

# Municipal Bridge Maintenance & Management



08 September 2021



# Webinar Agenda

1. General Overview
2. Inspection Organization
3. Inspection Terms
4. Inspection Process
5. Inspection Results and Outcomes
6. Responsibilities
7. Posting, Enforcement, and Permitting
8. Preventive Maintenance
9. Prioritization
10. Programming and Funding
11. Questions



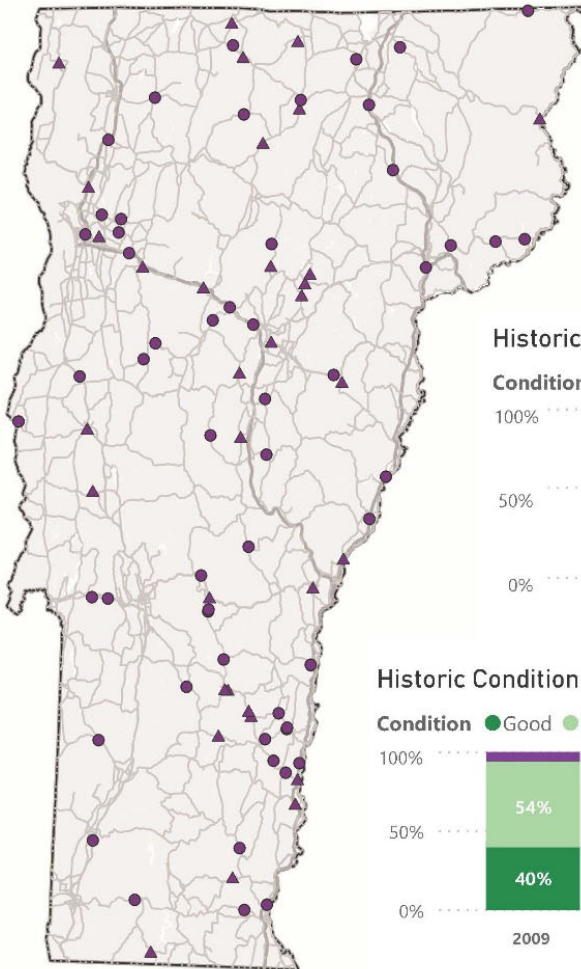


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# Structure Overview

- ▲ Long Structures in poor condition
- Short Structures in poor condition



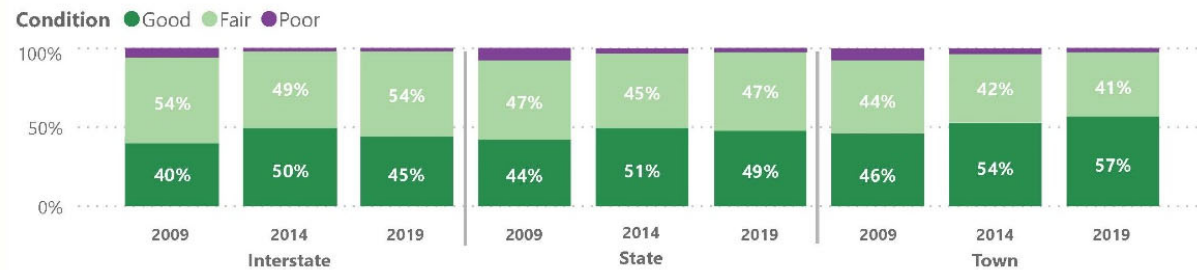
Structure Type	Interstate State-Owned	Non-Interstate State-Owned	Town-Owned	Private or Rail-Owned	Total
<b>Long Structures</b>	<b>314</b>	<b>810</b>	<b>1,659</b>	<b>7</b>	<b>2,790</b>
Good	130 41%	395 49%	934 56%	4 57%	1,463 52%
Fair	178 56%	383 47%	691 42%	2 29%	1,254 45%
Poor	6 2%	32 4%	34 2%	1 14%	73 3%
<b>Short Structures</b>	<b>204</b>	<b>1,056</b>	*	*	<b>1,260</b>
Good	103 50%	432 41%	*	*	535 42%
Fair	91 45%	578 55%	*	*	669 53%
Poor	10 5%	46 4%	*	*	56 4%
<b>Total</b>	<b>518</b>	<b>1,866</b>	<b>1,659</b>	<b>7</b>	<b>4,050</b>

\* VTrans does not maintain an inventory or perform safety inspections on town highway or other short structures.

Historic Condition Distribution (short structures, span length between 6 ft and 20 ft)



Historic Condition Distribution (long structures, span length greater than 20 ft)





# Long Structures

- Bridges having a span length greater than 20 feet and located on a public road – 2,790 total
  - 314 on the interstate system
  - 810 on the state highway system
  - 1,659 on the town highway system
  - 7 on a public road but owned privately



# Short Structures

- Bridges having a span length greater than six feet up to of equal to 20 feet and located on a public road – 1,260 total
  - 204 on the interstate system
  - 1,056 on the state highway system
  - VTrans does not maintain an inventory of or inspect off-system short structures







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# Bridge Inspection and Management Section

- Program Manager
- Lead Inspector and Inspection Teams
  - Perform visual assessments
  - Qualified, trained, and experienced
- Load Rating Engineer







