



**VDOT  
Supplement  
to the  
AASHTO  
Manual for  
Bridge  
Element  
Inspection**

**2016**



**VDOT GOVERNANCE DOCUMENT**

**VDOT Supplement to the AASHTO Manual for Bridge Element Inspection, 2016**

**OWNING DIVISION: Structure and Bridge**

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## ACKNOWLEDGEMENTS

Since the original issuance of VDOT'S 'Manual for Bridge Element Inspection' The FHWA has significantly modified the Elements, modified the Condition States and changed Smart Flags to Defects. These changes have been made due to the lessons learned since the inception of Elements and to make the definitions of Element and Condition States more logical. In addition, Elements and Defect have been added by VDOT to assist inspectors in the coding of Virginia Elements and the Defects observed in the field. These additional Elements and Defects have been based on Virginia's experience and were collected from the Central Office and the District bridge personnel. All of the changes have been made considering the safety of the traveling public and making the best use of our financial assets. With the input from the District and Central Office Structure and Bridge personnel this manual will meet those goals.

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## **INTRODUCTION AND BACKGROUND**

This manual will serve as the Virginia Supplement to the AASHTO Manual for Bridge Element Inspection, First Edition. This manual includes information concerning VDOT Agency Defined Elements, VDOT Defects, and VDOT guidance.

A bridge management system (BMS) provides the tools to consider where and when to best spend funds. It provides an initial indication of the best action to take for each bridge to promote the health of the network.

Using a bridge management system, a transportation agency should be able to:

- (1) predict deterioration with and without intervening actions;
- (2) identify feasible actions to improve condition, safety, or the ability of an element to function as intended;
- (3) estimate costs and savings;
- (4) determine maintenance strategies;
- (5) optimize a program over a specified period with limited funds; and
- (6) generate reports quantifying bridge needs for use by legislative budget makers.

VDOT has been collecting element level inspection data since 1995 using the AASHTO Commonly Recognized Elements (CoRe elements), VDOT defined Elements and Smart Flags (now Defects). This collection of Element level data was not required by the National Bridge Inspection Standards.

Title 23 of the United States Code, as amended by the MAP-21 legislation in 2012, now requires each state to report Element level data for all bridges on the National Highway System. See Appendix A.

The FHWA issued the Specification for the National Bridge Inventory Bridge Elements on December 16, 2013. This Specification provides the framework to support the collection and reporting of Element level bridge condition data to the FHWA, contains a listing of the Elements for which data will be collected by the FHWA and refers to the new AASHTO Manual for Bridge Element Inspection, First Edition, for Element descriptions, quantity calculations, and condition states. A link to the Specification for the National Bridge Inventory Bridge Elements follows: <http://www.fhwa.dot.gov/bridge/nbi/131216.cfm>

The new AASHTO elements are the basis for the new system for categorizing bridge conditions as outlined in the AASHTO Manual for Bridge Element Inspection. The new bridge element system is intended to replace the 'Commonly Recognized Elements' (CoRe Elements) currently in use by VDOT.

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The new AASHTO manual includes three Element types (shown below) and the Defects associated with each Element:

- National Bridge Elements (NBE's) - which are Elements that are reported to FHWA.
- Bridge Management Elements (BME's) which are Elements used by the individual states some of which are and some are not reported to FHWA. See Page 4 for a list of elements that are reported to FHWA.
- Agency Developed Elements (ADE's) which are state elements used by the individual states but are not reported to FHWA.

Twenty (20) VDOT Agency Developed Elements and ten (10) VDOT Defects have been defined. This document will provide guidance for the coding of the twenty (20) VDOT elements and the VDOT defects.

The 20 VDOT Agency Developed Elements are sub-divided into the following.

- 1 NBE Sub-Elements
- 0 BME Sub-Elements
- 19 ADE Elements

The Maintenance Section of the Structure and Bridge Division plans to use the new element and defect quantities to develop work recommendations for the maintenance program.

The use of the new AASHTO and VDOT elements and defects to develop work recommendations will replace the previous effort to investigate the potential for statewide improvements in the inspection report work recommendation process.

The Bridge Management System uses element data to determine future budgets.

Element Condition data is used in several Districts to help select bridges to include in Districtwide contracts.

Bridge Maintenance Managers will use the Defect data to help determine structures that need different types of maintenance work.

In addition to the condition of a bridge element, its environment and the effects of traffic may govern its rate of deterioration. VDOT has decided to place all elements in the "low" environment (Environment 2), which will not adversely affect the condition of the element.

The previous element inspection process used "smart flags". These have either been eliminated or replaced by defects or VDOT inventory items. For further discussion of defects see the AASHTO Manual for Bridge Element Inspection, First Edition.

## ELEMENTS TO BE COLLECTED FOR FHWA

Element	Units	Element Number					
		Steel	Prestressed Concrete	Reinforced Concrete	Timber	Masonry	Other
<b>Deck/Slab</b>							
Deck	SF		13	12	31		60
Open Grid Deck	SF	28					
Concrete Filled Grid Deck	SF	29					
Corrugated or Orthotropic Deck	SF	30					
Slab	SF			38	54		65
Top Flange	SF		15	16			
<b>Superstructure</b>							
Closed Web/Box Girder	LF	102	104	105			106
Girder/Beam	LF	107	109	110	111		112
Stringer	LF	113	115	116	117		118
Truss	LF	120			135		136
Arch	LF	141	143	144	146	145	142
Main Cable	LF	147					
Secondary Cable	EA	148					149
Floor Beam	LF	152	154	155	156		157
Pin, Pin and Hanger Assembly	EA	161					
Gusset Plate	EA	162					
<b>Substructure</b>							
Column	EA	202	204	205	206		203
Column Tower (Trestle)	LF	207			208		
Pier Wall	LF			210	212	213	211
Abutment	LF	219		215	216	217	218
Pile Cap/Footing	LF			220			
Pile	EA	225	226	227	228		229
Pier Cap	LF	231	233	234	235		236
<b>Culvert</b>							
Culvert	LF	240	245	241	242	244	243
<b>Bridge Rail</b>							
Bridge Rail	LF	330*		331	332	334	333
<b>Joint</b>							
Strip Seal	LF			300			
Pourable	LF			301			
Compression	LF			302			
Assembly with Seal (Modular)	LF			303			
Open	LF			304			
Assembly without Seal	LF			305			
Other	LF			306			
<b>Bearing</b>							
Elastomeric	EA			310			
Movable (roller, sliding, etc.)	EA			311			
Enclosed/Concealed	EA			312			
Fixed	EA			313			
Pot	EA			314			
Disk	EA			315			
Other	EA			316			
<b>Wearing Surfaces and Protective Coatings</b>							
Wearing Surfaces	SF			510			
Steel Protective Coating	SF			515			
Concrete Protective Coating	SF			521			

\*Element 330-Metal Bridge Rail may include steel or aluminum rails.



## **VIRGINIA AGENCY DEVELOPED ELEMENTS (ADEs)**

Virginia Agency Developed Elements are denoted by 800 series element numbers.

The numbering system for the Virginia Agency Developed Elements is shown below:

- 801 – 810 – Deck Elements
- 811 – 820 – Superstructure Elements
- 821 – 830 – Substructure Elements
- 831 – 840 – Culvert Elements
- 841 – 850 – Joint Elements
- 851 – 860 – Slope and Channel Elements
- 861 – 880 – Reserved for Future Use
- 881 – 889 – Protective Elements

In the following charts much information is contained including many parent/child associations.

Virginia Element Title	Units	Virginia Element Number	Sub – Element (Child) to NBE	NBE Number	Sub-Element (Child) to BME	BME Number	Comments
Sidewalk	SF	801	No	N/A	No	N/A	
Deck Drains	EA	802	No	N/A	No	N/A	
Beam/Girder End	EA	811	No	N/A	No	N/A	
Steel Diaphragms/Cross Frames for Curved Girder Systems	LF	813	Yes	107	No	N/A	Code for all curved steel girders
Steel Wingwall	EA	822	No	N/A	No	N/A	
Reinforced Concrete Wingwall	EA	824	No	N/A	No	N/A	
Timber Wingwall	EA	826	No	N/A	No	N/A	
Masonry Wingwall	EA	828	No	N/A	No	N/A	
MSE Wall (50' Maximum per Wing)	LF	830	No	N/A	No	N/A	Wingwalls >50 ft. will be roadway items
Culvert Endwall/Headwall	EA	831	No	N/A	No	N/A	
Roadway Over Culvert	EA	833	No	N/A	No	N/A	
Link Slab	EA	843	No	N/A	No	N/A	Joint Closures at Piers
Slab Extension	EA	844	No	N/A	No	N/A	Joint Closures at Abutments
Joint Effectiveness	EA	845	No	N/A	No	N/A	Code for all Joints
Unprotected Slope	EA	851	No	N/A	No	N/A	
Protected Slope Paved	EA	852	No	N/A	No	N/A	
Protected Slope Riprap	EA	853	No	N/A	No	N/A	
Channel	EA	854	No	N/A	No	N/A	
Beam/Girder End Protective Coating – Steel	EA	886	No	N/A	No	N/A	
Beam/Girder End Protective Coating - Concrete	EA	887	No	N/A	No	N/A	

**NOTE: See 'VDOT ADEs Condition State Definitions – with Associated Defects' for additional coding instructions**

DESCRIPTIONS OF VDOT AGENCY DEVELOPED ELEMENTS

ELEMENT NUMBER	TITLE	DESCRIPTION
801	Sidewalk	This element defines the area that is 3 feet or more in width that is designated for pedestrian use on the structure.
802	Deck Drains	This element defines deck drains (scuppers), grates, and downspouts and does not apply to drainage off the end of a bridge
811	Beam/Girder End	This element defines the last 5 feet of a beam/girder end. Measurement shall begin at the end of the beam/girder and continue toward the center of the structure.
813	Steel Diaphragms/ Cross Frames for Curved Girder Systems	This element defines steel diaphragms/cross frames for curved girder systems regardless of protective systems.
822	Steel Wingwall	This element defines steel wingwalls and includes the sheet material retaining the embankment. This is for all wingwalls regardless of protective systems.
824	Reinforced Concrete Wingwall	This element defines reinforced concrete wingwalls. This includes the material retaining the embankment. This is for all reinforced concrete wingwalls regardless of protective systems.
826	Timber Wingwall	This element defines timber wingwalls. This includes the sheet material retaining the embankment. This is for all wingwalls regardless of protective system.
828	Masonry Wingwall	This element defines those wingwalls constructed of block or stone. The block or stone may be placed with or without mortar. This is for all abutments regardless of protective systems.
830	MSE Wall	This element defines those walls constructed with facing and various combinations of geotechnical materials and reinforcement materials – 50' maximum.
831	Culvert Endwall / Headwall	This element defines culvert endwalls / headwalls of any material.
833	Roadway Over Culvert	This element defines the condition of the roadway over a culvert.
843	Link Slab	This element defines joint closures constructed at piers.
844	Slab Extension	This element defines joint closures constructed at abutments.
845	Joint Effectiveness	This element defines the effectiveness of expansion joints. There are two condition states for this element.
851	Unprotected Slope	This element defines slopes under bridges that are NOT protected by an erosion resistant material.

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## DESCRIPTIONS OF VDOT AGENCY DEVELOPED ELEMENTS

ELEMENT NUMBER	TITLE	DESCRIPTION
852	Protected Slope - Paved	This element defines slopes under a bridge that are protected by an erosion resistant material such as precast concrete blocks or cast-in-place concrete.
853	Protected Slope - Riprap	This element defines slopes under a bridge that are protected by an erosion resistant stone material such as riprap. This element includes combination concrete slab and stone riprap.
854	Channel	This element defines the channel, stream control devices, and channel protective devices such as channel armoring, gabions, grout filled bags, and other protective devices.
886	Beam/Girder End Protective Coating - Steel	This element is for the last 5 feet of steel beam/girder ends that have a protective coating such as paint, galvanization, weathering steel patina or other top coat steel corrosion inhibitor. Measurement shall begin at the end of the beam/girder and continue toward the center of the structure.
887	Beam/Girder End Protective Coating - Concrete	This element is for the last 5 feet of concrete beam/girder ends that have a protective coating such as epoxy or any other top coat barrier that protects concrete from deterioration and reinforcing steel corrosion. Measurement shall begin at the end of the beam/girder and continue toward the center of the structure.

## VDOT AGENCY DEFINED DEFECTS

VDOT DEFECT NUMBER	TITLE	DESCRIPTION	VDOT ASSOCIATED ELEMENT
2000	Deck Drainage System Effectiveness	Indicates the effectiveness of deck drainage system.	802
2399	Joint Effectiveness	Indicates the number of joints in functional and non-functional condition.	845
6500	Debris	Debris restricting channel flow.	854
6501	Facing Panel Displacement /Separation	Displacement or separation of facing panels for MSE walls	830
6502	Facing Panel Bulging	Bulging of facing panels for MSE walls.	830
6503	Facing Panel Joint Openings	Joint openings for MSE walls	830
6505	Unprotected Slope Effectiveness	Indicates the effectiveness of unprotected slopes.	851
6506	Paved Slope Effectiveness	Indicates effectiveness of paved slopes	852
6507	Loss of Riprap	Indicates the loss of riprap stone on slopes.	853
6508	Effectiveness of Stream Control and Channel Protective Devices	Indicates the effectiveness of stream control and channel protective devices.	854

## VDOT ADEs CONDITION STATE DEFINITIONS – with Associated Defects

<b>VDOT ELEMENT NUMBER</b>	<b>801</b>	<b>VDOT ELEMENT NAME</b>	<b>SIDEWALK</b>
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<b>DESCRIPTION</b>	This Element defines the area that is three (3) feet or more in width and that is designated for pedestrian use on the structure.
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<b>UNIT OF MEASURE</b>	<b>SF</b>
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<b>STEEL</b>		<b>CONDITION STATES</b>			
<b>DEFECT</b>		<b>1 GOOD</b>	<b>2 FAIR</b>	<b>3 POOR</b>	<b>4 SEVERE</b>
<b>1000</b>	Corrosion	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
<b>1010</b>	Cracking	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.	
<b>1020</b>	Connection	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 structural review.	
<b>1900</b>	Distortion	None	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed but does not warrant structural review.	

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<b>VDOT ELEMENT NUMBER</b>	<b>801</b>	<b>VDOT ELEMENT NAME</b>	<b>SIDEWALK</b>
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<b>REINFORCED CONCRETE</b>		<b>CONDITION STATES</b>			
<b>DEFECT</b>		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
		<b>GOOD</b>	<b>FAIR</b>	<b>POOR</b>	<b>SEVERE</b>
<b>1080</b>	Delamination/ Spall/Patched Area	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter and/or a 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
<b>1090</b>	Exposed Rebar	None	Present without measurable section loss.	Present with measurable section loss but does not warrant structural review.	
<b>1120</b>	Efflorescence/ Rust Staining	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
<b>1130</b>	Cracking (RC and Other)	Width less than 0.012 in. or spacing greater than 3.0 ft.	Width 0.012 - 0.05 in. or spacing of 1.0 - 3.0 ft.	Width greater than 0.05 in. or spacing of less than 1 ft.	
<b>1190</b>	Abrasion/Wear (PSC/RC)	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.	

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<b>VDOT ELEMENT NUMBER</b>	<b>801</b>
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<b>VDOT ELEMENT NAME</b>	<b>SIDEWALK</b>
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<b>TIMBER</b>		<b>CONDITION STATES</b>			
<b>DEFECT</b>		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
		<b>GOOD</b>	<b>FAIR</b>	<b>POOR</b>	<b>SEVERE</b>
<b>1140</b>	Decay/ Section Loss	None	Affects less than 10% of the member section.	Affects 10% or more of the member 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
<b>1150</b>	Check / Shake	Surface penetration less than 5% of the member thickness regardless of location.	Penetrates 5% to 50% of the thickness of the member and not in a tension zone.	Penetrates more than 50% of the thickness of the member or more than 5% of the member thickness in a tension zone. Does not warrant structural review.	
<b>1160</b>	Crack (Timber)	None	Crack has been arrested through effective means.	Identified crack that is not arrested but does not require structural review.	
<b>1170</b>	Split / Delamination (Timber)	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.	
<b>1180</b>	Abrasion / Wear (Timber)	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.	

