.25 wide
Rigid and Semi-Rigid Wearing Surfaces	Less than 0.012 wide	0.012 to 0.05 wide	Greater than 0.05 wide

3.2.11.2

One of the purposes of coding Element 515 is to include a factor in the prediction model for BMS which will reduce the deterioration rate for elements with protective coating than those without any coating. This element is not to be used for estimating painting contracts which would assume a level of accuracy that would not be realistic. For example, this element is not useful in estimating quantities for painting needs because it would not include the diaphragms, cross frames, and other non-primary load carrying elements, and usually the units are in tons and not square feet.

3.2.12—Approach Slabs

Approach slabs are 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 (NBEs).

There is no element for approach pavement, and it is not coded under any of the approach slab elements.

3.2.12.1

The length used to calculate the quantity for the approach slab element must be coded in accordance with the bridge construction plans/field measurements or 25 feet, whichever is less, multiplied by the total width to determine the area in square feet. Element 510, 8511, or 8512 can be coded as appropriate with an equivalent quantity.

3.3—Reinforced Concrete Elements

Element No.	Element Name	Classification	Units of Measurement	Element No.	Element Name	Classification	Units of Measurement
Deck				**Substructure**			
12	Reinforced Concrete Deck	NBE	ft^2	205	Reinforced Concrete Column	NBE	ea
16	Reinforced Concrete Top Flange	NBE	ft^2	8205	Reinforced Concrete Column (LF)	ADE	ft
38	Reinforced Concrete Slab	NBE	ft^2	8252	Reinforced Concrete Web Wall, Strut, Lateral Bracing, etc. Between Columns	ADE	ft
8012	Underside of Reinforced Concrete Deck	ADE	ft^2	210	Reinforced Concrete Pier Wall	NBE	ft
8038	Underside of Reinforced Concrete Slab	ADE	ft^2	215	Reinforced Concrete Abutment	NBE	ft
Superstructure				220	Reinforced Concrete Pile Cap/Footing	NBE	ft
105	Reinforced Concrete Closed Web/Box Girder	NBE	ft	227	Reinforced Concrete Pile	NBE	ea
110	Reinforced Concrete Open Girder/Beam	NBE	ft	234	Reinforced Concrete Pier Cap	NBE	ft
116	Reinforced Concrete Stringer	NBE	ft	8262	Reinforced Concrete Wingwall	ADE	ft
144	Reinforced Concrete Arch	NBE	ft	8266	Reinforced Concrete Headwall	ADE	ft
155	Reinforced Concrete Floor Beam	NBE	ft	**Other**			
8122	Reinforced Concrete Diaphragm	ADE	ea	321	Reinforced Concrete Approach Slab	BME	ft^2
Culvert				331	Reinforced Concrete Bridge Railing	NBE	ft
241	Reinforced Concrete Culvert	NBE	ft	8331	Reinforced Concrete Pedestrian Railing	ADE	ft
				8351	Concrete Curbs/Sidewalks	ADE	ft

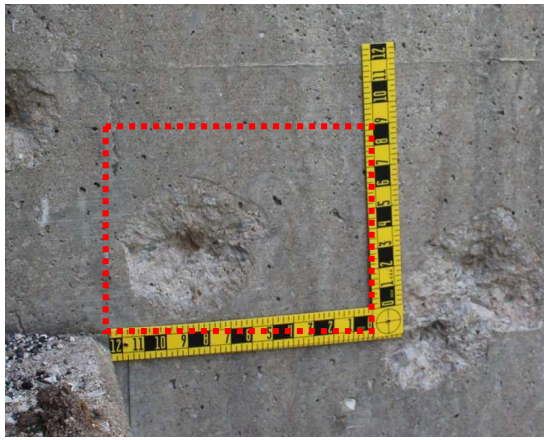
Defects for Reinforced Concrete Elements

Defects	CS 1	CS 2	CS 3	CS 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) (1130)	Insignificant cracks or medium width cracks that have been sealed.	Unsealed medium width cracks or unsealed medium pattern (map) cracking.	Wide crack or heavy pattern (map) cracking.	
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.	
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in CS 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in CS 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in CS 4 under the appropriate material defect entry.

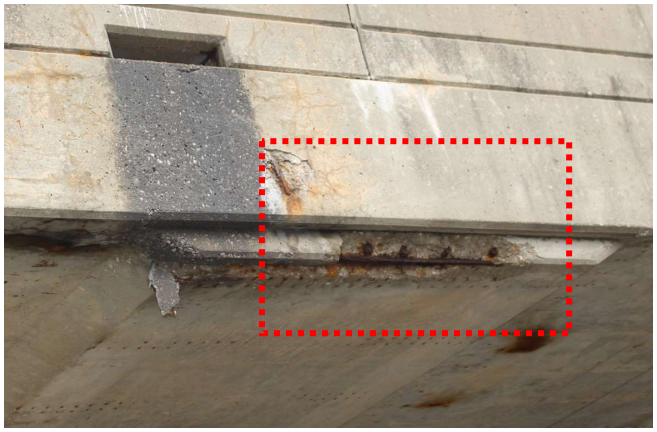
Defects	CS 1	CS 2	CS 3	CS 4
	GOOD	FAIR	POOR	SEVERE
Settlement (Curbs/Sidewalk) (88004)	None.	Minor.	Moderate, but does not warrant maintenance review.	The condition warrants a maintenance review to determine the effectiveness of sidewalk and curbs on the bridge; OR a maintenance review has been completed.

Defect 1080–Delamination/Spall/Patched Area

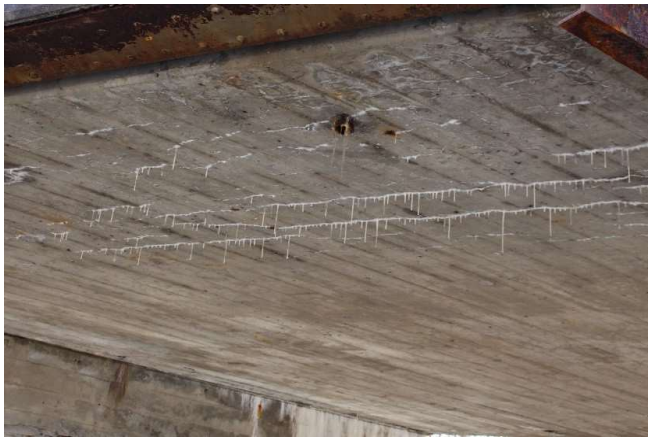
Condition State 1	Condition State 2	Condition State 3
None.	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area that is sound.	Spall greater than 1 in. deep or greater than 6 in. diameter. Patched area that is unsound or showing distress. Does not warrant structural review.
		

Boundary Image CS 1–2	Boundary Image CS 2–3
	

Defect 1090–Exposed Rebar

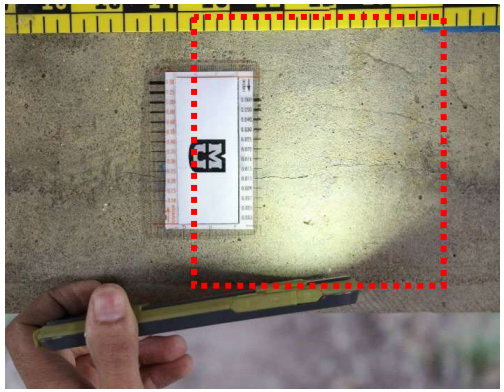
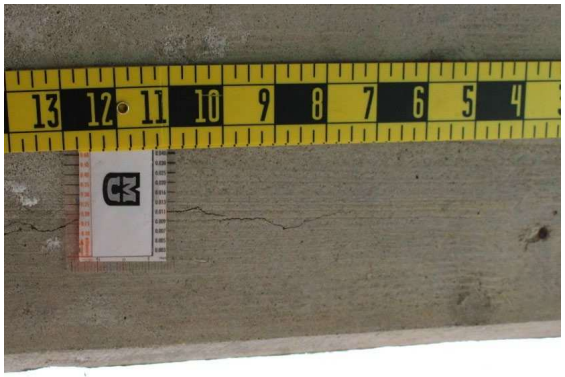
Condition State 1	Condition State 2	Condition State 3
None.	Present without measurable section loss.	Present with measurable section loss but does not warrant structural review.
		
		Boundary Image CS 2–3
		

Defect 1120–Efflorescence/Rust Staining

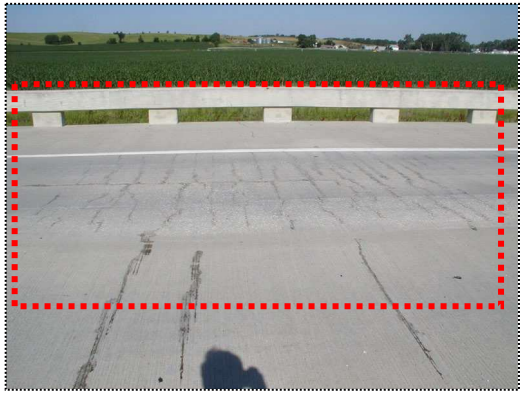
Condition State 1	Condition State 2	Condition State 3
None.	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.
		

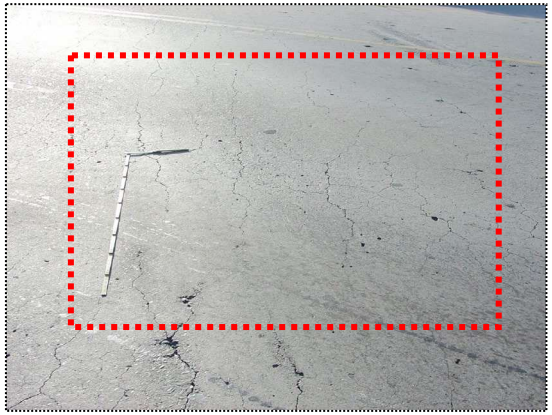
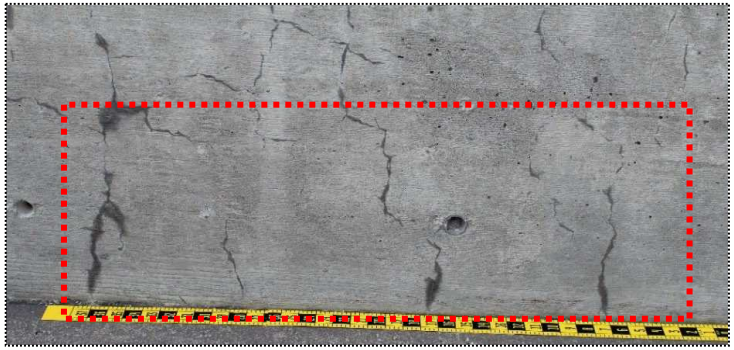
Boundary Image CS 1–2	Boundary Image CS 2–3
	

Defect 1130–Cracking (RC and Other)

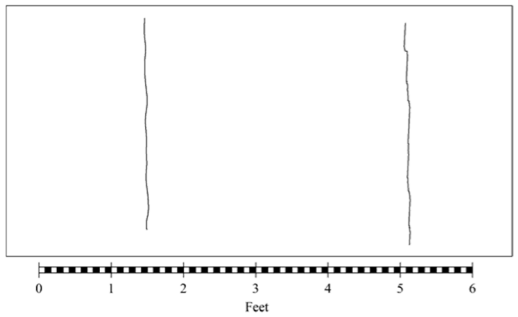
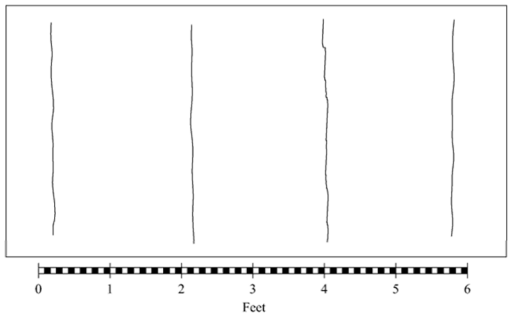
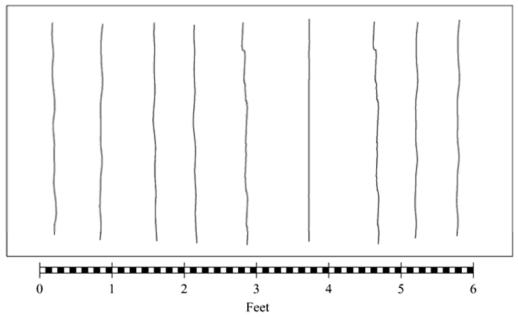
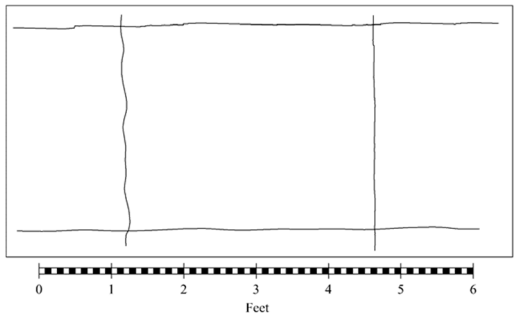
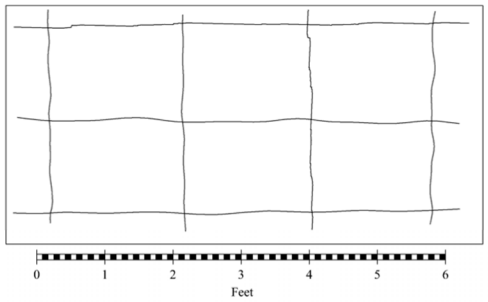
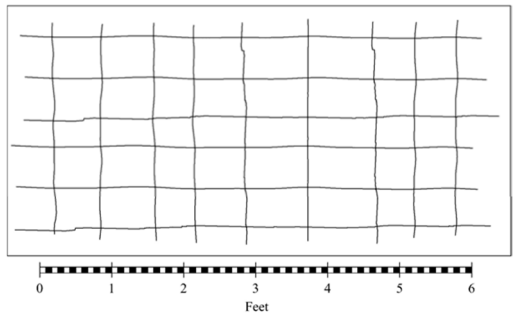
Condition State 1	Condition State 2	Condition State 3
Insignificant cracks or medium-width cracks that have been sealed.	Unsealed medium width cracks or unsealed medium pattern (map) cracking.	Wide cracks or heavy pattern (map) cracking.
Width less than 0.012 in.	*Width 0.012–0.05 in.*	*Width greater than 0.05 in.*
		
Boundary Image CS 1–2		Boundary Image CS 2–3
		

Defect 1130–Cracking (RC and Other)

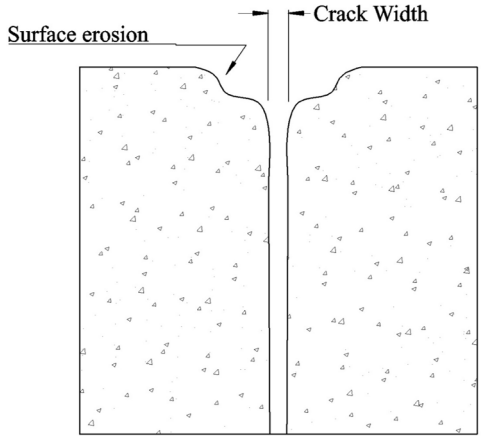
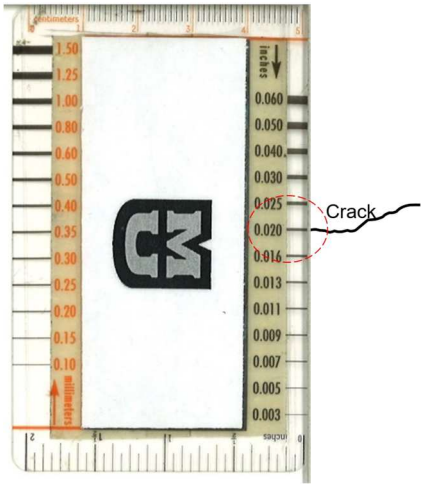
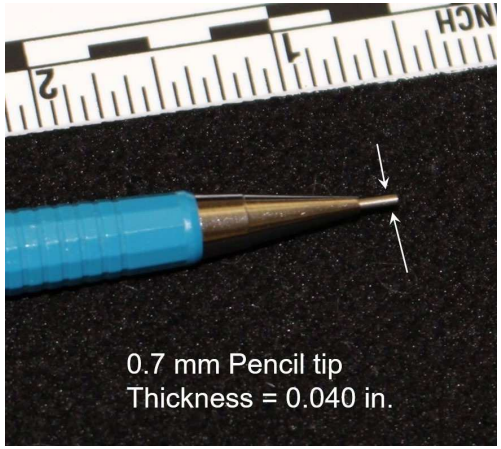
Condition State 1	Condition State 2	Condition State 3
Insignificant cracks or medium-width cracks that have been sealed.	Unsealed medium width cracks or unsealed medium pattern (map) cracking.	Wide cracks or heavy pattern (map) cracking.
Spacing greater than 3.0 ft.	*Spacing of 1.0-3.0 ft.*	*Spacing of less than 1 ft.*
		

Boundary Image CS 1–2	Boundary Image CS 2–3
	

Crack Pattern Guide

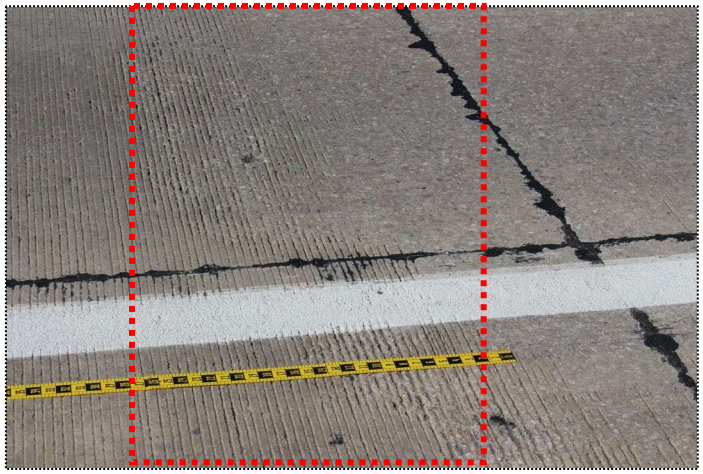
Condition State 1	Condition State 2	Condition State 3
Spacing >3 ft.	Medium pattern (map) cracking, spacing 1–3 ft.	Heavy pattern (map) cracking, spacing less than 1 ft.
		
		

Crack Width Guide

Crack Width Measurement	Crack Measurement	Width Measures
The surface of concrete erodes at a crack, making the crack appear wider at the surface. Crack width measurements should describe the actual crack width, not the eroded surface.	Crack widths can be measured using a crack comparator.	• 1/32 in. = 0.0313 in. • 1/16 in. = 0.0625 in. • 3/32 in. = 0.0938 in. • 1/8 in. = 0.1250 in. • 3/16 in. = 0.1875 in.
		
		

Defect 1190–Abrasion/Wear

Condition State 1	Condition State 2	Condition State 3
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.
		

Boundary Image CS 1–2	Boundary Image CS 2–3
	

3.4—Prestressed Concrete Elements

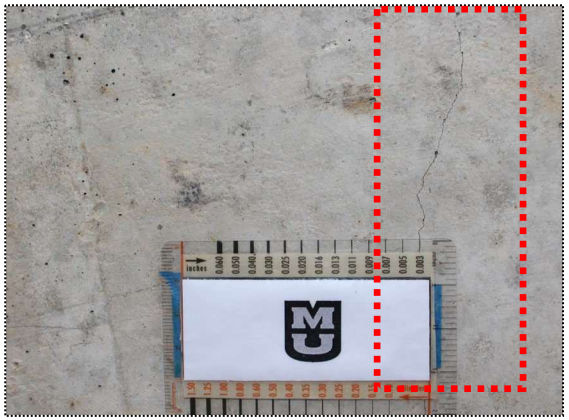
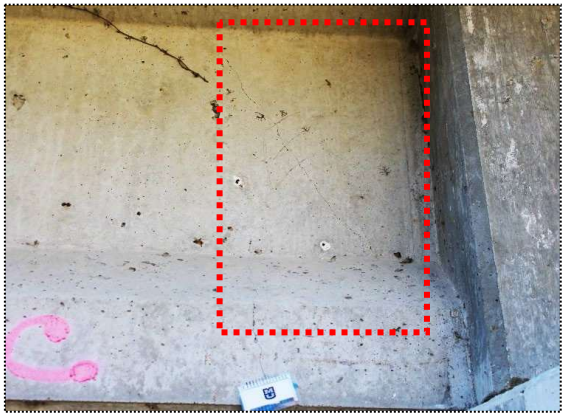
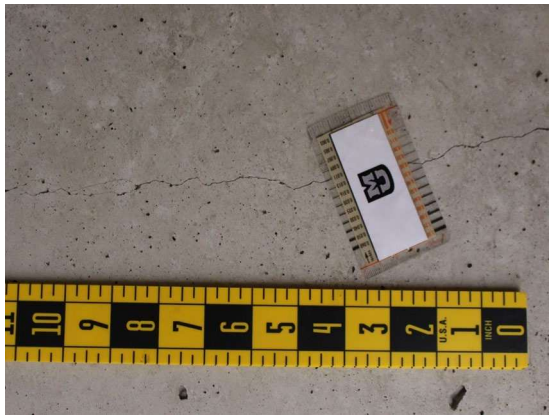
Element No.	Element Name	Classification	Units of Measurement	Element No.	Element Name	Classification	Units of Measurement
Deck				**Substructure**			
13	PSC Deck	NBE	ft^2	204	PSC Column	NBE	ea
15	PSC Top Flange	NBE	ft^2	8204	PSC Column (LF)	ADE	ft
39	PSC Slab	NBE	ft^2	8251	Prestressed Concrete Web Wall, Strut, Lateral Bracing, etc. Between Columns	ADE	ft
8013	Underside of PSC Deck	ADE	ft^2	226	PSC Pile	NBE	ea
8039	Underside of PSC Slab	ADE	ft^2	233	PSC Pier Cap	NBE	ft
	Superstructure			**Culvert**			
104	PSC Closed Web/Box Girder	NBE	ft	245	PSC Culvert	NBE	ft
109	PSC Open Girder/Beam	NBE	ft	**Other**			
115	PSC Stringer	NBE	ft	320	PSC Approach Slab	BME	ft^2
143	PSC Arch	NBE	ft				
154	PSC Floor Beam	NBE	ft				
8123	PSC Diaphragm	ADE	ea				

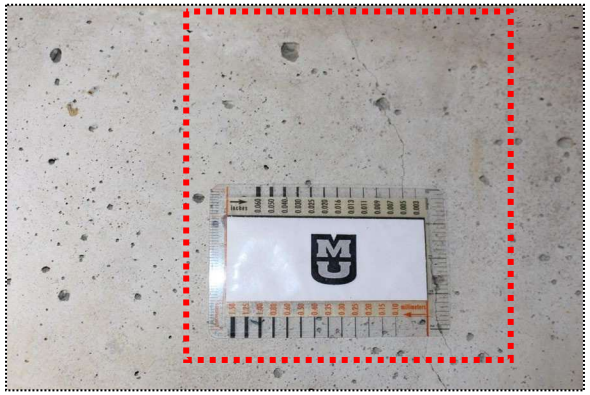
Defects for Prestressed Concrete Elements

Defects	CS 1	CS 2	CS 3	CS 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.	
Efflorescence/ Rust Staining (1120)	None.	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
Cracking (PSC) (1110)	Insignificant cracks or medium width cracks that have been sealed.	Unsealed medium width cracks or unsealed medium pattern (map) cracking.	Wide crack or heavy pattern (map) cracking.	
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	CS 1	CS 2	CS 3	CS 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 CS 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in CS 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in CS 4 under the appropriate material defect entry.

Defect 1110–Cracking (PSC)

Condition State 1	Condition State 2	Condition State 3
Insignificant cracks or medium-width cracks that have been sealed.	Unsealed medium width cracks or unsealed medium pattern (map) cracking.	Wide cracks or heavy pattern (map) cracking.
Width less than 0.004 in. or spacing greater than 3 ft.	*Width 0.004-0.009 in. or spacing1.0-3.0 ft.*	*Width greater than 0.009 in. or spacing less than 1 ft.*
		

Boundary Image CS 1–2	Boundary Image CS 2–3
	

3.5—Steel Elements

Element No.	Element Name	Classification	Units of Measurement	Element No.	Element Name	Classification	Units of Measurement
Deck				**Superstructure**			
28	Steel Deck with Open Grid	NBE	ft^2	102	Steel Closed Web/Box Girder	NBE	ft
29	Steel Deck with Concrete Filled Grid	NBE	ft^2	107	Steel Open Girder/Beam	NBE	ft
30	Steel Deck Corrugated/Orthotropic/Etc.	NBE	ft^2	113	Steel Stringer	NBE	ft
8029	Underside of Steel Deck with Concrete Filled Grid	ADE	ft^2	120	Steel Truss	NBE	ft
8030	Underside of Steel Deck Corrugated/Orthotropic/Etc.	ADE	ft^2	141	Steel Arch	NBE	ft
Substructure				147	Steel Main Cables	NBE	ft
202	Steel Column	NBE	ea	148	Secondary Steel Cables	NBE	ea
8202	Steel Column (LF)	ADE	ft	152	Steel Floor Beam	NBE	ft
8250	Steel Web Wall, Strut, Lateral Bracing, etc. Between Columns	ADE	ft	161	Steel Pin, Pin & Hanger Assembly or both	NBE	ea
207	Steel Tower	NBE	ft	162	Steel Gusset Plate	NBE	ea
219	Steel Abutment	NBE	ft	8121	Steel Diaphragm	ADE	ea
225	Steel Pile	NBE	ea	**Other**			
231	Steel Pier Cap	NBE	ft	330	Metal Bridge Railing	NBE	ft
Culvert				8330	Metal Pedestrian Railing	ADE	ft
240	Steel Culvert	NBE	ft	8350	Steel Curbs/Sidewalks	ADE	ft
				8362	Chain Link Fencing	ADE	ft

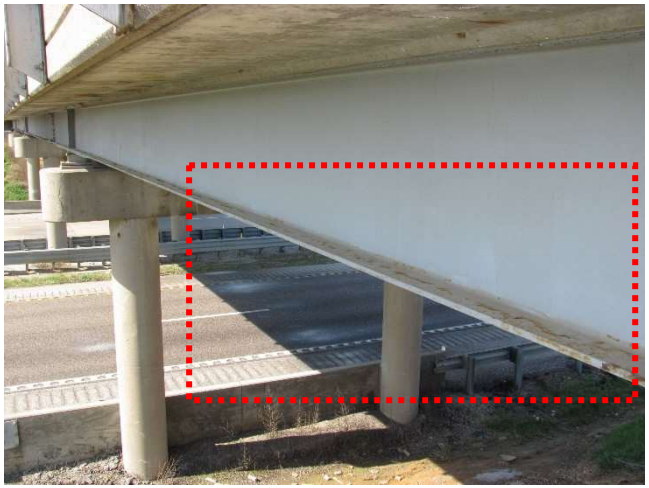
Defects for Steel Elements

Defects	CS 1	CS 2	CS 3	CS 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 (1010)	None.	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack 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, or fasteners; broken welds; 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.	
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in CS 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in CS 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in CS 4 under the appropriate material defect entry.

Defects	CS 1	CS 2	CS 3	CS 4
	GOOD	FAIR	POOR	SEVERE
Settlement (Curbs/Sidewalk) (88004)	None.	Minor.	Moderate, but does not warrant maintenance review.	The condition warrants a maintenance review to determine the effectiveness of sidewalk and curbs on the bridge; OR a maintenance review has been completed.

Defect 1000–Corrosion

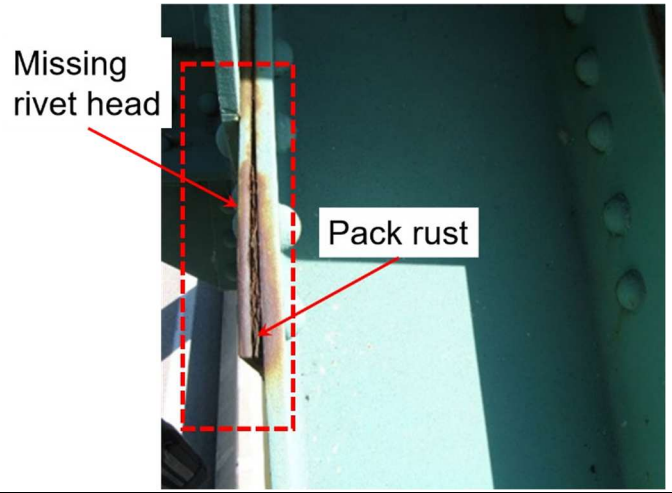
Condition State 1	Condition State 2	Condition State 3
None.	Freckled rust. Corrosion of steel has initiated.	Section loss is evident or pack rust is present but does not warrant structural review.
		

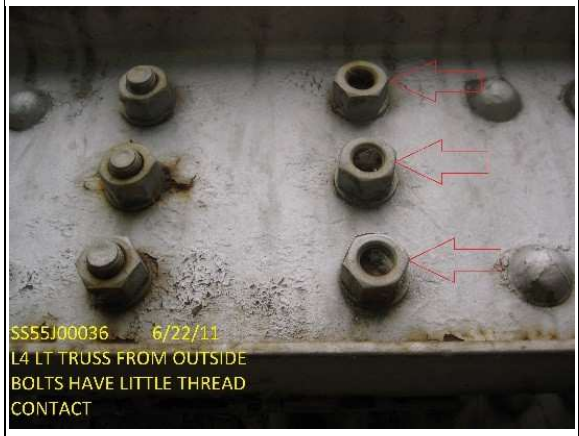
Boundary Image CS 1–2	Boundary Image CS 2–3
	

Defect 1010–Cracking

Condition State 1	Condition State 2	Condition State 3
None.	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack that is not arrested but does not warrant structural review.
		
Condition State 1	**Condition State 2**	**Condition State 3**
		

Defect 1020–Connection

Condition State 1	Condition State 2	Condition State 3
	Loose fasteners or pack rust without distortion is present but the connection is in place and functioning as intended.	Missing bolts, rivets, or fasteners; broken welds; or pack rust with distortion but does not warrant a structural review.
		

Boundary Image CS 1–2	Boundary Image CS 2–3	Boundary Image CS 3–4
		

Defects for Chain Link Fencing (NJDOT ADE 8362)

Defects	CS 1	CS 2	CS 3	CS 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 without an effect on safety or integrity.	Advanced section loss is evident, or significant pack rust is present and safety and/or integrity of the system is compromised.
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, or fasteners; broken welds; or pack rust with distortion but without an effect on safety or integrity.	Numerous missing bolts, rivets, or fasteners; numerous broken welds; or significant pack rust with distortion and safety and/or integrity of the system is compromised.
Damage to Fabric (88006)	None.	Chain link fabric has some minor deterioration. Coating may have small areas of peeling, bubbling, or cracking.	Chain link fabric has some moderate deterioration or small holes or snags that are slightly stretched or deformed. Coating may have areas of peeling, bubbling, or cracking.	Chain link fabric has significant deterioration or large holes or snags that present safety and/or integrity issues. Coating has failed and bare metal is exposed throughout.
Damage to Framework (88007)	None.	Fencing framework has some minor deterioration or distortion. Coating may have small areas of peeling, bubbling, or cracking.	Fencing framework has some moderate deterioration or damage. Moderate distortion that requires mitigation. Coating may have areas of peeling, bubbling, or cracking.	Fencing framework has significant deterioration, damage, or distortion that present safety and/or integrity issues. Coating has failed and bare metal is exposed throughout.