# Webinar Agenda

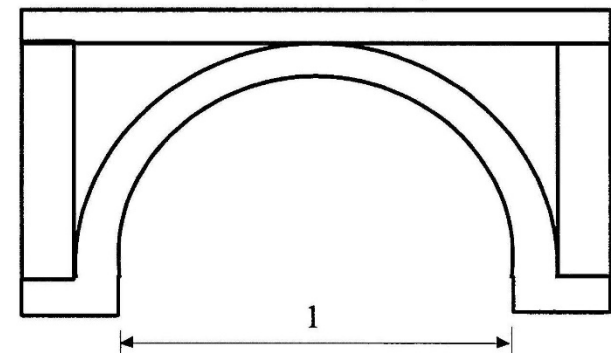
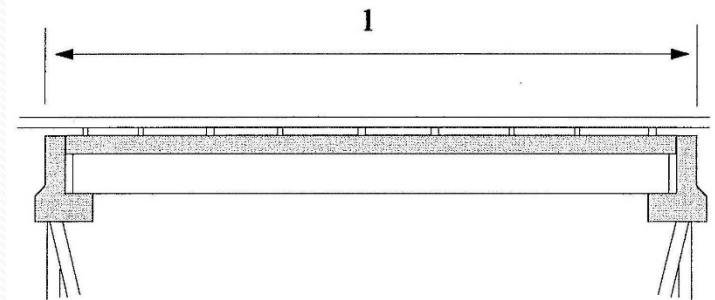
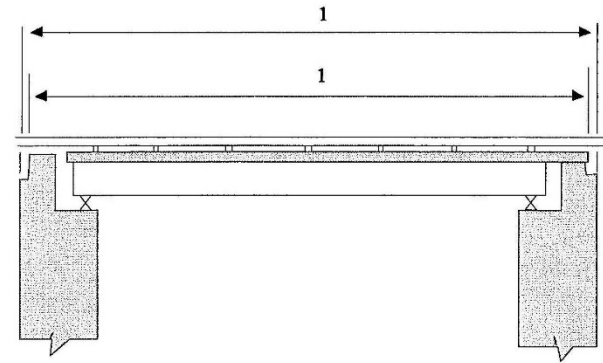
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# What's a long?

**Bridge.** The National Bridge Inspection Standards published in the Code of Federal Regulations (23 CFR 650.3) give the following definition:

A structure including supports erected over a depression or an obstruction, such as water, highway, or railway, and having a track or passageway for carrying traffic or other moving loads, and having an opening measured along the center of the roadway of more than 20 feet\* between undercopings of abutments or spring lines of arches, or extreme ends of openings for multiple boxes; it may also include multiple pipes, where the clear distance between openings is less than half of the smaller contiguous opening.

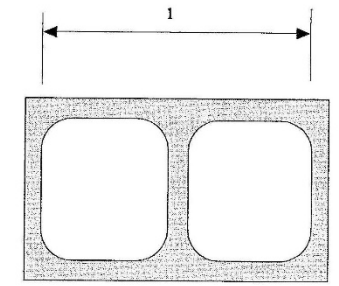
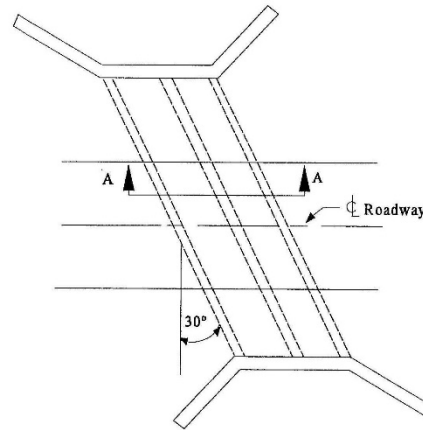
\*(6.1 meters)



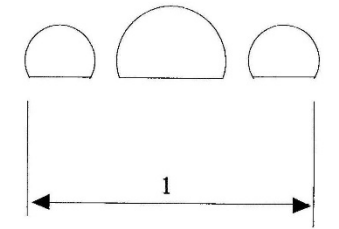
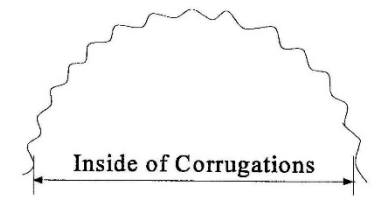
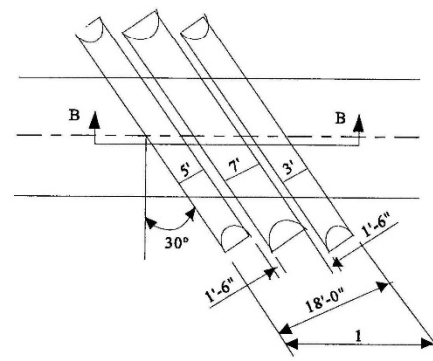


# What's a long?

**Culvert.** A structure designed hydraulically to take advantage of submergence to increase hydraulic capacity. Culverts, as distinguished from bridges, are usually covered with embankment and are composed of structural material around the entire perimeter, although some are supported on spread footings with the streambed serving as the bottom of the culvert. Culverts may qualify to be considered "bridge" length.



SECTION A-A



SECTION B-B

At least one pipe or barrel has to be 6' in length to make long structure inventory.

Item 49 - Structure length =  $\frac{18}{\cos 30 \text{ degrees}}$  = 20.78

Code: 000021



# Bridge Inspection Terms

- Bridges are considered **structurally deficient** if significant load carrying elements are found to be in poor condition due to deterioration.
  - The fact that a bridge is classified under the federal definition as “structurally deficient” does not imply that it is unsafe.
  - A structurally deficient bridge, when left open to traffic, typically requires significant maintenance and repair to remain in service and eventual rehabilitation or replacement to address deficiencies. To remain in service, structurally deficient bridges are often posted with weight limits to restrict the gross weight of vehicles using the bridges to less than the maximum weight typically allowed by statute.



# Bridge Inspection Terms

- A **fracture critical member** is a steel member in tension that does not have enough additional, structural members to sufficiently redistribute load in the bridge if one member loses capacity, thus resulting in a portion of or entire bridge collapse.
- **Fatigue** is a material response that describes the tendency of a material to break when subjected to repeated loading.
- If the lowest rating is greater than or equal to 7, the bridge is classified as **Good**; if it is less than or equal to 4, the classification is **Poor**. Bridges rated 5 or 6 are classified as **Fair**.