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<b>VDOT ELEMENT NUMBER</b>	<b>801</b>
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<b>VDOT ELEMENT NAME</b>	<b>SIDEWALK</b>
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<b>ALL</b>		<b>CONDITION STATES</b>			
<b>DEFECT</b>		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
		<b>GOOD</b>	<b>FAIR</b>	<b>POOR</b>	<b>SEVERE</b>
<b>7000</b>	Damage	Not Applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate defect entry.

<b>VDOT ELEMENT NUMBER</b>	<b>802</b>
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<b>VDOT ELEMENT NAME</b>	<b>DECK DRAINS</b>
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<b>DESCRIPTION</b>	This element defines deck drains/scuppers, grates, and downspouts and does not apply to drainage off the end of a bridge. The quantity will always be one, even if there are dissimilar drainage types.
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<b>UNIT OF MEASURE</b>	<b>EA</b>
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<b>ALL DECK DRAINS</b>		<b>CONDITION STATES</b>			
<b>DEFECT</b>		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
		<b>GOOD</b>	<b>FAIR</b>	<b>POOR</b>	<b>SEVERE</b>
<b>1900</b>	Distortion	None	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed 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.
<b>2000</b>	Deck Drainage System Effectiveness	Grating over scuppers/drains is intact and is functioning as intended. Bridge drainage and/or downspout is adequately terminated. No signs of ponding on the deck as a result of drainage problems.	Scuppers and/or downspouts are clogged, however, there are no signs of ponding on the deck. Downspout is inadequately terminated.	Scuppers and/or downspouts are clogged and there are signs of ponding on the deck but does not extend into the normal traffic lane.	Broken/missing grates/drainage assembly may pose a hazard to vehicular or pedestrian traffic. Scuppers and/or downspouts are clogged and there are signs of ponding on the deck that extends into the normal traffic lane.
<b>7000</b>	Damage	Not Applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate defect entry.

VDOT ELEMENT NUMBER	811
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VDOT ELEMENT NAME	BEAM/GIRDER END
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DESCRIPTION	This element defines the last 5 feet of a beam/girder end. Measurement shall begin at the end of the beam/girder and continue toward the center of the structure.
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UNIT OF MEASURE	EA
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STEEL		CONDITION STATES			
DEFECT		1	2	3	4
		GOOD	FAIR	POOR	SEVERE
1000	Corrosion	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
1010	Cracking	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.	
1020	Connection	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 structural review.	

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<b>VDOT ELEMENT NUMBER</b>	<b>811</b>
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<b>VDOT ELEMENT NAME</b>	<b>BEAM/GIRDER END</b>
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<b>CONCRETE</b>		<b>CONDITION STATES</b>			
<b>DEFECT</b>		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
		<b>GOOD</b>	<b>FAIR</b>	<b>POOR</b>	<b>SEVERE</b>
<b>1080</b>	Delamination/ Spall/Patched Area	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter and/or a 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
<b>1090</b>	Exposed Rebar	None	Present without measurable section loss.	Present with measurable section loss but does not warrant structural review.	
<b>1100</b>	Exposed Prestressing	None	Present without section loss.	Present with section loss but does not warrant structural review.	
<b>1110</b>	Cracking (PSC)	Width less than 0.004 in. or spacing greater than 3 ft.	Width 0.004 - 0.009 in. or spacing 1.0 - 3.0 ft.	Width greater than 0.009 in. or spacing less than 1 ft.	
<b>1120</b>	Efflorescence/ Rust Staining	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
<b>1130</b>	Cracking (RC and Other)	Width less than 0.012 in. or spacing greater than 3.0 ft.	Width 0.012 - 0.05 in. or spacing of 1.0 - 3.0 ft.	Width greater than 0.05 in. or spacing of less than 1 ft.	

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<b>VDOT ELEMENT NUMBER</b>	<b>811</b>
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<b>VDOT ELEMENT NAME</b>	<b>BEAM/GIRDER END</b>
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<b>ALL</b>		<b>CONDITION STATES</b>			
<b>DEFECT</b>		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
		<b>GOOD</b>	<b>FAIR</b>	<b>POOR</b>	<b>SEVERE</b>
<b>1900</b>	Distortion	None	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed 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
<b>7000</b>	Damage	Not Applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate defect entry.

<b>VDOT ELEMENT NUMBER</b>	<b>813</b>
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<b>VDOT ELEMENT NAME</b>	<b>STEEL DIAPHRAGMS/CROSS FRAMES FOR CURVED GIRDER SYSTEMS</b>
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<b>DESCRIPTION</b>	This element defines steel diaphragms/cross frames for curved girder systems regardless of protective systems.
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<b>UNIT OF MEASURE</b>	<b>LF</b>
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<b>STEEL</b>		<b>CONDITION STATES</b>			
<b>DEFECT</b>		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
		<b>GOOD</b>	<b>FAIR</b>	<b>POOR</b>	<b>SEVERE</b>
<b>1000</b>	Corrosion	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
<b>1010</b>	Cracking	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.	
<b>1020</b>	Connection	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 structural review.	
<b>1900</b>	Distortion	None	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed but does not warrant structural review.	
<b>7000</b>	Damage	Not Applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate defect entry.	
					The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate defect entry.

<b>VDOT ELEMENT NUMBER</b>	<b>822</b>
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<b>VDOT ELEMENT NAME</b>	<b>STEEL WINGWALL</b>
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<b>DESCRIPTION</b>	This element defines steel wingwalls and includes the sheet material retaining the embankment. This is for all wingwalls regardless of protective systems.
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<b>UNIT OF MEASURE</b>	<b>EA</b>
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<b>STEEL</b>		<b>CONDITION STATES</b>			
<b>DEFECT</b>		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
		<b>GOOD</b>	<b>FAIR</b>	<b>POOR</b>	<b>SEVERE</b>
<b>1000</b>	Corrosion	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
<b>1010</b>	Cracking	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.	
<b>1020</b>	Connection	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 structural review.	
<b>1900</b>	Distortion	None	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed but does not warrant structural review.	

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<b>VDOT ELEMENT NUMBER</b>	<b>822</b>
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<b>VDOT ELEMENT NAME</b>	<b>STEEL WINGWALLS</b>
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<b>STEEL</b>		<b>CONDITION STATES</b>			
<b>DEFECT</b>		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
		<b>GOOD</b>	<b>FAIR</b>	<b>POOR</b>	<b>SEVERE</b>
<b>4000</b>	Settlement	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
<b>6000</b>	Scour	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.	
<b>7000</b>	Damage	Not Applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate defect entry.



<b>VDOT ELEMENT NUMBER</b>	<b>824</b>
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<b>VDOT ELEMENT NAME</b>	<b>REINF. CONCRETE WINGWALL</b>
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<b>DESCRIPTION</b>	This element defines reinforced concrete wingwalls. This includes the material retaining the embankment. This is for all reinforced concrete wingwalls regardless of protective systems.
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<b>UNIT OF MEASURE</b>	<b>EA</b>
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<b>CONCRETE</b>		<b>CONDITION STATES</b>			
<b>DEFECT</b>		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
		<b>GOOD</b>	<b>FAIR</b>	<b>POOR</b>	<b>SEVERE</b>
<b>1080</b>	Delamination/Spall/Patched Area	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter and/or a 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
<b>1090</b>	Exposed Rebar	None	Present without measurable section loss.	Present with measurable section loss but does not warrant structural review.	
<b>1120</b>	Efflorescence/Rust Staining	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
<b>1130</b>	Cracking (RC and Other)	Width less than 0.012 in. or spacing greater than 3.0 ft.	Width 0.012 - 0.05 in. or spacing of 1.0 - 3.0 ft.	Width greater than 0.05 in. or spacing of less than 1 ft.	
<b>1190</b>	Abrasion/Wear (PSC/RC)	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.	

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<b>VDOT ELEMENT NUMBER</b>	<b>824</b>
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<b>VDOT ELEMENT NAME</b>	<b>REINF. CONCRETE WINGWALL</b>
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<b>CONCRETE</b>		<b>CONDITION STATES</b>			
<b>DEFECT</b>		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
		<b>GOOD</b>	<b>FAIR</b>	<b>POOR</b>	<b>SEVERE</b>
<b>4000</b>	Settlement	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
<b>6000</b>	Scour	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.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate defect entry.
<b>7000</b>	Damage	Not Applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate defect entry.

<b>VDOT ELEMENT NUMBER</b>	<b>826</b>
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<b>VDOT ELEMENT NAME</b>	<b>TIMBER WINGWALL</b>
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<b>DESCRIPTION</b>	<b>This element defines timber wingwalls. This includes the sheet material retaining the embankment. This is for all timber wingwalls regardless of protective systems.</b>
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<b>UNIT OF MEASURE</b>	<b>EA</b>
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<b>TIMBER</b>		<b>CONDITION STATES</b>			
<b>DEFECT</b>		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
		<b>GOOD</b>	<b>FAIR</b>	<b>POOR</b>	<b>SEVERE</b>
<b>1020</b>	Connection	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
<b>1140</b>	Decay/ Section Loss	None	Affects less than 10% of the member section.	Affects 10% or more of the member but does not warrant structural review.	
<b>1150</b>	Check / Shake	Surface penetration less than 5% of the member thickness regardless of location.	Penetrates 5% to 50% of the thickness of the member and not in a tension zone.	Penetrates more than 50% of the thickness of the member or more than 5% of the member thickness in a tension zone. Does not warrant structural review.	
<b>1160</b>	Crack (Timber)	None	Crack has been arrested through effective means.	Identified crack that is not arrested but does not require structural review.	
<b>1170</b>	Split / Delamination (Timber)	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.	

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<b>VDOT ELEMENT NUMBER</b>	<b>826</b>
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<b>VDOT ELEMENT NAME</b>	<b>TIMBER WINGWALLS</b>
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<b>TIMBER</b>		<b>CONDITION STATES</b>			
<b>DEFECT</b>		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
		<b>GOOD</b>	<b>FAIR</b>	<b>POOR</b>	<b>SEVERE</b>
<b>1180</b>	Abrasion / Wear (Timber)	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.	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
<b>4000</b>	Settlement	None	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits but does not warrant structural review.	
<b>6000</b>	Scour	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.	
<b>7000</b>	Damage	Not Applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate defect entry.	
					The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate defect entry.

<b>VDOT ELEMENT NUMBER</b>	<b>828</b>
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<b>VDOT ELEMENT NAME</b>	<b>MASONRY WINGWALL</b>
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<b>DESCRIPTION</b>	This element defines those wingwalls constructed of block or stone. The block or stone may be placed with or without mortar. This is for all masonry wingwalls regardless of protective systems.
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<b>UNIT OF MEASURE</b>	<b>EA</b>
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<b>MASONRY</b>		<b>CONDITION STATES</b>			
<b>DEFECT</b>		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
		<b>GOOD</b>	<b>FAIR</b>	<b>POOR</b>	<b>SEVERE</b>
<b>1120</b>	Efflorescence/ Rust Staining	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge
<b>1610</b>	Mortar Breakdown (Masonry)	None	Cracking or voids in less than 10% of joints.	Cracking or voids in 10% or more of the joints.	
<b>1620</b>	Split / Spall (Masonry)	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.	
<b>1630</b>	Patched Area (Masonry)	None	Sound patch.	Unsound patch.	
<b>1640</b>	Masonry Displacement	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.	
<b>4000</b>	Settlement	None	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits but does not warrant structural review.	

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<b>VDOT ELEMENT NUMBER</b>	<b>828</b>
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<b>VDOT ELEMENT NAME</b>	<b>MASONRY WINGWALL</b>
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<b>MASONRY</b>		<b>CONDITION STATES</b>			
<b>DEFECT</b>		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
		<b>GOOD</b>	<b>FAIR</b>	<b>POOR</b>	<b>SEVERE</b>
<b>6000</b>	Scour	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.	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
<b>7000</b>	Damage	Not Applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate defect entry.

<b>VDOT ELEMENT NUMBER</b>	<b>830</b>
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<b>VDOT ELEMENT NAME</b>	<b>MSE WALL</b>
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<b>DESCRIPTION</b>	This element defines those walls constructed with facing and various combinations of geotechnical materials and reinforcement materials. This Element replaces the old MSE Abutment and MSE Wingwall Elements.
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<b>UNIT OF MEASURE</b>	<b>LF</b>
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<b>MSE WALL</b>		<b>CONDITION STATES</b>			
<b>DEFECT</b>		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
		<b>GOOD</b>	<b>FAIR</b>	<b>POOR</b>	<b>SEVERE</b>
<b>1080</b>	Delamination/ Spall/Patched Area	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
<b>1090</b>	Exposed Rebar	None	Present without measurable section loss.	Present with measurable section loss but does not warrant structural review.	
<b>1120</b>	Efflorescence/ Rust Staining	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
<b>1130</b>	Cracking (RC and Other)	Width less than 0.012 in. or spacing greater than 3.0 ft.	Width 0.012 - 0.05 in. or spacing of 1.0 - 3.0 ft.	Width greater than 0.05 in. or spacing of less than 1 ft.	
<b>4000</b>	Settlement	None	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits but does not warrant structural review.	

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<b>VDOT ELEMENT NUMBER</b>	<b>830</b>
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<b>VDOT ELEMENT NAME</b>	<b>MSE WALL</b>
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<b>MSE WALL</b>		<b>CONDITION STATES</b>			
<b>DEFECT</b>		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
		<b>GOOD</b>	<b>FAIR</b>	<b>POOR</b>	<b>SEVERE</b>
<b>6000</b>	Scour	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.	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
<b>6501</b>	Facing Panel Displacement/ Separation	None	Facing panels have shifted slightly out of alignment	Facing panels have shifted significantly out of alignment or are missing and do not warrant structural review.	
<b>6502</b>	Facing Panel Bulging	None	Facing panels have bulged slightly.	Facing panels have bulged significantly and do not warrant structural review.	
<b>6503</b>	Facing Panel Joint Opening	None	Facing Panel Joints have minor openings.	Facing panel joints have significant joint openings and do not warrant structural review.	
<b>7000</b>	Damage	Not Applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate defect entry.	
					The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate defect entry.



<b>VDOT ELEMENT NUMBER</b>	<b>831</b>
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<b>VDOT ELEMENT NAME</b>	<b>CULVERT ENDWALL/HEADWALL</b>
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<b>DESCRIPTION</b>	<b>This Element defines culvert endwalls/headwalls of any material.</b>
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<b>UNIT OF MEASURE</b>	<b>EA</b>
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<b>STEEL</b>		<b>CONDITION STATES</b>			
<b>DEFECT</b>		<b>1 GOOD</b>	<b>2 FAIR</b>	<b>3 POOR</b>	<b>4 SEVERE</b>
<b>1000</b>	Corrosion	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
<b>1010</b>	Cracking	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.	
<b>1020</b>	Connection	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 structural review.	

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<b>VDOT ELEMENT NUMBER</b>	<b>831</b>
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<b>VDOT ELEMENT NAME</b>	<b>CULVERT ENDWALL/HEADWALL</b>
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<b>CONCRETE</b>		<b>CONDITION STATES</b>			
<b>DEFECT</b>		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
		<b>GOOD</b>	<b>FAIR</b>	<b>POOR</b>	<b>SEVERE</b>
<b>1080</b>	Delamination/ Spall/Patched Area	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter and/or a 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
<b>1090</b>	Exposed Rebar	None	Present without measurable section loss.	Present with measurable section loss but does not warrant structural review.	
<b>1120</b>	Efflorescence/ Rust Staining	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
<b>1130</b>	Cracking (RC and Other)	Width less than 0.012 in. or spacing greater than 3.0 ft.	Width 0.012 - 0.05 in. or spacing of 1.0 - 3.0 ft.	Width greater than 0.05 in. or spacing of less than 1 ft.	
<b>1190</b>	Abrasion/Wear (PSC/RC)	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.	