3.6—Timber Elements

Element No.	Element Name	Classification	Units of Measurement	Element No.	Element Name	Classification	Units of Measurement
Deck				**Substructure**			
31	Timber Deck	NBE	ft^2	206	Timber Column	NBE	ea
54	Timber Slab	NBE	ft^2	8206	Timber Column (LF)	ADE	ft
8031	Underside of Timber Deck	ADE	ft^2	8253	Timber Web Wall, Strut, Lateral Bracing, etc. Between Columns	ADE	ft
8054	Underside of Timber Slab	ADE	ft^2	208	Timber Trestle	NBE	ft
Superstructure				212	Timber Pier Wall	NBE	ft
111	Timber Open Girder/Beam	NBE	ft	216	Timber Abutment	NBE	ft
117	Timber Stringer	NBE	ft	228	Timber Pile	NBE	ea
135	Timber Truss	NBE	ft	235	Timber Pier Cap	NBE	ft
146	Timber Arch	NBE	ft	8263	Timber Wingwall	ADE	ft
156	Timber Floor Beam	NBE	ft	**Other**			
8124	Timber Diaphragm	ADE	ea	332	Timber Bridge Railing	NBE	ft
Culvert				8332	Timber Pedestrian Railing	ADE	ft
242	Timber Culvert	NBE	ft	8352	Timber Curbs/Sidewalks	ADE	ft

Defects for Timber Elements

Defects	CS 1	CS 2	CS 3	CS 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, or fasteners; broken welds; 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 penetrates more than 5% of the thickness of the member in the tension zone. Does not warrant structural review.	
Crack (Timber) (1160)	None.	Crack that has been arrested through effective measures.	Identified crack 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.	
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	CS 1	CS 2	CS 3	CS 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 CS 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in CS 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in CS 4 under the appropriate material defect entry.
Settlement (Curbs/Sidewalk) (88004)	None.	Minor.	Moderate, but does not warrant maintenance review.	The condition warrants a maintenance review to determine the effectiveness of sidewalk and curbs on the bridge; OR a maintenance review has been completed.

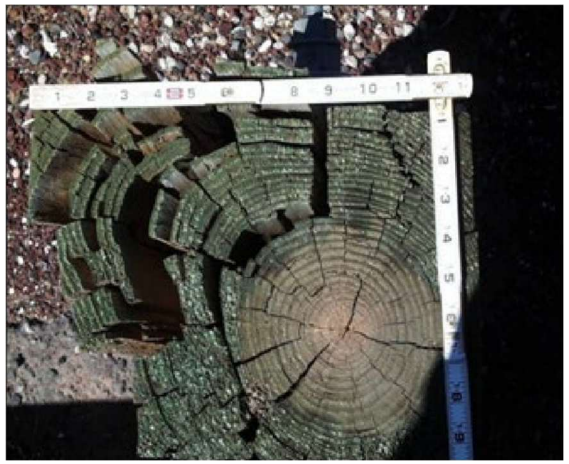
Defect 1140–Decay/Section Loss

Condition State 1	Condition State 2	Condition State 3
None.	Affects less than 10% of the member section.	Affects 10% or more of the member but does not warrant structural review.
		

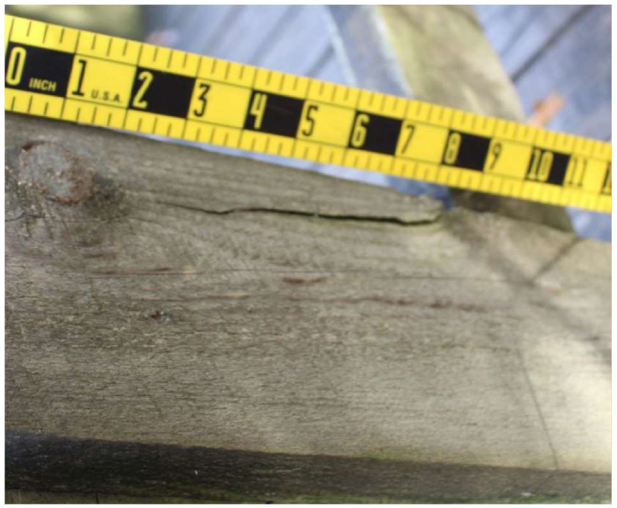
Defect 1150–Check/Shake (Check)

Condition State 1	Condition State 2	Condition State 3
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 penetrates more than 5% of the thickness of the member in the tension zone. Does not warrant structural review.
		

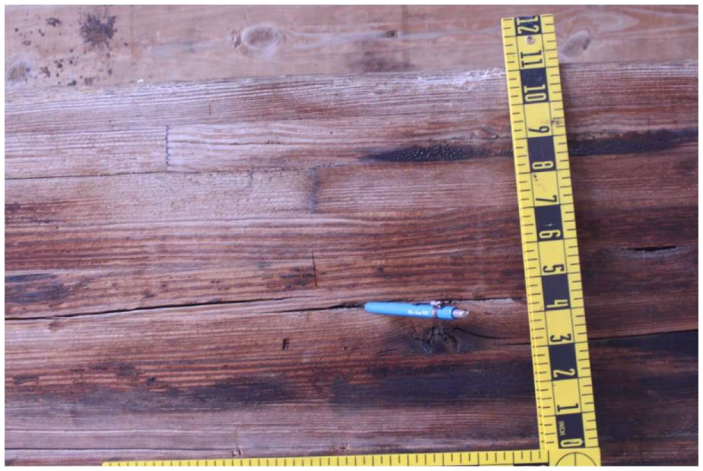
Defect 1150–Check/Shake (Shake)

Condition State 1	Condition State 2	Condition State 3
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 penetrates more than 5% of the thickness of the member in the tension zone. Does not warrant structural review.
		

Defect 1160–Crack (Timber)

Condition State 1	Condition State 2	Condition State 3
None.	Crack that has been arrested through effective measures.	Identified crack that is not arrested but does not require structural review.
		

Defect 1170–Split/Delamination (Timber)

Condition State 1	Condition State 2	Condition State 3
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.
		

Defect 1180–Abrasion/Wear (Timber)

Condition State 1	Condition State 2	Condition State 3
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.
		

3.7—Masonry Elements

Element No.	Element Name	Classification	Units of Measurement	Element No.	Element Name	Classification	Units of Measurement
Superstructure				**Culvert**			
145	Masonry Arch	NBE	ft	244	Masonry Culvert	NBE	ft
Substructure				**Other**			
213	Masonry Pier Wall	NBE	ft	334	Masonry Bridge Railing	NBE	ft
213	Masonry Pier Wall	NBE	ft	8334	Masonry Pedestrian Railing	ADE	ft
217	Masonry Abutment	NBE	ft	8354	Masonry Curbs/Sidewalks	ADE	ft
8264	Masonry Wingwall	ADE	ft				
8267	Masonry Headwall	ADE	ft				

Defects for Masonry Elements

Defects	CS 1	CS 2	CS 3	CS 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 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.	

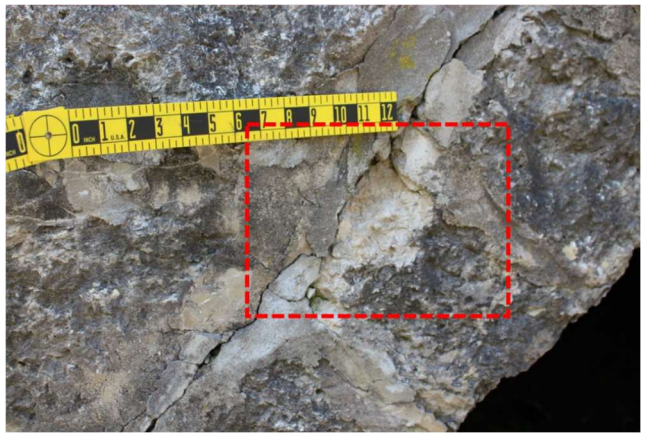
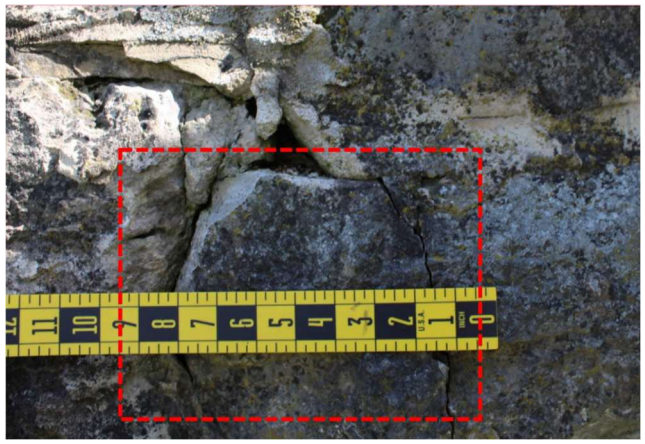
Defects	CS 1	CS 2	CS 3	CS 4
	GOOD	FAIR	POOR	SEVERE
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in CS 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in CS 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in CS 4 under the appropriate material defect entry.
Settlement (Curbs/Sidewalk) (88004)	None.	Minor.	Moderate, but does not warrant maintenance review.	The condition warrants a maintenance review to determine the effectiveness of sidewalk and curbs on the bridge; OR a maintenance review has been completed.

Defect 1610–Mortar Breakdown (Masonry)

Condition State 1	Condition State 2	Condition State 3
None.	Cracking or voids in less than 10% of joints.	Cracking or voids in 10% or more of the joints.
		
	Boundary Image CS 2–3	
		

Defect 1620–Split/Spall (Masonry)

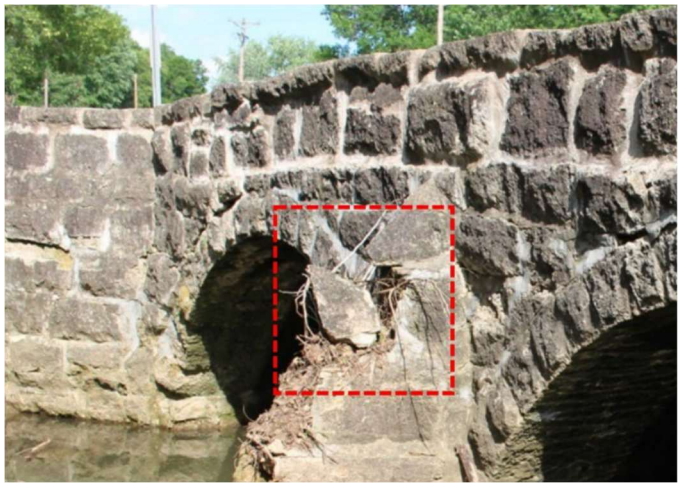
Condition State 1	Condition State 2	Condition State 3
None.	Block or stone has split or spalled with no shifting.	Block or stone has split or spalled with shifting but does not warrant a structural review.
		

Boundary Image CS 1–2	Boundary Image CS 2–3	
		

Defect 1630–Patched Area (Masonry)

Condition State 1	Condition State 2	Condition State 3
None.	Sound patch.	Unsound patch.
		

Defect 1640–Masonry Displacement

Condition State 1	Condition State 2	Condition State 3
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.
		

3.8—Other Material Elements

Element No.	Element Name	Classification	Units of Measurement	Element No.	Element Name	Classification	Units of Measurement
Deck				**Superstructure**			
60	Other Deck	NBE	ft^2	106	Other Closed Web/Box Girder	NBE	ft
65	Other Slab	NBE	ft^2	112	Other Open Girder/Beam	NBE	ft
8060	Underside of Other Deck	ADE	ft^2	118	Other Stringer	NBE	ft
8065	Underside of Other Slab	ADE	ft^2	136	Other Truss	NBE	ft
Substructure				142	Other Arch	NBE	ft
203	Other Column	NBE	ea	149	Other Secondary Cable	NBE	ea
8203	Other Column (LF)	ADE	ft	157	Other Floor Beam	NBE	ft
211	Other Pier Wall	NBE	ft	8125	Other Diaphragm	ADE	ea
218	Other Abutment	NBE	ft	**Other**			
229	Other Pile	NBE	ea	333	Other Bridge Railing	NBE	ft
236	Other Pier Cap	NBE	ft	8333	Other Pedestrian Railing	ADE	ft
8261	Slope Protection	ADE	ft^2	8353	Other Curbs/Sidewalks	ADE	ft
8265	Other Wingwall	ADE	ft	8361	Sound Barrier Wall	ADE	ft
8268	Other Headwall	ADE	ft	8363	Ornamental Railing	ADE	ft
8269	Fender System	ADE	ft	8364	Ornamental Truss	ADE	ft
8270	Bulkhead	ADE	ft	8170	Bridge Drainage	ADE	ea
Culvert				8171	Seismic Retrofit Components	ADE	ea
243	Other Culvert	NBE	ft	8172	Fascia Mounted Sign Structures	ADE	ea
				8173	Temporary Support Structures	ADE	ea

Defects for Other Material Elements

Defects	CS 1	CS 2	CS 3	CS 4
	GOOD	FAIR	POOR	SEVERE
Corrosion (1000)	None.	Freckled rust. Corrosion of the metal 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 (1010)	None.	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack 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, or fasteners; broken welds; 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)	Insignificant cracks or medium width cracks that have been sealed.	Unsealed medium width cracks or unsealed medium pattern (map) cracking.	Wide crack or heavy pattern (map) cracking.	
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	CS 1	CS 2	CS 3	CS 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 CS 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in CS 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in CS 4 under the appropriate material defect entry.
Settlement (Curbs/Sidewalks) (88004)	None.	Minor.	Moderate, but does not warrant maintenance review.	The condition warrants a maintenance review to determine the effectiveness of sidewalk and curbs on the bridge; OR a maintenance review has been completed.

Defects for Slope Protection (NJDOT ADE 8261)

Defects	CS 1	CS 2	CS 3	CS 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.	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.
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in CS 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in CS 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in CS 4 under the appropriate material defect entry.
Erosion/ Undermining (Slope Protection) (88001)	None.	Exists within tolerable limits or has been arrested with effective drainage system.	Exceeds tolerable limits but is less than the critical limits determined by slope stability evaluation and does not warrant geotechnical or structural review.	The condition warrants a geotechnical and/or geotechnical review to determine the effect on strength or serviceability of the element or bridge; OR a geotechnical and/or structural review has been completed and the defects impact strength or serviceability of the element or bridge.
Cracking/ Displacement/ Missing Mortar/ Broken Slab (Slope Protection) (88005)	Insignificant defects or medium width cracks that have been sealed.	Unsealed medium width cracks or displacement/missing mortar/broken slab affecting less than one-third of the area.	Unsealed severe width cracks or displacement/ missing mortar/broken slab affecting more than one-third of the area.	

Defects for Fender System (NJDOT ADE 8269)

Defects	CS 1	CS 2	CS 3	CS 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, or fasteners; broken welds; or pack rust with distortion but does not warrant a structural review.	
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.	
Crack (Timber) (1160)	None.	Crack that has been arrested through effective measures.	Identified crack 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.	
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 CS 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in CS 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in CS 4 under the appropriate material defect entry.

Defects for Bulkhead (NJDOT ADE 8270)

Defects	CS 1	CS 2	CS 3	CS 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.
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.	
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, or fasteners; broken welds; 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.	
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 CS 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in CS 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in CS 4 under the appropriate material defect entry.

Defects for Sound Barrier Wall (NJDOT ADE 8361)

Defects	CS 1	CS 2	CS 3	CS 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, or fasteners; broken welds; 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.	
Cracking (RC) (1130)	Insignificant cracks or medium width cracks that have been sealed.	Unsealed medium width cracks or unsealed medium pattern (map) cracking.	Wide crack or heavy pattern (map) cracking.	
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 CS 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in CS 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in CS 4 under the appropriate material defect entry.

Defects for Bridge Drainage (NJDOT ADE 8170)

Defects	CS 1	CS 2	CS 3	CS 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, or fasteners; broken welds; 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.
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in CS 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in CS 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in CS 4 under the appropriate material defect entry.
Clogging (Bridge Drainage) (88002)	None.	Minimal. Scuppers, inlets, and pipes clogged for less than 10% area. No water accumulation.	Moderate. Up to 50% area clogged in scuppers, inlets, and pipes. No water accumulation. Does not warrant bridge drainage review.	Failed. 50% to 100% area of scuppers, inlets, and pipes clogged. Water accumulation is present. The condition warrants detailed review of Bridge Drainage System.
Leakage (Bridge Drainage) (88003)	None.	Minimal. Minor dripping through the downspouts or pipes without damaging the primary member.	Moderate. More than a drip and less than free flow of water through downspouts, pipes or joints without damaging the primary member.	Failed. Water leakage is damaging the primary member. The condition warrants detailed review of the Bridge Drainage System.

Defects for Temporary Support Structures (NJDOT ADE 8173)

Defects	CS 1	CS 2	CS 3	CS 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 (1010)	None.	Crack that has self-arrested or has been arrested with effective arrest holes, doubling plates, or similar.	Identified crack 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, or fasteners; broken welds; 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.	
Settlement (4000)	None.	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits 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 CS 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in CS 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in CS 4 under the appropriate material defect entry.

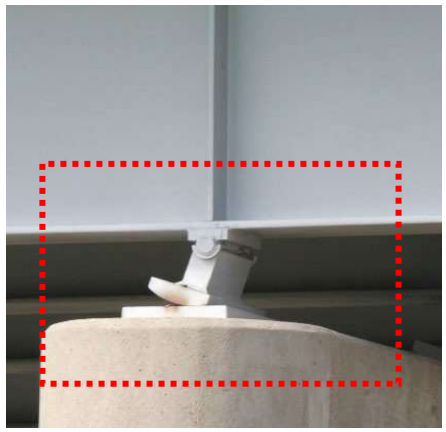
3.9—Bearings

Element No.	Element Name	Classification	Units of Measurement	Element No.	Element Name	Classification	Units of Measurement
310	Elastomeric Bearing	NBE	ea	313	Fixed Bearing	NBE	ea
8310	Isolation Bearing	ADE	ea	314	Pot Bearing	NBE	ea
311	Movable Bearing	NBE	ea	315	Disk Bearing	NBE	ea
8311	Sliding Plate Bearing–Expansion/Movable	ADE	ea	8315	Spherical Bearing	ADE	ea
8317	Rocker Bearing–Expansion/Movable	ADE	ea	316	Other Bearing	NBE	ea
312	Enclosed/Concealed Bearing	NBE	ea	8316	Bond Breaker Bearing–Expansion/Movable	ADE	ea

Defects for Bearings

Defects	CS 1	CS 2	CS 3	CS 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, or fasteners; broken welds; 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. Minor splitting.	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.	
Damage (7000)	Not applicable.	The element has impact damage. The specific damage caused by the impact has been captured in CS 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in CS 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in CS 4 under the appropriate material defect entry.

Defect 2220–Alignment

Condition State 1	Condition State 2	Condition State 3
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.
		

Boundary Image CS 1–2	Boundary Image CS 2–3	Boundary Image CS 3–4
		

Defect 2230–Bulging, Splitting, or Tearing

Condition State 1	Condition State 2	Condition State 3
None.	Bulging less than 15% of the thickness. Minor splitting.	Bulging 15% or more of the thickness. Splitting or tearing. Bearing surfaces are not parallel. Does not warrant structural review.
		
		

Defect 2240–Loss of Bearing Area

Condition State 1	Condition State 2	Condition State 3
None.	Less than 10%.	10% or more, but does not warrant structural review.
		

Boundary Image CS 1–2	Boundary Image CS 2–3	
		

3.10—Joints

Element No.	Element Name	Classification	Units of Measurement	Element No.	Element Name	Classification	Units of Measurement
300	Strip Seal Joint	BME	ft	303A	Segmental Joint System	BME	ft
301	Pourable Joint Seal	BME	ft	303B	Modular Joint Assembly	BME	ft
301A	Poured-ln-Place Plug Joint System	BME	ft	304	Open Joint	BME	ft
302	Compression Joint Seal	BME	ft	305	Assembly Joint without Seal	BME	ft
302A	Bonded Preformed Joint Seal	BME	ft	305A	Sliding Plate Joint Assembly	BME	ft
302B	Bonded Foam Joint Seal	BME	ft	305B	Finger (Tooth) Joint Assembly	BME	ft
303	Assembly Joint with Seal	BME	ft	306	Other Joint	BME	ft
				8308	Approach Slab Relief Joint	ADE	ft

Defects for Joints

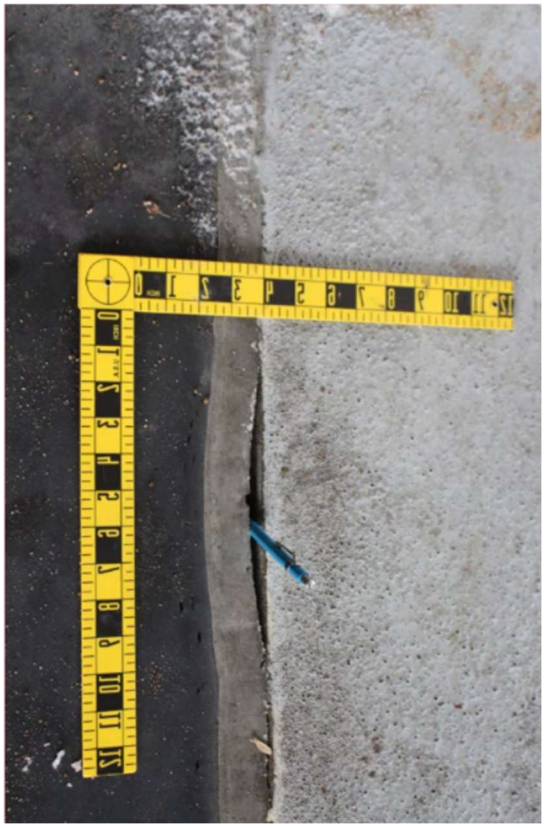
Defects	CS 1	CS 2	CS 3	CS 4
	GOOD	FAIR	POOR	SEVERE
Leakage (2310)	None.	Minimal. Minor dripping through the joint.	Moderate. More than a drip and less than free flow of water.	Free flow of water through the joint.
Seal Adhesion (2320)	Fully adhered.	Adhered for more than 50% of the joint height.	Adhered 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.
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. Joint still functioning as intended.	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 CS 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in CS 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in CS 4 under the appropriate material defect entry.

Note, joints not visible due to an asphalt overlay shall be coded in CS 2. Joints displaying evidence of mechanism failures, such as loose or broken springs, bolts, or support bars, shall be coded in CS 3.

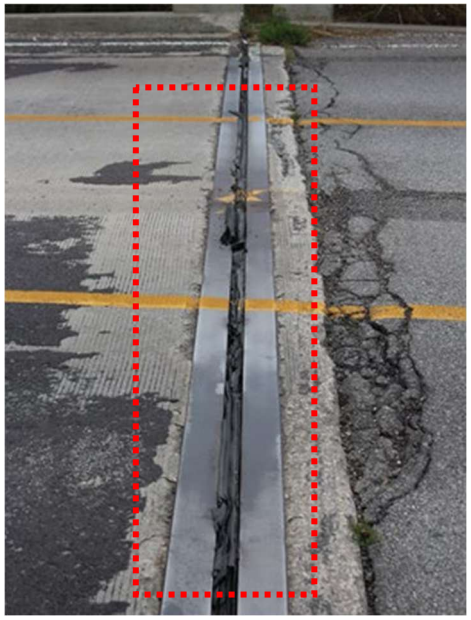
Defect 2310–Leakage

Condition State 1	Condition State 2	Condition State 3	Condition State 4
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.
			

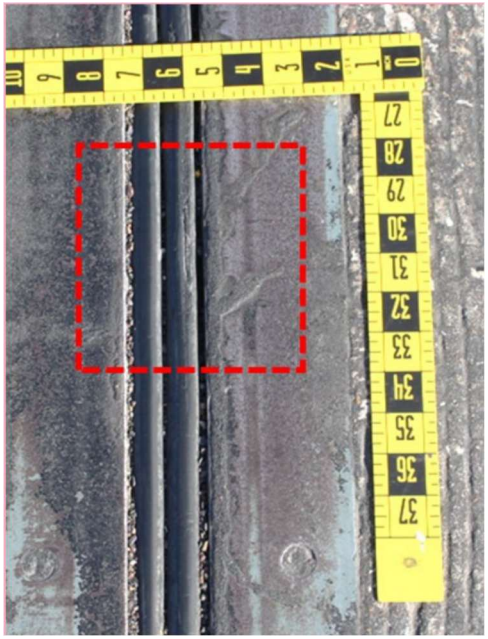
Defect 2320–Seal Adhesion

Condition State 1	Condition State 2	Condition State 3	Condition State 4
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.
			

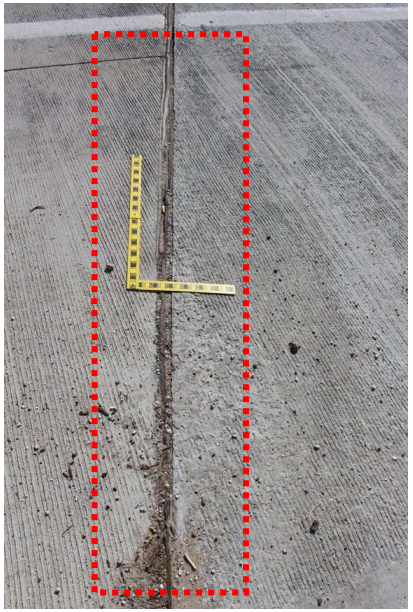
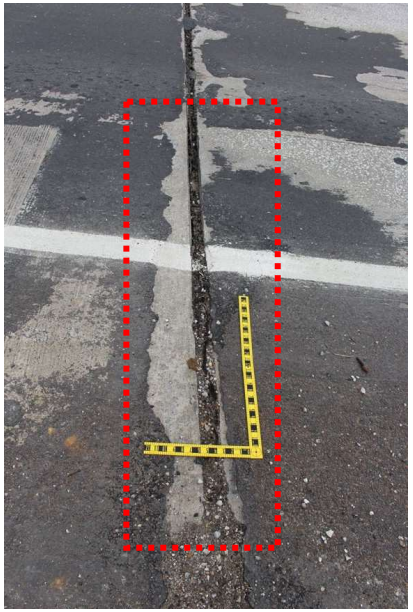
Defect 2330–Seal Damage

Condition State 1	Condition State 2	Condition State 3	Condition State 4
None.	Seal abrasion without punctures.	Punctured or ripped or partially pulled out.	Punctured completely through, pulled out, or missing.
			

Defect 2340–Seal Cracking

Condition State 1	Condition State 2	Condition State 3	Condition State 4
None.	Surface crack.	Crack that partially penetrates the seal.	Crack that fully penetrates the seal.
			

Defect 2350–Debris Impaction

Condition State 1	Condition State 2	Condition State 3	Condition State 4
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.
			

Defect 2360–Adjacent Deck or Header

Condition State 1	Condition State 2	Condition State 3	Condition State 4
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.
			

Defect 2370–Metal Deterioration or Damage

Condition State 1	Condition State 2	Condition State 3	Condition State 4
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. Joint still functioning as intended.	Metal cracking, section loss, damage, or connection failure that prevents the joint from functioning as intended.
			

3.11—Wearing Surfaces, Protective Coatings, and Concrete Reinforcing Steel Protective Systems

Element No.	Element Name	Classification	Units of Measurement	Element No.	Element Name	Classification	Units of Measurement
510	Wearing Surfaces	BME	ft^2	515	Steel Protective Coating	BME	ft^2 (surface)
8511	Wearing Surfaces–Flexible Overlays	ADE	ft^2	521	Concrete Protective Coating	BME	ft^2 (surface)
8512	Wearing Surfaces–Rigid and Semi-Rigid Overlays	ADE	ft^2	520	Concrete Reinforcing Steel Protective System	BME	ft^2
				8516	Concrete Encasement	ADE	ft^2

Defects for Wearing Surfaces

Defects	CS 1	CS 2	CS 3	CS 4
	GOOD	FAIR	POOR	SEVERE
Delamination/ Spall/Patched Area/Pothole (Wearing Surfaces) (3210)	None.	Delaminated. Spall less than 1 in. deep or less than 6 in. diameter. Patched area that is sound. Partial-depth pothole.	Spall 1 in. deep or greater or 6 in. diameter or greater. Patched area that is unsound or showing distress. Full-depth pothole.	The wearing surface is no longer effective.
Crack (Wearing Surface) (3220)	Insignificant cracks or medium width cracks that have been sealed.	Unsealed medium width cracks or unsealed medium pattern (map) cracking.	Wide cracks or heavy pattern (map) cracking.	
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 CS 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in CS 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in CS 4 under the appropriate material defect entry.

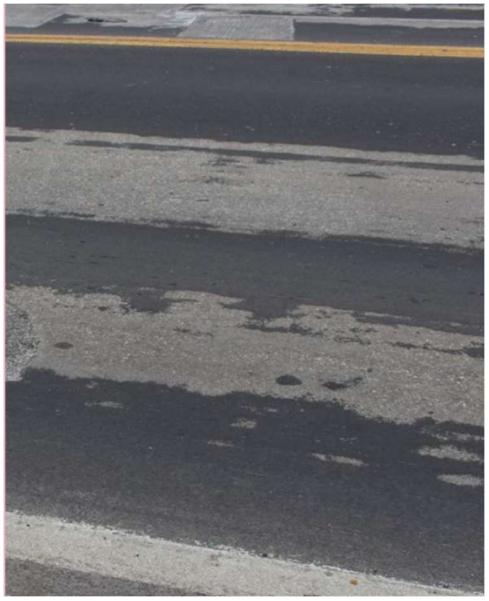
Defect 3210–Delamination/Spall/Patched Area/Pothole (Wearing Surfaces)

Condition State 1	Condition State 2	Condition State 3	Condition State 4
None.	Delaminated. Spall less than 1 in. deep or less than 6 in. diameter. Patched area that is sound. Partial-depth pothole.	Spall 1 in. deep or greater or 6 in. diameter or greater. Patched area that is unsound or showing distress. Full-depth pothole.	The wearing surface is no longer effective.
			

Defect 3220–Crack (Wearing Surface)

Condition State 1	Condition State 2	Condition State 3	Condition State 4
Insignificant cracks or medium width cracks that have been sealed.	Unsealed medium width cracks or unsealed medium pattern (map) cracking.	Wide cracks or heavy pattern (map) cracking.	The wearing surface is no longer effective.
			

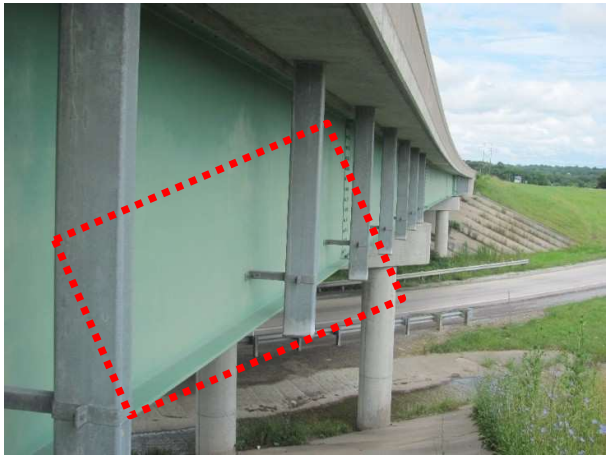
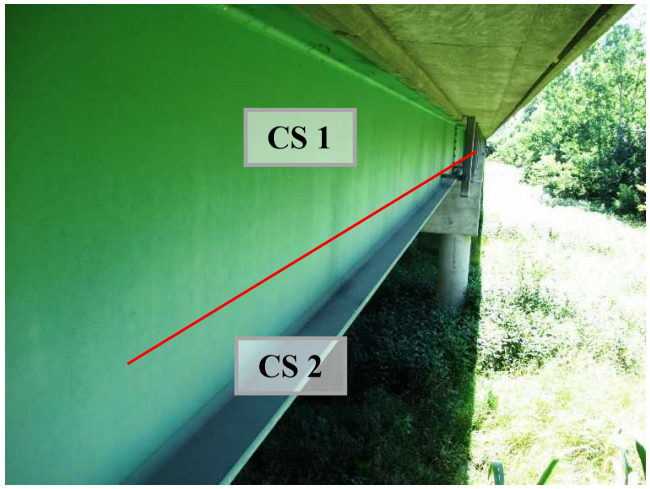
Defect 3230–Effectiveness (Wearing Surface)

Condition State 1	Condition State 2	Condition State 3	Condition State 4
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.	The wearing surface is no longer effective.
			

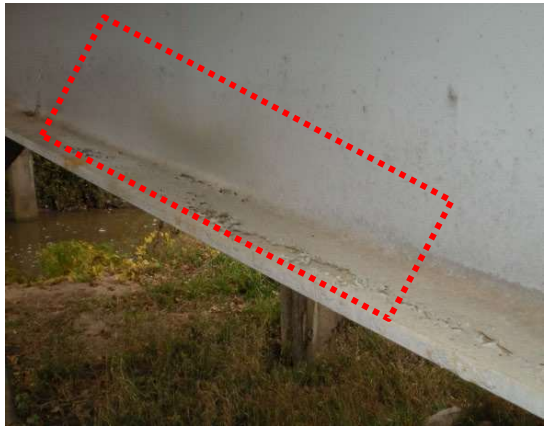
Defects for Steel Protective Coating

Defects	CS 1	CS 2	CS 3	CS 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.
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. Tightly adhered, capable of withstanding hammering or vigorous wire brushing.	Granular texture.	Small flakes, less than 1/2-in. diameter.	Dark black color. 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 CS 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in CS 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in CS 4 under the appropriate material defect entry.