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# Bridge Inspection

- How?
  - Visual assessment
- When?
  - 24 months “NBI structures” maximum
  - 60 months “non-NBI structures”
- Who?
  - Qualified and trained inspectors each having a minimum of five (5) years experience





# Type of NBI Data Collected

- Identification
  - Bridge number, route, and location
- Structure type and material
- Age and service
- Geometric data
  - Length, width, and clearances
- Navigation data
- Classification
  - Functional class, ownership, direction of traffic, etc.



## Recording and Coding Guide for the Structure Inventory and Appraisal of the Nation's Bridges

Report No. FHWA-PD-96-001



Office of Engineering  
Bridge Division

December 1995



# Type of NBI Data Collected

- Condition
  - Deck, superstructure, substructure, culvert, and channel
- Load rating and posting
  - Design load, inventory/operating rating, and posting
- Appraisal
  - Deck geometry, scour critical, safety features, etc.
- Proposed improvements
  - Type of work, cost, and future traffic
- Inspections
  - Routine, fracture critical, underwater, and special



# National Bridge Elements

- Starting in 2014, October 1<sup>st</sup>, state agencies that have not already done so are to begin collecting element level data as each National Highway System (NHS) highway bridge is field inspected.
- The intent being that element level bridge inspection data will provide the granularity for improved bridge management and decision-making through enhanced deterioration forecasting and bridge condition evaluation.



# Types of Inspection

- Initial
  - The first inspection of a bridge to determine baseline structural conditions
- Routine
  - Regularly scheduled inspection consisting of observations or measurements needed to determine the physical and functional condition
- In-Depth
  - A close-up inspection of one or more members to identify deficiencies



# Types of Inspection



- Fracture Critical
  - A hands-on inspection of a fracture critical member. A fracture critical member is a steel member in tension that does not have enough additional, structural members to sufficiently redistribute load in the bridge if one member loses capacity, thus resulting in a portion of or entire bridge collapse.
- Special
  - An inspection scheduled at the discretion of the inspector used to monitor a known or suspected deficiency



# Types of Inspection

- Damage
  - Unscheduled inspection to assess structural damage resulting from environmental factors or human actions
- Underwater
  - Inspection of the underwater portion of the bridge substructure





# Numbering Standard

- Interstate, US, and Vermont routes have abutments and piers numbers relative to route log stationing (south → north or west → east)
- FAS (federal-aid secondary), FAU (federal-aid urban), and Town Highway bridges have abutments numbered in relationship to the stream flow. When looking downstream through bridge opening, abutment #1 is on the right side of channel and abutment #2 is on the left side.
- Individual beams or stringers shall be numbered left to right, looking in direction of stationing (e.g., on town system bridges, upstream beam is beam #1).

# Bridge Inspection

- Condition Ratings

- Deck

- Roadway portion of a bridge which carries traffic, including shoulders

- Superstructure

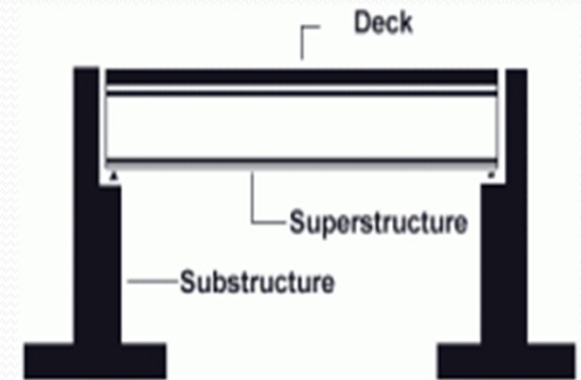
- Supports the deck and connects substructure elements to another

- Substructure

- Supports the superstructure and distributes all loads to foundation

- Culvert

- A structure used for drainage under a highway or railroad



# Bridge Condition Ratings

Code	Description
N	NOT APPLICABLE
9	EXCELLENT CONDITION
8	VERY GOOD CONDITION - no problems noted.
7	GOOD CONDITION - some minor problems.





# Bridge Condition Ratings

Code	Description
6	SATISFACTORY CONDITION - structural elements show some minor deterioration.
5	FAIR CONDITION - all primary structural elements are sound but may have minor section loss, cracking, spalling or scour.



# Bridge Condition Ratings

Code	Description
4	POOR CONDITION - advanced section loss, deterioration, spalling or scour.
3	SERIOUS CONDITION - loss of section, deterioration, spalling or scour have seriously affected primary structural components. Local failures are possible. Fatigue cracks in steel or shear cracks in concrete may be present.



# Bridge Condition Ratings

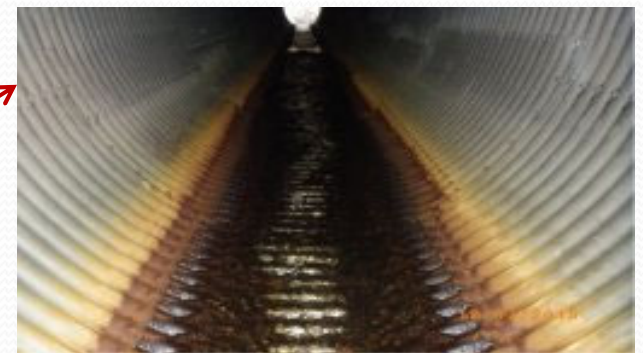
Code	Description
2	CRITICAL CONDITION - advanced deterioration of primary structural elements. Fatigue cracks in steel or shear cracks in concrete may be present or scour may have removed substructure support. Unless closely monitored it may be necessary to close the bridge until corrective action is taken.
1	"IMMINENT" FAILURE CONDITION - major deterioration or section loss present in critical structural components or obvious vertical or horizontal movement affecting structure stability. Bridge is closed to traffic but corrective action may put back in light service.
0	FAILED CONDITION - out of service - beyond corrective action.





# Culvert Condition Ratings

Code	Description
N	Not applicable. Use if structure is not a culvert.
9	No deficiencies.
8	No noticeable or noteworthy deficiencies which affect the condition of the culvert. Insignificant scrape marks caused by drift.
7	Shrinkage cracks, light scaling, and insignificant spalling which does not expose reinforcing steel. Insignificant damage caused by drift with no misalignment and not requiring corrective action. Some minor scouring has occurred near curtain walls, wingwalls, or pipes. Metal culverts have a smooth symmetrical curvature with superficial corrosion and no pitting.