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<b>VDOT ELEMENT NUMBER</b>	<b>831</b>
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<b>VDOT ELEMENT NAME</b>	<b>CULVERT ENDWALL/HEADWALL</b>
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<b>TIMBER</b>		<b>CONDITION STATES</b>			
<b>DEFECT</b>		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
		<b>GOOD</b>	<b>FAIR</b>	<b>POOR</b>	<b>SEVERE</b>
<b>1020</b>	Connection	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
<b>1140</b>	Decay/Section Loss	None	Affects less than 10% of the member section.	Affects 10% or more of the member but does not warrant structural review.	
<b>1150</b>	Check / Shake	Surface penetration less than 5% of the member thickness regardless of location.	Penetrates 5% to 50% of the thickness of the member and not in a tension zone.	Penetrates more than 50% of the thickness of the member or more than 5% of the member thickness in a tension zone. Does not warrant structural review.	
<b>1160</b>	Crack (Timber)	None	Crack has been arrested through effective means.	Identified crack that is not arrested but does not require structural review.	
<b>1170</b>	Split / Delamination (Timber)	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.	
<b>1180</b>	Abrasion / Wear (Timber)	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.	

(continues)

<b>VDOT ELEMENT NUMBER</b>	<b>831</b>
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<b>VDOT ELEMENT NAME</b>	<b>CULVERT ENDWALL/HEADWALL</b>
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<b>MASONRY</b>		<b>CONDITION STATES</b>			
<b>DEFECT</b>		<b>1 GOOD</b>	<b>2 FAIR</b>	<b>3 POOR</b>	<b>4 SEVERE</b>
<b>1120</b>	Efflorescence/ Rust Staining	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	The condition warrants a structural review to determine the effect on strength or serviceability of the element or bridge; OR a structural review has been completed and the defects impact strength or serviceability of the element or bridge
<b>1610</b>	Mortar Breakdown (Masonry)	None	Cracking or voids in less than 10% of joints.	Cracking or voids in 10% or more of the joints.	
<b>1620</b>	Split/Spall (Masonry)	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.	
<b>1630</b>	Patched Area (Masonry)	None	Sound patch.	Unsound patch.	
<b>1640</b>	Masonry Displacement	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.	

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<b>VDOT ELEMENT NUMBER</b>	<b>831</b>
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<b>VDOT ELEMENT NAME</b>	<b>CULVERT ENDWALL/HEADWALL</b>
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<b>ALL</b>		<b>CONDITION STATES</b>			
<b>DEFECT</b>		<b>1 GOOD</b>	<b>2 FAIR</b>	<b>3 POOR</b>	<b>4 SEVERE</b>
<b>1220</b>	Deterioration (Other)	None	Initiated breakdown or deterioration.	Significant deterioration or breakdown 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
<b>1900</b>	Distortion	None	Distortion not requiring mitigation or mitigated distortion.	Distortion that requires mitigation that has not been addressed but does not warrant structural review.	
<b>4000</b>	Settlement	None	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits but does not warrant structural review.	
<b>6000</b>	Scour	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.	
<b>7000</b>	Damage	Not Applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate defect entry.	
					The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate defect entry.

<b>VDOT ELEMENT NUMBER</b>	<b>833</b>
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<b>VDOT ELEMENT NAME</b>	<b>ROADWAY OVER CULVERT</b>
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<b>DESCRIPTION</b>	This Element defines the condition of the roadway over a culvert.
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<b>UNIT OF MEASURE</b>	EA
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<b>ROADWAY OVER CULVERT</b>		<b>CONDITION STATES</b>			
		<b>1 GOOD</b>	<b>2 FAIR</b>	<b>3 POOR</b>	<b>4 SEVERE</b>
<b>DEFFECT</b>					
<b>3210</b>	Delamination/ Spalls/Patched Area/Pothole (Wearing Surfaces)	None	Delaminated. Spall less than 1 in. deep or less than 6 in. 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 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
<b>3220</b>	Crack (Wearing Surface)	Width less than 0.012 in. or spacing greater than 3.0 ft.	Width 0.012 - 0.05 in. or spacing of 1.0 - 3.0 ft.	Width greater than 0.05 in. or spacing of less than 1 ft.	
<b>3230</b>	Effectiveness (Wearing Surface)	Fully effective.	Substantially effective. Deterioration of the wearing surface has slowed.	Limited effectiveness. Deterioration of the wearing surface has progressed.	
<b>4000</b>	Settlement	None	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits but does not warrant structural review.	Roadway over culvert has excessive settlement and a substantial reduction in speed is required to safely negotiate this section of roadway over the culvert.

(continues)

(continued)

<b>VDOT ELEMENT NUMBER</b>	<b>833</b>
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<b>VDOT ELEMENT NAME</b>	<b>ROADWAY OVER CULVERT</b>
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<b>ROADWAY OVER CULVERT</b>		<b>CONDITION STATES</b>			
<b>DEFECT</b>		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
		<b>GOOD</b>	<b>FAIR</b>	<b>POOR</b>	<b>SEVERE</b>
<b>6000</b>	Scour	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.	Roadway over culvert has voids and areas of erosion that may pose a traffic hazard.
<b>7000</b>	Damage	Not Applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate defect entry.

<b>VDOT ELEMENT NUMBER</b>	<b>843</b>
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<b>VDOT ELEMENT NAME</b>	<b>LINK SLAB</b>
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<b>DESCRIPTION</b>	This element defines joint closures constructed at piers,
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<b>UNIT OF MEASURE</b>	EA
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<b>LINK SLAB</b>		<b>CONDITION STATES</b>			
		<b>1 GOOD</b>	<b>2 FAIR</b>	<b>3 POOR</b>	<b>4 SEVERE</b>
<b>1080</b>	Delamination/ Spall/Patched Area	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter and/or a 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
<b>1090</b>	Exposed Rebar	None	Present without measurable section loss.	Present with measurable section loss but does not warrant structural review.	
<b>1120</b>	Efflorescence/ Rust Staining	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
<b>1130</b>	Cracking (RC and Other	Width less than 0.012 in. or spacing greater than 3.0 ft.	Width 0.012 - 0.05 in. or spacing of 1.0 - 3.0 ft.	Width greater than 0.05 in. or spacing of less than 1 ft.	
<b>1190</b>	Abrasion/Wear (PSC/RC)	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.	
<b>2310</b>	Leakage	None	Minimal. Minor dripping through the joint.	Moderate. More than a drip and less than free flow of water.	

(continues)



(continued)

<b>VDOT ELEMENT NUMBER</b>	<b>843</b>
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<b>VDOT ELEMENT NAME</b>	<b>LINK SLAB</b>
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<b>LINK SLAB</b>		<b>CONDITION STATES</b>			
<b>DEFECT</b>		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
		<b>GOOD</b>	<b>FAIR</b>	<b>POOR</b>	<b>SEVERE</b>
<b>7000</b>	Damage	Not Applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate defect entry.

<b>VDOT ELEMENT NUMBER</b>	<b>844</b>
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<b>VDOT ELEMENT NAME</b>	<b>SLAB EXTENSION</b>
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<b>DESCRIPTION</b>	<b>This element defines joint closures constructed at abutments</b>
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<b>UNIT OF MEASURE</b>	<b>EA</b>
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<b>SLAB EXTENSION</b>		<b>CONDITION STATES</b>			
<b>DEFECT</b>		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
		<b>GOOD</b>	<b>FAIR</b>	<b>POOR</b>	<b>SEVERE</b>
<b>1080</b>	Delamination/ Spall/Patched Area	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter and/or a 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
<b>1090</b>	Exposed Rebar	None	Present without measurable section loss.	Present with measurable section loss but does not warrant structural review.	
<b>1120</b>	Efflorescence/ Rust Staining	None	Surface white without build-up or leaching without rust staining.	Heavy build-up with rust staining.	
<b>1130</b>	Cracking (RC and Other	Width less than 0.012 in. or spacing greater than 3.0 ft.	Width 0.012 - 0.05 in. or spacing of 1.0 - 3.0 ft.	Width greater than 0.05 in. or spacing of less than 1 ft.	
<b>1190</b>	Abrasion/Wear (PSC/RC)	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.	
<b>2310</b>	Leakage	None	Minimal. Minor dripping through the joint.	Moderate. More than a drip and less than free flow of water.	

(continues)

(continued)

<b>VDOT ELEMENT NUMBER</b>	<b>844</b>
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<b>VDOT ELEMENT NAME</b>	<b>SLAB EXTENSION</b>
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<b>SLAB EXTENSION</b>		<b>CONDITION STATES</b>			
<b>DEFECT</b>		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
		<b>GOOD</b>	<b>FAIR</b>	<b>POOR</b>	<b>SEVERE</b>
<b>7000</b>	Damage	Not Applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate defect entry.

<b>VDOT ELEMENT NUMBER</b>	<b>845</b>
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<b>VDOT ELEMENT NAME</b>	<b>JOINT EFFECTIVENESS</b>
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<b>DESCRIPTION</b>	This element defines the effectiveness of expansion joints. There are only two Condition States for this element.
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<b>UNIT OF MEASURE</b>	EA
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<b>JOINT EFFECTIVENESS</b>		<b>CONDITION STATES</b>			
<b>DEFECT</b>		<b>1</b>			<b>4</b>
		<b>GOOD</b>			<b>SEVERE</b>
<b>2399</b>	Joint effectiveness	Joints that are functional and have no leaks at any point along the length of the joint or show no evidence of being compromised.			Joints that are non-functional and have leaks along the length of the joint or show evidence of being compromised.

<b>VDOT ELEMENT NUMBER</b>	<b>851</b>
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<b>VDOT ELEMENT NAME</b>	<b>UNPROTECTED SLOPE</b>
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<b>DESCRIPTION</b>	This Element defines slopes under bridges that are <b>NOT</b> protected by an erosion resistant material.
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<b>UNIT OF MEASURE</b>	EA
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<b>UNPROTECTED SLOPE</b>		<b>CONDITION STATES</b>			
<b>DEFECT</b>		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
		<b>GOOD</b>	<b>FAIR</b>	<b>POOR</b>	<b>SEVERE</b>
<b>6505</b>	Unprotected Slope Effectiveness	The element shows little or no erosion.	Minor erosion may have occurred. There is no undermining or exposed piles. There has been no erosion that has exposed the bottom of substructure elements.	Moderate erosion of slope is present but is incidental and does not adversely affect the ability of this element to function as intended. The bottom of the substructure elements may be exposed for insignificant lengths with no undermining or exposed piles.	The slope is no longer functioning as intended. The bottom of the substructure elements are exposed for significant lengths. Piles may be exposed. Substructure elements may be undermined.
<b>4000</b>	Settlement	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
<b>6000</b>	Scour	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.	
<b>7000</b>	Damage	Not Applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate defect entry.

<b>VDOT ELEMENT NUMBER</b>	<b>852</b>
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<b>VDOT ELEMENT NAME</b>	<b>PROTECTED SLOPE - PAVED</b>
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<b>DESCRIPTION</b>	This Element defines slopes under bridges that <u>ARE</u> protected by an erosion resistant material such as precast concrete blocks or cast-in-place concrete.
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<b>UNIT OF MEASURE</b>	<b>EA</b>
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<b>PROTECTED SLOPE - PAVED</b>		<b>CONDITION STATES</b>			
<b>DEFECT</b>		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
		<b>GOOD</b>	<b>FAIR</b>	<b>POOR</b>	<b>SEVERE</b>
<b>6506</b>	Paved Slope Effectiveness	The slope shows little or no deterioration.	Minor cracks, spalls splitting, settlement or joint deterioration may be present, but there is no evidence of undermining of the paved slope.	Moderate deterioration of slope protection. Minor undermining and/or settlement may be present but erosion due to road run-off is still controlled by slope protection.	Advanced deterioration (misalignment, crushing and/or settlement). Undermining of slope protection renders protection largely ineffective.
<b>1080</b>	Delamination / Spall / Patched Area	None	Delaminated. Spall 1 in. or less deep or 6 in. or less in diameter. Patched area 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 analysis.	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
<b>1130</b>	Cracking (RC and Other)	Width less than 0.012 in. or spacing greater than 3.0 ft.	Width 0.012 - 0.05 in. or spacing of 1.0 - 3.0 ft.	Width greater than 0.05 in. or spacing of less than 1 ft.	
<b>1220</b>	Deterioration (Other)	None	Initiated breakdown or deterioration.	Significant deterioration or breakdown but does not warrant structural review.	
<b>4000</b>	Settlement	None	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits but does not warrant structural review.	

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<b>VDOT ELEMENT NUMBER</b>	<b>852</b>
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<b>VDOT ELEMENT NAME</b>	<b>PROTECTED SLOPE - PAVED</b>
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<b>PROTECTED SLOPE - PAVED</b>		<b>CONDITION STATES</b>			
<b>DEFECT</b>		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
		<b>GOOD</b>	<b>FAIR</b>	<b>POOR</b>	<b>SEVERE</b>
<b>6000</b>	Scour	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.	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
<b>7000</b>	Damage	Not Applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate defect entry.

<b>VDOT ELEMENT NUMBER</b>	<b>853</b>
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<b>VDOT ELEMENT NAME</b>	<b>PROTECTED SLOPE - RIPRAP</b>
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<b>DESCRIPTION</b>	This Element defines slopes under bridges that <b>ARE</b> protected by an erosion resistant stone material such as riprap. This element includes combination concrete slab and stone riprap.
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<b>UNIT OF MEASURE</b>	<b>EA</b>
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<b>PROTECTED SLOPE - RIPRAP</b>		<b>CONDITION STATES</b>			
<b>DEFECT</b>		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
		<b>GOOD</b>	<b>FAIR</b>	<b>POOR</b>	<b>SEVERE</b>
<b>6507</b>	Loss of Riprap	None	Less than 10% of slope area exhibits a loss of stones.	10% to 25% of slope area exhibits a loss of stones.	More than 25% of slope area exhibits a loss of stones.
<b>1220</b>	Deterioration (Other)	None	Initiated breakdown or deterioration.	Significant deterioration or breakdown 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
<b>4000</b>	Settlement	None	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits but does not warrant structural review.	
<b>6000</b>	Scour	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.	
<b>7000</b>	Damage	Not Applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate defect entry.



<b>VDOT ELEMENT NUMBER</b>	<b>854</b>
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<b>VDOT ELEMENT NAME</b>	<b>CHANNEL</b>
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<b>DESCRIPTION</b>	This Element defines the channel, stream control devices and channel protective devices such as channel armoring, gabions, grout filled bags and other protective systems.
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<b>UNIT OF MEASURE</b>	EA
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<b>CHANNEL</b>		<b>CONDITION STATES</b>			
		<b>1 GOOD</b>	<b>2 FAIR</b>	<b>3 POOR</b>	<b>4 SEVERE</b>
<b>DEFECT</b>					
<b>1220</b>	Deterioration (Other)	None	Initiated breakdown or deterioration.	Significant deterioration or breakdown 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
<b>4000</b>	Settlement	None	Exists within tolerable limits or arrested with no observed structural distress.	Exceeds tolerable limits but does not warrant structural review.	
<b>6000</b>	Scour	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.	
<b>6500</b>	Debris	None	Minor amount of debris in channel. Less than 10% of the opening is blocked. Debris is not detrimental to the structure and no action is required.	Moderate amount of debris in channel. 10% to 25% of the opening is blocked. Debris is not detrimental to the structure and should be removed as soon as practicable to prevent damage/additional accumulation.	

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<b>VDOT ELEMENT NUMBER</b>	<b>854</b>
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<b>VDOT ELEMENT NAME</b>	<b>CHANNEL</b>
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<b>CHANNEL</b>		<b>CONDITION STATES</b>			
<b>DEFECT</b>		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
		<b>GOOD</b>	<b>FAIR</b>	<b>POOR</b>	<b>SEVERE</b>
<b>6508</b>	Effectiveness of stream control and channel protective devices	Devices are effective with no loss of material.	Devices are effective and up to 10% of device area exhibits a loss of material.	Devices are moderately effective and 10% to 25% of device area exhibits a loss of material.	Devices are not effective and more than 25% of device area exhibits a loss of material.
<b>7000</b>	Damage	Not Applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate defect entry.