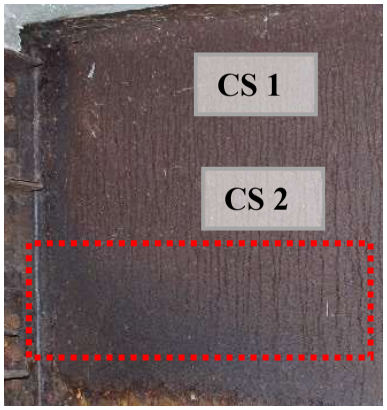
Defect 3410–Chalking (Steel Protective Coatings)

Condition State 1	Condition State 2	Condition State 3
None.	Surface dulling.	Loss of pigment.
		
Boundary Image CS 1–2		Boundary Image CS 2–3
		

Defect 3420–Peeling/Bubbling/Cracking (Steel Protective Coatings)

Condition State 1	Condition State 2	Condition State 3	Condition State 4
None.	Finish coats only.	Finish and primer coats.	Exposure of bare metal.
			
Boundary Image CS 1–2			
			

Defect 3430–Oxide Film Degradation

Condition State 1	Condition State 2	Condition State 3	Condition State 4
Yellow-orange or light brown for early development. Chocolate-brown to purple-brown for fully developed. Tightly adhered, capable of withstanding hammering or vigorous wire brushing.	Granular texture.	Small flakes, less than 1/2-in. diameter.	Dark black color. Large flakes, 1/2-in. diameter or greater, or laminar sheets or nodules.
			

Boundary Image CS 1–2	Boundary Image CS 2–3	Boundary Image CS 3–4
		

Defect 3440–Effectiveness (Steel Protective Coatings)

Condition State 1	Condition State 2	Condition State 3	Condition State 4
Fully effective.	Substantially effective.	Limited effectiveness.	Failed; no protection of the underlying metal.
			

Boundary Image CS 1–2	Boundary Image CS 2–3	Boundary Image CS 3–4
		

Defects for Concrete Protective Coating

Defects	CS 1	CS 2	CS 3	CS 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 CS 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in CS 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in CS 4 under the appropriate material defect entry.

Defect 3510–Wear (Concrete Protective Coatings)

Condition State 1	Condition State 2	Condition State 3	Condition State 4
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.
			

Defect 3540–Effectiveness (Concrete Protective Coatings)

Condition State 1	Condition State 2	Condition State 3	Condition State 4
Fully effective.	Substantially effective.	Limited effectiveness.	The protective system has failed or is no longer effective.
			

Defects for Concrete Reinforcing Steel Protective System

Defects	CS 1	CS 2	CS 3	CS 4
	GOOD	FAIR	POOR	SEVERE
Effectiveness – Protective System (e.g. 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 CS 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in CS 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in CS 4 under the appropriate material defect entry.

Defects for Concrete Encasement (NJDOT ADE 8516)

Defects	CS 1	CS 2	CS 3	CS 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.	
Cracking (RC) (1130)	Insignificant cracks or medium width cracks that have been sealed.	Unsealed medium width cracks or unsealed medium pattern (map) cracking.	Wide crack or heavy pattern (map) cracking.	
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 CS 2 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in CS 3 under the appropriate material defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in CS 4 under the appropriate material defect entry.

3.12—Spatial Area Estimates Diagrams

This section includes diagrams that can be used to estimate the amount of damage in a particular CS. The area estimates are presented in terms of percentage of the total area shown in the diagram. The area of each diagram represents 4000 sq ft of surface area configured as a 40 ft × 100 ft scale diagram. The diagrams can be used to assist in estimating an area of damage by comparing the appearance of the diagram with conditions observed in the field.

Figures 3.12-1 through 3.12-6 illustrate areas of damage distributed in different configurations. For example, Figure 3.12-1a illustrates 1 percent damage that is widely distributed, Figure 3.12-1b illustrates 1 percent damage that is moderately distributed, and Figure 3.12-1c illustrates 1 percent damage in a single area. Areas of 1 percent, 3 precent, 5 percent, 10 percent, 25 percent, and 50 percent are illustrated in the diagrams.

Figures 3.12-7 and 3.12-8 illustrate areas of medium and heavy pattern cracking, respectively. The diagrams in Figures 3.12-7 and 3.12-8 illustrate pattern cracking quantities of 5 percent, 10 percent, and 25 percent of the total area. Figure 3.12-9 illustrates isolated cracking representing 1 percent, 5 percent, and 10 percent of the deck area. In this diagram, 1 ft of crack is assigned as 1 sq ft of damage.

Figure 3.12-10 illustrates length quantity estimates for damage of 5 percent, 10 percent, 25 percent, and 50 percent of the total length.

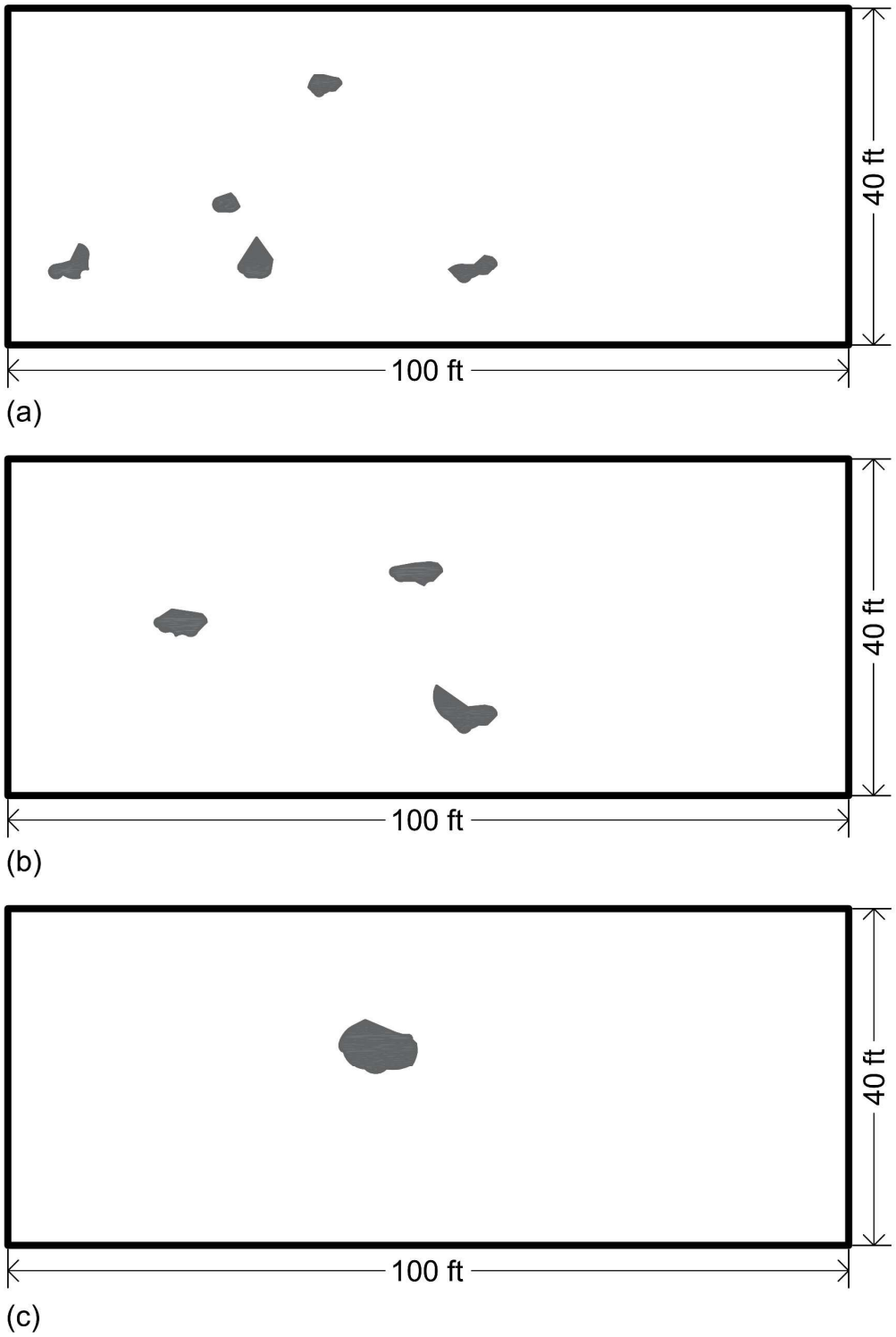


Figure 3.12-1. a), b), and c) area quantity estimate showing 1 percent of area damaged

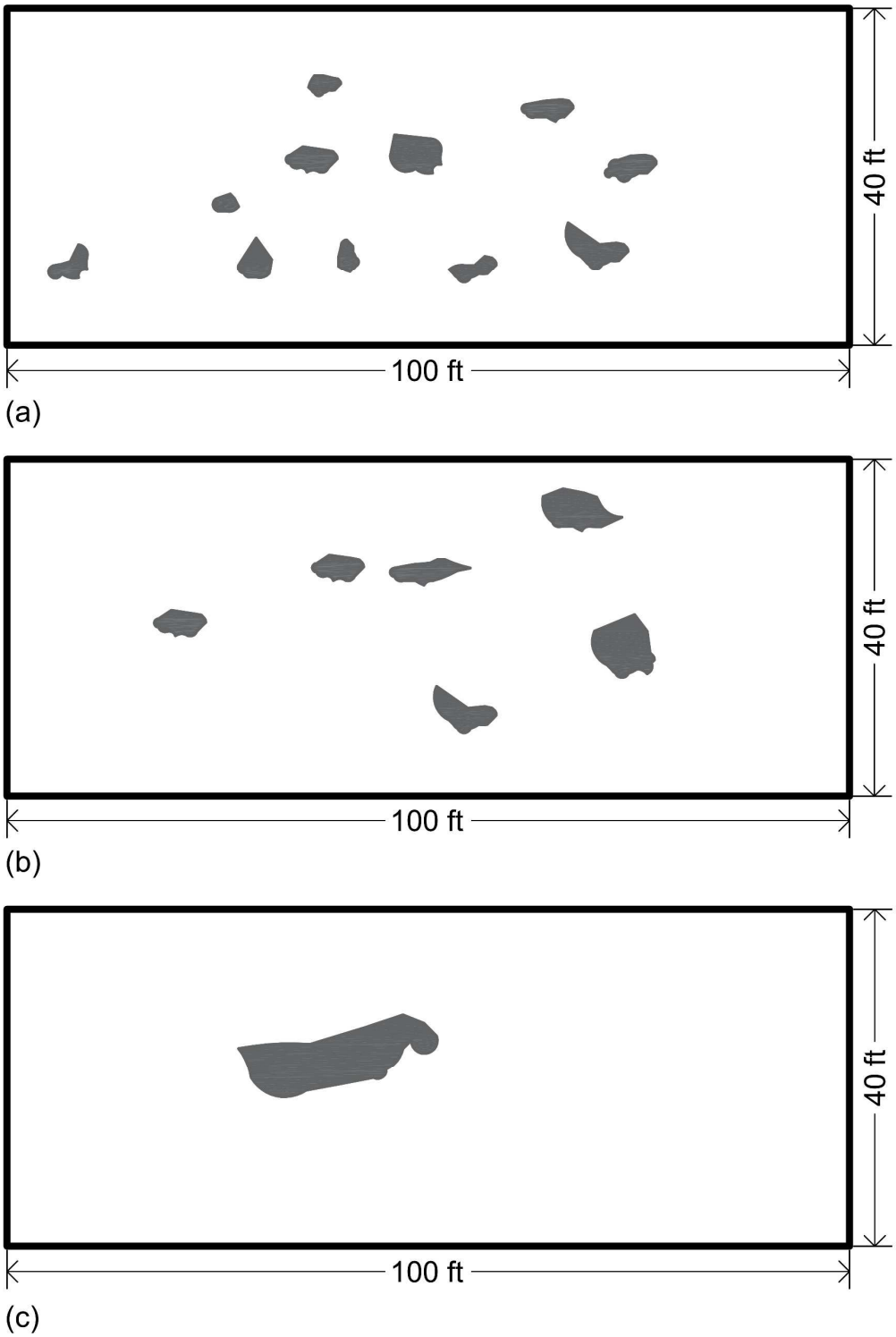


Figure 3.12-2. a), b), and c) area quantity estimate showing 3 percent of area damaged

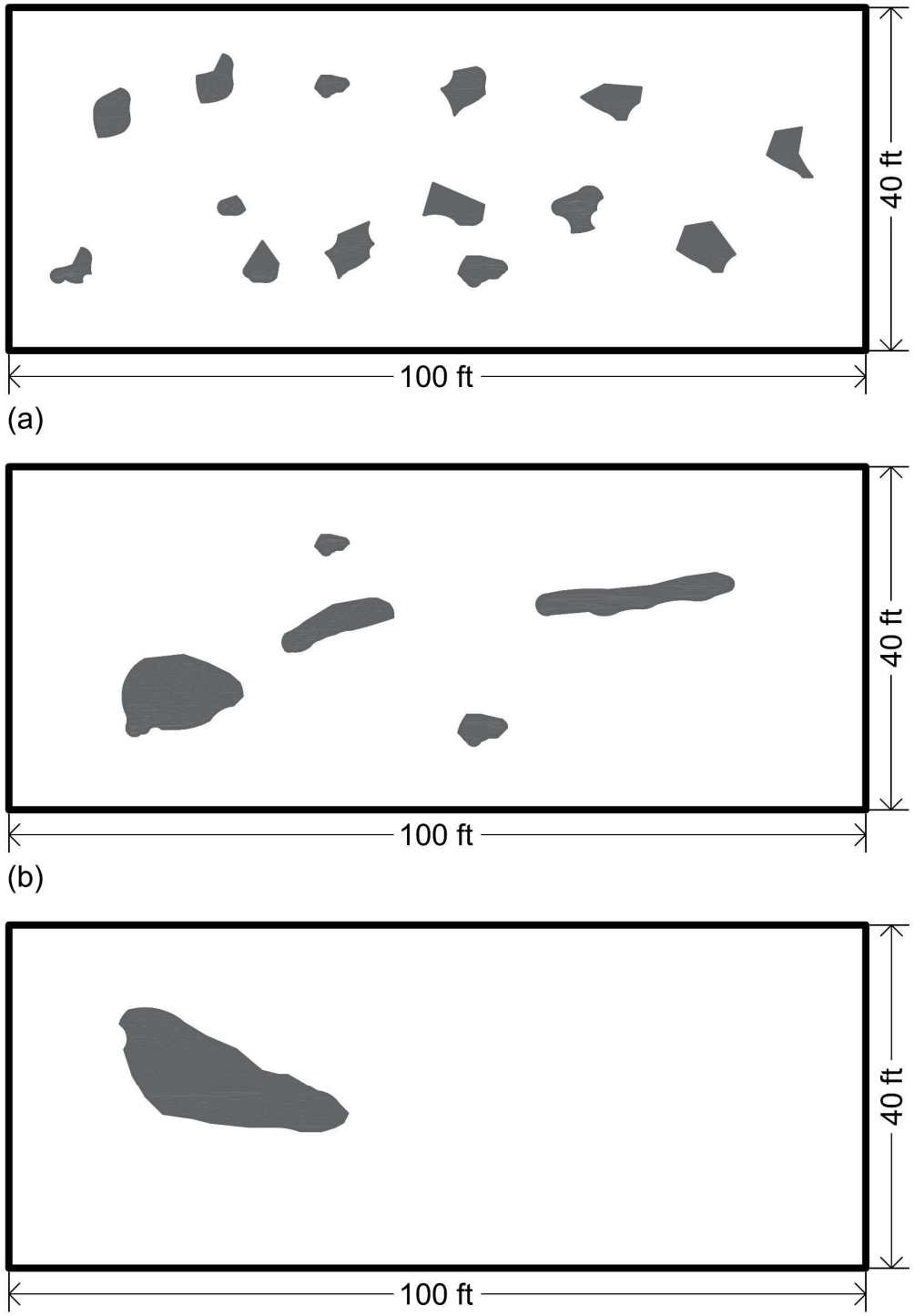
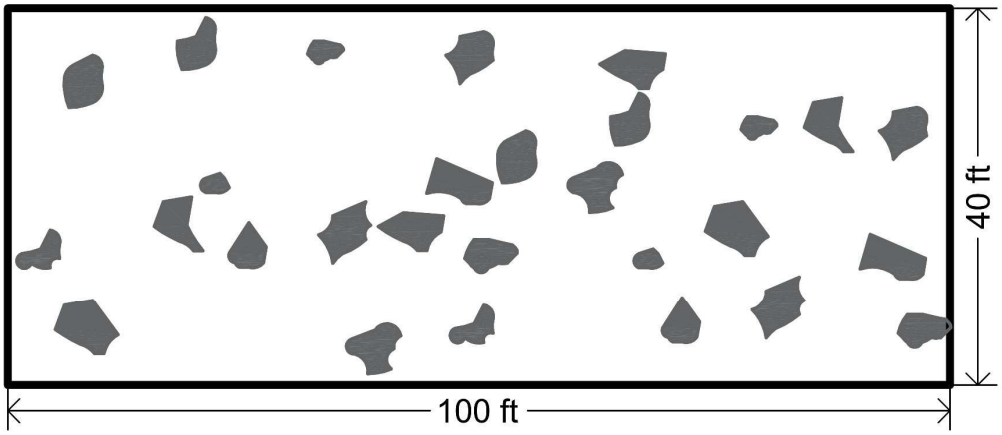
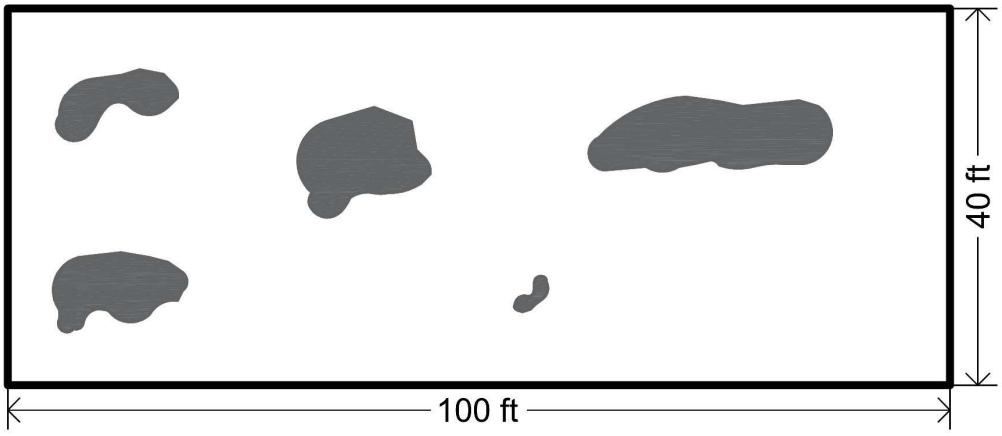


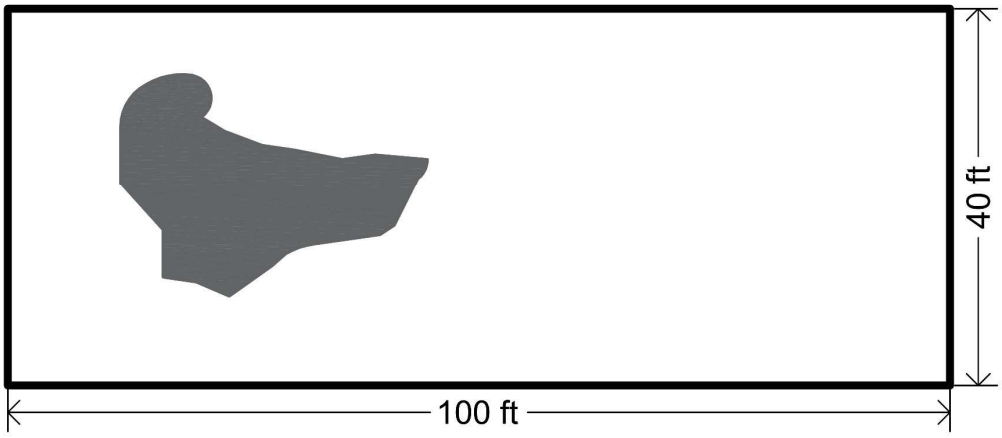
Figure 3.12-3. a), b), and c) area quantity estimate showing 5 percent of area damaged



(a)



(b)



(c)

Figure 3.12-4. a), b), and c) area quantity estimate showing 10 percent of area damaged

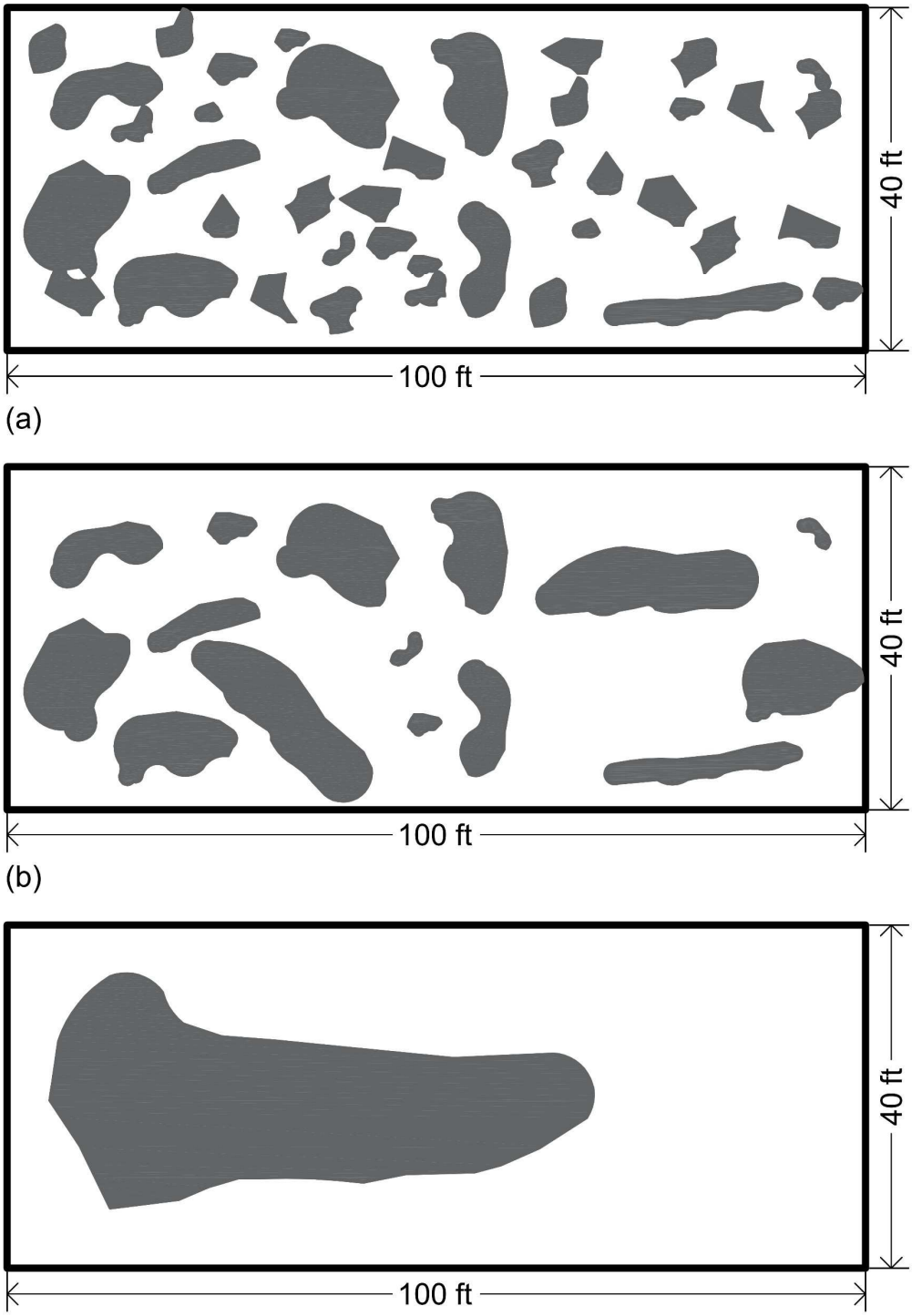


Figure 3.12-5. a), b), and c) area quantity estimate showing 25 percent of area damaged

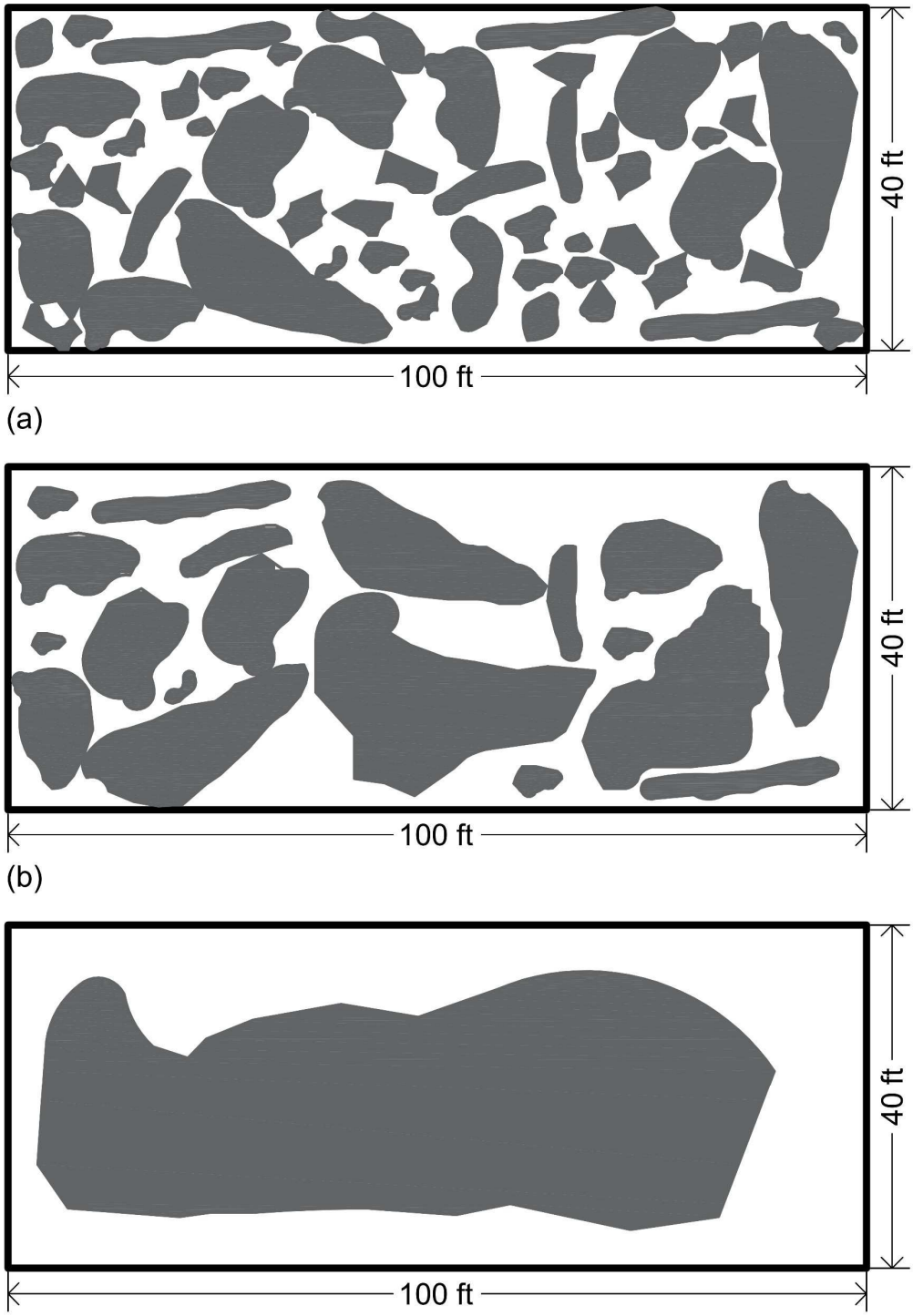


Figure 3.12-6. a), b), and c) area quantity estimate showing 50 percent of area damaged

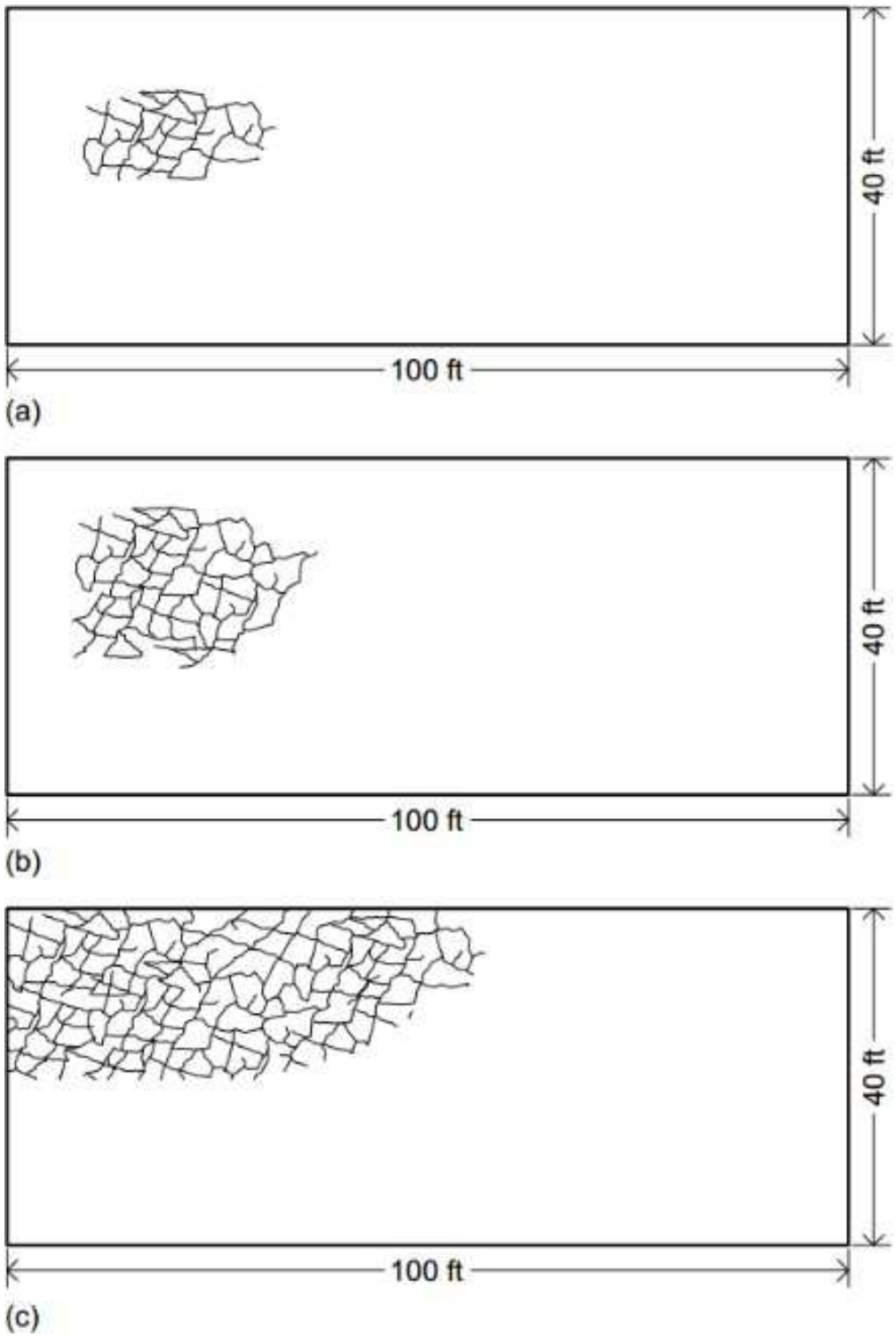


Figure 3.12-7. Medium Pattern Cracking (Spacing between 1 and 3 ft) (a) 5 percent, (b) 10 percent, (c) 25 percent