# Culvert Condition Ratings

Code	Description
6	Deterioration or initial disintegration, minor chloride contamination, cracking with some leaching, or spalls on concrete or masonry walls and slabs. Local minor scouring at curtain walls, wingwalls, or pipes. Metal culverts have a smooth curvature, non-symmetrical shape, significant corrosion or moderate pitting.
5	Moderate to major deterioration or disintegration, extensive cracking and leaching, or spalls on concrete or masonry walls and slabs. Minor settlement or misalignment. Noticeable scouring or erosion at curtain walls, wingwalls, or pipes. Metal culverts have significant distortion and deflection in one section, significant corrosion or deep pitting.





# Culvert Condition Ratings

Code	Description
4	Large spalls, heavy scaling, wide cracks, considerable efflorescence, or opened construction joint permitting loss of backfill. Considerable settlement or misalignment. Considerable scouring or erosion at curtain walls, wingwalls or pipes. Metal culverts have significant distortion and deflection throughout, extensive corrosion or deep pitting.
3	Any condition described in Code 4 but which is excessive in scope. Severe movement or differential settlement of the segments, or loss of fill. Holes may exist in walls or slabs. Integral wingwalls nearly severed from culvert. Severe scour or erosion at curtain walls, wingwalls or pipes. Metal culverts have extreme distortion and deflection in one section, extensive corrosion, or deep pitting with scattered perforations.





# Culvert Condition Ratings

Code	Description
2	Integral wingwalls collapsed, severe settlement of roadway due to loss of fill. Section of culvert may have failed and can no longer support embankment. Complete undermining at curtain walls and pipes. Corrective action required to maintain traffic. Metal culverts have extreme distortion and deflection throughout with extensive perforations due to corrosion.
1	Bridge closed. Corrective action may put back in light service.
0	Bridge closed. Replacement necessary.





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# Classifying Work Candidates

Code	Description	Commonly Employed Feasible Actions
9	Excellent Condition	Preventive Maintenance
8	Very Good Condition	
7	Good Condition	
6	Satisfactory Condition	Preventive Maintenance or Rehabilitation
5	Fair Condition	
4	Poor Condition	Rehabilitation or Replacement
3	Serious Condition	
2	Critical Condition	
1	Imminent Failure Condition	
0	Failed Condition	



# SI&A Report

- Every bridge will have a structure inspection, inventory, and appraisal report (SI&A) created and available to the bridge owner
- The SI&A provides a sense of the immediate and pending bridge needs
- Don't wait for a town bridge needs letter

STRUCTURE INSPECTION, INVENTORY and APPRAISAL SHEET	
Vermont Agency of Transportation – Structures Section – Bridge Management and Inspection Unit	
Inspection Report for <b>HARDWICK</b>	bridge no.: 00028 District: 7
Located on: C3030 ove LAMOILLE RIVER	approximately 0.05 MI JCT TH 30 + VT16 Owner: 03 TOWN-OWNED
<b>CONDITION</b> Deck Rating: 6 SATISFACTORY Superstructure Rating: 6 SATISFACTORY Substructure Rating: 6 SATISFACTORY Channel Rating: 5 FAIR Culvert Rating: N NOT APPLICABLE Federal Str. Number: 100305002803051 Federal Sufficiency Rating: 031.7 Deficiency Status of Structure: SD	<b>STRUCTURE TYPE and MATERIALS</b> Bridge Type: RLD BM W TIMBER DK Number of Approach Spans 0000 Number of Main Spans: 001 Kind of Material and/or Design: 3 STEEL Deck Structure Type: 8 TIMBER Type of Wearing Surface: 7 WOOD OR TIMBER Type of Membrane 0 NONE Deck Protection: 0 NONE
<b>AGE and SERVICE</b> Year Built: 1950 Year Reconstructed: 0000 Service On: 1 HIGHWAY Service Under: 5 WATERWAY Lanes On the Structure: 01 Lanes Under the Structure: 00 Bypass, Detour Length (miles): 99 ADT: 000010 % Truck ADT: 02 Year of ADT: 2007	<b>APPRAISAL *AS COMPARED TO FEDERAL STANDARDS</b> Bridge Railings: 0 DOES NOT MEET CURRENT STANDARD Transitions: 0 DOES NOT MEET CURRENT STANDARD Approach Guardrail 0 DOES NOT MEET CURRENT STANDARD Approach Guardrail Ends: 0 DOES NOT MEET CURRENT STANDARD Structural Evaluation: 2 INTOLERABLE, REPLACEMENT NEEDED Deck Geometry: 5 BETTER THAN MINIMUM TOLERABLE CRITERIA Underclearances Vertical and Horizontal: N NOT APPLICABLE Waterway Adequacy: 6 OCCASIONAL OVERTOPPING OF ROADWAY WITH INSIGNIFICANT TRAFFIC DELAYS Approach Roadway Alignment: 6 EQUAL TO MINIMUM CRITERIA Scour Critical Bridges: 2 SCOUR CRITICAL - IMMEDIATE ACTION REQU
<b>GEOMETRIC DATA</b> Length of Maximum Span (ft): 0054 Structure Length (ft): 000056 Lt Curb/Sidewalk Width (ft): 0 Rt Curb/Sidewalk Width (ft): 0 Bridge Rdwy Width Curb-to-Curb (ft): 13.5 Deck Width Out-to-Out (ft): 14.6 Appr. Roadway Width (ft): 016 Skew: 00 Bridge Median: 0 NO MEDIAN Min Vertical Clr Over (ft): 99 FT 99 IN Feature Under: FEATURE NOT A HIGHWAY OR RAILROAD Min Vertical Underclr (ft): 00 FT 00 IN	<b>DESIGN VEHICLE, RATING, and POSTING</b> Load Rating Method (Inv): 2 ALLOWABLE STRESS (AS) Posting Status: B OPEN, POSTING RECOMMENDED Bridge Posting: 4 POSTING REQUIRED Load Posting: 01 NO LOAD POSTING SIGNS EXIST NEAR BRIDGE Posted Vehicle: POSTING NOT REQUIRED Posted Weight (tons): Design Load: 0 OTHER OR UNKNOWN
	<b>INSPECTION and CROSS REFERENCE X-Ref. Route:</b> Insp. Date: 092013 Insp. Freq. (months) 24 X-Ref. BrNum:
<b>INSPECTION SUMMARY and NEEDS</b> 09/30/13 Guardrail system is poor and needs to be repaired as numerous bridge post are sheared off. Sheathing along abutment 1 has failed & is laying flat in streambed. Due to failure concrete kneewall is undermined. Due to deck configuration the structure should be posted for 3 tons or full width runners need to be installed. Previous letter sent in 03/2010 and no action taken yet. MJX SP 07/18/11 Structure is in need of repairs due to scouring along abut 1. The driven sheathing has pulled away from concrete and scouring is present beneath the concrete kneewall that was poured some time ago. The bridge rail and approach rail is non-functional and needs to be upgraded as it is a traffic safety concern. Refer to town letter dated 3/29/10 for bridge posting for 3 tons & rail needing replacement. MJX & NV 10/28/2009 The overall condition of this bridge is satisfactory except for dysfunctional bridge and approach guardrails all around. PLB	