<b>VDOT ELEMENT NUMBER</b>	<b>886</b>
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<b>VDOT ELEMENT NAME</b>	<b>BEAM/GIRDER END PROTECTIVE COATING - STEEL</b>
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<b>DESCRIPTION</b>	This Element is for the last five feet of the steel beam/girder ends that have a protective coating such as paint, galvanization, weathering steel patina or other top coat steel corrosion inhibitor. Measurement shall begin at the end of the beam/girder and continue out toward the center of the structure.
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<b>UNIT OF MEASURE</b>	<b>EA</b>
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<b>BEAM/GIRDER END PROTECTIVE COATING - STEEL</b>		<b>CONDITION STATES</b>			
<b>DEFECT</b>		<b>1</b>	<b>2</b>	<b>3</b>	<b>4</b>
		<b>GOOD</b>	<b>FAIR</b>	<b>POOR</b>	<b>SEVERE</b>
<b>3410</b>	Chalking (Steel Protective Coatings)	None	Surface Dulling.	Loss of Pigment	Not applicable.
<b>3420</b>	Peeling / Bubbling / Cracking (Steel Protective Coatings)	None	Finish coats only.	Finish and Primer coats.	Exposure of bare metal.
<b>3430</b>	Oxide Film Duration Color / Texture Adherence (Steel Protective Coatings)	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.
<b>3440</b>	Effectiveness (Steel Protective Coatings)	Fully effective.	Substantially effective.	Limited effectiveness.	Failed; no protection of the underlying metal.
<b>7000</b>	Damage	Not Applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate defect entry.

VDOT ELEMENT NUMBER	887
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VDOT ELEMENT NAME	BEAM/GIRDER END PROTECTIVE COATING - CONCRETE
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DESCRIPTION	This Element is for the last five feet of the concrete beam/girder ends that have a protective coating such as epoxy or any other top coat barrier that protects the concrete from deterioration and reinforcing steel corrosion. Measurement shall begin at the end of the beam/girder and continue out toward the center of the structure.
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UNIT OF MEASURE	EA
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BEAM/GIRDER END PROTECTIVE COATING - CONCRETE		CONDITION STATES			
DEFECT		1 GOOD	2 FAIR	3 POOR	4 SEVERE
3510	Wear (Concrete Protective Coatings)	None	Underlying concrete not exposed, coating showing wear from UV exposure.	Underlying concrete is not exposed; thickness of coating is reduced.	Underlying concrete exposed. Protective coating is no longer effective.
3540	Effectiveness (Concrete Protective Coatings)	Fully effective.	Substantially effective.	Limited effectiveness.	The protective system has failed or is no longer effective.
7000	Damage	Not Applicable	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 2 under the appropriate defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 3 under the appropriate defect entry.	The element has impact damage. The specific damage caused by the impact has been captured in Condition State 4 under the appropriate defect entry.

## OVERLAPPING DEFECTS

Defects will often overlap. The most obvious case is where two defects occur in the exact same place, a classic example would be exposed rebar in a spall. A less obvious case would be where two defects occur next to each other in the same area. An example would be a one foot section of a girder with cracking and a spall, but the cracking doesn't run through the spall. We can't count this one foot area twice, once for the spall and once for the cracking. That would give us two feet of defects where we have only one foot of element.

In cases where defects overlap, we can only report one defect. The following will assist the inspector in deciding which defect shall be reported. When there are two or more defects in the same area (overlap) then the one in the worst condition state trumps the others. If the worst defect in an area is in Condition State 3, then that portion of the element is in condition state 3 regardless of how many other Condition State 2 defects share that space with the Condition State 3 defect. In any given area where multiple defects exist only the worst defect will be 'rolled-up' for that area.

This rule works fine until a situation occurs when more than one defect falls into the same condition state in an area i.e. there is a "tie". VDOT has created a hierarchy for these situations to aid the inspector in deciding which defect controls in a tie. This hierarchy should be viewed as a guideline in deciding which defect is the most "important" in any given situation, not as a set of hard and fast rules. Ultimately, inspectors must use their own judgment.

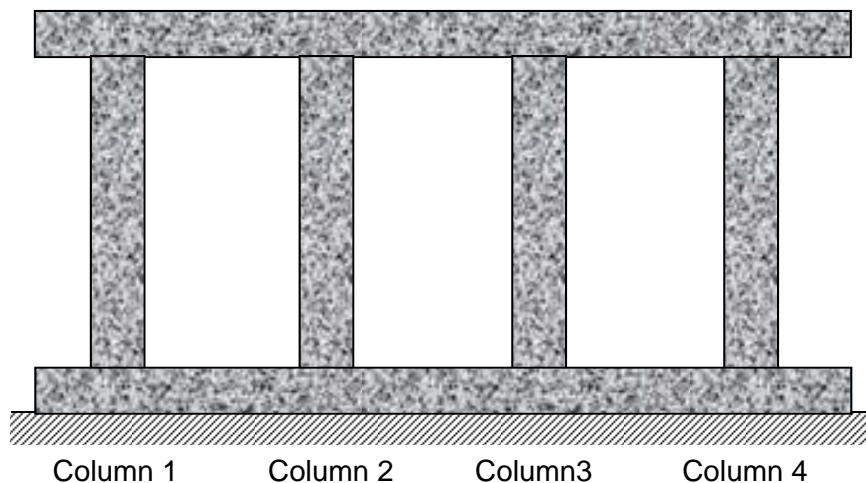
One thing to keep in mind in selecting a controlling defect in a tie is the relative extent of the defects over the element. An example would be a situation where there is a steel girder with cracking and corrosion defects, both in Condition State 3. The cracking occurs in the last foot of the element, the corrosion over the last 10 feet. The two defects occur together only in the last foot. If the inspector decides corrosion controls, then 10 feet of Condition State 3 corrosion is reported, the cracking is not reported at all. If the inspector decides cracking controls, 9 feet of Condition State 3 corrosion and one foot of Condition State 3 cracking are reported. The second solution may be more desirable.

Elements with a unit of "Each" are handled differently. "Each" elements are viewed as a group of indivisible individuals. For example, with columns there can be one column, there can be two columns, there can't be 1.5 columns. Each individual column is entirely in one and only one condition state. Each column can have one and only one defect 'rolled-up' to the Element. If two Condition State 3 defects occur on an individual column, only one can be reported, regardless of the relative extent of the two defects. The inspector will need to decide which is the bigger "threat" for that column and report that defect on that column.

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(continued)

An example may be in order.



**Column 1**

Pristine Condition

**Column 2**

Pristine Condition

**Column 3**

Number of CS 3 spalls  
A large amount of CS 2 cracking

**Column 4**

A minimal amount of CS 2 spalls  
CS 3 cracking over all of column

**TOTALS REPORTED**

CS1 = 2 (Columns 1 and 2 – Pristine Condition)  
CS2 = 1 (Column 4 CS2 spalling controls over CS3 cracking)  
CS3 = 1 (Column 3 - CS3 because in this column spalling trumps CS2 cracking)

**Note that all defects/conditions stated above must be reported in the inspection report in a manner that makes comparing the defects reported as simple as possible during the next inspection. That may be a chart, table or a narrative.**

What follows are the defects noted in hierarchy format to assist the inspector. As stated previously, inspectors must use their own judgment and use this only as a variable guide.

## DEFECT HIERARCHY

What follows are the defects noted in hierarchy format to assist the inspector in determining which defect may take precedence over another when the condition states of two different defects for the same Element are the same. This will be used for VDOT and AASHTO Defects. As stated previously, inspectors must use their own judgment and use this only as a variable guide.

### **Reinforced Concrete**

#### **Decks**

- 1090 - Exposed Conc. Rebar
- 1080 - Delamination/Spall/Patched Area
- 6504 - Wheel Track Rutting (Asphaltic Plug Joint)
- 1120 - Efflorescence/Rust Staining
- 1130 - Cracking
- 7000 - Damage
- 2000 - Deck Drainage System Effectiveness (VDOT Defect)
- 1190 - Abrasion/Wear

#### **Superstructure**

- 7000 - Damage
- 1900 - Distortion
- 1090 - Exposed Conc. Rebar
- 1080 - Delamination/Spall/Patched Area
- 1120 - Efflorescence/Rust Staining
- 1130 - Cracking

#### **Substructure**

- 7000 - Damage
- 6000 - Scour
- 4000 - Settlement
- 1090 - Exposed Concrete Rebar
- 1080 - Delamination/Spall/Patched Area
- 1120 - Efflorescence/Rust Staining
- 1130 - Cracking
- 6501 - Facing Panel Displacement/Separation (VDOT Defect)
- 6502 - Facing Panel Bulging (VDOT Defect)
- 6503 - Facing Panel Joint Opening (VDOT Defect)
- 1190 - Abrasion/Wear

### **Prestressed Concrete**

#### **Decks**

- 1100 - Exposed Prestressing
- 1090 - Exposed Conc. Spalls/Delaminations Rebar
- 1080 - Delamination/Spall/Patched Area
- 1120 - Efflorescence/Rust Staining
- 1110 - Cracking
- 7000 - Damage
- 1190 - Abrasion

## **Superstructure**

- 7000 - Damage
- 1100 - Exposed Prestressing
- 1090 - Exposed Conc. Rebar
- 1080 - Delamination/Spall/Patched Area
- 1120 - Efflorescence/Rust Staining
- 1110 - Cracking

## **Substructure**

- 7000 - Damage
- 6000 - Scour
- 4000 - Settlements
- 1100 - Exposed Prestressing
- 1090 - Exposed Conc. Rebar
- 1080 - Delamination/Spall/Patched Area
- 1120 - Efflor/Rust Staining
- 1110 - Cracking
- 1190 - Abrasion/Wear

## **Timber**

### **Deck**

- 1140 - Decay/Section Loss
- 7000 - Damage
- 1180 - Abrasion/Wear
- 1160 - Cracks
- 1170 - Split/Delamination
- 1020 - Connections
- 1150 - Check/Shake

### **Superstructure**

- 7000 - Damage
- 1140 - Decay/Section Loss
- 1160 -Cracks
- 1170 - Split/Delamination
- 1020 - Connections
- 1150 - Check/Shake
- 1180 - Abrasion/Wear

### **Substructure**

- 6000 - Scour
- 4000 - Settlement
- 1140 - Decay/Section Loss
- 7000 - Damage
- 1180 - Abrasion/Wear
- 1160 - Cracks
- 1170 - Split/Delamination
- 1150 - Check/Shake
- 1020 - Connections



## **Joints**

- 2399 - Joint Effectiveness (VDOT Defect)
- 2310 - Leakage
- 2320 - Seal Adhesion
- 2370 - Metal Deterioration or Damage
- 2330 - Seal Damage
- 2340 - Seal Cracking
- 2360 - Adjacent Deck or Header
- 7000 - Damage
- 2350 - Debris Impact

## **Steel (All Elements)**

- 6000 - Scour (Substructure Only)
- 4000 - Settlement (Substructure Only)
- 1010 - Cracking
- 1020 - Connection
- 1900 - Distortion
- 1000 - Corrosion
- 7000 - Damage

## **Steel Protective Coating**

- 7000 - Damage
- 3440 - Effectiveness (Steel Protective Coatings) – Beam/Girder End Protective Coating Steel
- 3420 -Peeling/Bubbling/Cracking (Steel Protective Coatings) – Beam/Girder End Protective Coating Steel
- 3410 -Chalking (Steel Protective Coatings) – Beam/Girder End Protective Coating Steel)
- 3430 -Oxide Film Duration Color/Texture Adherence (Steel Protective Coatings) – Beam/Girder End Protective Coating Steel

## **Concrete Protective Coating**

- 7000 - Damage
- 3540 - Effectiveness (Concrete Protective Coatings – Beam/Girder End Protective Coating - Concrete
- 3510 - Wear (Concrete Protective Coatings) – Beam/Girder End Protective Coating – Concrete

### **Masonry (All Elements)**

- 6000 - Scour
- 4000 - Settlement
- 7000 - Damage
- 1640 - Masonry Displacement
- 1080 - Spalls/Delaminations/Patches
- 1620 - Split/Spall
- 1630 - Patched Area
- 1610 - Mortar Breakdown
- 1900 Distortion
- 1120 Efflorescence/Rust Staining

### **Other (All Elements)**

- 6000 - Scour (Substructure Only)
- 4000 - Settlement (Substructure Only)
- 1900 - Distortion
- 7000 - Damage
- 1010 - Cracking
- 1020 - Connection
- 1220 - Deterioration
- 1120 - Efflorescence/Rust Staining
- 1080 - Spalls/Delaminations/Patches
- 1130 - Cracking
- 1000 - Corrosion

### **Bearings (All Elements)**

- 7000 - Damage
- 2220 - Alignment
- 2210 - Movement
- 2240 - Loss of Bearing Area
- 2230 - Bulging, Splitting or Tearing
- 4000 - Settlement
- 1020 - Connection
- 1000 - Corrosion

### **Roadway over Culverts**

- 3210 - Delamination/Spalls/Patched Area/Pothole (Roadway)
- 3220 - Crack (Roadway)
- 3230 - Effectiveness (Wearing Surface)

### **Channel**

- 6500 - Debris (Channel) (VDOT Defect)
- 6508 - Effectiveness Of Stream Control/Channel Protective Devices (VDOT Defect)

## **Slope Protection**

- 6505 - Unprotected Slope Effectiveness (VDOT Defect)
- 6506 - Paved Slope Effectiveness (VDOT Defect)
- 6507 - Loss Of Riprap Stone (VDOT Defect)

## **Wearing Surfaces**

- 3230 - Effectiveness (Wearing Surface)
- 3210 - Delaminations/Spall/Patched Area/Pothole (Wearing Surface)
- 3220 - Crack (Wearing Surface)
- 7000 - Damage

# **DEFINITIONS AND GUIDANCE FOR DETERMINING ELEMENTS AND QUANTITIES**

## GENERAL NOTES

Any item placed to provide support until permanent repairs can be made is not to be entered as a Bridge Element. This includes but is not limited to steel or timber bents.

When backwalls or bearing seats consist of a material different from the primary material of the substructure unit, the condition of the backwall or the bearing seat will not be tracked using a Bridge Element or defect.

The Virginia Division Office of FHWA has advised that the unit of measure for Bridge Management Element 515 (Steel Protective Coating) shall be square feet.

## FOOTBRIDGES AND PEDESTRIAN BRIDGES

Footbridges and Pedestrian bridges will be placed in the Bridge Management (BrM) System and NBI ratings are required. However, no elements for either type of structure are required. Element Data may be collected if desired by the District.

## DECK ELEMENTS

### Deck Area

Deck area shall be calculated based on the out-to-out width of the slab and the total length of the bridge (back-to-back of backwalls or end-to-end of slab)

### Decks and Slabs

Deck Elements and Slab Elements are defined separately. Care should be taken to define these elements correctly. Slab Elements are stand-alone structures such as slab spans. Primary structural members, such as steel beams or prestressed beams, support Deck Elements.

### Decks - Multiple

A bridge may be composed of several deck elements i.e. Element 12 – Reinforced Concrete Deck and Element 28 - Steel Deck, Open Grid. For this example, both elements shall be coded.

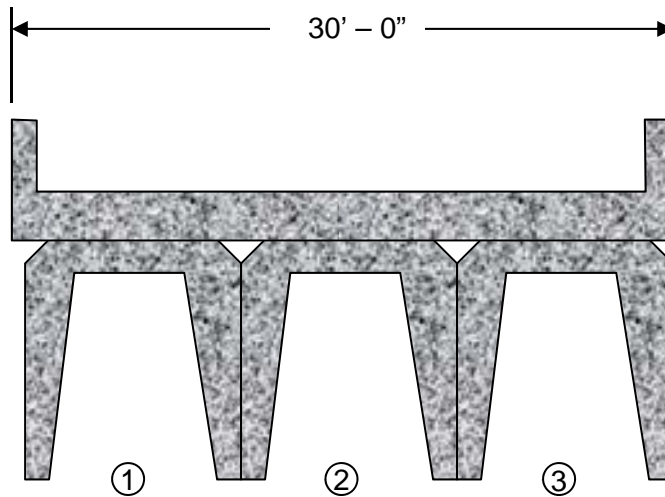
## SUPERSTRUCTURE ELEMENTS

### Determining quantities

This convention applies to all girders, channels, and box girders. The quantity is NOT dependent on the number of visible pairs of girder faces but is determined by the length of the bridge multiplied by the number of girders, beams, channels or box girders.