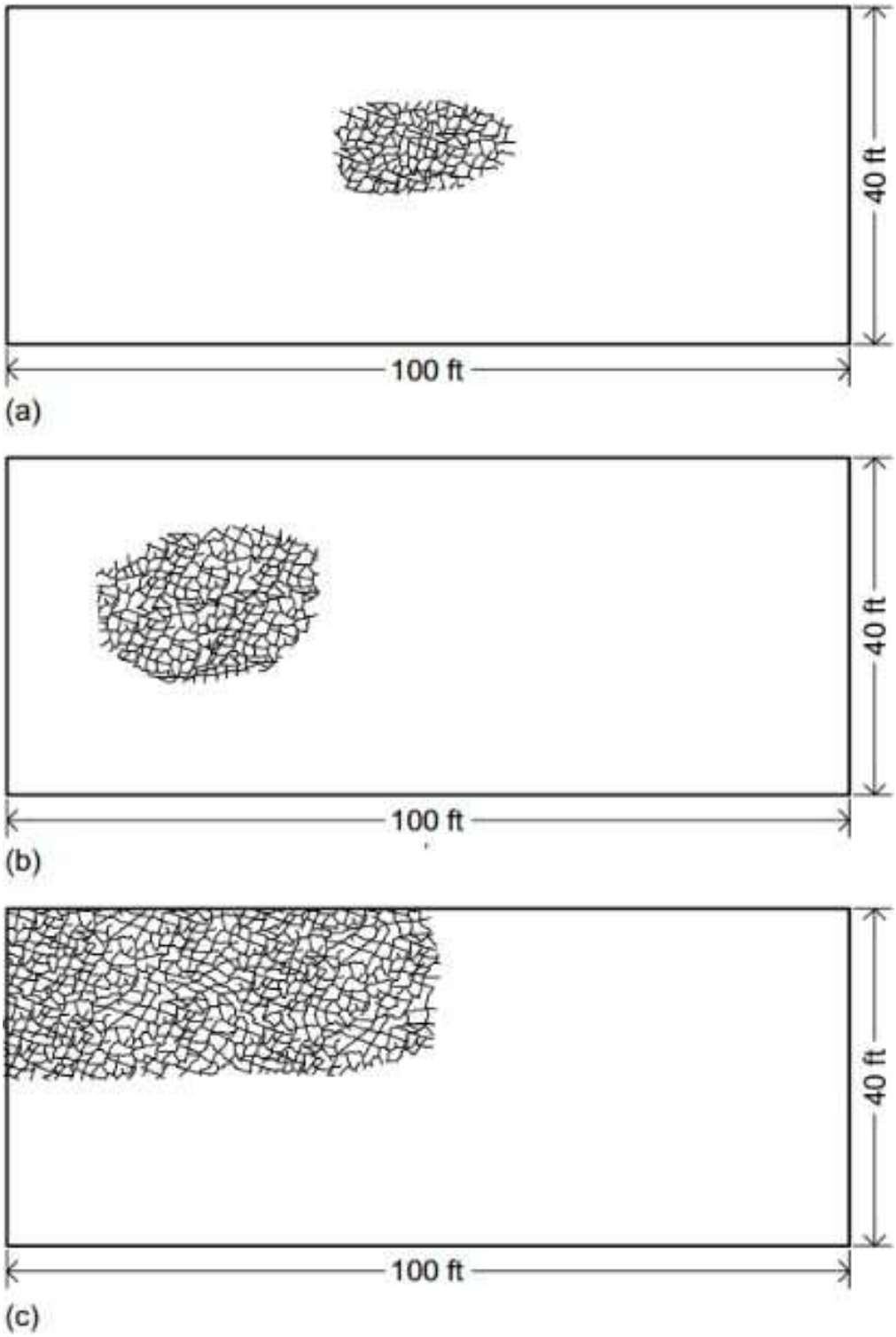


Figure 3.12-8. Heavy Pattern Cracking (spacing ≤ 1 ft.) (a) 5 percent, (b) 10 percent, (c) 25 percent

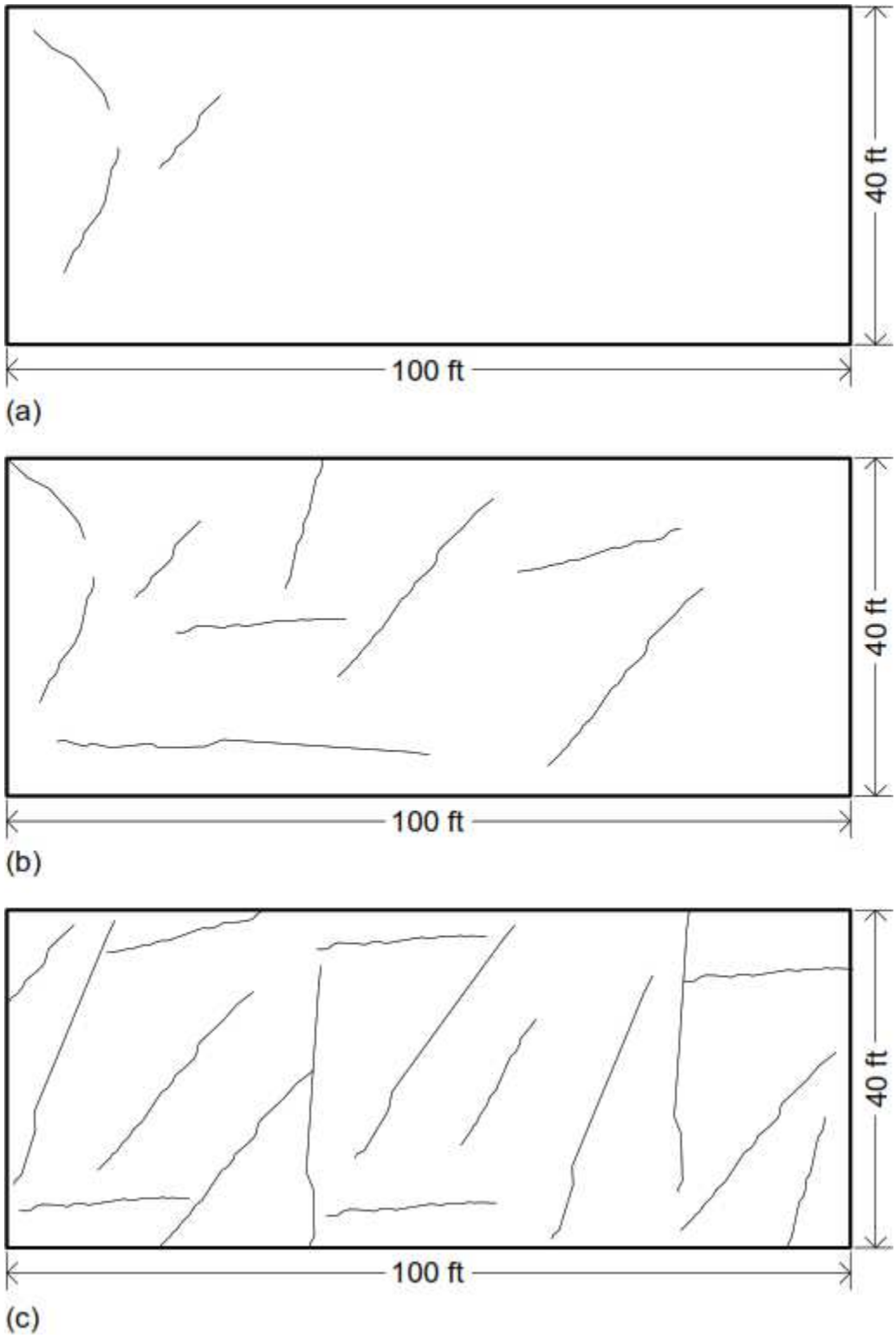


Figure 3.12-9. Isolated Cracking a) 1 percent, b) 5 percent, c) 10 percent

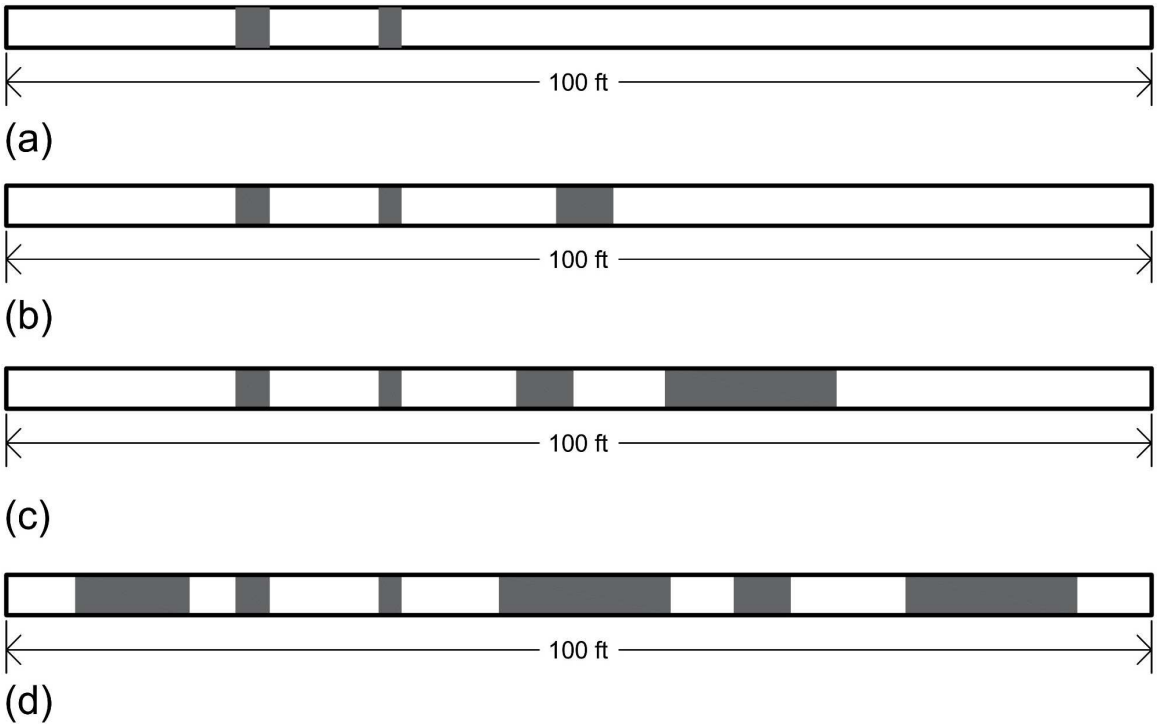


Figure 3.12-10. Linear quantity estimate a) 5 percent, b) 10 percent, c) 25 percent, d) 50 percent

3.13—Environmental Factors (Service Environments)

Elements exposed to different environmental factors and service environments 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, or
- 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 environmental 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 environmental 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. **Not used in New Jersey.**
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. **Not used in New Jersey.**
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. **Used for typical environments in New Jersey.**
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. **Used for severe environmental conditions in New Jersey such as saltwater (marine), brackish water (part saltwater), or industrial.**

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 environmental factor affecting an element.

Elements	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

Elements	Example Environmental Factors
	Tire chain wear
	Deck salting
Petroleum-Based	High temperature
Joints and Bearings	Extreme temperature ranges
Operating Practices	High traffic, truck volume, or both

4—Appendices
A—NJDOT Bridge Element Level and Condition Ratings Relationship

Defect Severity	Defect Extent
Inherent: Not indicative of damage or deterioration but is characteristic of the material or results from normal construction practices *(CS 1)*. Minor: Damage or deterioration has initiated but is not yet considered significant *(CS 2)*. Moderate: Damage or deterioration are significant, but the strength and performance of the component are not affected *(CS 3)*. Major: Affects the strength and/or performance of the component, as determined by a structural and/or hydraulic review. For joints, bearings, railings, and railing transitions, a major defect prevents the component from functioning as intended *(CS 4)*.	Isolated: Occurs in one or a few concentrated locations *(<10%)*. Widespread: Present in many separate areas of the component *(>40%)*. Some: Prevalence is more than isolated and less than widespread *(10% to 40%)*.
These orders of magnitudes are not meant to be prescriptive, but rather rough ideas to aid in comparing element level data to condition ratings.	

The following tables were created using concepts from the SNBI in conjunction with bridge element level evaluation. The information from these tables can be found in SNBI Subsection 7.1: Component Condition Ratings, though additional information has been added to best suit NJDOT's needs.

SNBI Items B.C.01 through B.C.07, B.C.14, and B.C.15 (Deck, Superstructure, Substructure, Culvert, Bridge Railings, Bridge Railing Transitions, and Bridge Bearings Condition Ratings; and NSTM Inspection and Underwater Inspection Conditions)												
SNBI Table 20			**Severity and Typical Condition State**								**Description**	
Class	Rating	Condition	Inherent *CS 1*		Minor *CS 2*		Moderate *CS 3*		Major *CS 4*		Strength &/or Performance	Other
	N	Not Applicable	Component does not exist.									
Good	9	Excellent	Isolated	<10%								*Or no defects.*
	8	Very Good	Some	10% - 40%	*Isolated*	*<10%*						
	7	Good	*Widespread*	*>40%*	Some	10% - 40%						
Fair	6	Satisfactory			Widespread	>40%	Isolated	<10%				
	5	Fair					Some	10% - 40%			Not Affected	
Poor	4	Poor					Widespread	>40%	Isolated	<10%	Affected	
	3	Serious							Isolated to Widespread	up to 100%	Seriously Affected	Condition typically necessitates more frequent monitoring, load restrictions, and/or corrective actions. Critical Finding for NSTM Inspection Condition.
	2	Critical							Isolated to Widespread	up to 100%	Severely Compromised	Condition typically necessitates frequent monitoring, significant load restrictions, and/or corrective actions to keep the bridge open. Critical Finding for Deck, Super, Sub, or Culvert.
	1	Imminent Failure	Bridge is closed to traffic due to component condition. Repair or rehabilitation may return the bridge to service.									
	0	Failed	Bridge is closed due to component condition, and is beyond corrective action. Replacement is required to restore service.									

SNBI Item B.C.08 (Bridge Joints Condition Rating)										
			Severity and Typical Condition State							
Class	Rating	Condition	Inherent		Minor		Moderate		Major	
			CS 1		*CS 2*		*CS 3*		*CS 4*	
	N	Not Applicable	Bridge does not have deck joints							
Good	9	Excellent	Isolated	<10%						
	8	Very Good	Some	10% - 40%	*Isolated*	*<10%*				
	7	Good	*Widespread*	*>40%*	Some	10% - 40%				
Fair	6	Satisfactory			Widespread	>40%	Isolated	<10%		
	5	Fair					Some	10% - 40%		
Poor	4	Poor					Widespread	>40%	Isolated	<10%
	3	Serious							Some	10% - 40%
	2	Critical							Widespread	>40%
	1	Imminent Failure	Joints have failed and are ineffective.							
	0	Failed	Joints have failed and present a safety hazard.							

SNBI Item B.C.09 (Channel Condition Rating)														
			Severity and Typical Condition State										**Description**	
Class	Rating	Condition	Inherent		Minor		Moderate		Major				Bridge &/or Approach Roadway	Other
			CS 1		*CS 2*		*CS 3*		*CS 4*					
	N	Not Applicable	Bridge does not cross over water.											
Good	9	Excellent	No defects.											
	8	Very Good	Isolated to Widespread	Up to 100%										
	7	Good			Isolated or Some	<40%								
Fair	6	Satisfactory			Widespread	>40%	Isolated	<10%						
	5	Fair					Some	<40%					Not Threatened	
Poor	4	Poor					Widespread	>40%	Isolated	<10%			Threatened	
	3	Serious							Isolated to Widespread	up to 100%			Seriously Threatened	Condition typically necessitates more frequent monitoring, load restrictions, and/or corrective actions.
	2	Critical							Isolated to Widespread	up to 100%			Severely Threatened	Condition typically necessitates frequent monitoring, significant load restrictions, and/or corrective actions to keep the bridge open. Critical Finding
	1	Imminent Failure	Bridge is closed to traffic due to channel condition. Channel rehabilitation may return the bridge to service.											
	0	Failed	Bridge is closed due to channel condition, and is beyond corrective action. Bridge location or design can no longer accommodate the channel, and bridge replacement is needed to restore service.											

SNBI Item B.C.10 (Channel Protection Condition Rating)												
			Severity and Typical Condition State								**Description**	
Class	Rating	Condition	Inherent		Minor		Moderate		Major		Performance	Other
			CS 1		*CS 2*		*CS 3*		*CS 4*			
	N	Not Applicable	Bridge does not cross over water or channel protection devices do not exist.									
Good	9	Excellent	Isolated	<10%								
	8	Very Good	Some	10% - 40%	*Isolated*	*<10%*						
	7	Good	*Widespread*	*>40%*	Some	10% - 40%						
Fair	6	Satisfactory			Widespread	>40%	Isolated	<10%				
	5	Fair					Some	10% - 40%			Not Affected	
Poor	4	Poor					Widespread	>40%	Isolated	<10%	Affected	
	3	Serious							Isolated to Widespread	up to 100%	Seriously Affected	Condition typically necessitates more frequent monitoring or corrective actions.
	2	Critical							Isolated to Widespread	up to 100%	Severely Compromised	Condition typically necessitates more frequent monitoring or corrective actions.
	1	Imminent Failure	Channel protection has failed, but corrective action could restore it to working condition.									
	0	Failed	Channel protection is beyond repair and must be replaced.									

The following should be used to assign defect severity when evaluating channel protection:

1. A minor defect does not limit the effectiveness of the channel protection.
2. A moderate defect may limit the effectiveness of the channel protection.
3. A major defect indicates that the channel protection is missing or is no longer effective as determined by a hydraulic review.

SNBI Item B.C.11 (Scour Condition Rating)												
			Scour Severity and Typical Condition State								**Description**	
Class	Rating	Condition	Insignificant		Minor		Moderate		Major		Strength &/or Stability	Other
			CS 1		*CS 2*		*CS 3*		*CS 4*			
	N	Not Applicable	Bridge does not cross over water.									
Good	9	Excellent	No scour.									
	8	Very Good	Insignificant scour.									
	7	Good			Isolated or Some	<40%						
Fair	6	Satisfactory			Widespread	>40%	Isolated	<10%				
	5	Fair					Some	10% - 40%			Not Affected	
Poor	4	Poor					Widespread	>40%	Isolated	<10%	Affected	
	3	Serious							Isolated to Widespread	up to 100%	Seriously Affected	Condition typically necessitates more frequent monitoring, load restrictions, and/or corrective actions.
	2	Critical							Isolated to Widespread	up to 100%	Severely Compromised	Condition typically necessitates frequent monitoring, significant load restrictions, and/or corrective actions to keep the bridge open. Critical Finding.
	1	Imminent Failure	Bridge is closed to traffic due to scour condition. Channel rehabilitation may return the bridge to service.									
	0	Failed	Bridge is closed due to scour condition and is beyond corrective action. Bridge replacement is needed to restore service.									

Refer to SNBI Item B.AP.03 (Scour Vulnerability) to verify if the bridge has been determined to be stable or unstable for appraised scour conditions.

B—NJDOT Guidelines for Quantity Measurement and Identifying Bearings and Joints

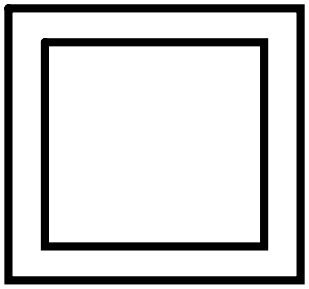
This appendix describes some examples of estimating quantities. Also, it includes sketches for different types of bearing and joints.

B.1—Estimating Total Quantities

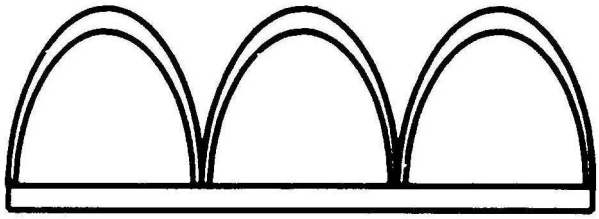
In most cases, quantities of elements are estimated based on the number of elements multiplied by the length or width of the bridge. For example, if there are 10 floor beams on a structure and the bridge is 40 feet wide, you can estimate the total quantity as 10 × 40' = 400'.The estimated quantities must be checked for accuracy during the first element level inspection. After field verification, the quantities will be accurate, unless a physical change is made to the bridge. Note that it is **not** required to be exact for the quantities; just to be close (+/- 1%) is sufficient.

B.1.1—Culverts

The quantity for culverts will be the length of the barrel (measured from headwall to headwall) multiplied by the number of barrels. For example, if you have a 2 barrel culvert that is 75' long, the total length of the culvert is 75' × 2 = 150'.



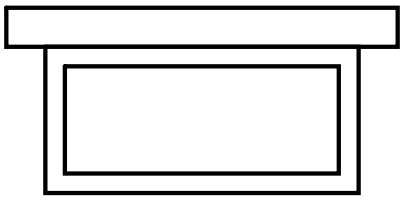
Quantity = 1 × Barrel Length



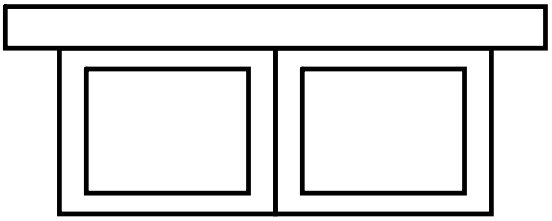
Quantity = 3 × Barrel Length

B.1.2—Box Girders

The quantity for box girder depends on the number of boxes which make up the girder. The quantity will be the number of "barrels" multiplied by the bridge length. See the following guideline:



Quantity = 1 × Length



Quantity = 2 × Length

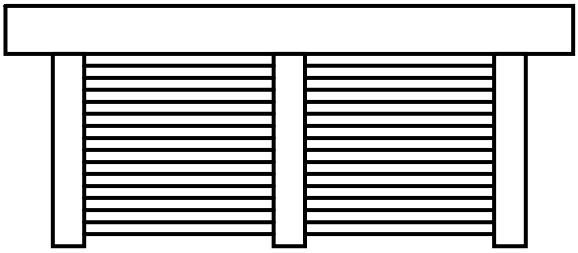
B.1.3—Integral Deck Girders

For this type of bridge include both an element for girder as well as one for deck. Because the deck acts integrally as part of the girder, if the deck is bad the girder should be rated down.

Quantity = 4 × Length

B.1.4—Timber Abutments

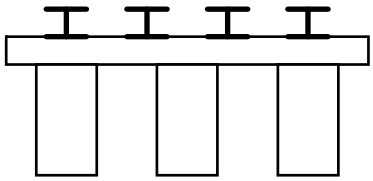
These types of abutments typically will get 3 different elements, a timber cap, timber column, and timber abutment. The timber abutment in these cases will consist only of the back wall of the abutment.



Quantity: timber piles = 3, timber cap = 1 × width, timber abutment = 1 × width

B.1.5—Pile Bent Pier

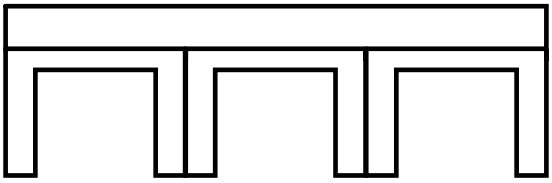
These piers will have two elements, a cap and columns. Any diagonal bracing will not be considered in rating the condition of the columns.



Quantity: columns = 3, cap = 1 × width

B.1.6—Concrete Channels

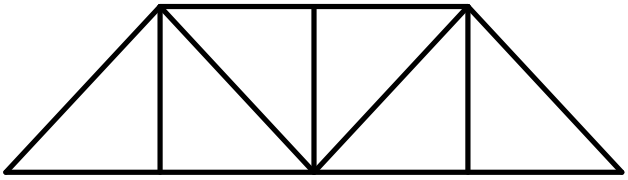
These elements are precast channels with normal reinforcement (not prestressed). Record these elements as a reinforced concrete girder, and also include the deck as a separate element. One channel is counted as a quantity of 1 times the length.



Quantity = 3 × length

B.1.7—Trusses

These are recorded as the number of lineal feet on each side of the bridge. Diagonals, verticals or cross bracing are not counted as additional quantities.



Quantity = 2 × length (one for each side of the bridge)

B.1.8—Stringers/Floor beams/Girders

Stringers are the small elements which run longitudinally to the deck and carry the load from the deck to the floor beams. Floor beams are transverse to the deck and carry the stringer load out to the truss or girders. Girders are the main longitudinal superstructure members which carry the loads to the substructures.

Stringers

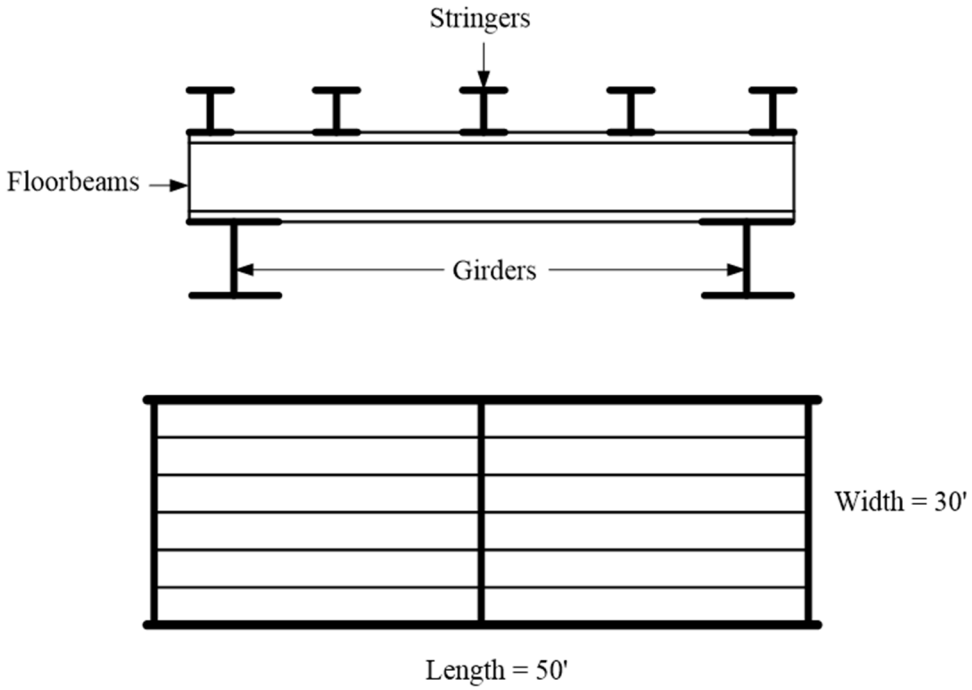
Quantity = length × number of stringers = 50' × 5 = 250 LF

Floor beams

Quantity = width × number of floor beams = 30' × 3 = 90 LF

Girders

Quantity = length × number of girders = 50' × 2 = 100 LF



B.1.9—Conventions for Quantities

Quantity for Culverts is the length of the barrel (measured headwall to headwall) times the number of barrels. Frames that are culverts are also included in this category.

Quantity for Abutments is measured along the entire face of the abutment and back along the wingwall to the first vertical joint of each wingwall. If the wingwall is integral, you would measure the face of the abutment and the entire length of the wingwall.

Quantity for Box Girders is the number of cells times the bridge length.

Quantity for Railing is the length of each railing measured from backwall to backwall.

Quantity for Pier Walls is from the outside edge to outside edge of pier wall. Use the pier wall element anytime the pier supporting member is 10 feet or greater in width.

Quantity for Arch is not measured along the length of the barrel. It is measured along the span length from spring line to spring line in one-foot increments. (Frames that are not culverts are also included in this category).

Quantity for Truss is measured in linear feet along the truss (a horizontal projection of the measurement). Do not add web member lengths.

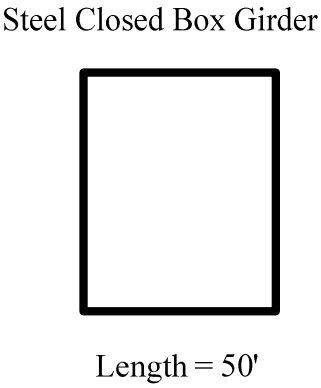
Quantity for Deck is measured in square footage. This total is obtained by using the out-to-out (fascia to fascia) and structure length dimensions.

Quantity for Beams and Girders is measured from beam or girder end to beam or girder end, not bearing to bearing.

B.2—Example for Element 102: Steel Close Web/Box Girder

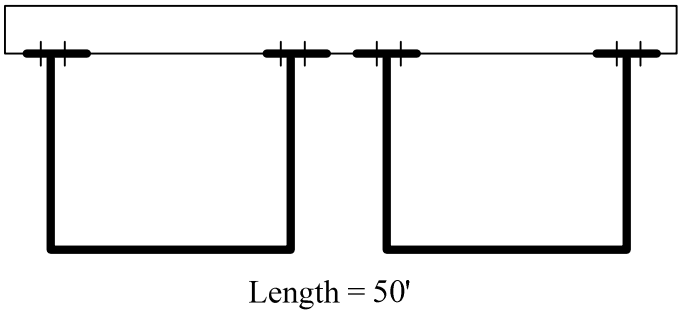
B.2.1—Steel Closed Box Girder

Quantity = (visible web faces / 2) × length = (2/2) × 50 = 50 LF



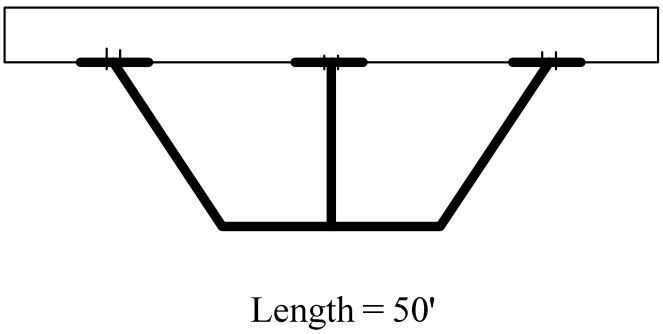
B.2.2—Steel Spread Closed Web Girder

Quantity = (visible web faces / 2) × length = (4/2) × 50 = 100 LF



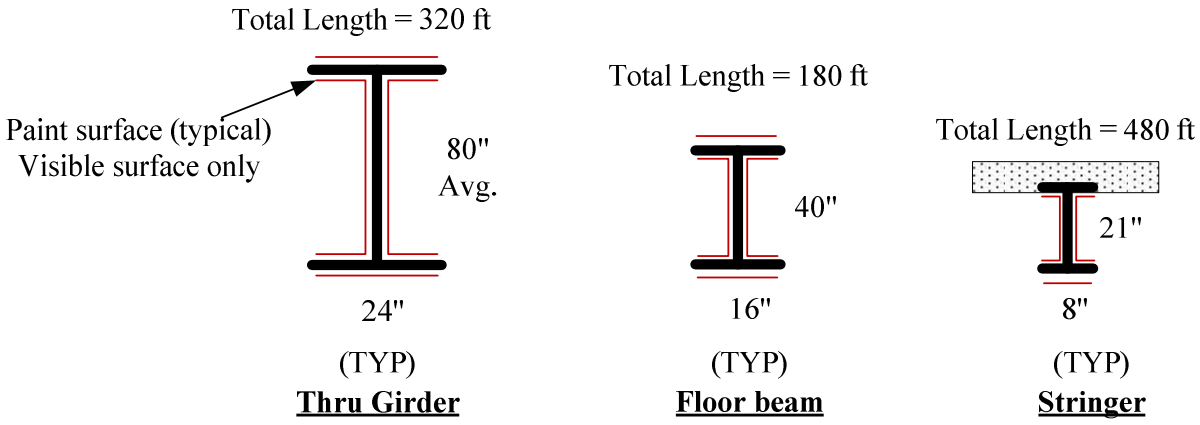
B.2.3—Steel Closed Web Girder

Quantity = (visible web faces / 2) × length = (2/2) × 50 = 50 LF



B.3—Example for Element 515: Steel Protective Coating

B.3.1—Protective Coating for a Through Girder-Floor Beam-Stringer System.