# SI&A Report

- Condition Ratings
  - Deck
  - Superstructure
  - Substructure
  - Culvert
- Appraisal Ratings
  - Structure Evaluation
  - Deck Geometry
  - Waterway Adequacy
- Summary and Needs

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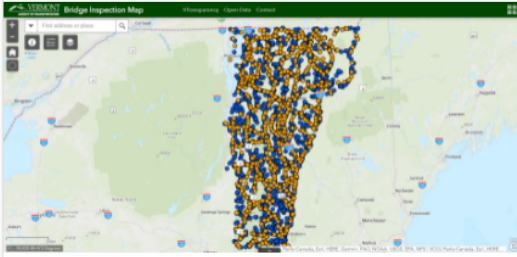


# VTransparency

<https://vtransparency.vermont.gov/>

## Bridge Conditions in Vermont

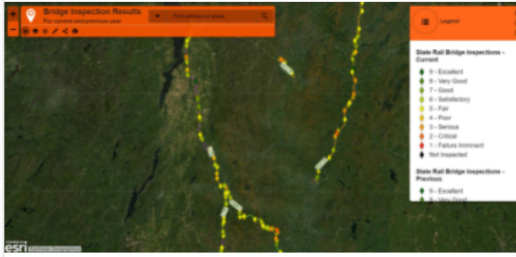
### Bridge Inspections



Explore

What is the condition of an individual bridge? View a map of the most recent bridge inspection reports and view recent inspection photos.

### Rail Bridge Inspections



Explore

What is the condition of an individual rail bridge? View a map of the most recent rail bridge inspection reports and view recent inspection photos.

### Bridge Inspection Reports



Explore

What is the condition of an individual bridge? Select a town to view and download bridge inspection reports and photos.



# Scour Plans of Action

Scour Critical Bridge - Plan of Action (POA)				
Vermont Agency of Transportation ~ Bridge Management and Inspection Unit				
<b>1. General Information</b>				
Structure Number 101322005513221	Town WILMINGTON	County WINDHAM	State VERMONT	Features Intersected BEAVER BROOK
Local Bridge Number 00055	Route Name C3023		Bridge Owner TOWN-OWNED	
Year Built 1954	Year Reconstructed 1993	Bridge Planned for Replacement or Rehabilitation Bid Let Date:		
Bridge Type: ROLLED BM W TMBR DK				
Abutment 1 - Type of Foundation: BOULDERS		Pier 1 - Type of Foundation: DOES NOT APPLY		
Abutment 2 - Type of Foundation: BOULDERS		Pier 2 - Type of Foundation: DOES NOT APPLY		
Pier 3 - Type of Foundation: DOES NOT APPLY				
Average Daily Traffic 000100	Year of ADT 2007	ADT % Truck Traffic 02	Source: ADT Estimated by Inspector During Field Inspection	
Does the bridge provide service to emergency facilities and/or an evacuation route (Y/N)? To be Determined				
<b>2. Responsibility for POA</b>				
Author(s) of POA (name, title, agency/organization, contact information): Chris Benda, Geotechnical Engineer - VTrans, 828-6910, chris.benda@state.vt.us Pam Thurber, Bridge Mgmt. Insp. Engineer - VTrans, 828-0041, pam.thurber@state.vt.us Nick Wark, Hydraulics Engineer - VTrans, 828-3987, nick.wark@state.vt.us Tod Kimball, FHWA - Vermont Office, 828-4574, tod.kimball@fhwa.dot.gov				
Date of POA: May 30, 2013      Planned Update for POA: 102017				
<b>3. Scour Vulnerability</b>				
Scour Rating: 3      BRIDGE IS SCOUR CRITICAL; BRIDGE FOUNDATIONS DETERMINED TO BE UNSTABLE FOR CALCULATED SCOUR CONDITIONS				
Source of Scour Coding: Assessment by Committee				
Bridge Condition Summary: 10/28/15 Relatively good shape. Abutment 1 could use some stone in front of it. MJK SP 10/15/2013 - Bridge is in satisfactory shape with recent improvements; new concrete wing walls and 2x6 wearing surface. ~ MJ/JS 08/14/2012 - Repair check - Abutment #2 undermining has been addressed with a stone and concrete kneewall. ~ MJ/DK				