See example below.

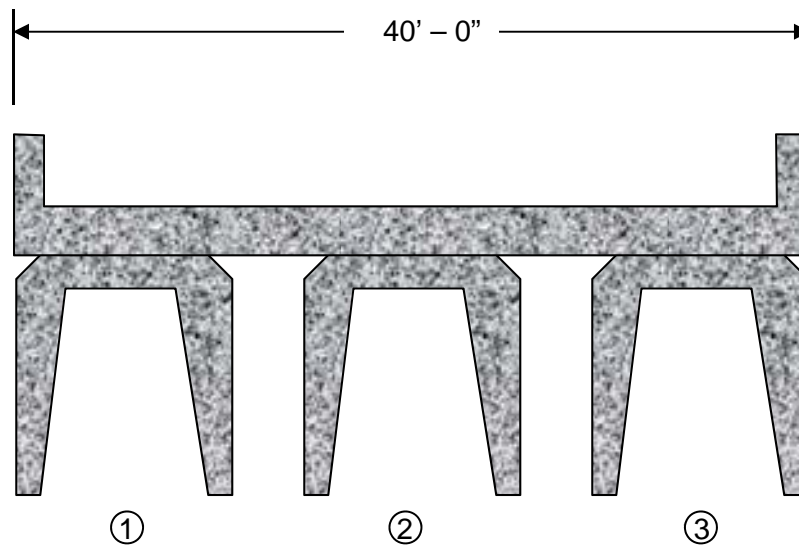
**Example 1:  
Reinforced Channels (Adjacent)**



Since there are three (3) channel beams, the quantity should be the length of the bridge multiplied by 3. For the above figure a bridge that is 25 feet in length and 30 feet wide, the total girder quantity should be 75 feet.

<u>Element #</u>	<u>Element Name</u>	<u>Quantity</u>
110	Reinforced Concrete - Open Girder/Beam	75 LF (3 X 25)
12	Reinforced Concrete Deck	750 SF (30 x 25)

**Example 2:**  
**Reinforced Channels (Spread) (No pre-stressing)**

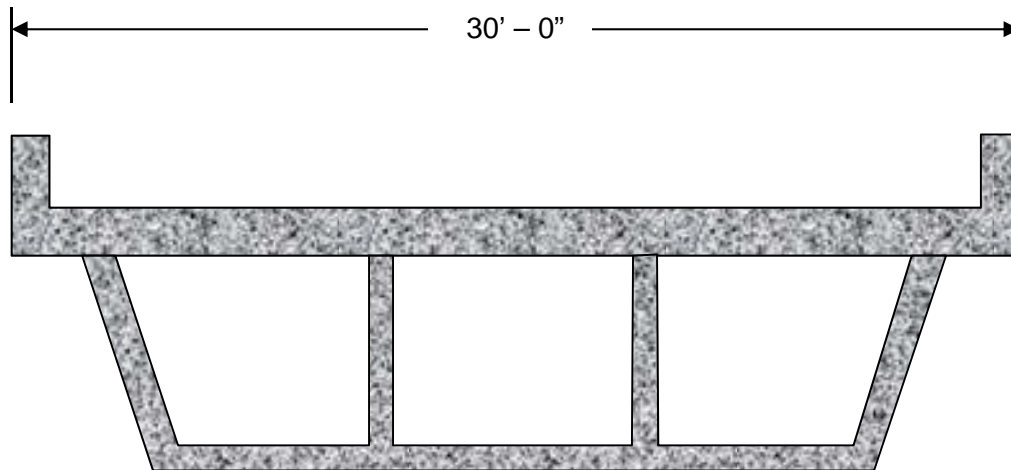


Since there are three (3) channel beams, the quantity should be the length of the bridge multiplied by 3. For the above figure a bridge that is 25 feet in length and 40 feet wide, the total girder quantity should be 75 feet.

<u>Element #</u>	<u>Element Name</u>	<u>Quantity</u>
110	Reinforced Concrete - Open Girder/Beam	75 LF (3 X 25)
12	Concrete Deck	1000 SF (40 x 25)

**Example 3:**

**Cast-in-Place Concrete Multi-cell Box Girders (Reinforced Concrete – Not Pre-Stressed)**



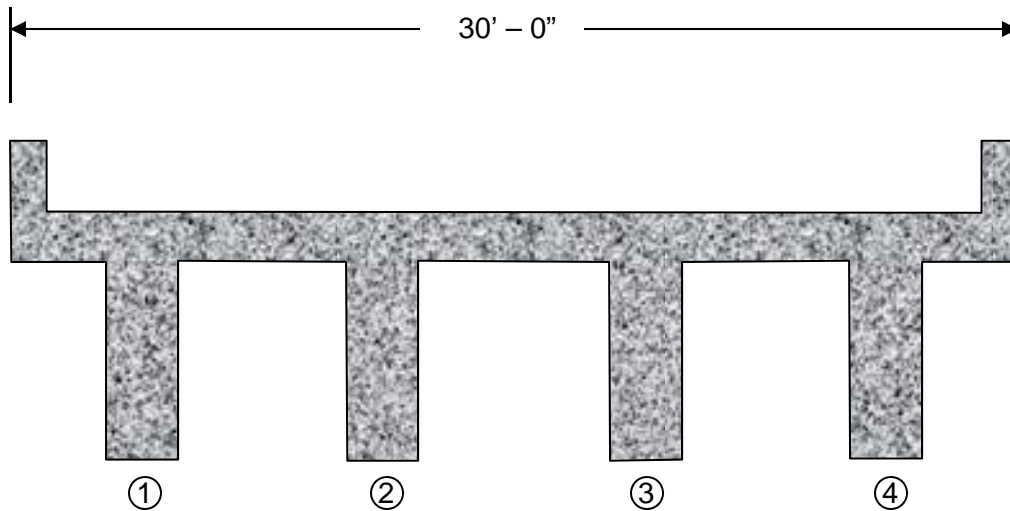
Elements for both the girder and the deck are necessary, even though the unit is integral. A multi-cell box girder is considered to be one girder. For the above figure a bridge that is 25 feet in length and 30 feet wide, the total girder quantity should be 25 feet.

<u>Element #</u>	<u>Element Name</u>	<u>Quantity</u>
105	Reinforced Concrete Closed Web/Box Girder	25 LF (1 X 25)
16	Reinforced Concrete - Top Flange	750 SF (30 x 25)

**Note:**

If an additional composite structural deck is placed on the beam/girder then a deck element would also apply and Element 16 would be removed.

**Example 4:  
Prestressed Concrete Tee Beam**



Elements for both the girder and the deck are necessary, even though the unit is integral. The quantity is the length of the bridge multiplied by 4. For the above figure a bridge that is 25 feet in length and 30 feet wide, the total girder quantity should be 100 feet.

<u>Element #</u>	<u>Element Name</u>	<u>Quantity</u>
109	Pre-stressed Open Concrete Open Girder/Beam	100 LF (4 X 25)
15	Prestressed Concrete - Top Flange	750 SF (30 x 25)

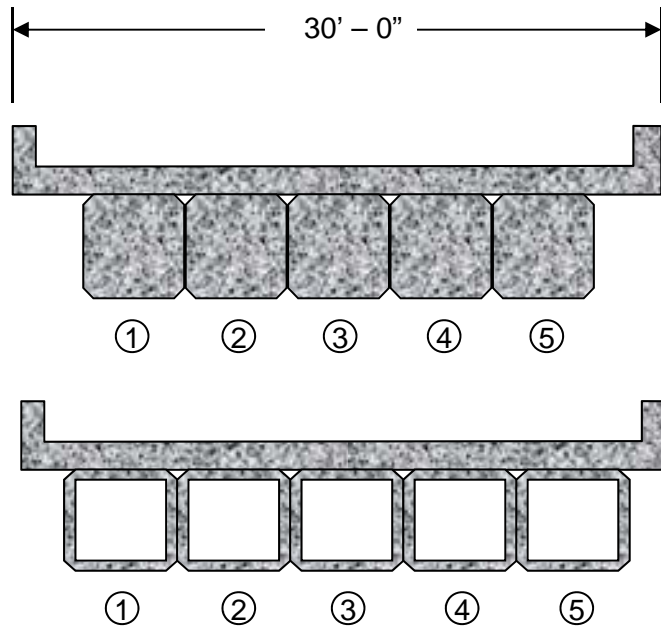
**Note:**

If an additional composite structural deck is placed on the beam/girder then a deck element would also apply and Element 15 would be removed.



**Example 5:**  
**Pre-stressed Concrete Closed Web/Box Girder (Adjacent) (Voided and Un-voided)**  
**with reinforced deck with mild steel.**

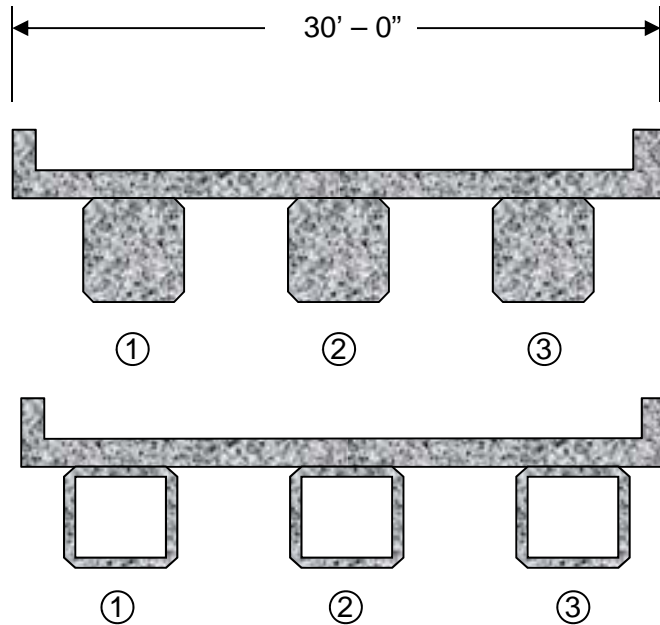
The quantity for box girders is based on the number of girders. A deck element should also be coded.



For each of the above figures a bridge that is 25 feet in length and 30 feet wide, the total girder quantity should be 125 feet.

<u>Element #</u>	<u>Element Name</u>	<u>Quantity</u>
104	Prestressed Concrete Closed Web/Box Girder	125 LF (5 x 25)
12	Reinforced Concrete Deck	750 SF (30 x 25)

**Example 6:**  
**Reinforced Concrete Voided and Unvoided Closed Web/Box Girder (Spread) (NO Pre-stressing)**

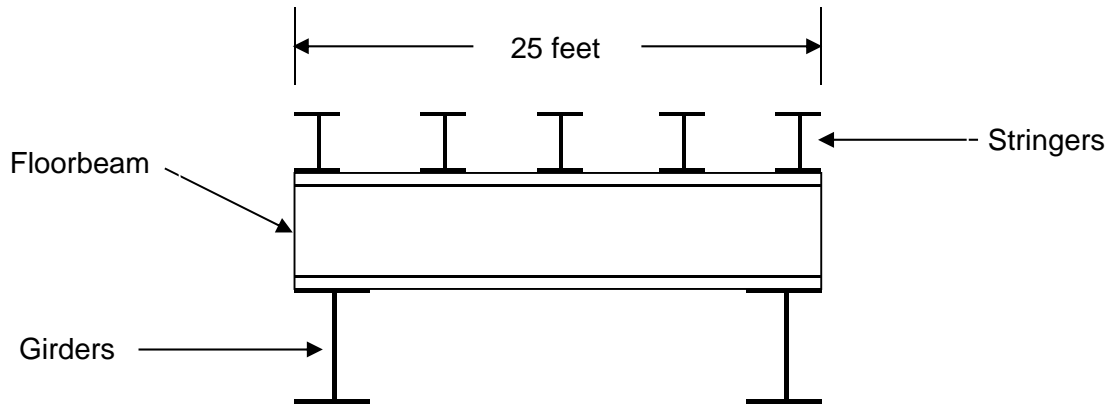


The quantity should be the length of the bridge multiplied by 3. For the above a bridge that is 25 feet in length and 30 feet wide, the total girder quantity should be 75 feet.

<u>Element #</u>	<u>Element Name</u>	<u>Quantity</u>
105	Reinforced Concrete Voided and Unvoided Closed Web/Box Girder	75 LF (3 X 25)
12	Reinforced Concrete Deck/Slab	750 SF (30 x 25)

**Example 7:  
Girders/Stringers/Floor Beams**

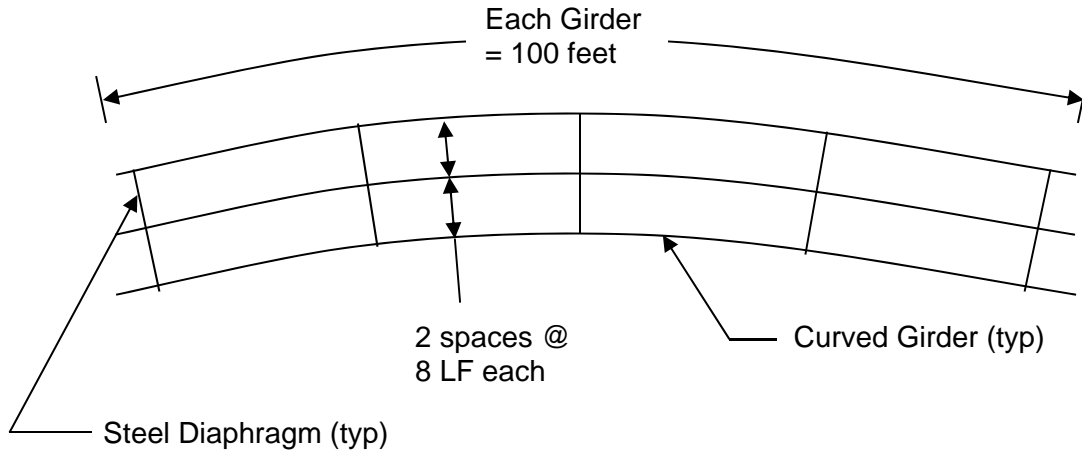
The figure below shows a two-girder bridge that is 50 feet long with three floorbeams that are 25 feet long each and five stringers.



<u>Element #</u>	<u>Element Name</u>	<u>Quantity</u>
107	Steel Open Girder/Beam	100 LF (2 x 50)
113	Steel Stringer	250 LF (5 x 50)
152	Steel Floor Beam	75 LF (3 x 25)

**Example 8:  
Steel Diaphragms/Cross Frames for curved girder systems.**

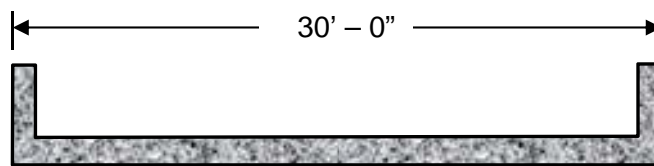
The figure below shows a three girder curved bridge that is 100 feet long with ten diaphragms that are 8 feet long each.



<u>Element #</u>	<u>Element Name</u>	<u>Quantity</u>
813	Steel Diaphragms/Cross Frames for curved girder systems	80 LF (8 x 10)

The quantity for Element 813 Steel Diaphragms is independent of the length of the girder.

**Example 9:  
Reinforced Concrete Slab**



Looking to Abutment A

For the above structure the bridge is 25 feet long and 30 feet wide, the element quantities are as follows:

<u>Element #</u>	<u>Element Name</u>	<u>Quantity</u>
12	Reinforced Concrete Deck / Slab	750 SF (30 x 25)
331	Reinforced Concrete Bridge Railing	50 LF (2 x 25)

## SUBSTRUCTURE ELEMENTS

### Abutments – General

Abutments will be coded using the AASHTO Elements (including Wings) plus the Virginia Agency Developed Elements for wing walls (each).