Element	Calculations		Area/Length SF/LF	Length (LF)	Total (SF)
Stringers	(4 + 21 + 4 + 8 + 4 + 21 + 4) / 12 =	5.50	5.50 SF/LF	480	2,640
Floor beams	(8 + 40 + 8 + 16 + 8 + 40 + 8 + 16) / 12 =	10.67	12.00 SF/LF	180	2,160
Through Girders	(12 + 80 + 12 + 24 + 12 + 80 + 12 + 24) / 12 =	21.33	21.33 SF/LF	320	6,827

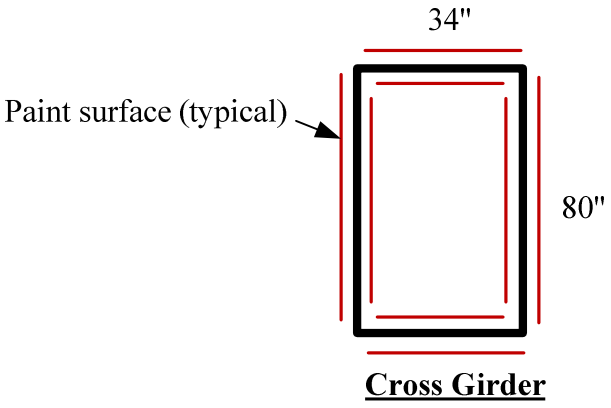
B.3.2—Steel Protective Coating for Cross Girder

Length = 50 LF

Quantity = [(80 + 34 + 80 + 34) /12] × 2 × 50

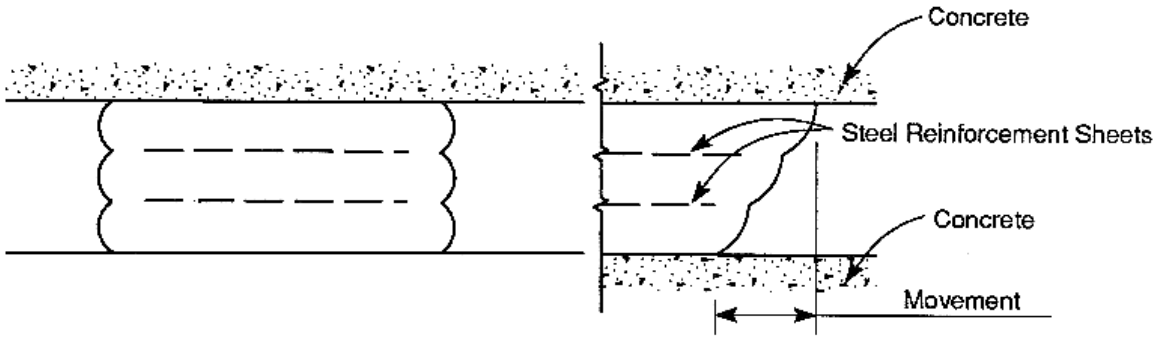
= 19 × 2 × 50

= 1900 SF

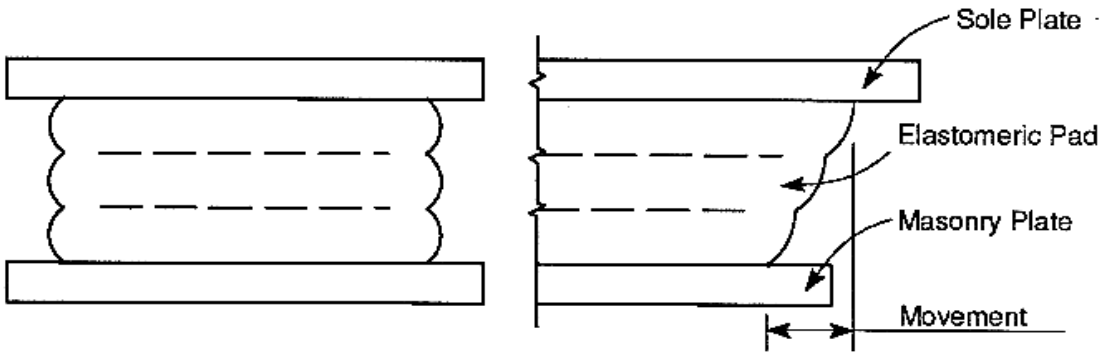


B.4—Examples of Bearing Types

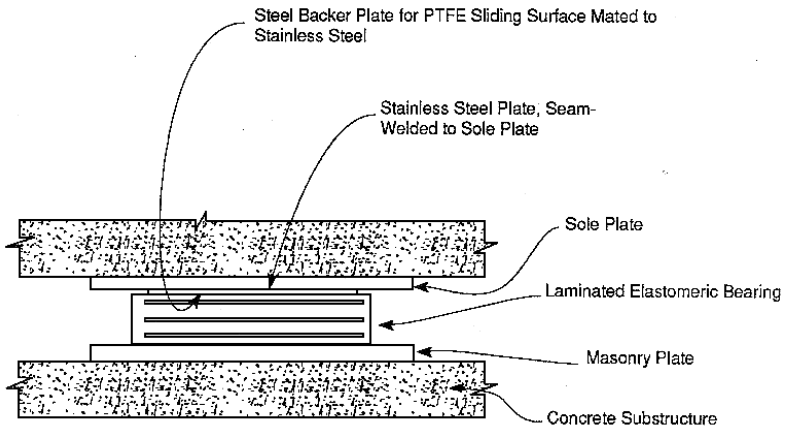
B.4.1—Elastomeric Bearing, Element 310



Elastomeric Pads



Elastomeric Pads with Steel Sole and Masonry Plates

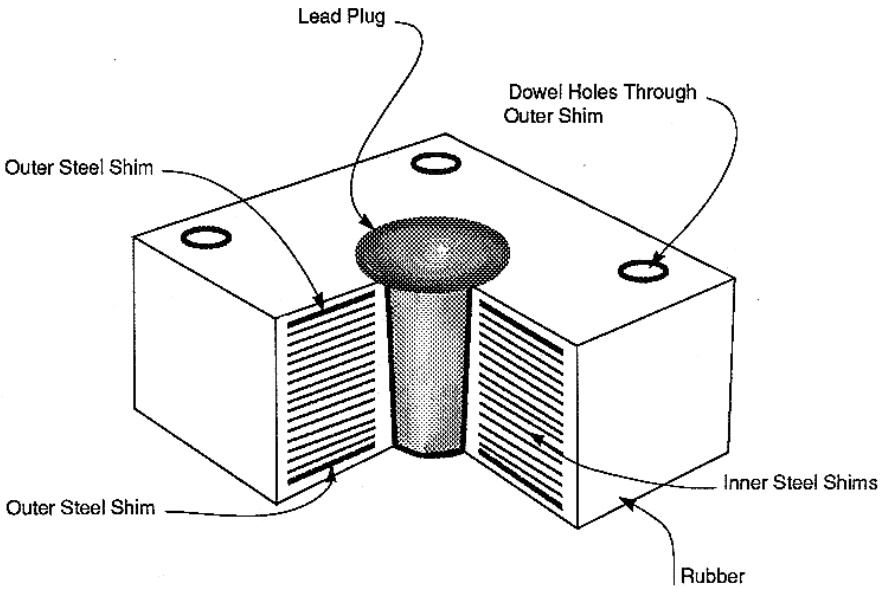


Elastomeric Bearing with PTFE (Teflon)

B.4.2—Isolation Bearing, Element 8310

(Sub-Element of NBE 310)

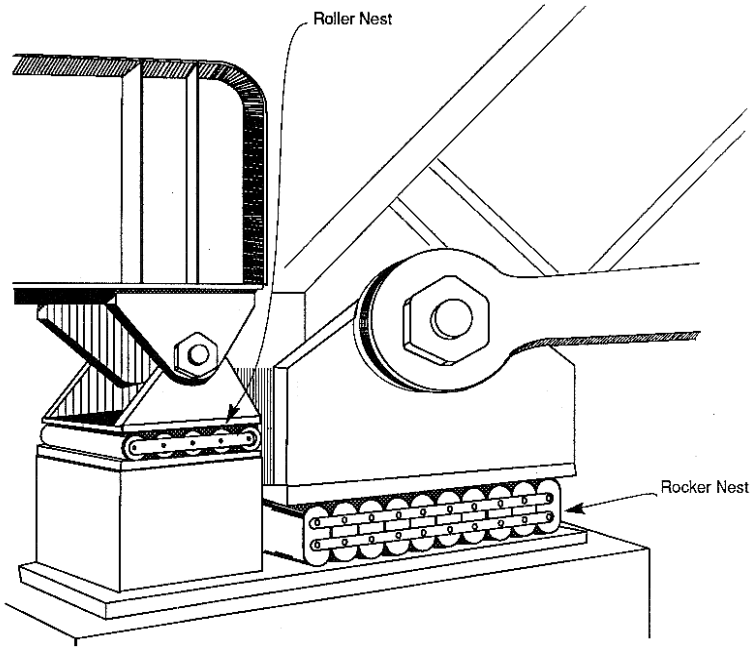
The inspection items for isolation bearings are essentially the same as those for plain or laminated neoprene bearings. The only elements unique to isolation bearings are the lead core and steel dowels, both of which are hidden from view and cannot be inspected. The lead core may yield during an earthquake. After a seismic event, the bearing shape and horizontal alignment in both the longitudinal and transverse



direction must be closely inspected. It may be necessary to replace these bearings after an earthquake

Typical Lead-Rubber Bearing

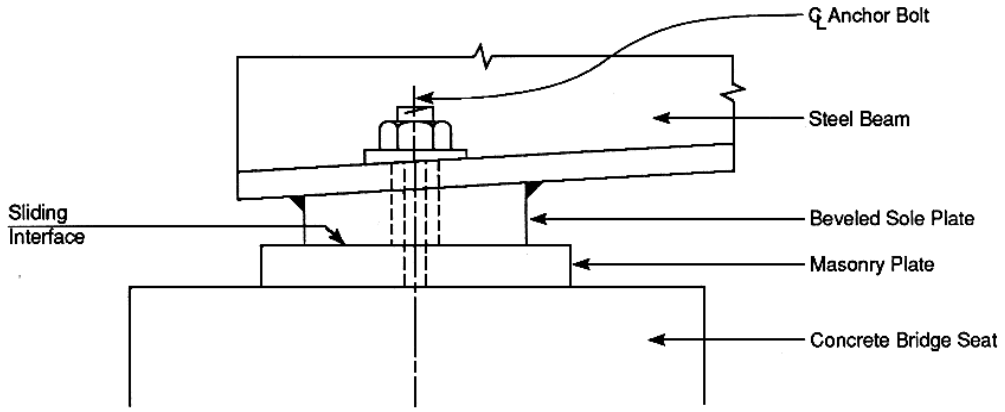
B.4.3—Moveable Bearing, Element 311



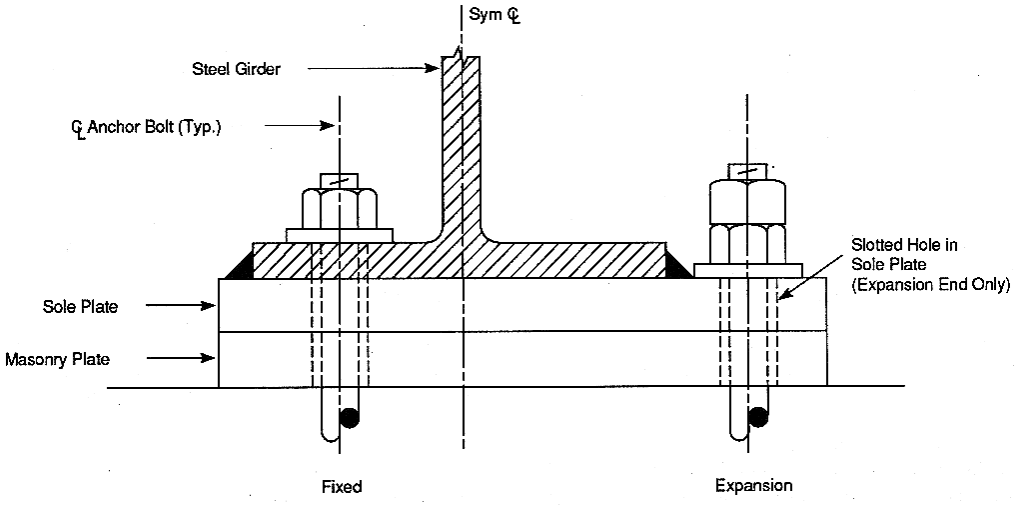
Roller and Rocker Nests

B.4.4—Sliding Plate Bearing - Expansion/Movable, Element 8311

(Sub-Element of NBE 311)



SIDE ELEVATION

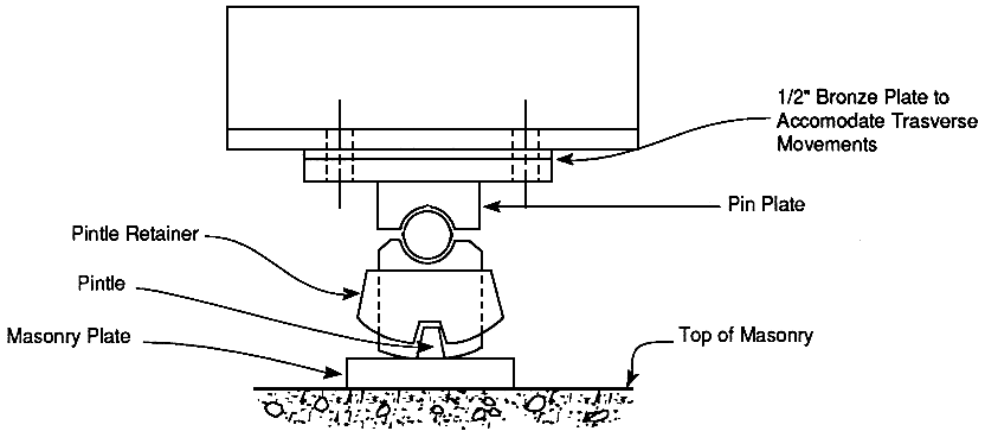


END ELEVATION

Sliding Plate Bearing

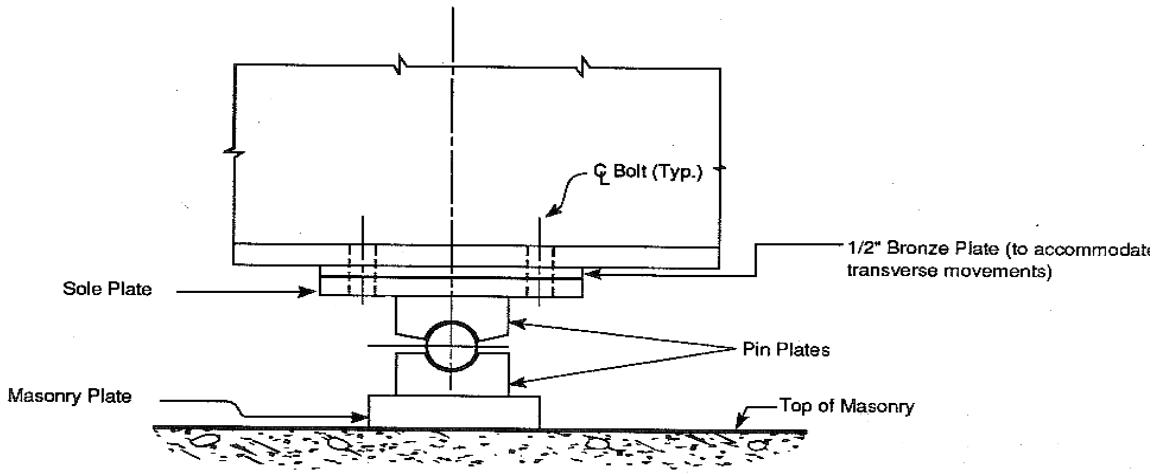
B.4.5—Rocker Bearing - Expansion/Movable, Element 8317

(Sub-Element of NBE 311)



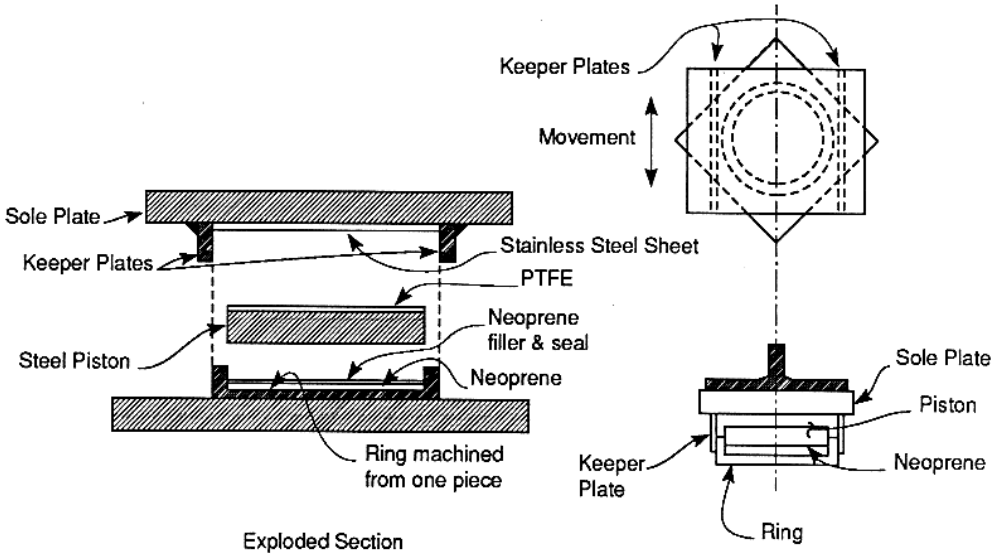
Rocker Bearing

B.4.6—Fixed Bearing, Element 313



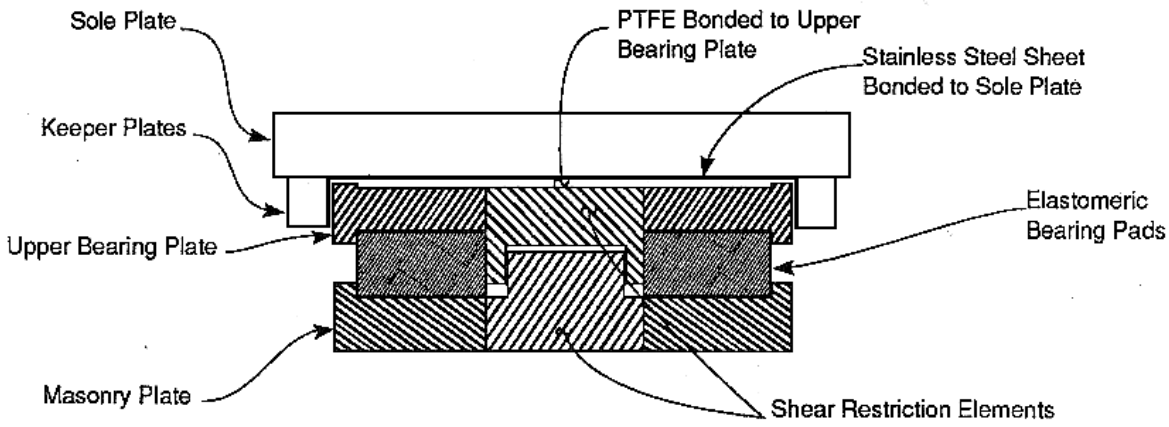
Fixed Bearing

B.4.7—Pot Bearing, Element 314



Sliding Pot Bearing

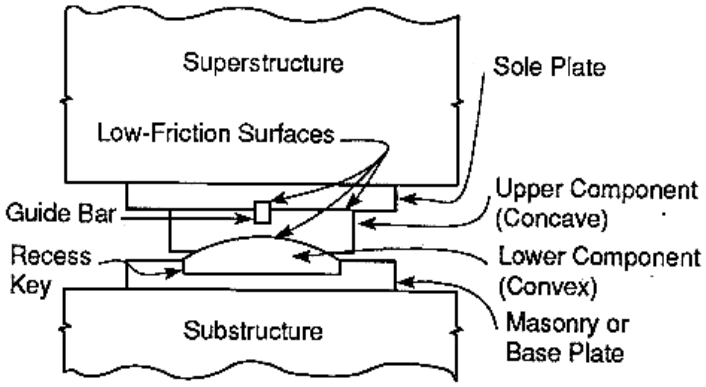
B.4.8—Disk Bearing, Element 315



Disk Bearing

B.4.9—Spherical Bearing, Element 8315

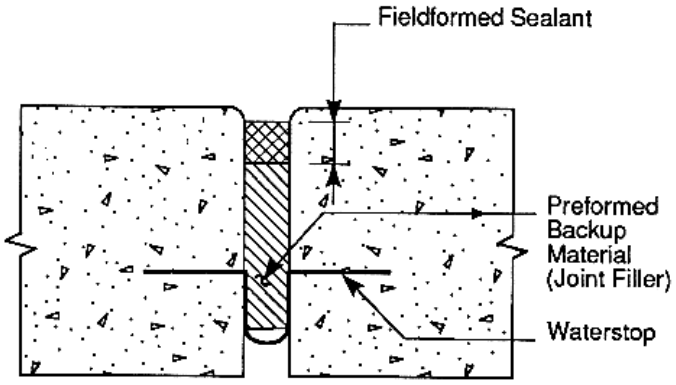
(Sub-Element of NBE 315)



Spherical Bearing

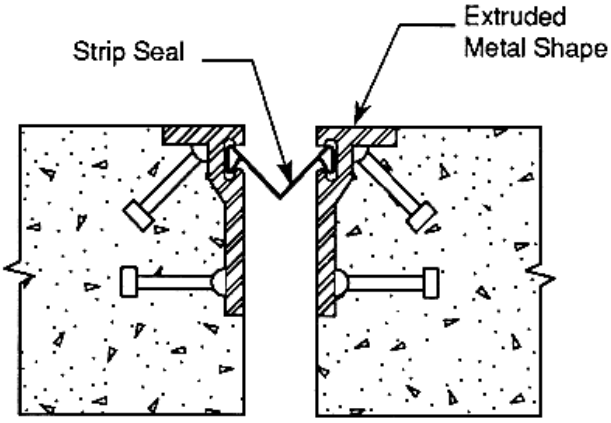
B.5—Examples of Joint Types

B.5.1—Pourable Joint Seal, Element 301



Filled Joint with Field formed Sealant

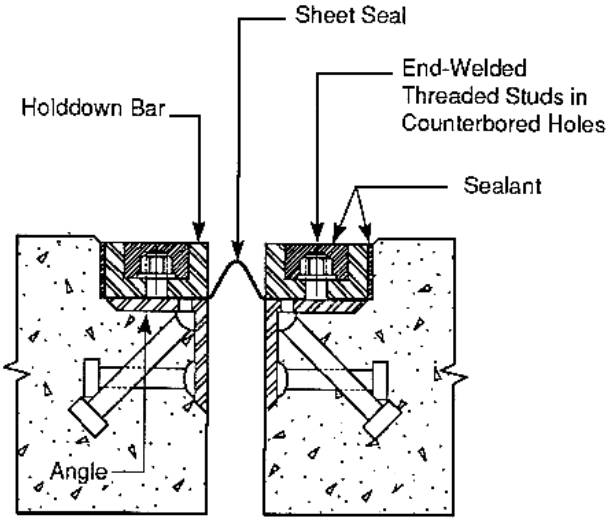
B.5.2—Strip Seal Expansion, Element 300



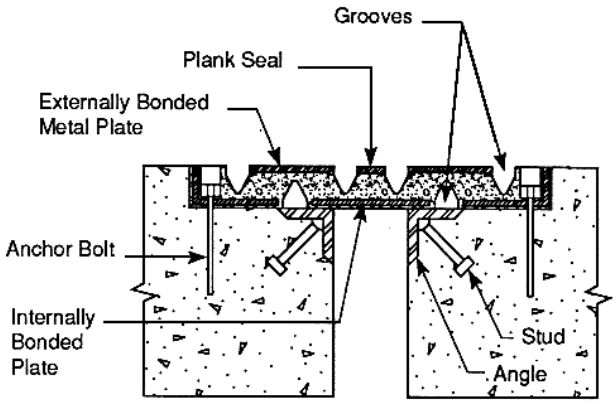
Strip Seal Joint

B.5.3—Segmental Joint System, Element 303A

(Sub-Element of BME 302, Previous NJDOT ADE 861-Elastomeric Flex-Type Joint)

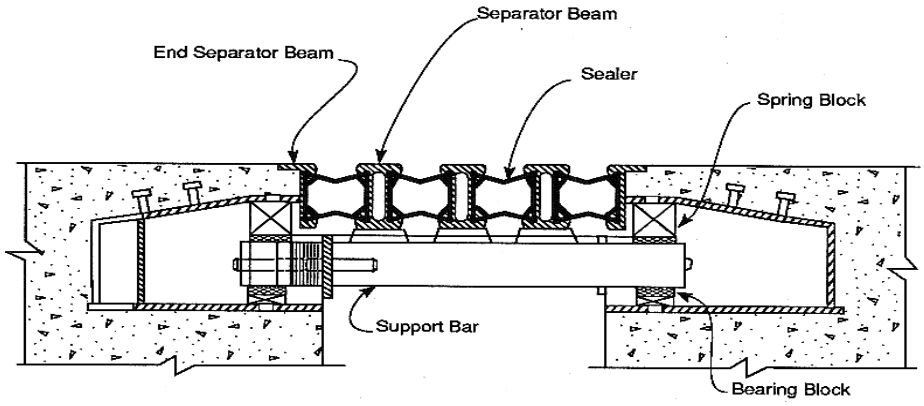


Sheet Seal Joint

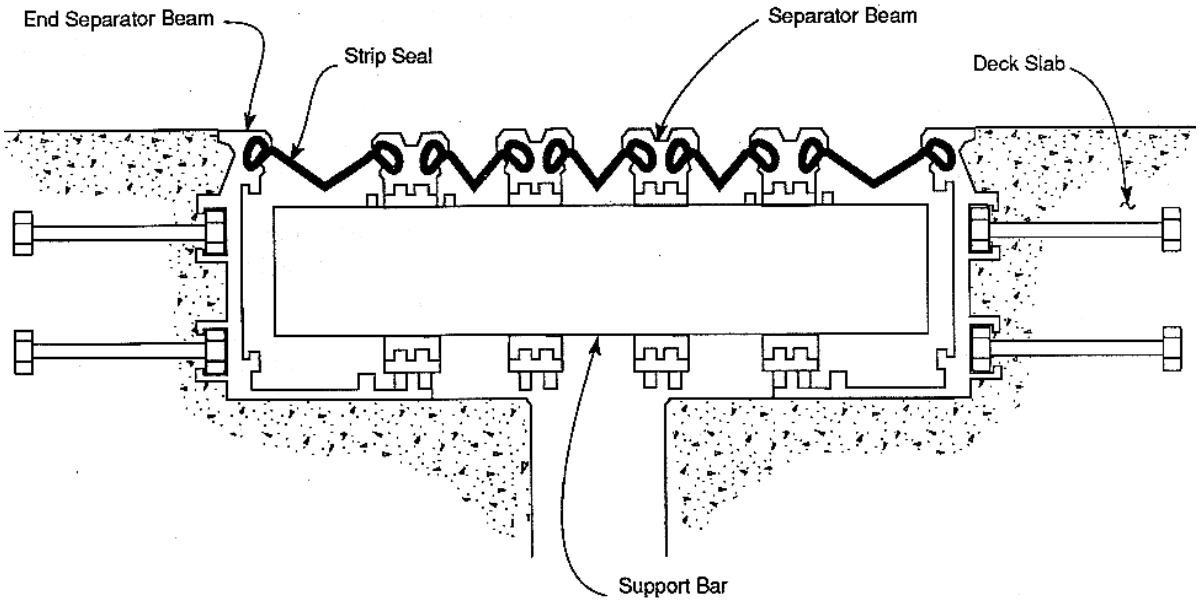


Plank Seal Joint (Waboflex)

B.5.4—Modular Expansion Joint, Element 303

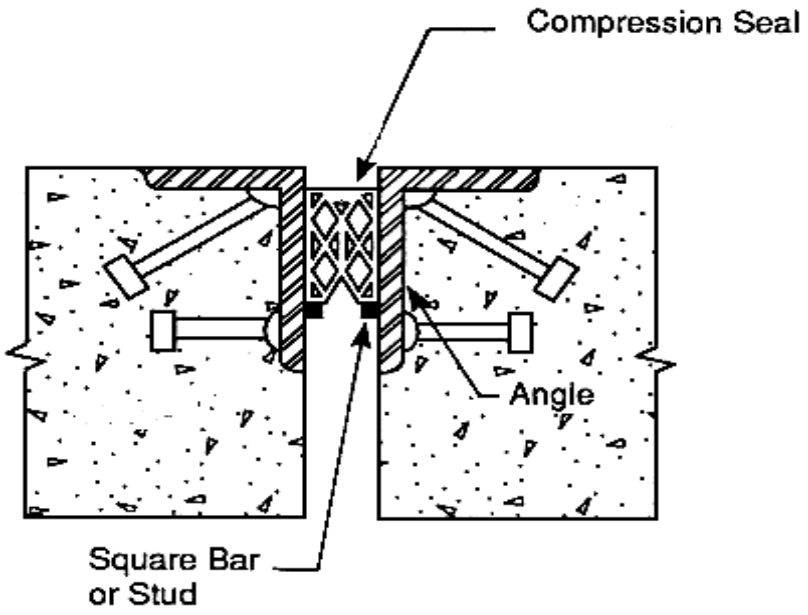


Modular Joint with Multiple Support Bar Control



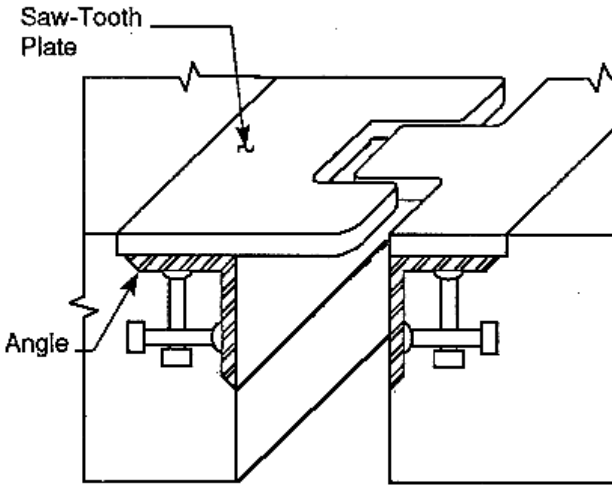
Modular Joint with Single Support Bar

B.5.5—Compression Joint Seal, Element 302



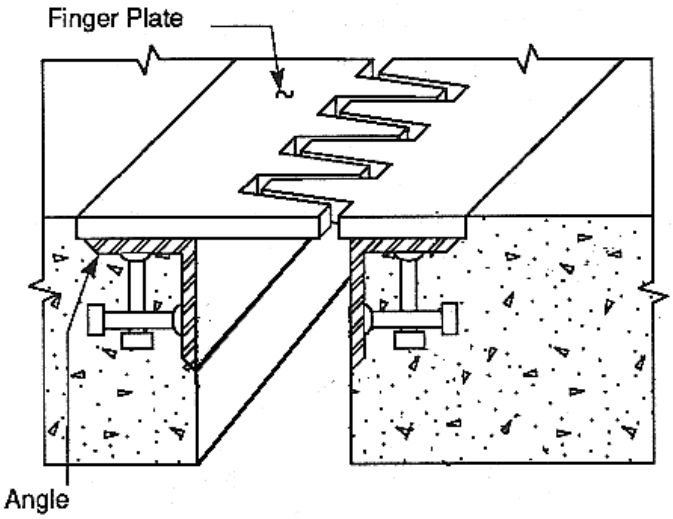
Compression Seal Joint

B.5.6—Assembly Joint without Seal, Element 305A

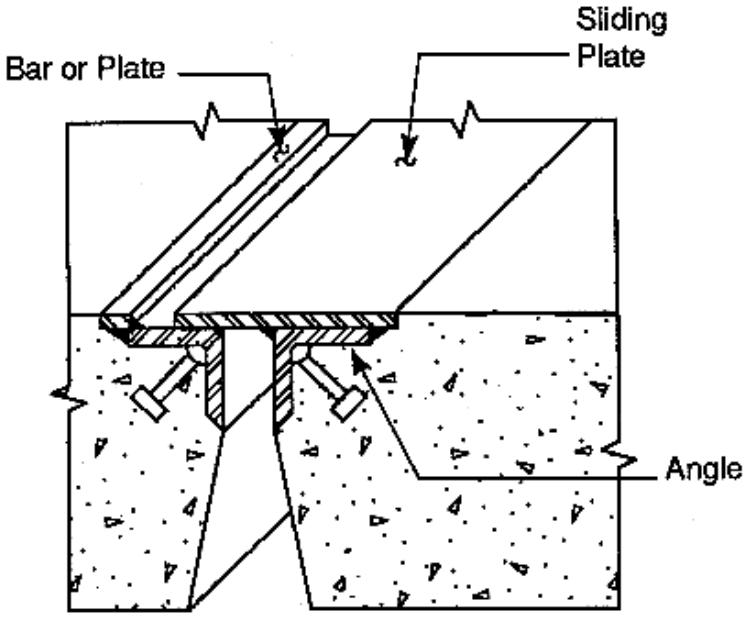


Sawtooth Plate Joint

B.5.7—Assembly Joint without Seal, Element 305B

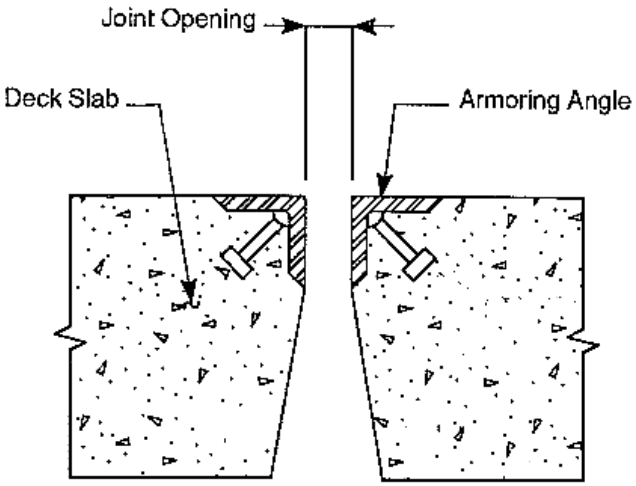


Finger Plate Joint



Sliding Plate Joint

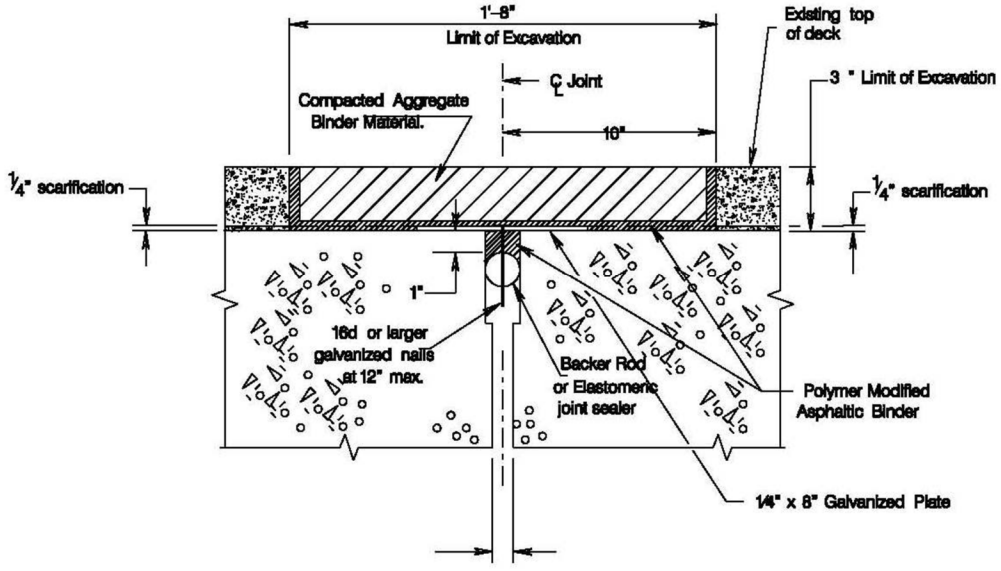
B.5.8—Open Expansion Joint, Element 304



Open Joint

B.5.9—Poured-In-Place Plug Joint System, Element 301A

(Sub-Element of BME 301, Previous NJDOT ADE 862-Asphaltic Plug Expansion Joint)



Asphaltic Plug Expansion Device

C—Inspection Examples

Examples C.1 through C.3 show the evaluation and coding of bridge inspection data for Steel Multi-Girder Bridge, Prestressed Concrete Adjacent Box Beam Bridge, and Reinforced Concrete Box Culvert. These examples were developed by NJDOT to demonstrate the use of the defect codes, National Bridge Elements (NBEs), Bridge Management Elements (BMEs), and Agency-Developed Elements (ADEs); and maintain consistency in recording them.