Scour Critical Bridge - Plan of Action (POA)	
Vermont Agency of Transportation ~ Bridge Management and Inspection Unit	
<b>4. Recommended Action(s)</b>	
The primary recommendation for this initial plan of action (POA) is to aid the bridge owner in the implementation of a flood monitoring program. An increased inspection frequency and/or placement of designed hydraulic/structural countermeasures shall be done at the recommendation of the bridge inspector or scour committee.	
<b>5. NBI Coding Information</b>	
Waterway Adequacy: 6 OCCASIONAL OVERTOPPING OF APPROACHES	
Substructure Rating: 7 GOOD CONDITION	
Channel and Channel Protection: 6 BANK PROTECTION IS BEING ERODED; DEBRIS IS RESTRICTING WATERWAY	
Routine Inspection Date: 102015 Underwater Inspection Required and Frequency (months): N      Underwater Inspection: N/A	
<b>6. Monitoring Program</b>	
Flood Monitoring shall begin when the National Weather Services issues a flood warning for the area and shall continue until the warning has been lifted or the structure is closed.  Town or City Road Commissioner/Foreman or his/her designee will be responsible for monitoring conditions along with closure and notification thereof if required.  Bridge to be routinely monitored at each regular inspection by qualified bridge inspectors. It is recommended that cross-sections, both upstream and downstream of the bridge, be taken and compared for changes.  In the event of high waters, the bridge shall be reviewed locally and any changes, problems and/or areas of concern brought to the attention of the Bridge Inspection Unit immediately. Contact Pam Thurber, Bridge Management and Inspection Engineer at 828-0041.	
<b>7. Countermeasure Recommendation(s)</b>	
Unless otherwise specified, either as part of the bridge inspection summary report or a special letter, only implementation of the monitoring program is required.	

Scour Critical Bridge - Plan of Action (POA)	
Vermont Agency of Transportation ~ Bridge Management and Inspection Unit	
<b>8. Bridge Closure Plan</b>	
The bridge shall be closed by the Town Road Commissioner or his/her selected representative when the following conditions occur and water continues to rise. Water elevation is at either ... Water Surface Elevation ---      OR      Distance: 1 FT BELOW LOW BEAM Flood Frequency: ---      Note: DEFAULT <i>* If structure movement or approach settlement is noted, immediate closure of the structure is warranted.</i> The bridge should remain closed to traffic until such time that waters have receded, all debris has been removed, and an inspection, by trained and qualified bridge inspectors, of the bridge completed.	
In the event conditions warrant closure of the bridge, immediate notification to those listed is required. District Contact: Nelson Blanchard, DTA - VTrans, 447-2790, nelson.blanchard@state.vt.us Emergency Services: Emergency Management, 244-8721 or 1-800-347-0488 VTrans Dispatch: Larry Dodge, 828-2648, larry.dodge@state.vt.us	
<b>9. Detour Route</b>	
Detour route may vary and shall be determined at the district level taking into consideration known quality of roadways and bridges, existing conditions, and storm coverage.	



# Bridge Needs Letter



State of Vermont  
 Program Development - Structures Section  
 One National Life Drive [phone] 802-828-2621  
 Montpelier, VT 05633-5001 [fax] 802-828-3566  
 www.aot.state.vt.us [url] 800-253-0191

Agency of Transportation

October 4, 2013

Mr. Jon Jewett, Town Manager and  
 Mr. Marcus Brown, Selectboard Chair  
 Town of Hardwick  
 c/o Ms. Alberta Miller, Town Clerk  
 P.O. Box 523  
 Hardwick, VT 05843

RE: Hardwick, bridge #28 on TH 30 (Class 3) over Lamoille River

Dear Mr. Jewett and Mr. Brown:

The Federal National Bridge Inspection Standards require inspection of all publicly owned bridges over 20 feet in length on a 24 month cycle. A two-member team performs the inspection, with at least one member specially trained for this work. The Agency of Transportation provides this inspection in the interest of public safety and as a service to the municipalities with the cost shared between the Federal government and the State.

The above referenced structure is a steel beam bridge with a timber deck spanning the Lamoille River.

Upon review of the bridge file, it has been noted that due to the current deck geometry, the runner system allows a vehicle tire to leave the runners and make contact with the underlying deck. Because of this, as presently configured, the bridge requires a load posting of 3 tons.

Load posting would not be needed if the town were to extend the runner system full width of the bridge. If extended, the runners would then be considered part of the deck system helping to increase the load capacity.

During the recent inspection two safety issues were noted. 1) The incorrect posting concern and 2) the existing bridge rail is heavily damaged with several posts are in fact broken off.

To solve these problems, the following options are proposed:

Option A) Legally post the bridge for 3 tons in accordance with the *Manual for Uniform Traffic Control Devices (MUTCD)* AND install new bridge guardrails of standard size and shape.

Option B) Extend the existing runner system laterally so that they cover the full width of the bridge AND install new bridge guardrails of standard size and shape.



photo taken 9/30/2013;  
 no load posting signs



To: Town of Hardwick  
 RE: Hardwick, bridge #28 on TH 30 (Class 3) over Lamoille River  
 Date: October 4, 2013  
 Page 2

It was also noticed during inspection that the driven sheathing at abutment #1 has failed and is now lying in the streambed. Undermining of the concrete knee wall is present and needs to be filled in and protected.



photos taken 9/30/2013

This structure is owned by the town and as such is the responsibility of the town. Failure to comply with the recommendations may compromise public safety, result in additional damage, and/or substantially reduce the service life of the structure.

Even though a bridge is recommended for weight, width, or height posting or closure by the State, the decision to properly post or close the structure is the responsibility of municipal officials. However, it is in the best interest of the municipality to post or sign the bridges in accordance with these recommendations. A failure to warn motorists of potential bridge hazards may result in tort liability claims.

Also, we have been notified by the Federal Highway Administration (FHWA) that failure by the town/city to properly post or close the structure (in accordance with the *Manual on Uniform Traffic Control Devices (MUTCD)* standards) will jeopardize federal-aid highway funds for town-owned projects in your municipality.