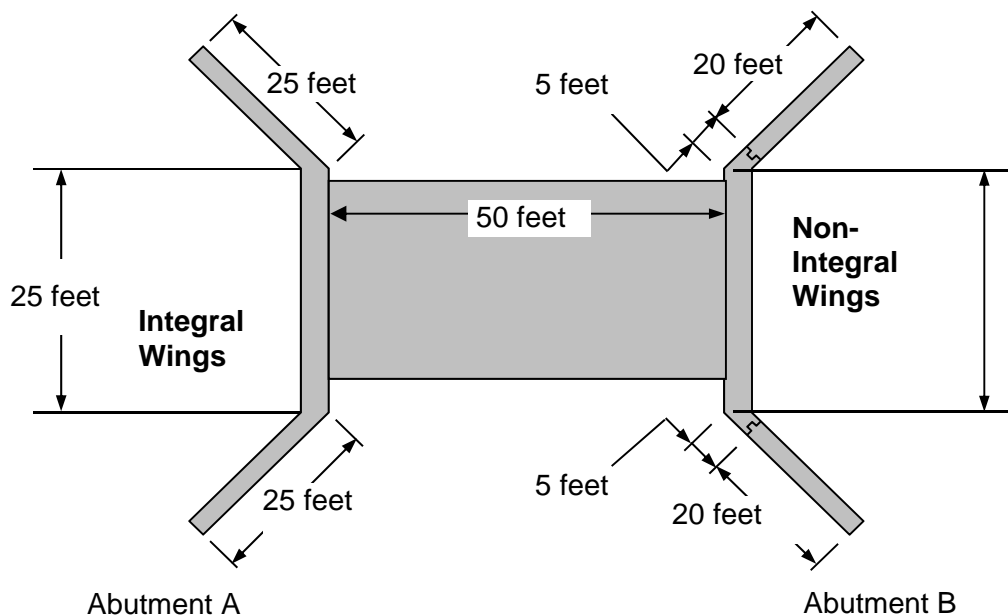
For the purposes of element-level inspections, the condition of backwalls, bearing seats, breast wall, weep holes, and footings are to be considered as a part of the abutment.

Gravity abutments should be coded as reinforced concrete abutments.

Wings will be considered to begin at the wing tip and end at one of the following locations:

- first vertical joint adjacent to the substructure/culvert proper
- break of the wing
- edge of the deck slab

In cases where more than one of the above locations is present on a substructure/culvert element the wingwalls shall be considered to begin at the wing tip and end at the first location reached in the order of the locations shown above.



Example for Reinforced Concrete Abutments

#### Abutment A

Element #	Element Name	Quantity
215	Reinforced Concrete Abutment	75 LF
824	Reinforced Concrete Wingwall	2 Each

#### Abutment B

Element #	Element Name	Quantity
215	Reinforced Concrete Abutment	35 LF (25 + 5 + 5)
824	Reinforced Concrete Wingwall	2 Each

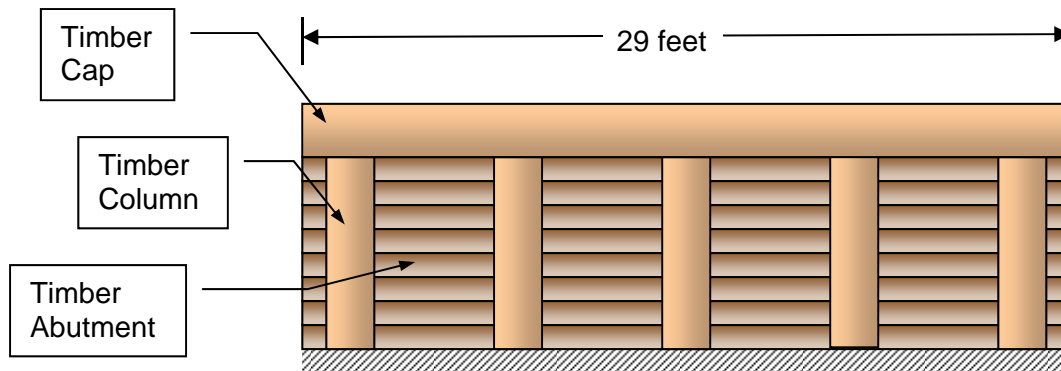
## Timber Abutments/Bents/Piers/Pile Bents, Etc.

### General

The condition of all diagonal/cross bracing on substructure units should be considered in rating the condition of the appropriate substructure unit (columns, piles, etc.). In the event that the bracing is deteriorated, deteriorated section of bracing should be considered to be part of the nearest appropriate substructure unit (columns, piles, etc.). Considering the Timber Bent shown below, if there was no decay of the piles, but there was decay of the cross bracing with no loss of strength or indication of deflection, then the element 'Timber Column or Pile Extension' should be placed in condition state 2.

### Timber Abutments

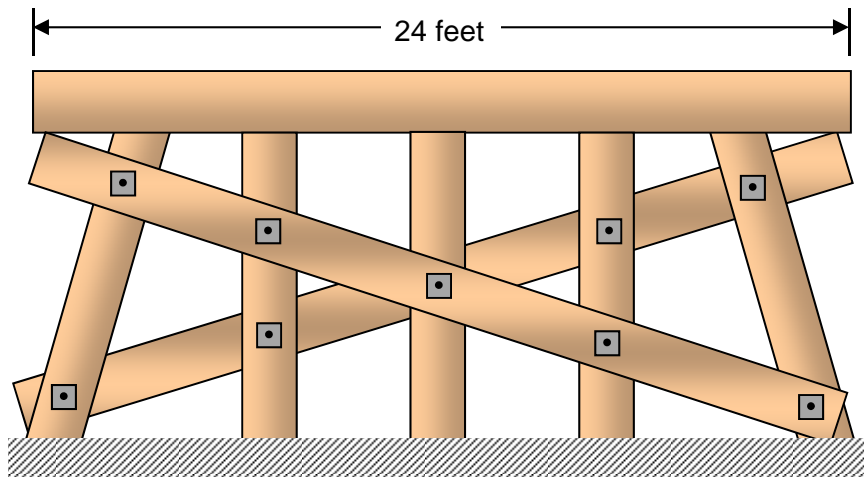
Typically coded as 3 different elements: a timber cap, timber columns, and a timber abutment. The timber abutment in these cases will consist only of the timber lagging of the abutment.



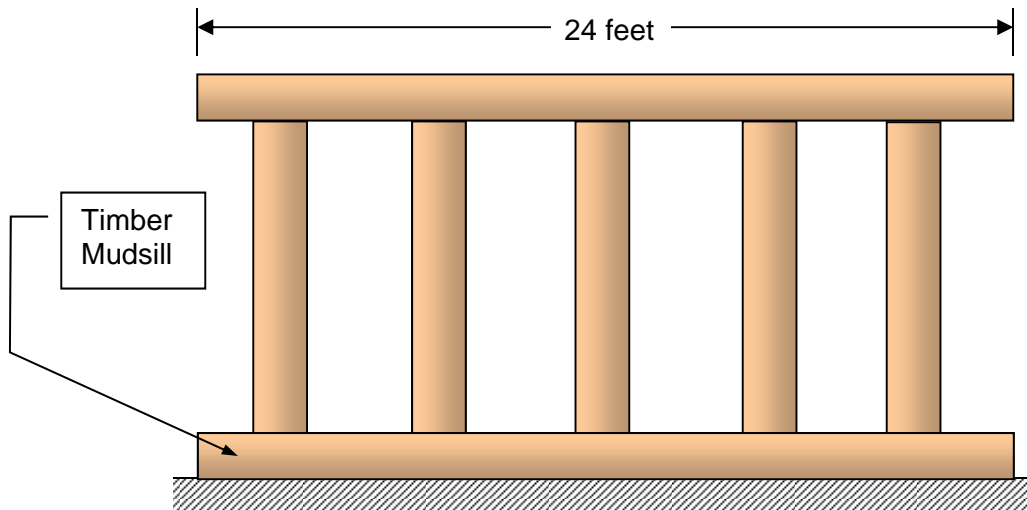
<u>Element #</u>	<u>Element Name</u>	<u>Quantity</u>
235	Timber Cap	29 LF
206	Timber Column	5 EA
216	Timber Abutment	29 LF

### Timber Bents/Piers

Timber mudsills will be considered with the element 'Timber Pier Cap and counted separately. In the example below, if a mudsill existed that was 24 feet wide, the quantity for the element 'Timber Pier Cap' would be 48 feet. See next example.



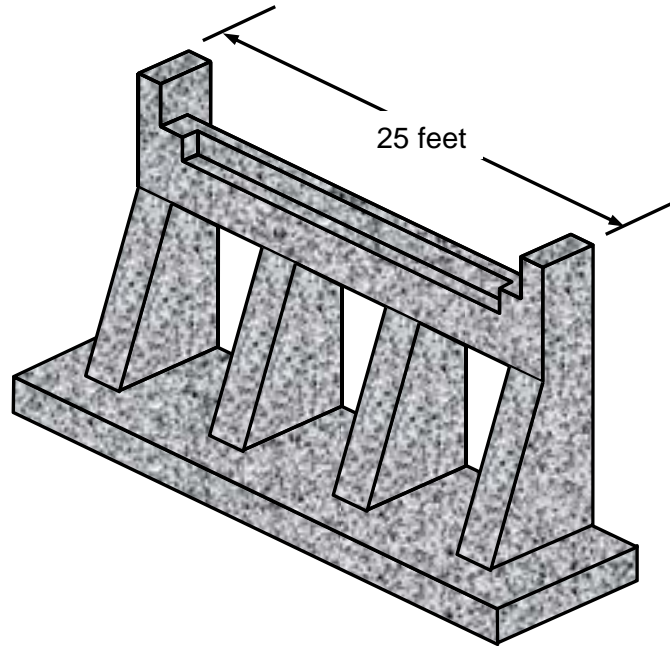
<u>Element #</u>	<u>Element Name</u>	<u>Quantity</u>
206	Timber Column	5 EA
235	Timber Pier Cap	24 FT



<u>Element #</u>	<u>Element Name</u>	<u>Quantity</u>
206	Timber Column	5 EA
235	Timber Pier Cap (includes Mudsill)	48 FT (2 x 24)

## Spill-Through Abutments

If the columns are visible, the abutment should be coded as indicated below. If the columns are present but not directly visible, reasonable efforts should be made to observe the columns. If the columns are still not visible the Element should be coded and the condition state should be coded by other criteria. Destructive or non-destructive testing is not necessarily needed.



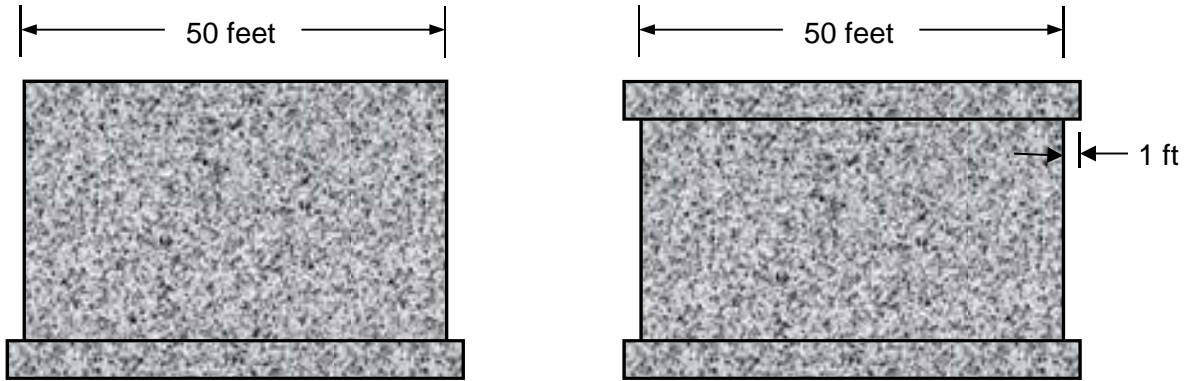
<u>Element #</u>	<u>Element Name</u>	<u>Quantity</u>
234	Reinforced Concrete Pier Cap	25 LF
205	Reinforced Concrete Column	4 EA



## Piers - General

The following piers will have two elements consisting of a cap and either columns/piles or pier walls.

Where there is no clear distinction between the column/pier wall and a cap if there is no cap.



**PIER WALL -NO CAP**

**PIER WALL -WITH CAP**

Example on right above – Pier Wall - With Cap

<u>Element #</u>	<u>Element Name</u>	<u>Quantity</u>
210	Reinforced Concrete Pier Wall	50 LF
234	Reinforced Concrete Cap	52 LF

Example on left above – Pier Wall – No Cap

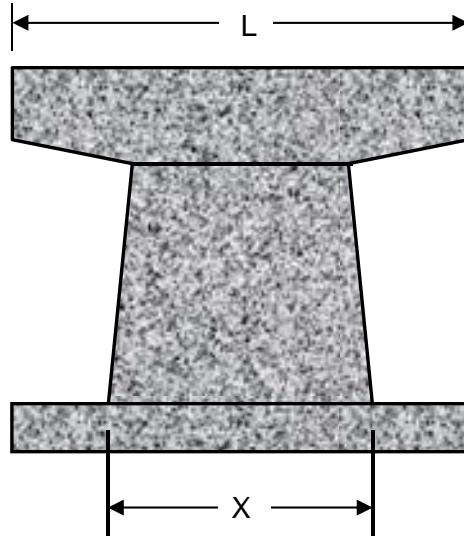
<u>Element #</u>	<u>Element Name</u>	<u>Quantity</u>
210	Reinforced Concrete Pier Wall	50 LF

## Column Bent



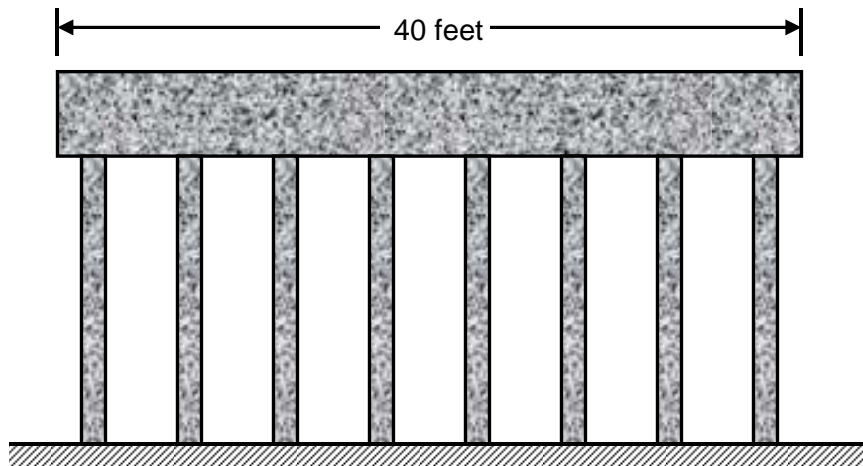
<u>Element #</u>	<u>Element Name</u>	<u>Quantity</u>
205	Reinforced Column or Pile Extension	2 EA
234	Reinforced Concrete Cap	28 LF

**Hammer Head Pier**



<u>Element #</u>	<u>Element Name</u>	<u>Quantity</u>
234	Reinforced Concrete Pier Cap	L FT
205	Reinforced Concrete Column (If X is less than 10 feet)	1 EA
210	Reinforced Concrete Pier Wall (If X is equal to or greater than 10 feet)	L FT