Examples C.4 through C.6 are from AASHTO Manual for Bridge Element Inspection, 2nd Edition, 2019 and show the evaluation and coding of bridge inspection data for timber, concrete, and steel bridges of varying complexity. The examples include the use of National Bridge Elements (NBEs) and Bridge Management Elements (BMEs) and the recording of defects. Photographs from visual guides showing the appropriate CS are included where appropriate. While it is an agency's choice of how to record defect codes, these examples were developed to demonstrate the use of the defect codes and the visual guides provided in Section 3.

C.1—Single Span Steel Multi-Girder Bridge

The subject of this example is a single-span multi-girder bridge crossing a lake. The bridge was originally constructed using 7 concrete encased steel girders and later widened with 2 additional rolled steel beams and 2 additional welded plate girders. The sketches in Figure C.1-1 show the bridge elements with relevant dimensions.

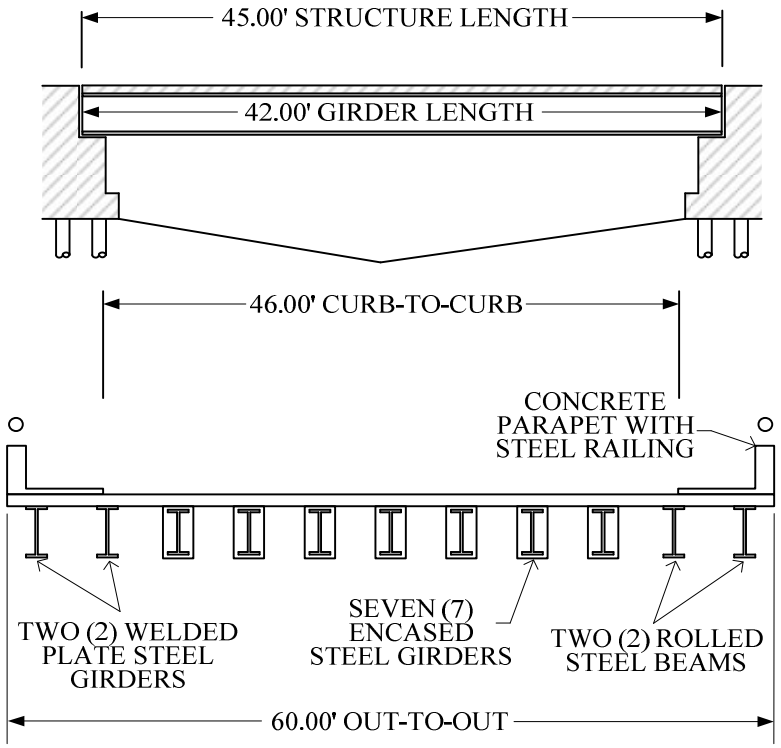


Figure C.1-1 – Elevation and Deck Cross Section of Single Span Steel Multi-Girder Bridge Example

C.1.1—Element Quantities

C.1.1.1—Deck/Approaches

The reinforced concrete deck has epoxy coated reinforcing steel and no protective overlay. There is a compression joint seal at both abutments extending out-to-out of the bridge deck. There is no skew. There are reinforced concrete approach slabs at each end of the bridge that are consistent with the bridge curb-to-curb width and extend 20' from the bridge. The approach slabs do not have epoxy coated reinforcing steel.

Reinforced Concrete Deck (Element 12)
Quantity: 45 ft × 60 ft = 2,700 ft²

Concrete Reinforcing Steel Protective System (Element 520)
Quantity: 45 ft × 60 ft = 2,700 ft²

Compression Joint Seal (Element 302)
Quantity: 60 ft × 2 seals = 120 ft

Reinforced Concrete Approach Slab (Element 321)
Quantity: 46 ft × 20 ft × 2 Approaches = 1,840 ft²

Reinforced concrete parapets with steel ornamental railings run on both sides of the bridge with curbs and sidewalks. The steel railing does not serve as a redirective element or as a contributor to the crash test level of the parapet; therefore, the steel railing is coded as an ornamental railing (metal bridge railing element is not coded). The reinforced concrete parapets are coded as reinforced concrete bridge railing. (If the steel railing was required for the crash test level, then only metal bridge railing would be coded and any defects in the concrete parapet would be included in the assessment of the metal bridge railing).

Ornamental Railing (Element 8363)
Quantity: 45 ft × 2 rows = 90 ft

Reinforced Concrete Bridge Railing (Element 331)
Quantity: 45 ft × 2 bridge railings = 90 ft

Curbs/Sidewalks – Reinforced Concrete (Element 8351)
Quantity: 45 ft × 2 Curbs/Sidewalks = 90 ft

C.1.1.2—Superstructure

All girders/beams extend approximately 1 ft past the bearings at each end as indicated on the bridge plans. The steel open girders/beams are protected with paint.

Steel Open Girder/Beam (Element 107)
Quantity: 42 ft × 11 girders = 462 ft

Concrete Encasement (Element 8516)
Quantity: 42 ft × 7 girders = 294 ft

Steel Protective Coating (Element 515)
Quantity: 2.25 ft (Beam Depth) × 2 × 42 ft (Beam Length) + .83 ft (Flange Width) × 3 (exposed flange faces) × 42 = 294 ft² per beam (Rolled Steel Beams only)

3.79 ft (Girder Depth) × 2 × 42 ft (Girder Length) + 1 ft (Flange Width) × 3 × 42 = 444 ft² per girder (Welded Plate Girders only)

= 294 × 2 + 444 × 2 = 1,476 ft² (Total Paint)

Fixed bearings are at one abutment while elastomeric bearings are on the painted steel girders/beams and sliding plate bearings are on the concrete encased girders at the other abutment.

Fixed Bearing (Element 313)
Quantity: 1 bearing per girder × 11 total girders = 11 Fixed Bearings

Sliding Plate Bearing (Element 8311)
Quantity: 1 bearing per concrete encased girder × 7 concrete encased girders = 7 Sliding Plate Bearings

Elastomeric Bearing (Element 310)

Quantity: 1 bearing per steel open girder/beam × 4 steel open girder/beams = 4 Elastomeric Bearings

C.1.1.3—Substructure

The reinforced concrete abutments have integral wingwalls and distributes vertical load to the piles (not visible for inspection) and retains the approach roadway embankment. The wingwalls are approximately half covered with fill. Bridge plans also indicated epoxy coated reinforcement throughout the entire substructure.

Reinforced Concrete Abutment (Element 215)
Quantity: 60 ft (Abutment Length) × 2 + 32 ft (Wingwall Length) × 4 = 248 ft

Concrete Reinforcing Steel Protective System (Element 520)
Quantity: 60 ft × 25 ft (Height that is visible for inspection inc. underwater) × 2 abutments + 32 ft × 25 ft × .5 (Half of wingwall visible for inspection due to fill) × 4 wingwalls = 4,600 ft²

C.1.2—Element Condition States

Aside from the defects described in Articles C.1.2.1 through C.2.1.6, all remaining element quantities are in good condition and assigned to Condition State 1. The following defects correspond to those labeled in Figure C.1-1.

C.1.2.1—Defect #1, Reinforced Concrete Deck (Element 12)

Transverse, hairline cracks throughout at variable spacing greater than 3 ft throughout the top surface of the deck. Based on the cracks' widths (less than 0.012 in) and density (greater than 3 ft), the entire deck meets the criteria for Condition State 1.

C.1.2.2—Defect #2, R.C. Approach Slab (Element 321)

A wide crack was noted in the approach slab measuring approximately 0.25 in wide and 15 ft long. Based on the crack width measurement of greater than 0.05 in, this area met the criteria for Condition State 3. The affected area (Defect 1130) is coded in ft^2 (1 ft × 15 ft = 15 ft^2). Since this is the only defect noted in the approach slabs, the remainder of the area meets the criteria for Condition State 1.

Figure C.1.2.2-1 – Wide Transverse Crack on Approach Slab

C.1.2.3—Defect #3, Steel Open Girder/Beam (107) & Steel Protective Coating (515)

The paint on both fascia girders/beams exhibits chalking with loss of pigment throughout the entire exterior web face. The exterior top side of the bottom flange exhibits peeling of the entire finish coat with the primer coat left intact. Localized at 1 area on the fascia girder web, there is some bubbling with exposed rusted bare metal (3 ft height × 5 ft length). No section loss was present. 15 ft^2 is coded in Condition State 2 for Corrosion (Defect 1000), as no section loss is evident. 15 ft^2 is coded Condition State 3 for Peeling/Bubbling/Cracking (Defect 3420) and the remainder of the Steel Protective Coating is coded in Condition State 2 for Chalking (Defect 3410).

Figure C.1.2.3-1 – Fascia Beam Paint Condition

C.1.2.4—Defect #4, Elastomeric Bearing (Element 310)

The South fascia elastomeric bearing exhibits minor undermining with a loss of less than 10% of the total bearing area. Additionally, bulging was noted (less than 15% of the thickness). Since two defects exist at the same bearing, the only defect coded is Loss of Bearing Area (Defect 2240) as it is the more severe of the two defects. The remaining elastomeric bearings exhibit no defects and are coded in Condition State 1.

Figure C.1.2.4-1 – South Fascia Elastomeric Bearing

C.1.2.5—Defect #5, Concrete Encasement (Element 8516)

One girder exhibits a small spall approximately 1 in deep that has exposed the girder bottom flange. 1 ft is coded for Delamination/Spall/Patched Area (Defect 1080) in Condition State 2. There is an area of 15 ft exhibiting heavy rust staining, which is coded for Efflorescence/Rust Staining (Defect 1120) in Condition State 3. All concrete encased girders exhibit moderate scaling that has exposed the coarse aggregate; however, it remains secure in the concrete. The remaining area is coded for Abrasion/Wear (Defect 1190) in Condition State 2. Due to the spall and rust staining defects, the condition of the Steel Open Girder/Beam element is coded in the same condition states because those encasement defects are indicative of problems with the steel.

Figure C.1.2.5-1 – Typical Concrete Encasement Condition (Left), Localized Spalling of Concrete Encasement (Right)

C.1.2.6—Defect #6, Reinforced Concrete Abutment (Element 215)

Both abutments exhibit heavy efflorescence build-up with some rust staining underneath all bearings. This defect is coded 22 ft (22 bearings × 1 ft) for Efflorescence/Rust Staining (Defect 1120) in Condition State 3. Additionally, the underwater inspection report noted an area of minor scour for approximately 12 ft on the Northwest wingwall. This defect is coded 12 ft for Scour (Defect 6000) in Condition State 2.

Figure C.1.2.6-1 – Typical Efflorescence Staining

C.1.3—Element Quantity and Condition State Summary

Element Number	Element Description	Unit of Measure	Total Quantity	CS 1	CS 2	CS 3	CS 4	Defect #*
12	Reinforced Concrete Deck	ft^2	2,700	2,700	0	0	0	1
520	Concrete Reinforcing Steel Protective System	ft^2	2,700	2,700	0	0	0	N/A
302	Compression Joint Seal	ft	120	120	0	0	0	N/A
331	Reinforced Concrete Bridge Railing	ft	90	90	0	0	0	N/A
8363	Ornamental Railing	ft	90	90	0	0	0	N/A
8351	Curbs/Sidewalk – Reinforced Concrete	ft	90	90	0	0	0	N/A
321	Reinforced Concrete Approach Slab	ft^2	1,840	1,825	0	15	0	2
1130	*Cracking (RC and Other)*	*ft^2*	*15*	0	0	*15*	0	*2*
107	Steel Open Girder/Beam	ft	462	424	16	22	0	3
1000	*Corrosion*	*ft*	*15*	0	*15*	0	0	*3*
515	Steel Protective Coating	ft^2	1,476	0	15	1,461	0	3
3410	*Chalking*	*ft^2*	*1461*	*0*	*1,461*	*0*	0	*3*
3420	*Peeling/Bubbling/ Cracking*	*ft^2*	*15*	*0*	*0*	*15*	0	*3*
8516	Concrete Encasement	ft	294	0	294	0	0	5
1080	*Delamination/Spall/ Patched Area*	*ft*	*1*	0	1	0	0	5
1120	*Efflorescence/Rust Staining*	*ft*	*22*	0	*0*	*22*	0	*6*
1190	*Abrasion/Wear (PSC/RC)*	*ft*	*293*	0	293	0	0	5
310	Elastomeric Bearing	each	4	3	1	0	0	4
2240	*Loss of Bearing Area*	*each*	*1*	*0*	*1*	0	0	*4*
313	Fixed Bearing	each	11	11	0	0	0	N/A
8311	Sliding Plate Bearing	each	7	7	0	0	0	N/A
215	Reinforced Concrete Abutment	ft	248	214	12	22	0	6
1120	*Efflorescence/Rust Staining*	*ft*	*22*	0	0	*22*	0	*6*
6000	*Scour*	*ft*	*12*	0	*12*	0	0	*6*

Notes:
*See Figure C.1-1 for defect locations.
Blue Background: National Bridge Element (NBE)
Yellow Background: Bridge Management Element (BME)
Red Background: NJDOT Agency-Developed Element (ADE)
Italic Type: Defect

C.2—Single Span Adjacent Prestressed Concrete Box Beam Bridge

The subject of this example is a single-span adjacent prestressed concrete box beam bridge crossing a local roadway. The bridge was constructed with 8 beams in 2010 and is overall in very good condition with no significant defects noted in the most recent inspection report. The sketches in Figure C.2-1 show the bridge elements with relevant dimensions.

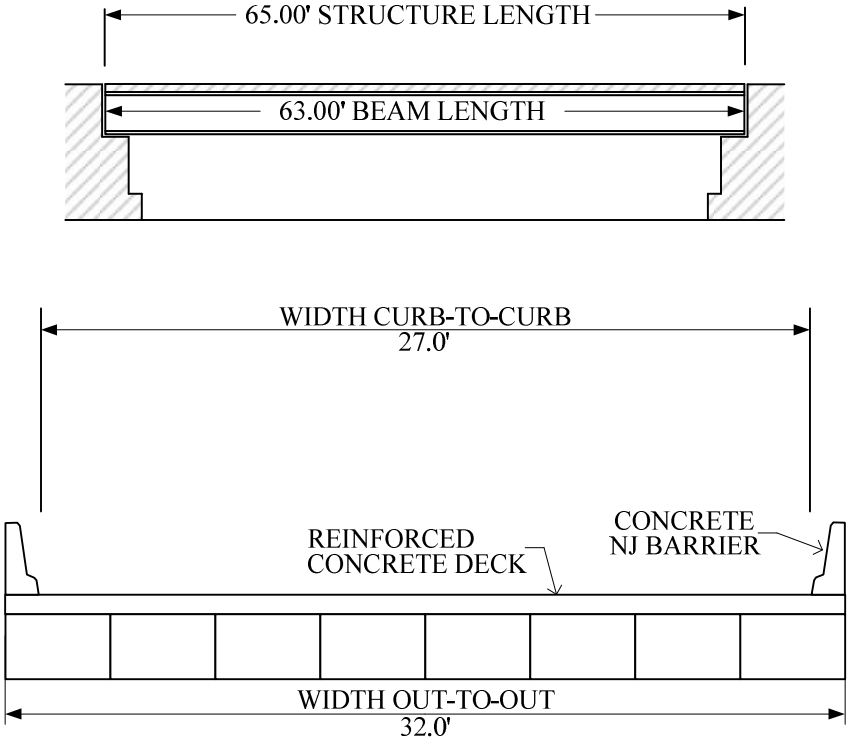


Figure C.2-1 – Elevation and Deck Cross Section

C.2.1—Element Quantities

C.2.1.1—Deck/Approaches

The reinforced concrete deck has epoxy coated reinforcing steel and no protective overlay. There is an elastomeric-type joint seal at each abutment extending out-to-out of the bridge deck. There is no skew. There are reinforced concrete approach slabs at each end of the bridge that are consistent with the bridge curb-to-curb width and extend 5’ from the bridge. The approach slabs do not have epoxy coated reinforcing steel. Reinforced Concrete New Jersey-type barriers are at both sides of the bridge and there are no sidewalks.

Reinforced Concrete Deck (Element 12)
Quantity: 65 ft x32 ft = 2,080 ft^2

Concrete Reinforcing Steel Protective System (Element 520)
Quantity: 65 ft × 32 ft = 2,080 ft^2

Segmental Joint System (Elastomeric Flex-Type Joint) (Element 303A)
Quantity: 32 ft × 2 seals = 64 ft

Reinforced Concrete Approach Slab (Element 321)
Quantity: 27 ft × 5 ft × 2 Approaches = 270 ft^2

Reinforced Concrete Bridge Railing (Element 331)
Quantity: 65 ft × 2 bridge railings = 130 '

C.2.1.2—Superstructure

All box beams extend approximately 1 ft past the bearings (elastomeric) at each end as indicated on the bridge plans. Mild reinforcement steel is coated with epoxy.

Prestressed Concrete Closed Web/Box Girder (Element 104)
Quantity: 63 ft × 8 beams = 504 ft

Elastomeric Bearing (Element 310)

Quantity: 8 beams × 2 bearings per beam = 16 Elastomeric Bearings

Concrete Reinforcing Steel Protective System (Element 520)

Quantity: 63 ft (Beam Length) × 4 ft (Beam Width) × 8 beams + 63 ft × 2.25 ft (Beam Height) × 2 (Visible Fascia Beam Faces) = 2,300 ft^2 – Only visible surfaces are coded

C.2.1.3—Substructure

The reinforced concrete abutments have non-integral wingwalls separated from the abutments by construction joints and distribute vertical load to spread footings (not visible for inspection). Bridge plans do not indicate epoxy coated reinforcement.

Reinforced Concrete Abutment (Element 215)
Quantity: 40 ft (Abutment Length) × 2 = 80 ft

Wingwalls - Reinforced Concrete (Element 8262)
Quantity: 20 ft (Wingwall Length) × 4 = 80 ft

C.2.2—Element Condition States

Aside from the defects described in Articles C.2.2.1 and C.2.2.2, all remaining element quantities are in good condition and assigned to Condition State 1. The following defects correspond to those labeled in Figure C.2-1.

C.2.2.1—Defect #1, Reinforced Concrete Deck (Element 12)

Transverse, hairline cracks throughout at variable spacing greater than 3 ft throughout the top surface of the deck. Based on the cracks' widths (less than 0.012 in) and density (greater than 3 ft), the entire deck meets the criteria for Condition State 1.

C.2.2.2—Defect #2, Wingwalls – Reinforced Concrete (Element 8262)

Vertical cracks measuring approximately 0.04 inches wide with variable spacing between 1.0 ft and 3.0 ft in the East wingwall for 15 feet length. Based on the cracks' width (less than 0.05 in) and density (between 1ft and 3 ft). 15 ft is coded for Cracking (Defect 1120) in Condition State 2. The remaining 65ft is coded in Condition State 1.

C.2.3—Element Quantity and Condition State Summary

Element Number	Element Description	Unit of Measure	Total Quantity	CS 1	CS 2	CS 3	CS 4	Defect #*
12	Reinforced Concrete Deck	ft^2	2,080	2,080	0	0	0	1
520	Concrete Reinforcing Steel Protective System	ft^2	2,080	2,080	0	0	0	N/A
303A	Segmental Joint System	ft	64	64	0	0	0	N/A
331	Reinforced Concrete Bridge Railing	ft	130	130	0	0	0	N/A
321	Reinforced Concrete Approach Slab	ft^2	270	270	0	0	0	N/A
104	Prestressed Concrete Closed Web/Box Girder	ft	504	0	0	0	0	N/A
520	Concrete Reinforcing Steel Protective System	ft^2	2,300	2,300	0	0	0	N/A
310	Elastomeric Bearing	each	16	16	0	0	0	N/A
215	Reinforced Concrete Abutment	ft	80	80	0	0	0	N/A
8262	Wingwalls – Reinforced Concrete	ft	80	65	15	0	0	2
1130	*Cracking (RC and Other)*	*ft*	*15*	*0*	*15*	*0*	*0*	*2*

Notes:
*See Figure C.2-1 for defect locations.
Blue Background: National Bridge Element (NBE)
Yellow Background: Bridge Management Element (BME)
Red Background: NJDOT Agency-Developed Element (ADE)
Italic Type: Defect

C.3—Single Barrel Reinforced Concrete Box Culvert with fill

The subject of this example is a single barrel, reinforced concrete box culvert with fill. The sketch in Figure C.3-1 shows the culvert elements with relevant dimensions.

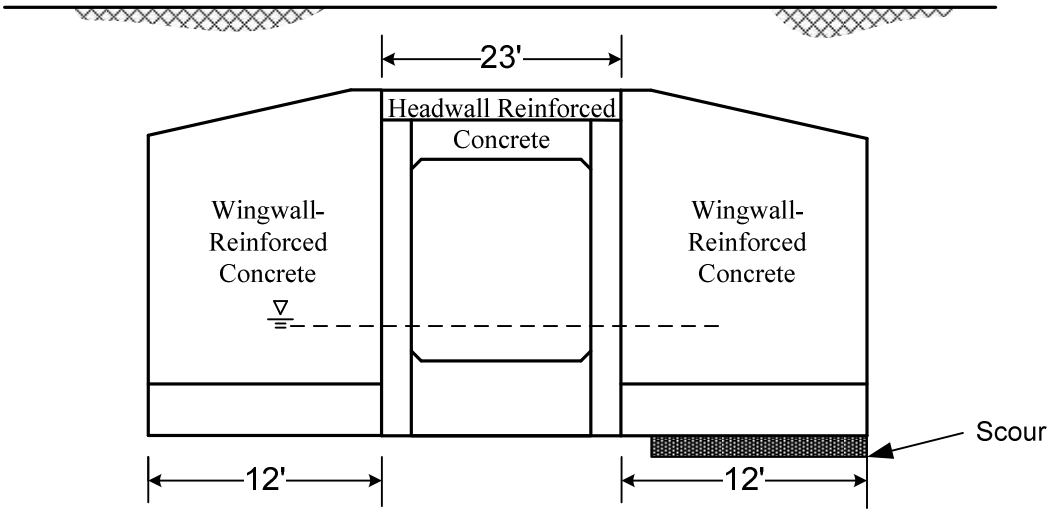


Figure C.3-1 – Elevation and Deck Cross Section

C.3.1—Element Quantities

C.3.1.1—Culvert

The culvert is reinforced concrete box with fill. Plans indicate epoxy coated rebar only in the top layer of the roof slab, which is not visible for inspection. Therefore, we have not coded Item 520 for Concrete Reinforcing Steel Protective System.

Concrete Culvert (Element 241)
Quantity: 50 ft (length of barrel) × 1(barrel) = 50 ft

Wingwalls – Reinforced Concrete (Element 8262)
Quantity: 12 ft × (4 Wingwalls) = 48 ft

Headwalls – Reinforced Concrete (Element 8266)
Quantity: 23 ft × (2 Headwalls) = 46 ft

C.3.2—Element Condition States

Aside from the defects described in Articles C.3.2.1 and C.3.2.2, all remaining element quantities are in good condition and assigned to Condition State 1. The following defects correspond to those labeled in Figure C.3-1.

C.3.2.1—Defect #1, Concrete Culvert (Element 241)

1-in to 2-in deep spalls with exposed rebar (with no section loss). The total length of exposed rebar (Defect 1090) is 1 ft, and it meets Condition State 2. The first spall is 4 feet long and less than 1-in deep (Defect 1080) shown in Figure C.3.2.1-1 (Left)meet the criteria for Condition State 2. The second spall is 3 feet long (with exposed rusted rebar), more than 1-in depth as shown in Figure C.3.2.1-1 (Right) and meet the criteria of Condition State 3.

Figure C.3.2.1-1 – Spalls with exposed Rebar at Roof Slab

C.3.2.2—Defect #2, Reinforced Concrete Wingwall (Element 842)

Scour with exposed footing (11 feet long) along the south end of wingwall. Max vertical reveal of 6" and 12" probe through silt (Defect 6000) meet the criteria for Condition State 2.

C.3.3—Element Quantity and Condition State Summary

Element Number	Element Description	Unit of Measure	Total Quantity	CS 1	CS 2	CS 3	CS 4	Defect #*
241	Reinforced Concrete Culvert	ft	50	43	4	3	0	1
1080	*Delamination/Spall/ Patched Area*	*ft*	*7*	*0*	*4*	*3*	*0*	*1*
1090	*Exposed Rebar*	*ft*	*1*	*0*	*1***	*0*	*0*	*1*
8262	Wingwalls – Reinforced Concrete	ft	48	37	11	0	0	2
6000	*Scour*	*ft*	*11*	*0*	*11*	*0*	*0*	*2*
8266	Headwalls – Reinforced Concrete	ft	46	46	0	0	0	N/A

Notes:
*See Figure C.3-1 for defect locations.
Blue Background: National Bridge Element (NBE)
Yellow Background: Bridge Management Element (BME)
Red Background: NJDOT Agency-Developed Element (ADE)
Italic Type: Defect

** Exposed Rebar (Defect 1090) for Condition State 2 (Quantity = 1 ft) is not aggregated into Element 241 because Delamination/Spall/Patched Area (Defect 1080) is also located in the same area.

C.4—Timber Bridge

The subject of this example is a four-span timber bridge crossing a small creek. The sketches in Figure C.4-1 show the bridge elements with relevant dimensions and note the locations of the defects described in Article C.4-2.

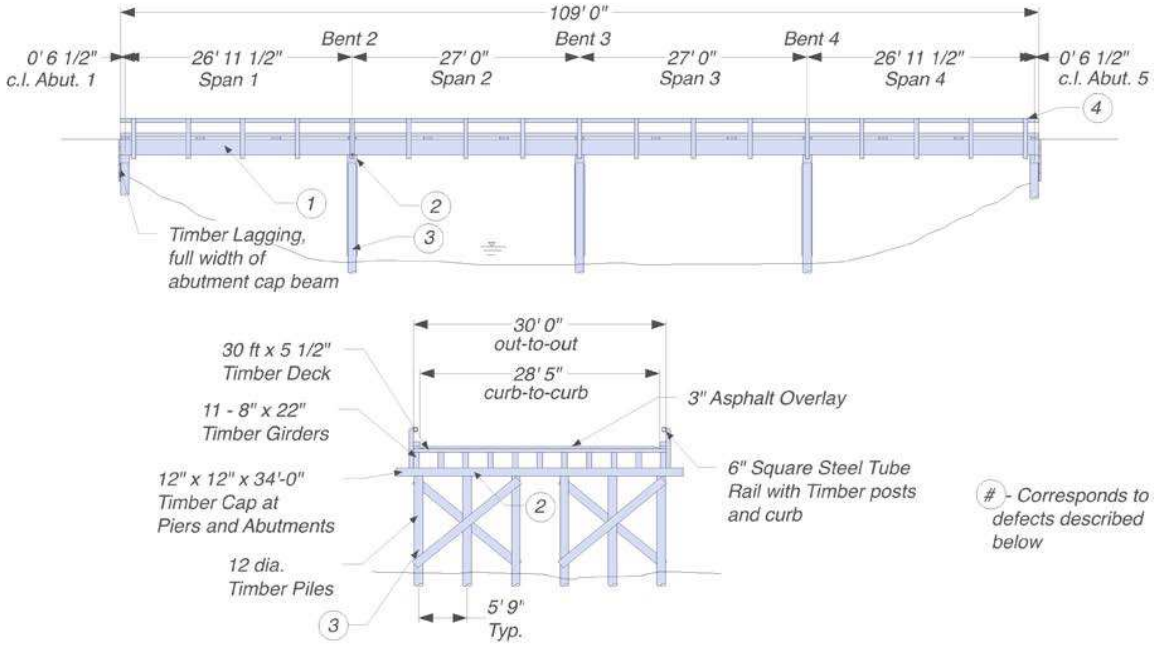


Figure C.4-1 – Elevation and typical section

C.4.1—Element Quantities

C.4.1.1—Deck

The timber deck has an asphalt wearing surface that runs curb to curb:

Timber Deck (Element 31) Quantity: 30 ft × 109 ft = 3,270 ft2
Wearing Surface (Element 510) Quantity: 28.42 ft × 109 ft = 3,097.78 ft2 (round up to 3,098 ft2)

The metal bridge railing has timber posts and curb. The square steel tube railing elements are galvanized:

Metal Bridge Railing (Element 330) Quantity: 109 ft × (2 railing lines) = 218 ft
Steel Protective Coating (Element 15) Quantity: 0.50 ft × (4 sides) × 109 ft × (2 railing lines) = 436 ft2

C.4.1.2—Superstructure

All four spans are composed of timber beams:

Timber Open Girder/Beam (Element 111) Quantity: 109 ft × (11 beams) = 1,199 ft

C.4.1.3—Substructure

As separate elements distribute vertical loads to the piles and retain the approach embankment, the vertical load-carrying elements will be considered similar to a bent and the timber abutment will consist of only the lagging retaining the approach embankment behind the abutment piles and cap beam:

Timber Abutment (Element 216) Quantity: 34 ft × (2 abutments) = 68 ft

The timber piles at the abutments and bents can be visually inspected to mud line:

Timber Pile (Element 228) Quantity: (6 piles per substructure unit) × (3 bents + 2 abutments) = 30 piles

Vertical load is transferred to the piles at the abutments and bents by the timber bent caps:

Timber Pier Cap (Element 235) Quantity: (34 ft per substructure unit) × (3 bents + 2 abutments) = 170 ft

C.4.2—Element Condition States

Aside from the defects described below, all remaining element quantities are in good condition and are assigned to Condition State 1. The following defects correspond to those labeled in Figure C.4-1.