Please send WRITTEN notification of your intent to comply with, your compliance with, or reasons for non-compliance with these recommendations within 60 days from receipt of this letter. We are required by the Federal Highway Administration to report to them when the recommended posting, closure, and/or safety repairs have been implemented. A response form has been provided for your use.

If you have any questions concerning the matter, please contact your local District Transportation Administrator, Dale Perron at 748-6670 or VTrans' Bridge Management and Inspection Engineer, Pamela M. Thurber at 828-0041. A representative from the Bridge Management and Inspection Unit would be willing to meet with you at the site to discuss the contents of this letter.

Sincerely,

Wm. Michael Hedges, P.E.  
 Structures Program Manager

WMH: PMT: MJJK  
 cc: Dale Perron, DTA District #7  
 NBIS Inspection Files via MJJK  
 FHWA Design and Structures Engineer



State of Vermont - VTrans  
 Program Development Division - Structures Section  
 One National Life Drive  
 Montpelier, VT 05633-5001

RE: Hardwick, bridge #28 on TH 30 (Class 3) over Lamoille River

The Selectboard of Hardwick...

WILL legally post both ends of this bridge for 3 tons in accordance with MUTCD AND properly install bridge rails on this structure based on the state's recommendations by \_\_\_\_\_ (date) \*must be within 60 days of receipt of this letter.

OR

WILL install a full width runner system AND properly install bridge rails on this structure based on the state's recommendations by \_\_\_\_\_ (date) \*must be within 60 days of receipt of this letter.

AND

WILL protect and fill in undermining along abutment #1

OTHER \*Reason(s) for non-compliance \_\_\_\_\_

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

Printed Name and

Signatures:

Town of

Hardwick

Selectboard

DATE:

\_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_





# Webinar Agenda

1. General Overview
2. Inspection Organization
3. Inspection Terms
4. Inspection Process
5. Inspection Results and Outcomes
- 6. Responsibilities**
7. Posting, Enforcement, and Permitting
8. Preventive Maintenance
9. Prioritization
10. Programming and Funding
11. Questions



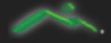
# Vermont Statutes

- **Town Liability For Neglecting Repairs**
- **19 V.S.A. § 985. Injuries from defective bridges and culverts**
- (a) If damage occurs to a person, or his or her property, by reason of the insufficiency or want of repair of a bridge or culvert which the town is liable to keep in repair, the person sustaining damage may recover in a civil action. If the damage accrues in consequence of the insufficiency or want of repair of a bridge erected and maintained by two or more towns, the action shall be brought against all the towns liable for the repairs. The damage and costs shall be paid by the towns in the proportions in which they are liable for the repairs. The court may issue execution against any or all towns for their proportion only; provided that the liability to any town shall not exceed \$75,000.00 or, where insurance is carried, the maximum policy liability limits, whichever sum is greater, on account of injury to or death of a person and damage to his or her property.
- (b) Towns and other corporations shall not be liable for damage to a person or his or her property by reason of the insufficiency or want of repair of a bridge or culvert while traveling on the highway or bridge in violation of the provisions of Title 23 regarding motor vehicle use.

# Vermont Statutes

- **Town Liability For Neglecting Repairs**
- **19 V.S.A. § 996. Highway construction, maintenance, and repair best management practices**
- (a) The agency of transportation shall work with municipal representatives to revise the agency of transportation's town road and bridge standards in order to incorporate a suite of practical and cost-effective best management practices, as approved by the agency of natural resources, for the construction, maintenance, and repair of all existing and future state and town highways. These best management practices shall address activities which have a potential for causing pollutants to enter the groundwater and waters of the state, including stormwater runoff and direct discharges to state waters. The best management practices shall not supersede any requirements for stormwater management already set forth in 10 V.S.A. §§ 1264 and 1264a that apply to state and town highways. The agency of transportation shall report to the house and senate committees on transportation, the house committee on fish, wildlife and water resources, and the senate committee on natural resources and energy by January 15, 2011, on the best management practices to be incorporated into the agency of transportation's town road and bridge standards.

# VT Culvert - <https://www.vtculverts.org>

[Home](#)[Statistics](#)[Help](#)[Sign in](#)[Google](#)[Mixed](#)[Imagery](#)

Show:

Structure

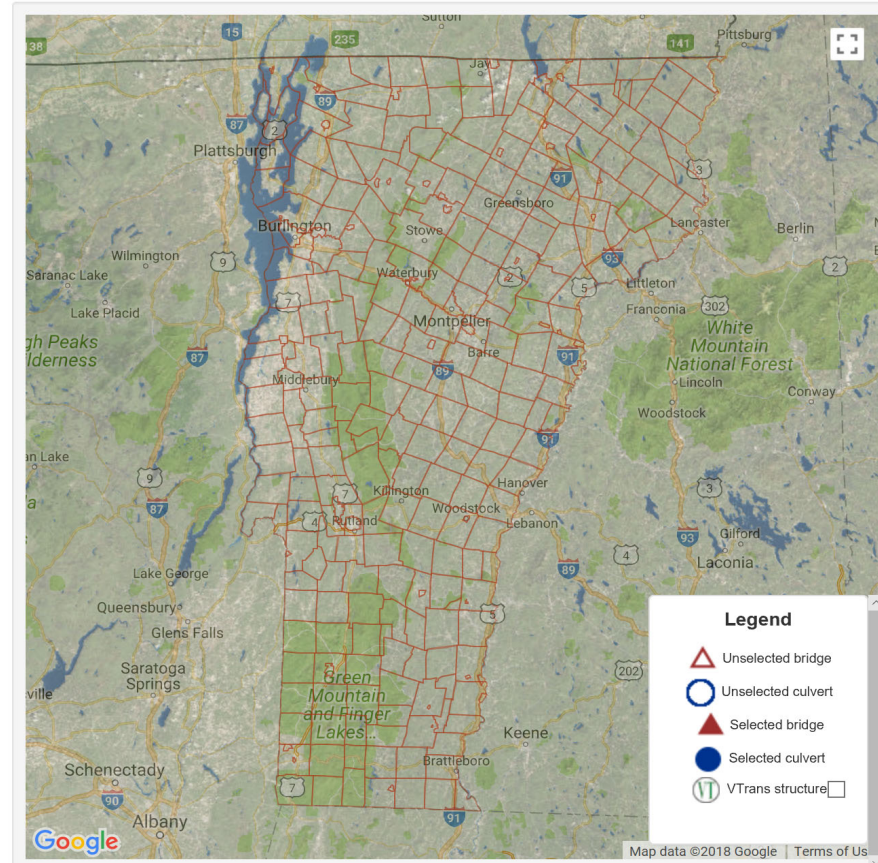
[Legend](#)[Reset map](#)