**Pile Bent**

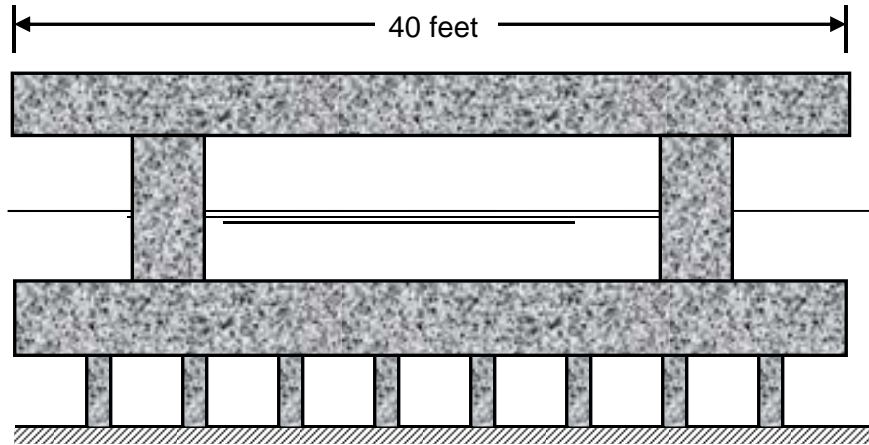


<u>Element #</u>	<u>Element Name</u>	<u>Quantity</u>
234	Reinforced Concrete Cap	40 LF
205	Reinforced Concrete Column	8 EA

## **Column Bent With Submerged Pile Cap**

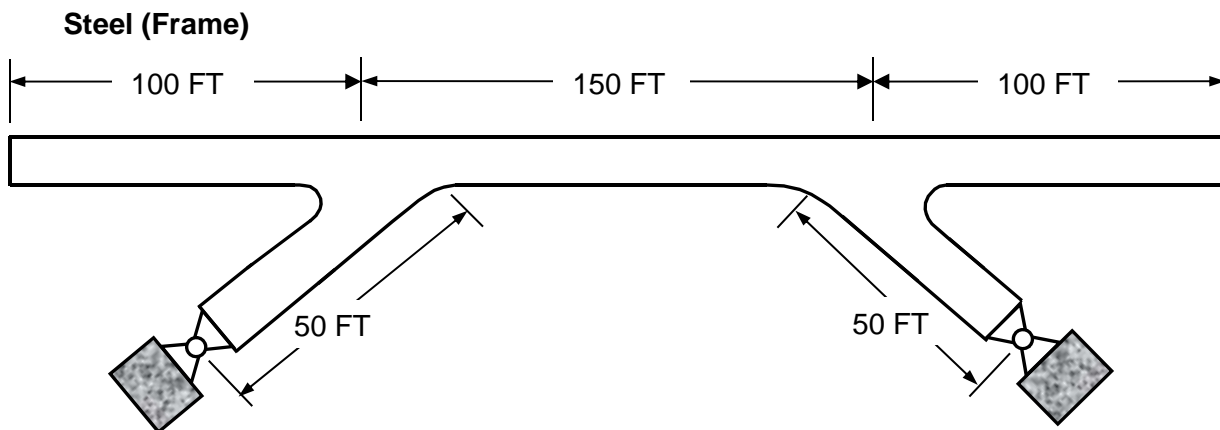
As shown below there can be cases where reinforced concrete pile caps are submerged. In these cases they should be coded using Element 220.

Where an element is intermittently submerged, code as if it were submerged constantly, 'Intermittently submerged' applies to submersion due to tidal action and does not necessarily apply to submersion caused by an occasional flood.



<b><u>Element #</u></b>	<b><u>Element Name</u></b>	<b><u>Quantity</u></b>
234	Reinforced Concrete Cap	40 LF
205	Reinforced Concrete Column	2 EA
220	Reinforced Concrete Pile Cap/Footing	40 LF
227	Reinforced Concrete Pile	8 EA

RIGID FRAMES AND THREE SIDED STRUCTURES

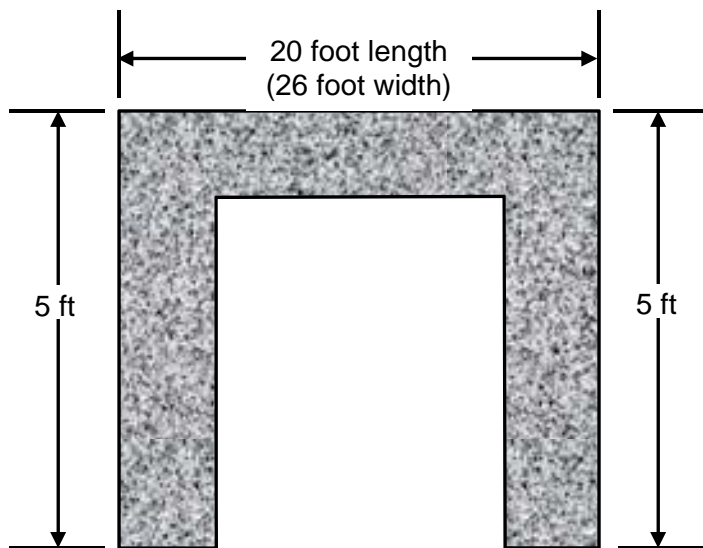


<u>Element #</u>	<u>Element Name</u>	<u>Quantity</u>
107	Steel Open Girder/Beam	450 LF (per girder line)

The legs of the steel frame in this example are included in the overall length of the element ‘Steel Open Girder/Beam’. Any elements located above the bearings are part of the superstructure.

**Concrete (Frame)**

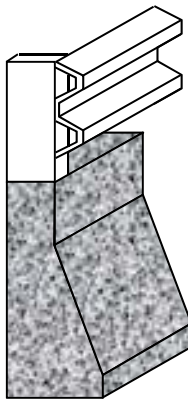
Concrete frames should be coded using the elements for reinforced concrete abutment and reinforced concrete deck/slab.



<u>Element #</u>	<u>Element Name</u>	<u>Quantity</u>
215	Reinforced Concrete Abutment	52 LF
12	Reinforced Concrete Deck / Slab	520 SF

## BRIDGE RAILING, CURBS, SIDEWALKS, MEDIANS AND TERMINAL WALLS

1. Element 333 is no longer used for combination or miscellaneous bridge railing. There are other Elements that will more closely allow this Element to be tracked. See example below.
2. The quantity for bridge railing, curbing, sidewalks, medians and terminal walls are measured from backwall to backwall. Rail posts are NOT to be included in this quantity.
3. If a structure has concrete terminal walls, they should be included in the element 'Concrete Bridge Railing'. Typically, the part of the terminal wall past the backwall is not included in this element. However; in the case of 'U-Back' wings the part of the railing on the 'U-Back will be coded as part of the 'Concrete Bridge Railing'.
4. Sidewalks are defined as being 3 feet wide or greater. This dimension distinguishes the sidewalk from the safety curb.
5. Sidewalks and medians 3 feet wide or greater should be coded as a sidewalk, and included in the sidewalk element.
6. Curbs, sidewalks and medians less than 3 feet in width should be coded as concrete railing and measured in linear feet along the centerline of the bridge.
7. Chain link pedestrian fencing used as safety fence on a structure shall be included with the linear feet of any other steel railing in place. If no other steel railing is in place it shall be coded as a separate steel railing. For example, if a 100 foot long structure has steel railing and a chain link pedestrian fence on each side of the structure, 200 linear feet shall be coded for Element 330 (Metal Bridge Railing). If no other steel railing is in place and there is a chain link pedestrian fence and a concrete bridge railing on each side of the structure, 200 linear feet shall be coded for Element 330 and 200 linear feet shall be coded for Element 331 (Reinforced Concrete Bridge Railing).



Assuming the structure being considered is 70 feet long and there is the railing shown above on each side of the structure, the following shall be coded.

<u>Element #</u>	<u>Element Name</u>	<u>Quantity</u>
330	Metal Bridge Railing	140 LF
331	Reinforced Concrete Bridge Railing	140 LF

## CULVERTS

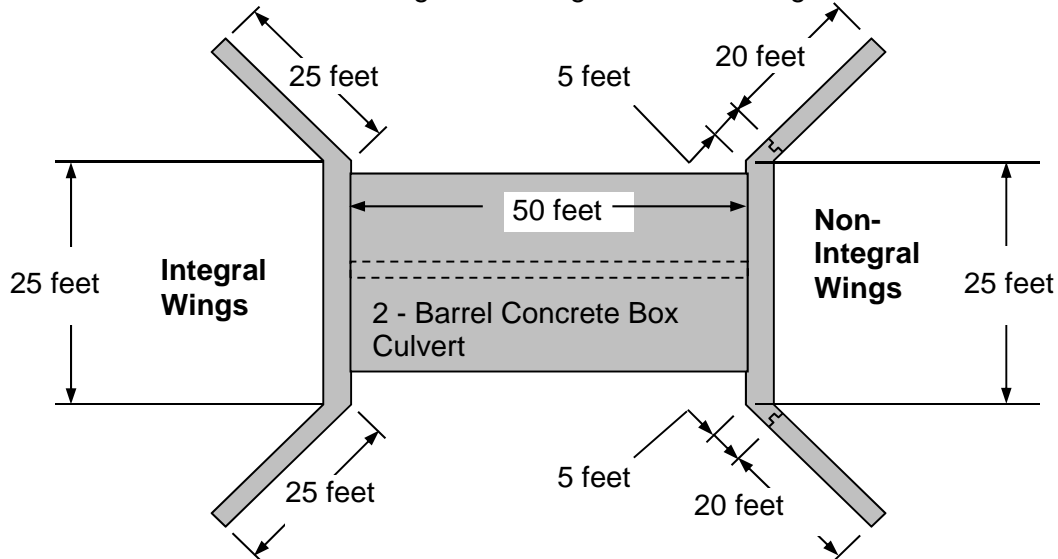
### Wingwalls/Endwalls

Element 831 – Culvert Endwall/Headwall is now to be used for the recording of Culvert Endwalls.

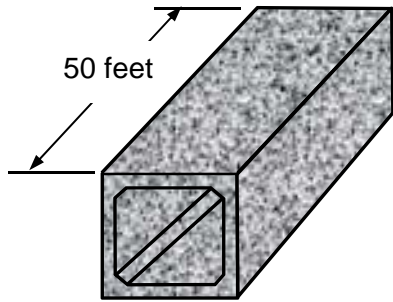
Elements 822, 824, 826, or 828 are now to be used for the recording of Culvert Wingwalls for the appropriate material.

**NOTE:**

For the recording of Wingwalls and Endwalls Element 295 and Smart Flag 298 – Endwalls/Headwalls and Smart Flag 299 – Wingwalls are no longer available.

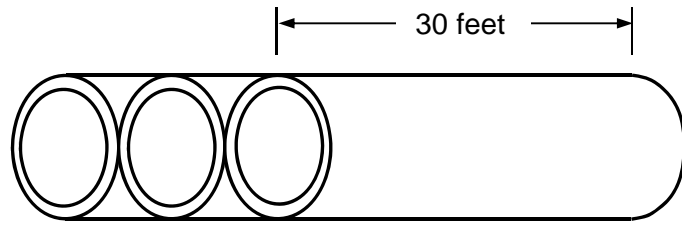


<u>Element #</u>	<u>Element Name</u>	<u>Quantity</u>
241	Reinforced Concrete Culvert	2 x 50 feet = 100 LF
831	Culvert Endwall/Headwall	2 Each
824	Reinforced Concrete Wingwall (Use Element appropriate for the Wingwall material)	4 Each



**Reinforced Concrete Box Culvert**

<u>Element #</u>	<u>Element Name</u>	<u>Quantity</u>
241	Reinforced Concrete Culvert	50 LF



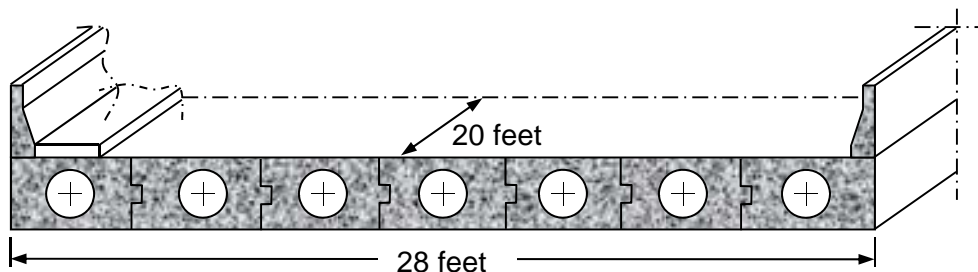
**Metal Pipe Culvert**

**Multiple Metal Pipe Culverts**

<u>Element #</u>	<u>Element Name</u>	<u>Quantity</u>
240	Steel Culvert	3 x 30 = 90 LF

## PRESTRESSED CONCRETE CLOSED WEB/BOX GIRDERS

Element 104 is for both voided and unvoided Prestressed Concrete Girders/Slabs. These slabs should be coded as Element 104 - Prestressed Concrete Closed Web/Box Girders. A top flange Element is also needed. If there is a separate wearing surface it must also be coded so the riding surface can be assessed. Where the girders are not spread and the traffic rides directly on the structural element, regardless of the wearing surface, evaluation of the top flange is considered with element 15- Prestressed Concrete Top Flange or 16-Reinforced Concrete Top Flange. This configuration will NOT typically have a separate deck element.

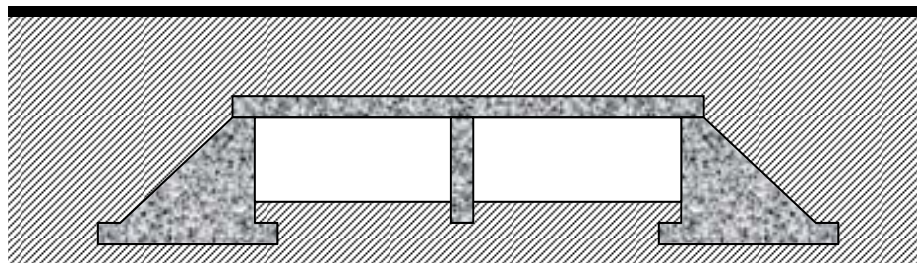


<u>Element #</u>	<u>Element Name</u>	<u>Quantity</u>
104	Prestressed Concrete Closed Web/Box Girders	140 LF (7 x 20)
15	Prestressed Concrete Top Flange	560 SF (20 x 28)
801	Sidewalk	20 SF (1 x 20)
510	Wearing Surface	560 SF (20 x 28)

## SLAB SPANS COVERED WITH FILL

This element also applies to Concrete Deck Arches covered with fill. Even though these structures are covered with fill, deck, superstructure, and substructure elements should be defined as appropriate. Element 65 should be used to report the condition of the slab.

All or part of the top surface will not be visible for inspection, therefore the Element shall be assessed based on the available visible surface, top and/or bottom of the slab. If both top and bottom surfaces are not visible, the condition shall be assessed based on destructive and/or nondestructive testing or indicators in the materials covering the surfaces. Information from other sources may be helpful in coding this Element.



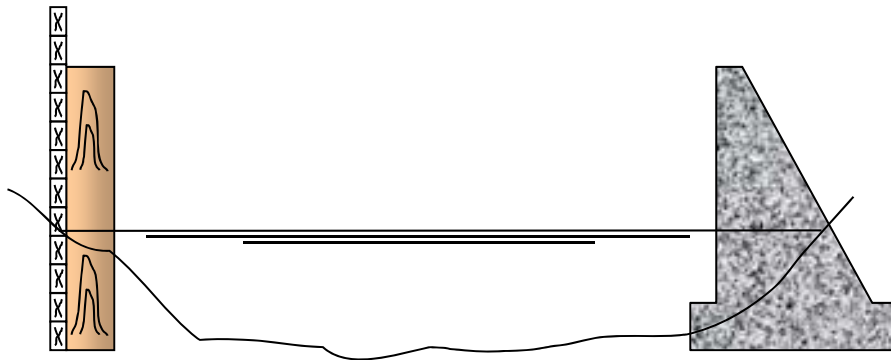
<u>Element #</u>	<u>Element Name</u>	<u>Quantity</u>
65	Other Slab	Area in SF
215	Reinforced Concrete Abutment	Length in LF
210	Reinforced Concrete Pier Wall	Length in LF



## SLOPE ELEMENTS

The slope at each abutment, as applicable, should be considered as a separate unit. Therefore, the quantity for slope will typically be '2'.

For the example shown below where the stream extends to the substructure there will be no slope element.



## TRUSSES

### Determining Quantities

The superstructure of a truss bridge usually consists of two parallel trusses. The quantity is determined by calculating the combined length in linear feet of the parallel trusses. Diagonals, verticals, or cross bracing are not counted as additional quantities.