C.4.2.1—Defect #1, Timber Open Girder/Beam (Element 111)

A 2-in. deep check (Defect 1150) extends the length of the right-side exterior beam in Span 1, shown in Figure C.4.2.1-1. As it penetrates 25% (2 in. of the 8 in. member thickness), the length of this beam (27 ft) is placed in Condition State 2. No other defects are present in the element.

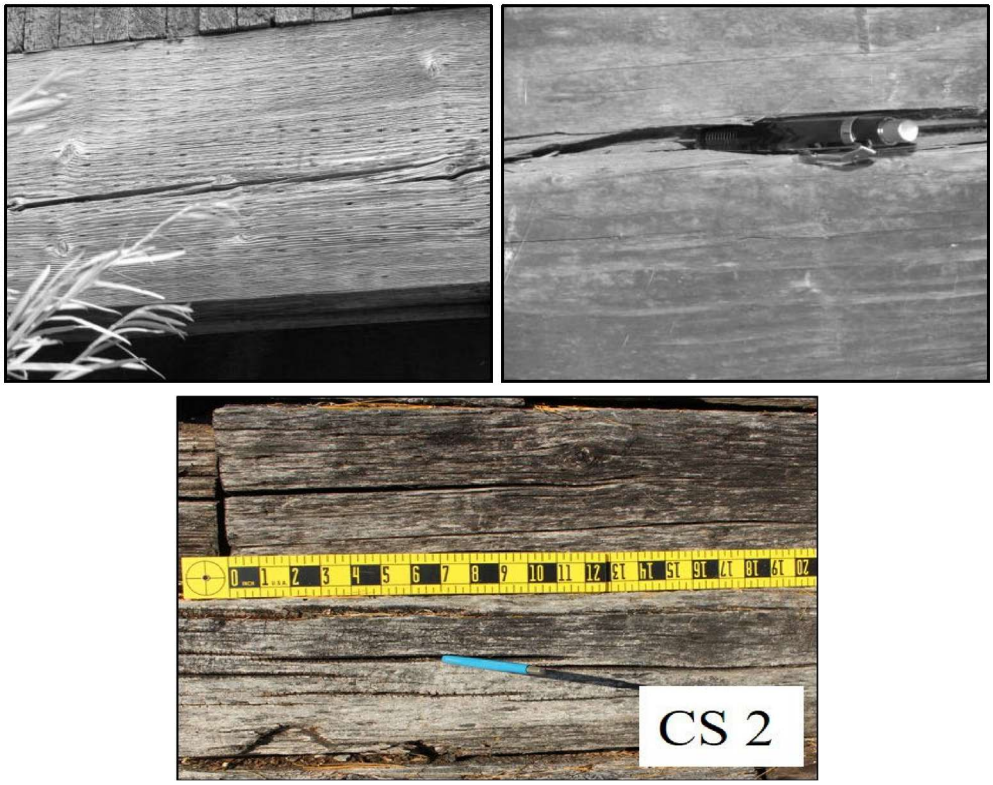


Figure C.4.2.1-1 – 2-in. Deep Check in Exterior Beam (top); visual guide for Defect 1150-Check/Shake CS 2 (bottom)

C.4.2.2—Defect #2, Timber bent cap (Element 235)

A 1-in. deep check (Defect 1150) extends the length of the bent cap at Bent 2 as shown in Figure C.4.2.2-1. As it penetrates 8% (1 in. of the 12-in. width of the member), the length of this beam (34 ft) is placed in Condition State 2. No other defects are present in the element.

Figure C.4.2.2-1 – 1-in. Deep Check in Bent Cap at Bent 2

C.4.2.3—Defect #3, Timber pile (Element 228)

A 7-in. deep check (Defect 1150) 3 ft long is present in the left exterior pile of Bent 2 as seen in Figure C.4.2.3-1. As it penetrates 58% (7 in. of the 12-in. member thickness), this condition meets the criteria for either Condition State 3 or Condition State 4. Per Agency guidance, the severity of the check does not warrant structural review; this pile is placed in Condition State Three. Five other piles exhibit 1½-in. to 2-in. deep checks (not shown) and are placed in Condition State 2.

Figure C.4.2.3-1 – 7-inch Deep Check in Right Exterior Pile of Bent 2

C.4.2.4—Defect #4, Metal Bridge railing (Element 330)

Two posts at Abutment 4 exhibit severe decay (Defect 1140) affecting 80% of the post section as seen in Figure C.4.2.4-1. Based on the severity and extent of the decay, this defect warrants structural review and the horizontal length of railing represented by the posts (2 ft) is placed in Condition State 4.

Figure C.4.2.4-1: Decay in Timber Railing Posts (left) and Defect 1140-Decay/Section Loss Condition State 3 (right).

C.4.3—Element Quantity and Condition State Summary

The element quantities and defects described above are summarized as follows:

Element Number	Element Description	Unit of Measure	Total Quantity	CS 1	CS 2	CS 3	CS 4	Defect #*
31	Timber Deck	ft^2	3,270	3,270	0	0	0	
510	Wearing Surfaces	ft^2	3,098	3,098	0	0	0	
330	Metal Bridge Railing	ft	218	216	0	0	2	4
1140	*Decay/Section Loss*	*ft*	*2*	*0*	*0*	*0*	*2*	*4*
515	Steel Protective Coating	ft^2	436	436	0	0	0	
111	Timber Open Girder/Beam	ft	1,199	1,172	27	0	0	1
1150	*Check/Shake*	*ft*	*27*	*0*	*27*	*0*	*0*	*1*
228	Timber Pile	each	30	24	5	1	0	3
1150	*Check/Shake*	*each*	*6*	*0*	*5*	*1*	*0*	*3*
216	Timber Abutment	ft	68	68	0	0	0	
235	Timber Pier Cap	ft	170	136	34	0	0	2
1150	*Check/Shake*	*ft*	*34*	*0*	*34*	*0*	*0*	*2*

Notes:

*See Figure C.4-1 for defect locations.
Blue background: National Bridge Element (NBE)
Yellow background: Bridge Management Element (BME)
Italic type: Defect

C.5—Prestressed Concrete Girder Bridge

The subject of this example is a four-span prestressed concrete girder bridge crossing a divided highway. The sketches in Figure C.5-1 show the bridge elements with relevant dimensions and note the locations of the defects described in Article C.5-2.

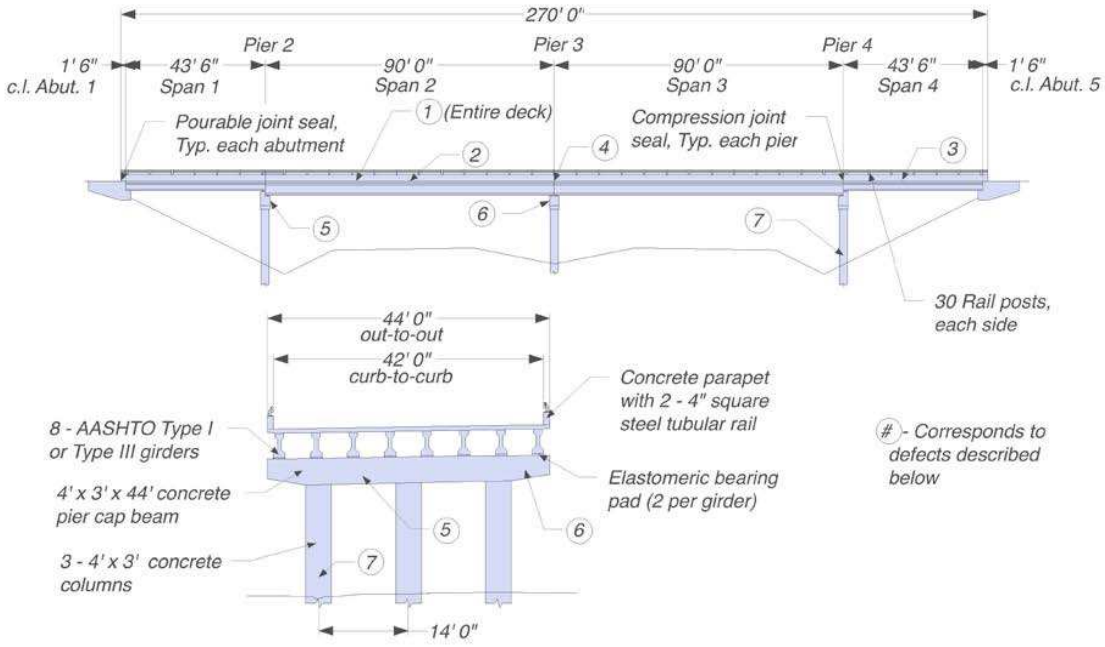


Figure C.5-1: Elevation and Typical Section of Bridge for Prestressed Concrete Girder Example

C.5.1—Element Quantities

C.5.1.1—Deck

The reinforced concrete deck has uncoated reinforcing steel and no protective overlay.

Reinforced Concrete Deck (Element 12) Quantity: 270 ft × 44 ft = 11,880 ft^2

As the redirective elements of the bridge railing consists of a combination of concrete and metal components, both the metal and reinforced concrete railing elements will be considered. The metal railing members are galvanized; estimate the surface area of each metal post as 5 ft^2. For NJDOT bridges, the only bridge railing element to be coded is metal. Defects within the reinforced concrete portion (if any) will be included in the metal bridge railing element.

Metal Bridge Railing (Element 330) Quantity: 270 ft × (2 railing lines) = 540 ft
Steel Protective Coating (Element 515) Quantity: [0.33 ft × (4 sides) × (2 rails) × 270 ft + 5 ft^2 per post × 30 posts] × (2 railing lines) = 1,725.60 ft^2 (rounded up to 1726 ft^2)

There is a deck joint at every substructure unit, extending out-to-out of the bridge deck, with pourable joint seals at the abutments and compression joint seals at the piers. There is no skew:

Pourable Joint Seal (Element 301) Quantity: 44 ft × (2 joints) = 88 ft
Compression Joint Seal (Element 302) Quantity: 44 ft × (3 joints) = 132 ft

C.5.1.2—Superstructure

Since the prestressed concrete girders extend past the bearings and are embedded in the end and pier diaphragms, the length of the bridge minus the backwall thickness (1 ft at each end) provides a good estimate of the total length of each girder line:

Prestressed Concrete Open Girder (Element 109) Quantity: [270 ft – (2 × 1ft)] × (8 girders) = 2,144 ft

Elastomeric bearings transfer load from the girders to the substructure:

> Elastomeric Bearing (Element 310) Quantity: (2 bearings per girder) × (8 girders per span) × (4 spans) = 64 bearings

C.5.1.3—Substructure

The reinforced concrete abutment distributes vertical load to the piles (not visible for inspection) and retains the approach embankment.

Reinforced Concrete Abutment (Element 215) Quantity: (44 ft per abutment) × (2 abutments) = 88 ft

Each reinforced concrete pier consists of a pier cap (Element 234) and three columns (Element 205):

> Reinforced Concrete Column (Element 205) Quantity: (3 columns per pier) × (3 piers) = 9 columns
> Reinforced Concrete Pier Cap (Element 234) Quantity: (44 ft per pier) × (3 piers) = 132 ft

C.5.2—Element Condition States

Aside from the defects described below, all remaining element quantities are in good condition and assigned to Condition State 1. The following defects correspond to those labeled in Figure C.5-1.

C.5.2.1—Defect #1, Reinforced Concrete Deck (Element 12)

Transverse, insignificant cracks throughout at variable spacing greater than 3 ft throughout the top surface of the deck. Based on the cracks' widths (less than 0.012 in.) and density (greater than 3 ft), these areas meet the criteria for Condition State 1.

C.5.2.2—Defect #2, Reinforced Concrete Deck (Element 12)

1-in. to 2-in. deep spalls with exposed rebar (with no section loss) and areas of distressed patches in both lanes near midspan of Span 2, shown in Figure C.5.2.2-1. The total area of spalls is 12 ft^2; the total area of distressed patches is 100 ft^2. With no section loss, the exposed rebar (Defect 1090) meets the criteria for Condition State 2. As the spalls (Defect 1080) are more than 1 in. deep, all of these areas (112 ft^2 total) meet the criteria for Condition State 3, which controls.

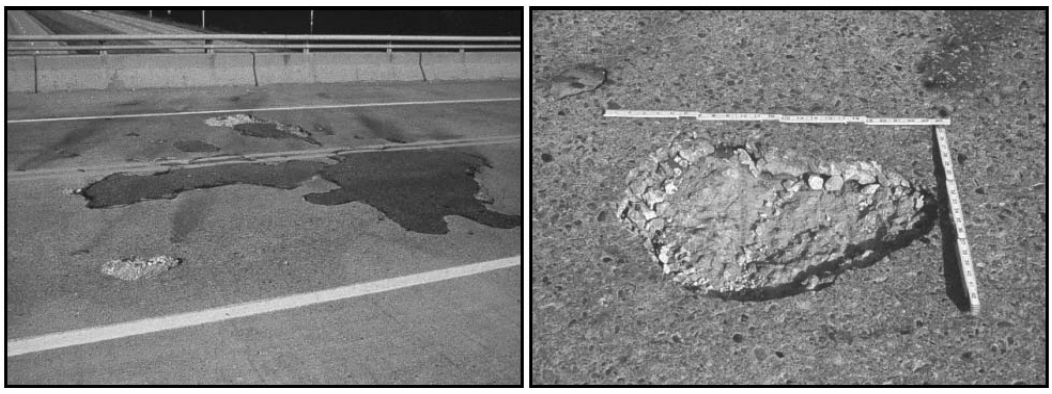


Figure C.5.2.2-1: Spalls and distressed patches in Span 2 deck

C.5.2.3—Defect #3, Reinforced Concrete Deck (Element 12)

1 in. to 2 in. deep spalls with exposed rebar (with no section loss) and areas of distressed patches in both lanes near midspan of Span 4, shown in Figure C.5.2.3-1. The total area of spalls is 40 ft^2; the total area of distressed patches is 60 ft^2. With no section loss, the exposed rebar (Defect 1090) meets the criteria for Condition State 2. As the spalls (Defect 1080) are more than 1 in. deep and the patches are not sound, all of these areas (100 ft^2 total) meet the criteria for Condition State 3.

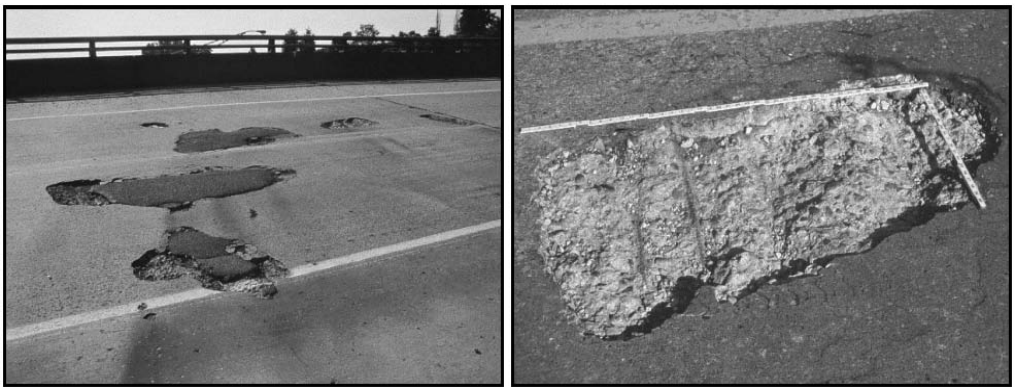


Figure C.5.2.3-1: Spalls and distressed patches in Span 4 deck

C.5.2.4—Defect #4, Compression Joint Seal (302) and Reinforced Concrete Deck (12)

Deep spalls with un-sound concrete the full length (40 ft) of the deck 6 in. adjacent to the joint seal at Pier 3, shown in Figure C.5.2.4-1. The gland at this joint is also partially pulled out. For the joint element, the seal damage (Defect 2330) meets the criteria for Condition State 3, but the adjacent deck damage (Defect 2360) meets the criteria for Condition State 4, which controls. Due to their depth, the spalls (Defect 1080) in the concrete deck element in this area (40 ft × 1 ft = 40 ft^2) meet the criteria for Condition State 3.

Figure C.5.2.4-1: Deep spalls in the deck adjacent to the joint seal at Pier 3

C.5.2.5—Defect #5, Reinforced Concrete Pier Cap (Element 234)

The underside of the Pier 2 cap has a spalled area 12 ft long and 2 in. deep with exposed rebar and rust staining, shown in Figure C.5.2.5-1. The depth of the spall (Defect 1080) meets the criteria to place this length of cap beam in Condition State 3. The section loss measured on the exposed rebar (Defect 1090) does not warrant a structural review of the cap beam and also meets the criteria for Condition State 3. Agency policy in this situation places a higher priority on the exposed rebar, making it the predominate defect.

Figure C.5.2.5-1: Spall, underside of Pier 2 cap

C.5.2.6—Defect #6, Reinforced Concrete Pier Cap (Element 234)

Both the right and left cantilevers of the Pier 3 cap exhibit 0.04 in. wide cracks, some with rust staining, shown in Figure C.5.2.6-1. This cracking extends for 2 ft on the left side and for 4 ft on the right. The widths of these cracks (Defect 1130) meet the criteria to place this quantity of the cap in Condition State 2; however, the presence of efflorescence (Defect 1120) with rust staining meets the criteria for Condition State 3, which controls.

Figure C.5.2.6-1: 0.04 in. width cracks with rust staining in the cantilevers of the Pier 3 cap

C.5.2.7—Defect #7, Reinforced Concrete Column (Element 205)

The left column of Pier 4 has a 3/16-in. wide by 11-ft long vertical crack, shown in Figure C.5.2.7-1. A previous structural review found that this crack does not affect the strength or serviceability of the element; thus, the width of this crack (Defect 1130) meets the criteria to place this column in Condition State 3.

Figure C.5.2.7-1: 3/16 in. width vertical crack in left column of Pier 4

C.5.3—Element Quantity and Condition State Summary

Element Number	Element Description	Unit of Measure	Total Quantity	CS 1	CS 2	CS 3	CS 4	Defect #*
12	Reinforced Concrete Deck	ft^2	11,880	11,628	0	252	0	1,2,3,4
1080	*Delamination/Spall/ Patched Area*	*ft^2*	*252*	*0*	*0*	*252*	*0*	*2,3,4*
301	Pourable Joint Seal	ft	88	88	0	0	0	
302	Compression Joint Seal	ft	132	92	0	0	40	4
2360	*Adjacent Deck or Header*	*ft*	*40*	*0*	*0*	*0*	*40*	*4*
330	Metal Bridge Railing	ft	540	540	0	0	0	
515	Steel Protective Coating	ft^2	1,726	1,726	0	0	0	
109	Prestressed Concrete Girder/Beam	ft	2,144	2,144	0	0	0	
310	Elastomeric Bearing	each	64	64	0	0	0	
215	Reinforced Concrete Abutment	ft	88	88	0	0	0	
205	Reinforced Concrete Column	each	9	8	0	1	0	7
1130	*Cracking (RC and Other)*	*each*	*1*	*0*	*0*	*1*	*0*	*7*
234	Reinforced Concrete Pier Cap	ft	132	114	0	18	0	5,6
1090	*Exposed Rebar*	*ft*	*12*	*0*	*0*	*12*	*0*	*5*
1120	*Efflorescence/Rust Staining*	*ft*	*6*	*0*	*0*	*6*	*0*	*6*

Notes:
*See Figure C.5-1 for defect locations
Blue background: National Bridge Element (NBE)
Yellow background: Bridge Management Element (BME)
Italic type: Defect

C.6—Steel Truss Bridge

The subject of this example is a two-span steel truss bridge crossing a river. The sketches in Figure C.6-1 show the bridge elements with relevant dimensions and note the locations of the defects described in Article C.6-2.

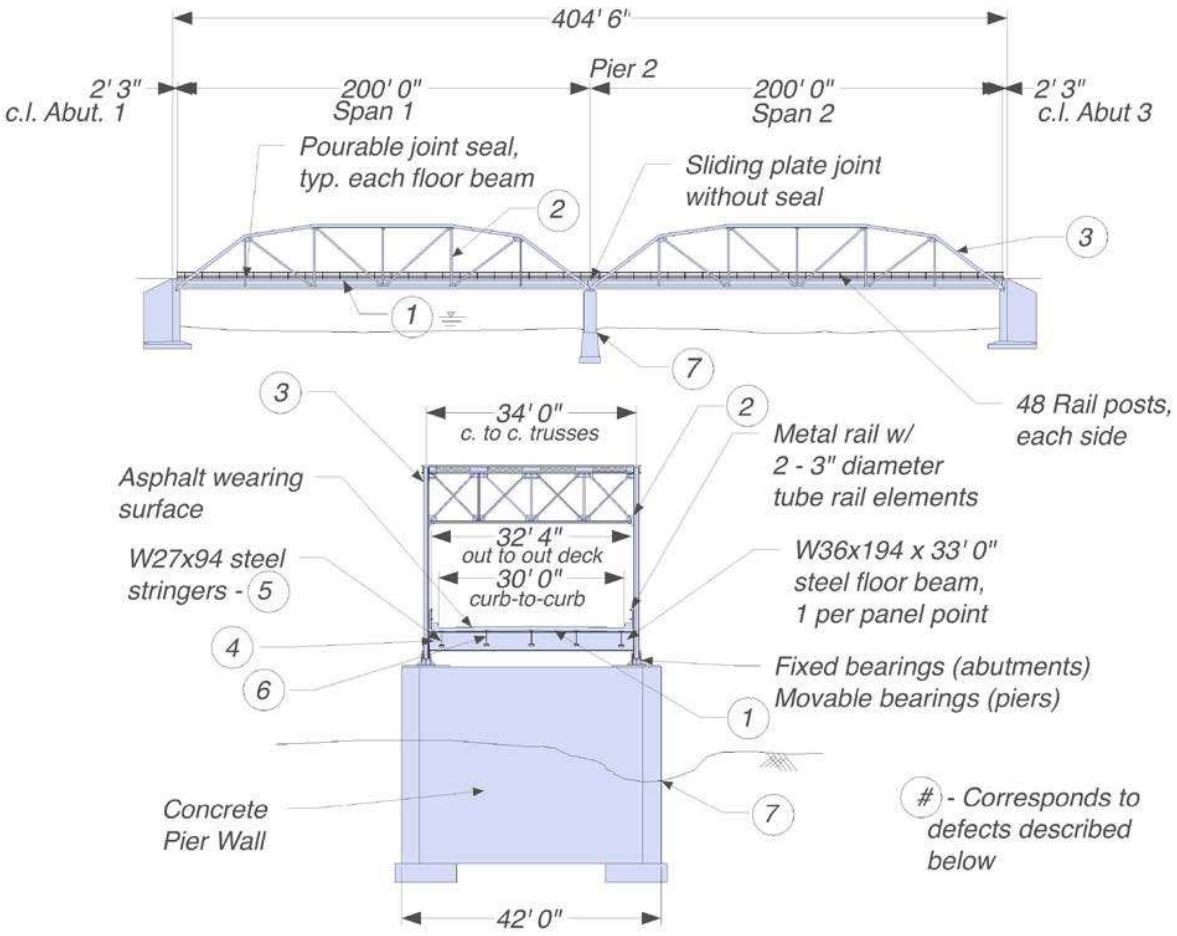


Figure C.6-1 – Elevation and Typical Section for Steel Truss Bridge Example

C.6.1—Element Quantities

C.6.1.1—Deck

The reinforced concrete deck has uncoated reinforcing steel and an asphalt wearing surface overlay.

Reinforced Concrete Deck (Element 12) Quantity: 404.50 ft × 32.33 ft = 13,077.49 ft^2 (round up to 13,078 ft^2)
Wearing Surface (Element 510) Quantity: 404.50 ft × 30 ft = 12,135 ft^2

The metal railing has a concrete curb and metal posts. The metal railing members are painted – estimate the surface area of each metal post as 5 ft^2:

Metal Bridge Railing (Element 330) Quantity: 404.50 ft × (2 railing lines) = 809 ft
Steel Protective Coating (Element 515) Quantity: [3.1416 × 0.25 ft] × (2 rails) × 404.50 ft + 5 ft^2 per post × 48 posts] × (2 railing lines) = 1,750.78 ft^2 (round up to 1751 ft^2)

There are deck joints with pourable seals at 12 of the 14 floor beams. The sliding plate expansion joint at the pier does not have a seal. All joints extend from out-to-out of the deck. There is no skew:

Pourable Joint Seal (Element 301) Quantity: 32.33 ft × (12 joints) = 388 ft
Assembly Joint Without Seal (Element 305) Quantity: 32.33 ft × (1 joint) = 32.33 ft (round up to 33 ft)

C.6.1.2—Superstructure

The main superstructure elements are the steel truss, floor beams and stringers. Each of these elements is painted:

Steel Truss (Element 120) Quantity: 200 ft × (2 trusses per span) × (2 spans) = 800 ft
Steel Protective Coating (Element 515) Quantity: Calculated from "as-built" plans – 18,696 ft^2

Steel Floor Beam (Element 152) Quantity: 33 ft × (7 floor beams per span) × (2 spans) = 462 ft
Steel Protective Coating (Element 515) Quantity: 33 ft × 8.9 ft2/ft* × (14 floor beams) = 4,112 ft^2

Steel Stringer (Element 113) Quantity: 200 ft × (5 stringers) × (2 spans) = 2,000 ft
Steel Protective Coating (Element 515) Quantity: 200 ft × 6.8 ft^2/ft* × (5 stringers) × (2 spans) = 13,600 ft^2

*Surface area per foot length for W36x194 (floor beams) and W27x94 (stringers) steel sections are taken from the AISC Steel Design Guide 19 "Fire Resistance of Structural Steel Framing", Appendix A, and does not include the surface area of the top face of the top flange.

There is a gusset plate assembly at each truss connection composed of two gusset plates (one on each side). All of the assemblies are painted – estimate the painted surface area of each gusset plate as 16 ft^2:

Steel Gusset Plate (Element 162) Quantity: (12 plate assemblies per span) × (2 trusses) × (2 spans) = 48
Steel Protective Coating (Element 515) Quantity: (48 assemblies) × (2 plates per assembly) × (16 ft^2/plate) = 1,536 ft^2

Each truss is supported on one movable bearing and one fixed bearing. The bearings are painted – estimate the painted surface area of each bearing as 12 ft^2 Per NJDOT, steel protective coating on bearings is not to be coded.

Movable Bearing (Element 311) Quantity: (1 bearing per truss) × (2 trusses per span) × (2 spans) = 4 bearings
Fixed Bearing (Element 313) Quantity: (1 bearing per truss) × (2 trusses per span) × (2 spans) = 4 bearings

C.6.1.3—Substructure

The reinforced concrete abutment distributes vertical load to the spread footing foundation and retains the approach embankment. The abutments are the same width as the pier wall.

Reinforced Concrete Abutment (Element 215) Quantity: 42 ft × (2 abutments) = 84 ft

The trusses are also supported on a reinforced concrete pier wall:

Reinforced Concrete Pier Wall (Element 215) Quantity: 42 ft × (1 pier) = 42 ft

C.6.2—Element Condition States

Aside from the defects described below, all element quantities are in good condition and assigned to Condition State 1. The following defects correspond to those labeled in Figure C.6-1:

C.6.2.1—Defect #1, Reinforced Concrete Deck (Element 12)

Moderate efflorescence (Defect 1120) is noted in the two interior deck bays throughout the length of Span 1 (affected area: 15 ft × 200 ft = 3000 ft^2), shown in Figure C.6.2.1-1. Based on the extent of the efflorescence build-up and the lack of rust staining, these areas meet the criteria for Condition State 2. Cracks (Defect 1130) measuring 0.015 in. wide spaced at 1 ft are also noted. The width and density of these cracks also meet the criteria for Condition State 2. Agency policy in this situation places a higher priority on the efflorescence, making it the predominant defect.

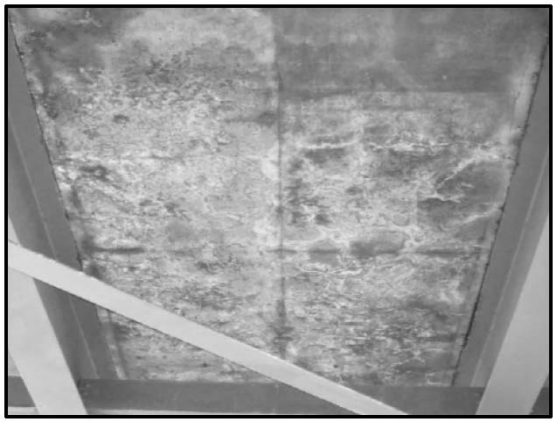


Figure C.6.2.1-1: Efflorescence on the Underside of the Deck in Span 1

C.6.2.2—Defect #2, Steel Truss (Element 120)

There is new impact damage to the sway bracing at panel point 4 in the Span 1 truss, resulting in a 1 in. distortion (Defect 7000) in the right side L4-U4 vertical member as shown in Figure C.6.2.2-1. As the impact of this damage on the strength and serviceability of the truss is unknown, the length of the truss attributed to the vertical, measured parallel to the traveled way (1 ft), is placed in Condition State 4.

Figure C.6.2.2-1: Sway Bracing Impact Damage in Span 1

C.6.2.3—Defect #3, Steel Truss (120), Steel Gusset Plate (162), Steel Protective Coating (515)

Freckle rust throughout the length of both spans, both trusses as shown in Figure C.6.2.3-1. As no section loss is measured, this corrosion (Defect 1000) results in the entire quantity of the steel truss and gusset plate elements being assigned to Condition State 2. The paint system throughout is chalking (Defect 3410), exhibiting loss of pigment and meeting the criteria for Condition State 3. The areas of paint where freckle rust is noted (estimated at 5% of the painted area, or 18,696 ft^2 × 0.05 = 935 ft^2 of the trusses and 1,536 ft^2 × 0.05 = 77 ft^2 of the gusset plates) have failed (Defect 3440), meeting the criteria for Condition State 4.

Figure C.6.2.3-1: Freckle Rust, Typical, Both Trusses, Both Spans

C.6.2.4—Defect #4, Steel Floor Beam (152) and Steel Protective Coating (515)

Freckle rust throughout the length of all floor beams, thus the quantity of the steel floor beam element not showing further corrosion is assigned to Condition State 2. There is corrosion (Defect 1000) with less than 10% section loss in the top flange at 20 of the 28 beam ends, shown in Figure C.6.2.4-1 which meets the criteria for Condition State 3. Each affected area will be considered to represent 2 feet of floor beam length (20 × 2 ft = 40 ft total). The paint system in these areas (approximately 2 ft^2 per location, 20 × 2 ft^2 = 40 ft^2 total) has failed (Defect 3440) and is assigned to Condition State 4. The paint system throughout the rest of the beams is chalking (Defect 3410), exhibiting loss of pigment and meeting the criteria for Condition State 3. The areas of paint where freckle rust is noted (estimated at 5% of the painted area, or 4,112 ft^2 × 0.05 = 206 ft^2) has also failed (Defect 3440), meeting the criteria for Condition State 4.

Figure C.6.2.4-1: Corrosion at Floor Beam Ends

C.6.2.5—Defect #5, Steel Stringer (Element 113)

Freckle rust present near the floor beam connections, total length affected is 50 ft. As no section loss is evident, the corrosion (Defect 1000) in these areas meets the criteria for Condition State 2. In these areas, the paint is chalking

(Defect 3410), exhibiting loss of pigment and meeting the criteria for Condition State 3 (total affected area is 50 ft × 6.8 ft^2/ft = 340 ft^2). The areas of paint where freckle rust is noted (estimated at 5% of the affected area, or 340 ft^2 × 0.05 = 17 ft^2) have failed (Defect 3440), meeting the criteria for Condition State 4.