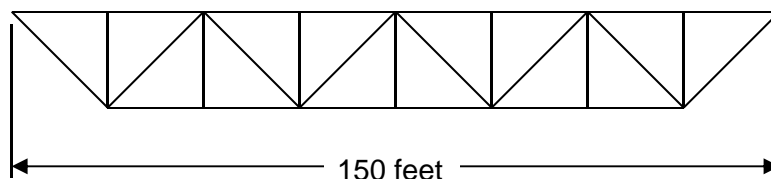
### Total Length

The overall quantity is determined by the length of the bridge multiplied by the number of trusses in each span. See example below.

### Deck Truss

#### NOTE

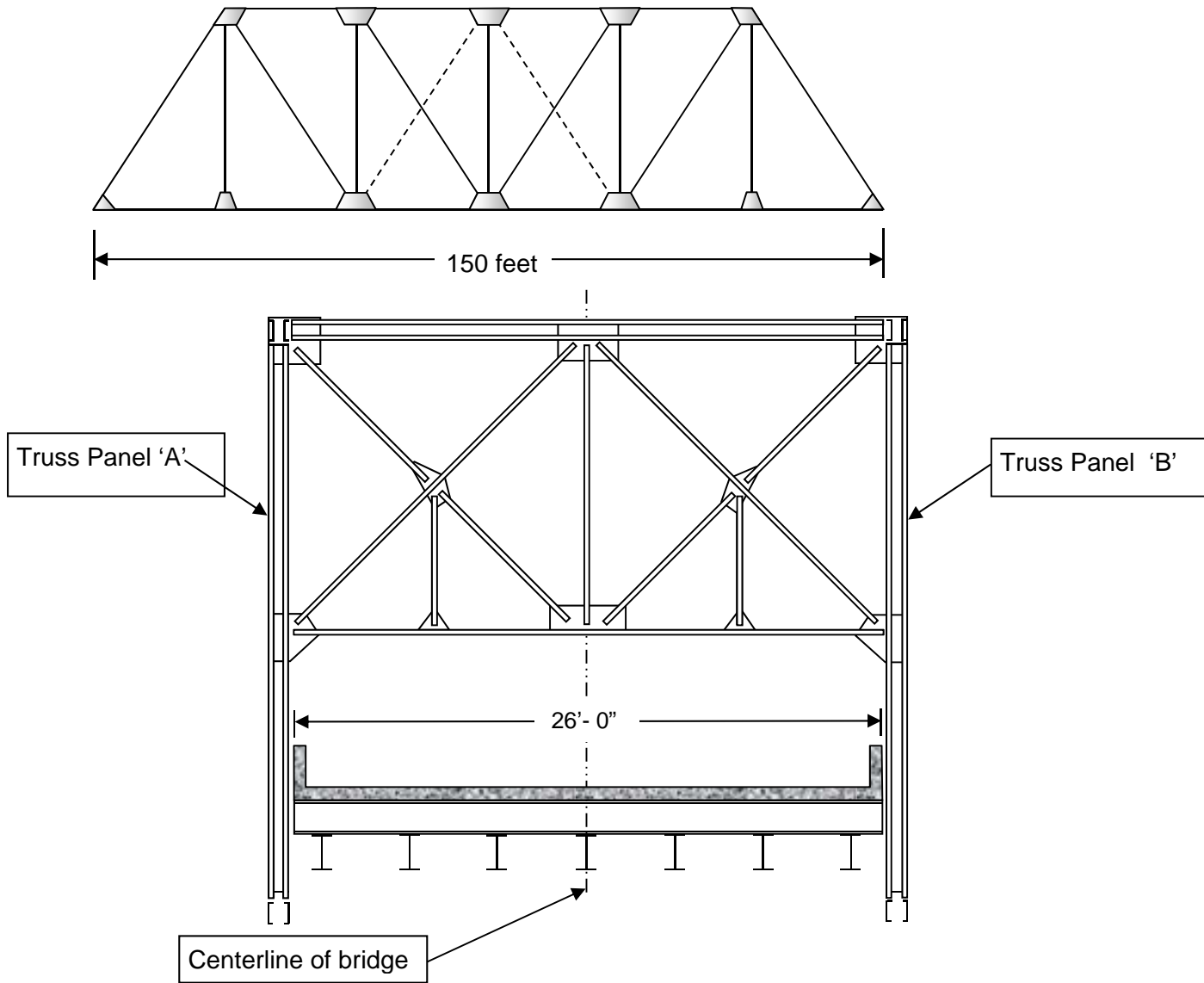
Both Through and Deck trusses are coded using the same Element depending on the material type. The following example is a steel deck truss. Also note the bottom chords are no longer a separate element for through trusses.



<u>Element #</u>	<u>Element Name</u>	<u>Quantity</u>
120	Steel Truss (Regardless of type and protective system)	300 LF (2 x 150)

## Through Truss (includes Pony Trusses)

The following example is for a steel through truss. **NOTE** the bottom chords are no longer a separate element for through trusses.



Trusses 'A' and 'B' are each 150 feet long.

<u>Element #</u>	<u>Element Name</u>	<u>Quantity</u>
12	Reinforced Concrete Deck	3900 LF (150 x 26)
113	Steel Stringer	1050 LF (7 x 150)
120	Steel Truss	300 LF (2 x 150)
162	Steel Gusset Plate	24 EA (2 x 12)
152	Steel Floorbeam	182 LF (7 x 26)

The length of the floor beam shown in this example is for illustration purposes only. The actual length of the floor beam should be measured in the field or determined from the plans.

**The above is not meant to signify all the Elements required for the structure above.**

## Deterioration

All deterioration is measured along the length of the bridge.

## Diagonals

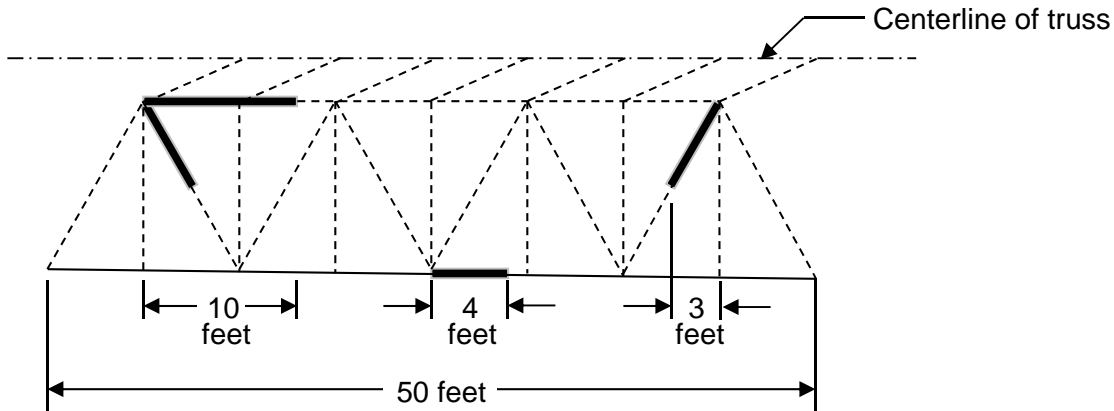
Deterioration of a diagonal member is measured along the length of the bridge and not along the diagonal. The quantity of a deteriorated section in diagonals and verticals that overlap deteriorated section(s) in other parts of the truss should not be double-counted. See example below.

## Portals/Bracing

The quantities of deterioration of portals/bracing should be counted with the truss element. The quantity of a deteriorated section in portals/bracing that overlaps a deteriorated section(s) in other parts of the truss, with which it has been associated, should not be double-counted. The darkened areas in the sketch below indicate areas of deterioration on a member.

## Through Truss (includes Pony Trusses)

The following example is a steel through truss. Quantities of deterioration should include both the left and right side trusses. Note that the deterioration should be measured along the horizontal projection. The severity of the deterioration is indicated by using the appropriate condition state. The quantities listed are the deteriorated portions of the truss.



<u>Element #</u>	<u>Element Name</u>	<u>Quantity</u>	<u>Deterioration</u>
120	Steel Truss	100 Feet (2 x 50)	17 LF (10 + 4 + 3)

## WEIGH SCALE PITS

Scale Pits are no longer inspected by VDOT. The Department of Motor Vehicles (DMV) now has responsibility for the Weigh Scale Pits.

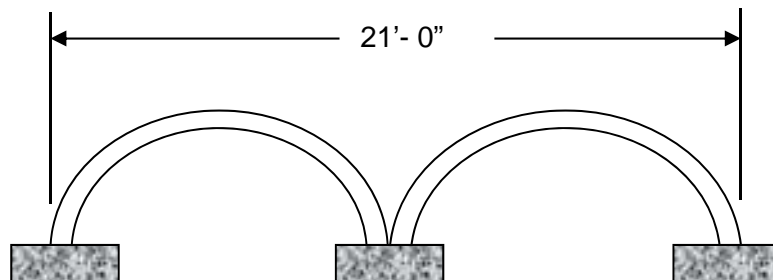
## ARCHES

The quantity for the Arch Elements is the sum of all of the lengths of each arch panel measured longitudinally along the travel way. It is not measured along the length of the barrel. See example below.

For Steel Through Arches, Tied Arches, Deck Arches, etc. there are no separate elements for verticals and diagonals. They shall be included in the arch element i.e. they shall be assessed similar to a truss. Also include other associated steel superstructure elements such as: girders, floor beams, stringers, cables, etc.

For 'Concrete Deck Arches – Covered With Fill' see 'Slab Spans - covered with fill')

In Virginia, arches include 'culverts' with no monolithically poured/constructed bottom.



## WEARING SURFACE

Wearing Surfaces will be coded using the AASHTO element for Wearing Surfaces (Element 510) to record the condition of the Wearing Surface plus Federal Inventory Item 108 to record the type of Wearing Surface.

For something to be called a wearing surface, it must be placed separately from the time the deck is placed. This is the first and most important test. Therefore, monolithically placed concrete (the 1/2" that designers call a wearing surface) is not a wearing surface. The following are examples of wearing surfaces: asphaltic concrete overlays, cementitious overlays and epoxy overlays. There are others not mentioned here.

**EXCEPTIONS** - as defined above for something to be called a wearing surface, it must be placed separately from the time the deck is placed. However, if an application is placed separately from the time the deck is placed and if the design engineer or load rating engineer considered it in the capacity (strength) of the structure, it will not be considered an overlay. Therefore, reinforced cementitious overlays, the concrete placed over prestressed deck panels, and other similar applications are not wearing surfaces and are to be considered part of the deck. See previous box girder example.

While this is in conflict with some of the wording of the Bridge Inspector's Reference Manual (BIRM), the above definitions best suit Virginia's need for this information and will reduce or eliminate coding disparities.

# APPENDICES

# APPENDIX A

## Collection of Element Level Data for National Highway System Bridges



U.S. Department of  
Transportation  
**Federal Highway  
Administration**

Memorandum

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Subject: **Information:** Collection of Element Level Data for  
National Highway System Bridges

Date: March 12, 2013

From: /s/ Original Signed by  
M. Myint Lwin, P.E., S.E.  
Director, Office of Bridge Technology

In Reply HIBT-30  
Refer  
To:

To: Federal Lands Highway Division Engineers  
Director of Technical Services  
Division Administrators

This memorandum provides initial guidance on the collection of element level data for bridges on the National Highway System (NHS). Section 1111 of the Moving Ahead for Progress in the 21st Century Act (MAP-21) modified 23 U.S.C. 144, which requires each State and appropriate Federal agency to report bridge element level data to the Secretary.

The following are frequently asked questions and answers regarding the collection of element level data for NHS bridges:

### **When does the requirement to collect element level bridge inspection data for NHS bridges take effect?**

In accordance with 23 U.S.C. 144(d)(2), commencing on October 1, 2014, State and Federal agencies that have not already done so are to begin collecting element level data as each NHS highway bridge is field inspected in accordance with 23 CFR 650 Subpart C.

### **When will the element level data for NHS bridges be reported to the Federal Highway Administration (FHWA)?**

As a supplement to the National Bridge Inventory (NBI) data submission due April 1, 2015, and every year thereafter, each State and Federal agency will also provide element level bridge inspection data for bridges on the NHS to the FHWA for inclusion in the NBI.

### **How will the data be submitted?**

Initially, the element level bridge inspection data is to be submitted as an extensible markup language (XML) file separate from the NBI 432 character text file. Both the NBI and the element data files are to be

fully populated with all appropriate data items. In the future, FHWA intends to establish a process for accepting a single data file containing both NBI and element data.

### **What elements are to be reported for NHS bridges?**

Later in 2013, the Office of Bridge Technology will provide additional information regarding the bridge elements to be reported, along with necessary basic bridge identification and inspection items. An XML Schema will be released at that time. Working in partnership with the American Association of State Highway Transportation Officials (AASHTO), Subcommittee on Bridges and Structures (SCOBS), we intend to refer to the AASHTO Manual for Bridge Element Inspection for element descriptions, quantity calculations and condition state definitions. The AASHTO Manual for Bridge Element Inspection, which is currently being updated, will be a topic of discussion at the June, 2013 SCOBS annual meeting.

### **Does the FHWA intend to mandate element level bridge inspection training?**

The National Bridge Inspection Standards (NBIS) address the training requirements for staff involved in the bridge inspection program. FHWA has modified its suite of National Highway Institute (NHI) bridge inspection training courses to incorporate the latest information available on element level bridge inspection. In addition to ensuring that the minimum training requirements of the NBIS are met, bridge owners should assess any additional needs they may have in the area of element level inspection and seek appropriate training.

### **What can State and Federal Agencies do at this time to prepare?**

The process flow chart in Attachment One delineates the kind of internal and external activities that are part of the NHS element level bridge inspection condition data collection process. As State and Federal agencies prepare for the collection of element level data for NHS bridges they should be made aware of the available training that the FHWA offers.

The FHWA Resource Center has developed training titled "Introduction to Element Level Bridge Inspection (ELBI)" based on material in the AASHTO Guide Manual for Bridge Element Inspection. The target audience is Federal, State, and local highway agency employees, and consultants involved in inspecting bridges or in charge of a bridge inspection unit. ELBI training can be tailored to specific agency needs for either one to two day training sessions. Additionally, the following FHWA NHI courses<sup>[1]</sup> include element level bridge inspection material:

- FHWA-NHI-130053 Bridge Inspection Refresher Training;
- FHWA-NHI-130054 Engineering Concepts for Bridge Inspectors;
- FHWA-NHI-130055 Safety Inspection of In-service Bridges;
- FHWA-NHI-130101 Introduction to Safety Inspection of In-Service Bridges, web based training.

### **When do State and Federal Agencies need to complete the collection of element level data for all of their NHS bridges?**

The move to collect element level bridge inspection data is a multi-year effort and requires communication, coordination and collaboration among a number of stakeholders. FHWA recognizes that the first NBI data submittal in April 2015 may not include element data for all NHS bridges. Preferably, element level data will be field collected at each NHS bridge during the next scheduled inspection after October 1, 2014, or at the latest, the second scheduled inspection after October 1, 2014. The April 2015 data submittal should reflect that element data collection has commenced for at least some, if not all, NHS bridges.

## Why is the element level bridge inspection data needed?

In addition to the legal requirement to collect element level data for NHS bridges under 23 U.S.C. 144, the granularity of bridge condition information afforded by element level inspection data provides for improved bridge management decision-making through enhanced deterioration forecasting and bridge condition evaluation. Element inspection data also provides for the development and use of meaningful performance measures.

We will continue to keep you updated as we move forward so that you can respond to inquiries from your partners and stakeholders. Please share this update with your State DOT or Federal Agency partners. Mr. Wade F. Casey, P.E. may be contacted at 202-366-4606 or [Wade.Casey@dot.gov](mailto:Wade.Casey@dot.gov) for further information on this initiative.

[1] Refer to the NHI website located at: <http://www.nhi.fhwa.dot.gov/default.aspx> for course descriptions and scheduling.

## Attachment NHS Element Level Bridge Inspection Condition Data Collection Process