C.6.2.6—Defect #6, Steel Stringer (Element 113)

Broken and missing rivets in 8 stringer-to-floor beam connections (Defect 1020), shown in Figure C.6.2.6-1. Each affected connection will be considered to represent 1 foot of stringer length, or 8 × 1ft = 8 ft total. This condition led the inspector to assign these quantities to Condition State 4 in the field. However, a structural review of the floor system demonstrates that, despite the missing fasteners, the bridge can still carry legal loads, and, per Agency policy, these quantities are reassigned to Condition State 3.

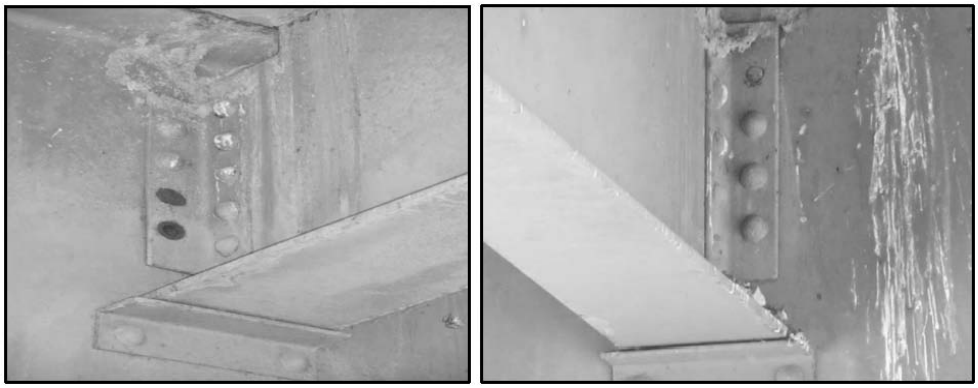


Figure C.6.2.6-1: Missing and Broken Fasteners at Stringer-to-Floor Beam Connections

C.6.2.7—Defect #7, Pier Wall (Element 210)

There is a small scour hole (Defect 6000) extending 10 ft in from the upstream end of the pier wall as shown in Figure C.6.2.7-1. The measured scour is within the tolerable limits established by the bridge's scour evaluation; thus, the affected length meets the criteria for Condition State 2.

Figure C.6.2.7-1: Scour Hole at the Upstream End of the Pier Wall

C.6.3—Element Quantity and Condition State Summary

Element Number	Element Description	Unit of Measure	Total Quantity	CS 1	CS 2	CS 3	CS 4	Defect #*
12	Reinforced Concrete Deck	ft^2	13,079	10,079	3,000	0	0	1
1120	*Efflorescence/Rust Staining*	*ft^2*	*3,000*	*0*	*3,000*	*0*	*0*	*1*
510	Wearing Surface	ft^2	12,135	12,135	0	0	0	
330	Metal Bridge Railing	ft	809	809	0	0	0	
515	Steel Protective Coating	ft^2	1,751	1,751	0	0	0	
301	Pourable Joint Seal	ft	388	388	0	0	0	
305	Assembly Joint without Seal	ft	33	33	0	0	0	
120	Steel Truss	ft	800	0	799	0	1	2,3
1000	*Corrosion*	*ft*	*800*	*0*	*799*	*0*	*0*	*3*
7000	*Damage*	*ft*	*1*	*0*	*0*	*0*	*1*	*2*
515	Steel Protective Coating	ft^2	18,696	0	0	17,761	935	3
3410	*Chalking*	*ft^2*	*17,761*	*0*	*0*	*17,761*	*0*	*3*
3440	*Effectiveness*	*ft^2*	*935*	*0*	*0*	*0*	*935*	*3*
152	Steel Floor Beam	ft	462	0	442	20	0	4
1000	*Corrosion*	*ft*	*462*	*0*	*442*	*20*	*0*	*4*
515	Steel Protective Coating	ft^2	4,112	0	0	3,866	246	4
3410	*Chalking*	*ft^2*	*3,866*	*0*	*0*	*3,866*	*0*	*4*
3440	*Effectiveness*	*ft^2*	*246*	*0*	*0*	*0*	*246*	*4*
113	Steel Stringer	ft	2,000	1,942	50	8	0	5,6
1000	*Corrosion*	*ft*	*50*	*0*	*50*	*0*	*0*	*5*
1020	*Connections*	*ft*	*8*	*0*	*0*	*8*	*0*	*6*
515	Steel Protective Coating	ft^2	13,600	13,260	0	323	17	5
3410	*Chalking*	*ft^2*	*323*	*0*	*0*	*323*	*0*	*5*
3440	*Effectiveness*	*ft^2*	*17*	*0*	*0*	*0*	*17*	*5*
162	Steel Gusset Plate	each	48	0	48	0	0	3
515	Steel Protective Coating	ft^2	1,536	0	0	1,459	77	3
3410	*Chalking*	*ft^2*	*1,459*	*0*	*0*	*1,459*	*0*	*3*
3440	*Effectiveness*	*ft^2*	*77*	*0*	*0*	*0*	*77*	*3*
311	Movable Bearing	each	4	4	0	0	0	
313	Fixed Bearing	each	4	4	0	0	0	
215	Reinforced Concrete Abutment	ft	84	84	0	0	0	
210	Reinforced Concrete Pier Wall	ft	42	32	10	0	0	7
6000	*Scour*	*ft*	*10*	*0*	*10*	*0*	*0*	*7*

Notes:
*See Figure C.6-1 for defect locations
Blue background: National Bridge Element (NBE)
Yellow background: Bridge Management Element (BME)
Italic type: Defect

D—Materials and Feasible Actions by Material Type

This appendix describes the element materials defined in this Specification and the feasible actions that may be applied for each condition state. Included are individual materials, such as reinforced and prestressed concrete, steel, timber, masonry, and other materials; and element types that are made of mixed materials or are not material-based, including joints, protective coatings, wearing surfaces, and deck protective systems. For each material or element type, the feasible actions are listed at a high level, with the understanding that NJDOT practices will differ in scope and detail. The primary intent is to provide a roadmap of possible actions scaled by distress or defect severity, with the assumption that needed work for all elements constructed of these materials or in an element family may be addressed by one or more of these common feasible actions. Material identification codes are provided for reference consistent with Section 3.

D.1.1—Steel (100)

	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Feasible Actions:	Do Nothing Protect	Do Nothing Protect Repair	Do Nothing Protect Repair Rehabilitate Replace	Do Nothing Protect Repair Rehabilitate Replace

D.1.2—Prestressed Concrete (300)

	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Feasible Actions:	Do Nothing Protect	Do Nothing Protect Repair	Do Nothing Protect Repair Rehabilitate Replace	Do Nothing Protect Repair Rehabilitate Replace

D.1.3—Reinforced Concrete (400)

	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Feasible Actions:	Do Nothing Protect	Do Nothing Protect Repair	Do Nothing Protect Repair Rehabilitate Replace	Do Nothing Protect Repair Rehabilitate Replace

D.1.4—Timber (500)

	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Feasible Actions:	Do Nothing Protect	Do Nothing Protect Repair	Do Nothing Protect Repair Rehabilitate Replace	Do Nothing Protect Repair Rehabilitate Replace

D.1.5—Other Materials (600)

	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Feasible Actions:	Do Nothing Protect	Do Nothing Protect Repair	Do Nothing Protect Repair Rehabilitate Replace	Do Nothing Protect Repair Rehabilitate Replace

D.1.6—Masonry (650)

	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Feasible Actions:	Do Nothing Protect	Do Nothing Protect Repair	Do Nothing Protect Repair Rehabilitate Replace	Do Nothing Protect Repair Rehabilitate Replace

D.1.7—Wearing Surfaces (800)

	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Feasible Actions:	Do Nothing Protect	Do Nothing Protect Repair	Do Nothing Protect Repair Rehabilitate Replace	Do Nothing Protect Repair Rehabilitate Replace

D.1.8—Concrete Reinforcing Steel Protective Systems (820)

	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Feasible Actions:	Do Nothing Protect	Do Nothing Protect Repair	Do Nothing Protect Repair Rehabilitate Replace	Do Nothing Protect Repair Rehabilitate Replace

D.1.9—Steel Protective Coatings (850)

	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Feasible Actions:	Do Nothing Protect	Do Nothing Protect Repair	Do Nothing Protect Repair Rehabilitate Replace	Do Nothing Protect Repair Rehabilitate Replace

D.1.10—Concrete Protective Coatings (880)

	Condition States			
	1	2	3	4
	GOOD	FAIR	POOR	SEVERE
Feasible Actions:	Do Nothing Protect	Do Nothing Protect Repair	Do Nothing Protect Repair Rehabilitate Replace	Do Nothing Protect Repair Rehabilitate Replace

E—NJDOT Defined Agency-Developed Elements (ADEs)

E.1—Additional Guidance on Sound Barrier Wall ADE 8361

The following guidance was taken from Noise Barrier Design Handbook posted on FHWA website at http://www.fhwa.dot.gov/environment/noise/noise_barriers/design_construction/design/design04.cfm

Placing a new noise wall on an existing bridge adds a significant amount of stress on a structure caused by the additional weight and rotational loading for which the existing structure may not have been originally designed. This may result in the need to add additional girders, beams, and diaphragms; strengthen the existing bridge deck; or modify the existing parapet. Additional solutions which should be considered are reducing the weight of the noise wall by using light weight material or, only, if necessary, by reducing the height of the wall or, ultimately, eliminating the construction of the wall. The latter should only be considered under severe situations.

Besides the obvious additional costs of such structural modifications (above the noise wall cost), other issues related to modifying an existing bridge include:

- Maintenance.
- Protection of traffic (both on and beneath bridge).
- Accessibility to areas requiring modifications.
- Bridge vibrations due to existing traffic.
- Vibrations from construction operations.
- Potential environmental mitigation measures (related to painting beams or working over waterways or wetland areas).

While additional costs are still incurred (compared to the same bridge without a noise barrier), the ability to design the noise wall as an integral part of the overall structure addresses most if not all the loading and traffic-related concerns discussed above.

The proximity of the noise wall to the traveled portion of the bridge usually makes the wall considerably more susceptible to damage (compared to most ground-mounted noise walls). Such damage may be caused by vehicle impact, airborne debris such as stones, vehicle parts, snow removal operations, or material from salt spreaders in areas subject to snow fall.

Factors considered in addressing this concern include:

- Type and proximity of land use adjacent to or beneath the noise wall.
- Location of the noise wall on the bridge.
- Noise wall-to-bridge attachment details.
- Weight, composition, and likelihood of shattering of the noise wall component parts.
- Any mechanisms (either internal or external to the noise wall) designed to retain noise wall components.

While these factors are typically considered by the noise wall designers, the degree of consideration can vary significantly during the decision-making process. The use of barrier materials which tear (such as metal) rather than break/shatter into pieces should be considered this process.

The proximity of bridge-mounted noise walls to traffic has raised concerns related to issues such as vehicular sight distance, barrier shading which increases potential for highway icing, and adverse effects on highway lighting. These issues are discussed elsewhere in this document.

Snow drifting and storage implications, restrictions to bridge inspection teams using bucket trucks to inspect beams, and maintenance of the noise wall itself including graffiti removal, noise barrier and structure damage repair, repainting, etc., are some of the concerns which should be considered during all stages of design and construction. These concerns, except for bridge inspection, are common to both ground-mounted and structure-mounted systems. These concerns are generally greater for bridge-mounted noise walls due to their proximity to the roadway and accessibility limitations.

Several techniques have been successfully employed to attach noise walls to bridges. While somewhat different procedures and operations exist for attaching noise walls to existing bridges as compared to attachments to new bridges, the resultant attachment types are similar enough to be discussed under the following general categories:

E.1.1—Post and Panel Noise Barriers

E.1.1.1—Post and Panel Noise Barriers on Top of Parapet

Such attachments usually include high strength bolts anchored to or embedded into the top of the parapet. On new construction, such bolts are often set in the parapet form work prior to the concrete pour. In existing parapets, bolts may be anchored by mechanical fastening or chemical bonding (epoxy grout) methods. Depending on the type of noise wall material, these high strength anchored bolts and nuts are used to secure either a continuous horizontal beam (or angle) or vertical posts to the parapet. Noise wall panels or other components are then secured to the beam or posts to create the in-place barrier. Obtaining a smooth or desired top of barrier profile with such a system may require each panel to be custom made if the top of parapet profile is not smooth and/or consistent. Any bottom of barrier jaggedness or gapping can be concealed by flashing.

E.1.1.2—Post and Panel Noise Barriers Inserted into Parapet

This method should only be considered for new bridges. Although not as common an attachment technique, posts have been inserted into the parapet itself (either prior to casting of the parapet, or after parapet casting) via insertion into precast holes within the parapet wall itself.

E.1.1.3—Post and Panel Noise Barriers on Outside Face of Parapet

Although suitable for existing and new bridges, it is particularly suitable for retrofitting of existing bridges. A rather common practice is to mount noise barriers onto the outside face of the parapet (Note: special consideration should be given in the situation of two parallel bridges, where a sizable gap between the bridges might compromise barrier performance). The barrier posts are usually attached to the parapet by one of four methods:

- *Mechanical anchoring system* - This type of anchor system consists of a wedge-shaped nut which is inserted into a drilled or cast hole in the concrete parapet wall. As the bolt is turned, the nut is forced to spread and is wedged in the hole providing a solid anchor for the bolt to be sufficiently tightened. This system is limited in its use and should only be considered for use in concrete and should not be used in situations where the anchor will be exposed to constant vibrations from traffic and wind loading. In addition, any drilling into the parapet walls may diminish its bearing capacity, particularly if reinforcing bars are severed during the drilling operation.
- *Chemical anchoring systems* - This system basically consists of a two-part epoxy mixture adhesive inserted into a drilled or cast hole in the concrete wall and then mixed by spinning the bolt inside the hole. This method is more suited for older structures and for areas where the anchors are routinely exposed to vibrations. However, the same concerns regarding the severing of the reinforcing bars during the drilling operation (see Mechanical anchoring system above) should be considered before using this method. When this product first came onto the market, concerns were expressed regarding its durability and long-term performance. These concerns appear to have been addressed by the industry, and use of this type of anchoring method is not restricted to specific applications.
- *Bolt through system* - The bolt through system uses long bolts which are inserted into holes either cast into or drilled completely through the parapet walls. This method addresses most of the concerns associated with the durability of both the mechanical and the chemical anchoring systems. However, it is more destructive to existing structures and may diminish the bearing capacity of portions of the wall.

- *Cast-in-place bolts* - Although a less commonly used method, this anchoring system is the most effective and least destructive of all methods. However, this method should only be considered for new structures or where key areas of the structure are being rehabilitated. There may also be some difficulty in maintaining bolt location tolerances due to movement of the forms during pouring.

Additional barrier anchorage may be provided via angle iron mounted to the top of the parapet. On barriers constructed as part of a new bridge construction, the bridge slab may be extended beyond the outside edge of the parapet, providing additional dead load support for the barrier

E.1.2—"Post-less" Panels

Such systems use either concealed posts or no posts with the panels, typically mounted in the following manners:

E.1.2.1—"Post-less" Panels on Top of Parapet

For concealed post systems, the post to parapet connections is like those discussed above for the post and panel systems. For "post-less" systems, the panels (typically constructed of relatively lightweight materials) are attached via bolts to two parallel angle iron pieces mounted to the parapet.

E.1.2.2—"Post-less" Panels on Outside Face of Parapet

Such systems are mounted in manners like those for post-and-panel systems listed above except that the panels themselves are bolted to or through the parapet. With this type of system, additional detailed care should be taken in the design of the horizontal joints between panels to assure a leak-free noise condition and to maintain the consistent alignment of adjacent panels.

E.1.3—Masonry Block Noise Barriers

These barriers are "laid up" in a manner like ground-mounted masonry block barriers except that their anchorage is to the protective concrete bridge parapet wall, which usually has the same shape as the standard concrete traffic barrier walls, i.e., Jersey barriers. The anchoring is via reinforcing bars extending out of the top of the parapet wall. The noise barrier wall can be further strengthened by inserting reinforcing bars and concrete within the voids of the masonry blocks.

E.1.4—Cast-In-Place Integral with Parapet Wall

On occasions it may be necessary and appropriate to construct noise barriers integral with the bridge parapet wall. This type of structure-mounted noise barrier wall is more suitable where short height barriers can provide the desired noise attenuation or in situations where it may be the only possible option due to restrictions in erecting any other types of barrier systems.

E.1.5—On Parallel Supporting Structure Adjacent to Parapet

This type of structure-mounted noise barrier wall is not as common as other methods mentioned previously. This mounting system is particularly suitable for older or weakened bridges, where the structure (parapet wall, deck, and/or superstructure) is incapable of supporting the loads of the desired noise barrier system. A parallel supporting beam or similar structure may be built immediately adjacent to the existing structure. This structure would support the full vertical dead load of the noise barrier wall and all or some of the torsion load, if the beam and/or the wall were attached to the adjacent existing structure.

E.2—Additional Guidance on Fascia Mounted Sign Structure ADE 8361

Most sign support structures are fabricated from structural steel tubes, angles, and plate or from aluminum tubes, angles and plate.

Fatigue failure of a support structure basically occurs because the stress ranges resulting from the wind or truck-induced gusts exceed the fatigue thresholds at critical details. Usually, these failures cannot be blamed on weld defects; rather, they are an indication that the structure is not adequately designed for the fluctuating loads and is experiencing excessively large stress ranges. This is a good reason to believe that other similar structures will soon be having similar cracking problems. Therefore, if a fatigue failure has occurred in a structure, one cannot be complacent about inspecting similar structures. All similar structures should be intensively inspected immediately.

The primary loads applied to fascia mounted sign structures are due to natural winds as well as truck gusts. Natural wind gusts exert a fluctuating force that is primarily horizontal, and the resulting motion of the mast arm is also primarily horizontal, although there is often a significant vertical motion as well. The passage of trucks beneath support structures induces both horizontal and vertical gust loads on the structure, creating a motion that is primarily vertical but may also include a significant horizontal component as well.

To protect steel structures from corroding some type of protective system is required. Though some ancillary steel structures may be painted, protection is most often provided by use of galvanizing or fabrication using weathering steel. Galvanizing is performed using the hot dip process. The protective life of a galvanized coating is determined primarily by the thickness of the coating and the severity of exposure. Environments such as exposure to industrial air pollutants or marine environments cause more rapid deterioration of the galvanized coating than, say, clean, dry rural environments.

Fascia mounted signs hanging from parapet or mounted on the fascia (with an actual mounting structure), which are intended to be viewed by traffic traveling under that bridge, would be included in Element 8361. Also included is any bridge-mounted sign structure (with an actual mounting structure) physically mounted to a bridge through-truss portal, and viewable by traffic traveling on the bridge. Overhead bridge fascia mounted sign structures which are included in the routine Sign Structure Inspection program are not to be coded in Element 8361. For example, sign structures mounted on pier caps are reported in the Sign Structure Inspection program, and therefore not to be coded in this element.

E.3—Additional Guidance on Fender Systems ADE 8269

The following guidance was taken from The Bridge Appurtenances, Part A – Energy Absorbing Fender Systems by Parker, Neville A. and Ansari, Farhad dates July 2003, posted online at http://www.utrc2.org/sites/default/files/pubs/bridge-appurtenances-final_0.pdf.

The existing technology, which has been used for bridge fender protective systems are identified and grouped into six main categories as:

- Pile supported
- Retractable
- Rubber
- Gravity
- Hydraulic/pneumatic
- Floating systems

Energy absorbing fender systems that are commercially available are identified the following table below:

Number	Fender Type	Description	Advantage	Disadvantage
A6.1	**Standard Pile Fender Systems**	Employs piles driven to the bottom of the sea. Energy on a fender pile is absorbed by deflection and the limited compression of the pile. Energy absorption capacity depends on the pile and is determined based on internal strain-energy characteristics.		
A6.1.1	Timber Piles	Consists of timber members. A contact frame is formed that distributes impact loads.	Low initial cost and abundant timber piles.	Limited energy absorption susceptibility to mechanical /biological damage.
A6.1.2	Steel Piles	Used in water depth greater than 40 feet.	Strength and feasibility for difficult seafloor conditions.	Vulnerability to corrosion and high initial cost.
A6.1.3	Concrete Piles	Pre-stressed concrete piles with rubber buffers at deck level have been used.	Resists natural and biological deterioration.	Limited strain energy. Capacity and corrosion of steel through cracks.
A6.1.4	Composite Piles	Composite pile is a cylindrical shell fabricated of high-strength fiber reinforced composite materials.	High-energy absorption resists natural and biological deterioration.	High initial cost.

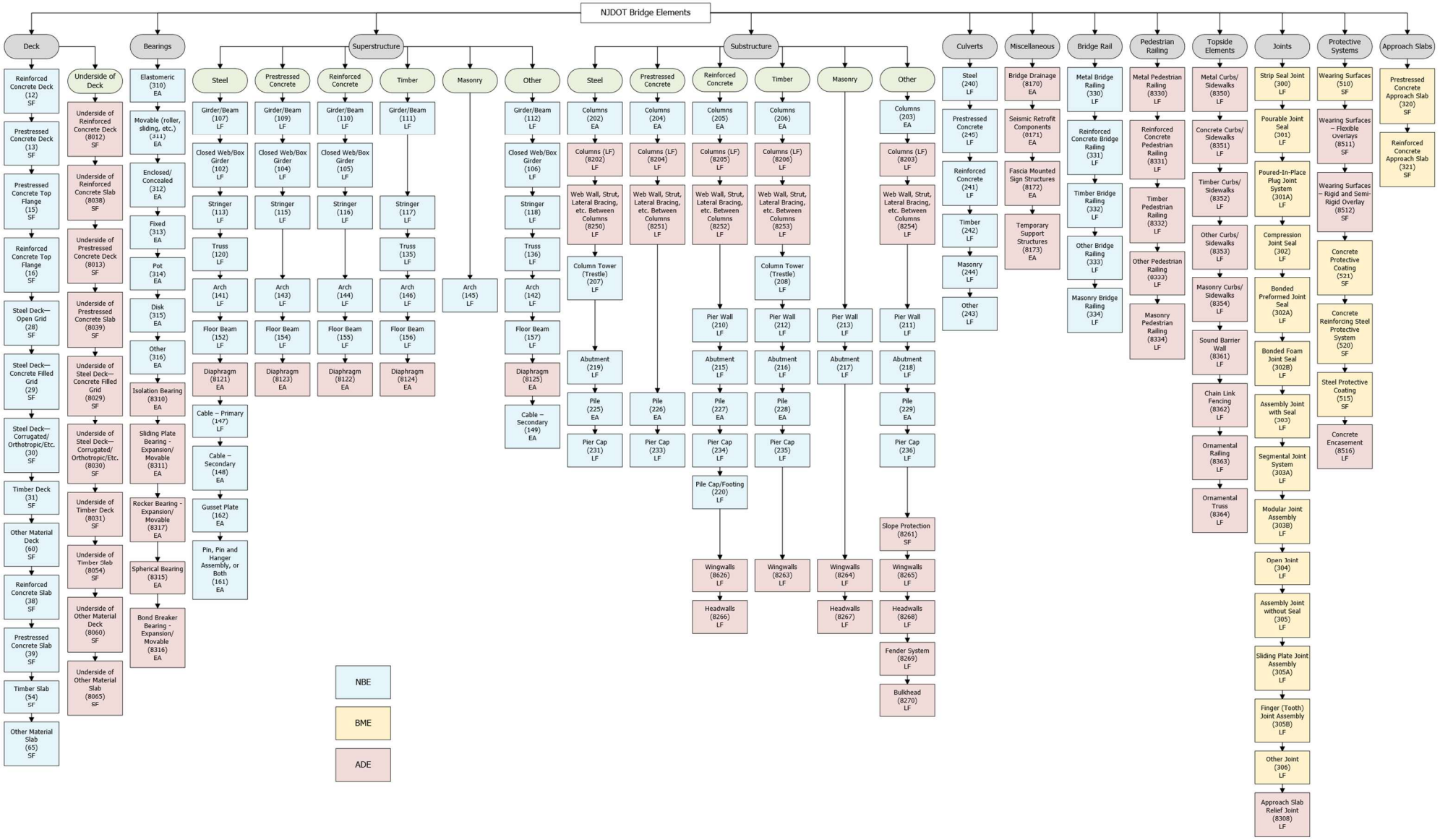
Number	Fender Type	Description	Advantage	Disadvantage
A6.2	**Retractable Fender Systems**	A retractable fender system consists of vertical-contact posts connected by rows of wales and chocks. The fender retracts under impact, thus absorbing energy by action of gravity and friction. Energy absorption capacity depends directly on the effective weights, the angle of inclination of the supporting brackets and the maximum amount of retraction of the system.	Negligible effects of Bio-deterioration on energy absorption capacity. Low maintenance cost. Minimum equipment requirements.	Vulnerability to corrosion of the supporting brackets. High initial cost if used on open type piers.
A6.3	**Rubber Fender Systems**	Rubber fenders consist of two major types, rubber-in- compression and rubber-in-shear.		
A6.3.1	Rubber-in-compression	Consists of a series of cylindrical rubber or rectangular tubes installed behind standard fender piles. Energy absorption is achieved by compression of the rubber. Absorption capacity depends on the size of the buffer and on maximum deflection. The energy-absorption capacity can be varied by using the tubes in single or double layers, or by varying tube size.	Simplicity and adaptability plus effectiveness at reasonable cost.	High concentrated loading may result. Initial cost is higher than standard pile system without resilient units.
A6.3.2	Rubber-in-shear	Consists of a series of rubber pads bonded between steel plates to form a series of rubber sandwiches mounted firmly as buffers between a pile-fender system and a pier. Two types of mounting units are available: standard unit or overload unit, which is capable of absorbing 100% more energy.	Capability of Cushioning impact from lateral and vertical directions. High energy absorption capacity. Favorable initial cost.	Too stiff for small vessel. Steel plates are subject to corrosion. Problems with bond between steel plates and rubber.
A6.3.3	Lord Flexible	Consists of an arch-shaped rubber block bonded between two end steel plates. It can be installed on open or bulkhead-type piers, dolphins, or incorporated with standard pile or hung fender systems. Impact energy is absorbed by bending (buckling) and compression of the arch-shaped column.	High energy absorption and low terminal-load characteristics.	Bond between steel plates and rubber plus possible fatigue problems.

Number	Fender Type	Description	Advantage	Disadvantage
A6.3.4	Rubber-in-torsion	Rubber and steel combination fabricated in cone-shaped compact bumper form, molded into a specially cast steel frame and bonded to the steel. It absorbs energy by torsion, compression, shear and tension, but most energy is absorbed by compression.	Capable of resisting the impact load from all directions	Bond between steel casting and rubber and fatigue problems
A6.3.5	Pneumatic	Pneumatic fenders are pressurized, airtight rubber devices designed to absorb impact energy by the compression of air inside a rubber envelope. Energy absorption capacity and resistance load depend on the size and number of tires used and on the initial air pressure when inflated.	Suitable for both berthed and moored ships.	High maintenance cost.
A6.4	**Gravity Type Fender Systems**	Gravity fenders are normally made of concrete blocks and are suspended from heavily constructed wharf decks. Impact energy is absorbed by moving and lifting the heavy concrete blocks.	High energy absorption.	Heavy equipment requirement. Initial and maintenance costs are high.
A6.5	**Hydraulic /Pneumatic Fender Systems**			
A6.5.1	Dashpot hydraulic	Consists of a cylinder full of oil or other fluid so arranged that when a plunger is depressed by impact, the fluid is displaced through a non-variable or variable orifice into a reservoir at higher elevation. Suitable where severe wind, wave, swell, and current conditions exist.	Favorable energy absorption characteristics.	High initial and maintenance costs.
A6.5.2	Hydro-pneumatic floating fender	This is a system of floating rubber envelopes filled with water and air, which absorbs energy by viscous resistance or by air compression.	Favorable energy absorption characteristics	High initial and maintenance costs.
A6.6	**Floating Fender Systems**	Consist of floating logs, which ride up and down against the timber breasting face.	Easy application. High water depths.	Low energy absorption

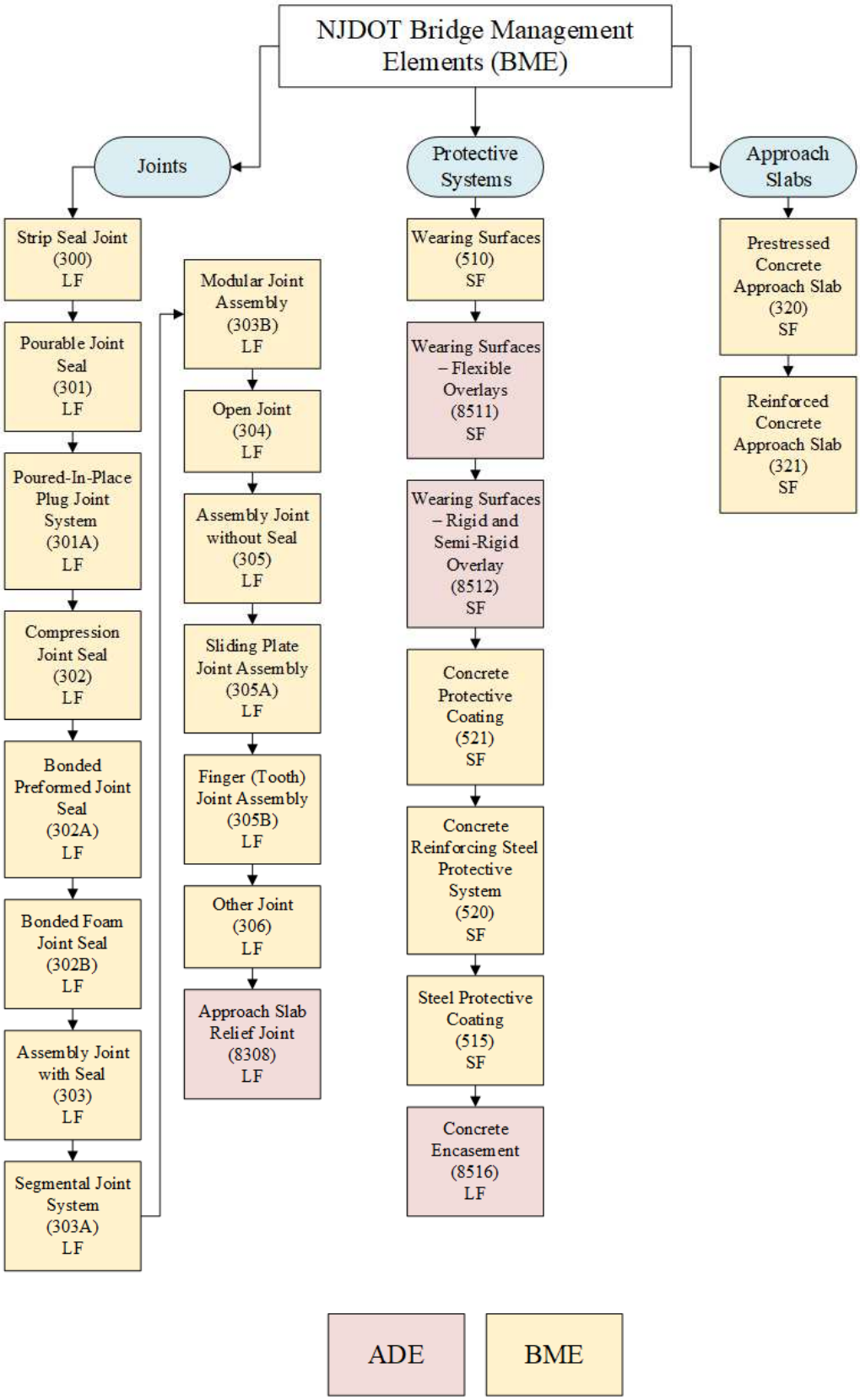
F—NJDOT Defined Element Groupings

The charts on the following pages organize the elements defined in Section 3 into National Bridge Elements (NBEs), Bridge Management Elements (BMEs), and Agency-Developed Elements (ADEs). For each element, the name, identifier and units of measure are shown, and elements are grouped by major bridge assembly and material type.

F.1—All NJDOT 2025 Bridge Elements



F.3—NJDOT Bridge Management Elements



F.4—NJDOT Agency-Developed Elements