## Welcome to VTCULVERTS

Provided by the Vermont Agency of Transportation and the Vermont Regional Planning Commissions

The Vermont Agency of Transportation was directed by the Vermont Legislature to complete and deploy an integrated software product to handle data entry, access and status reporting of town bridge and culvert inventories currently collected by the Regional Planning Commissions (RPCs), towns and their contractors.

All town bridge and culvert inventory data which has been previously collected and submitted through the old VOBICIT website is currently located in this system. All bridge and culvert data that adheres to the requirements of this database may be entered into this application.

[Search structures »](#)[Export structures »](#)





# Webinar Agenda

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11. Questions

# Posting and Enforcement

- Properly enforce for legal load limits and vertical restrictions





# Posting and Enforcement

- Make sure signs are properly placed and visible per the Manual of Uniform Traffic Control Devices (MUTCD)





# Vermont Statutes

- **Weight, Size, Loads**
- **23 V.S.A. § 1392. Gross weight limits on highways**
- Except as provided in section 1400 of this title, a person or corporation shall not operate or cause to be operated a motor vehicle in excess of the total weight, including vehicle, object, or contrivance and load, of:
  - (1) 16,000 pounds upon any bridge with a wood floor, wood subfloor, or wood stringers on a class 3 or 4 town highway or 20,000 pounds on a bridge with wood floor, wood subfloor, or wood stringers on a class 1 or 2 town highway unless otherwise posted by the selectboard of such town.
  - (2) 24,000 pounds, upon a class 2, 3, or 4 town highway or bridge with other than wood floor, in any town, incorporated village, or city.
  - (3) No vehicle may exceed a gross weight in excess of 80,000 pounds unless the operator or owner of the vehicle has complied with the provisions of section 1400 of this title, or except as otherwise provided in this section.

# Load Rating and Permitting

- Provide load rating oversight
- Provide support to DMV for evaluation of load and recommendation





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# Why Preventive Maintenance

- Economic analysis has shown that preventive maintenance is more cost effective than reactive maintenance. The old saying “An ounce of prevention is worth a pound of cure” is true for bridges too.
- Something as simple as sweeping and washing inhibits
  - Concrete delamination, spalling, and scaling
  - Steel corrosion and section loss



# Why Preventive Maintenance



1987 inspection



# Why Preventive Maintenance



1991 inspection



# Why Preventive Maintenance



1993 inspection

# Why Preventive Maintenance



1995 inspection



# Why Preventive Maintenance



1996 inspection



# Why Preventive Maintenance



2001 inspection

# Why Preventive Maintenance



2002 inspection



# Why Preventive Maintenance



2003 inspection

# Why Preventive Maintenance



2003 inspection



# Why Preventive Maintenance



2006



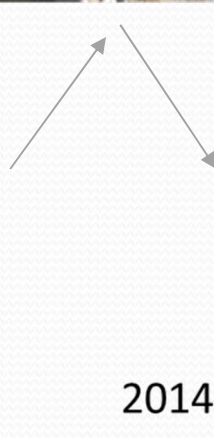
2012



2018



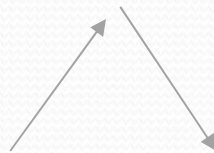
2008



2014



2020





# Preventive Maintenance

- Brush cutting around the bridge
- Removal of stream debris buildup or beaver dams
- Wash bridges every 12 months (deck, superstructure, and substructure)
- Apply water repellent to all exposed concrete surfaces every 48 months (underside of deck not needed)
- Train every member of the bridge maintenance workforce on proper bridge maintenance and the benefits of each activity



# Preventive Maintenance

- Smooth wearing surface and approaches (including filling potholes) to reduce impact damages
- Restripe approaches and bridge to enhance safety
- Repair bent, broken and/or unattached approach and bridge rail
- Install load, vertical and/or horizontal restriction signs
- Keep oversize/overweight vehicles off bridges thru enforcement efforts





# Preventive Maintenance

- Clean bearing area and take measures to reduce buildup or moisture
- Patch bearing area (superstructure jacking not required)
- Grease bearings



# Preventive Maintenance

- Clean expansion joint and drainage troughs
- Reseal or replace pavement joints at bridge ends as needed
- Replace or repair deck joint drainage systems as needed
- Maintain deck joints and ensure that they do not leak





# Preventive Maintenance

- Patch holes in metal culverts to deter loss/piping of material
- Maintain protective riprap countermeasures
- Monitor for scour after high water events and place concrete sub-footings or stone fill as needed
- Eliminate mitered ends on large multi-plate structures





# Preventive Maintenance

- Plug curb wind slots and drain off ends of deck
- Maintain runner planks on timber decks
- Spot paint or grease steel components below deck joints or other severe environments
- Repair or replace failed concrete deck waterproofing membrane
- Seal cracks/minor patching of concrete (deck, slab, abutments, piers, culvert headwall, etc.)





# Preventive Maintenance

- Maintain leak free roofs on covered bridges
- Maintain side boards on covered bridges
- Apply wood preservatives and insecticides
- Maintain mortar in mortared stonework
- Keep debris off truss chords on covered bridges and trusses
- Maintain secondary members on covered bridges and trusses





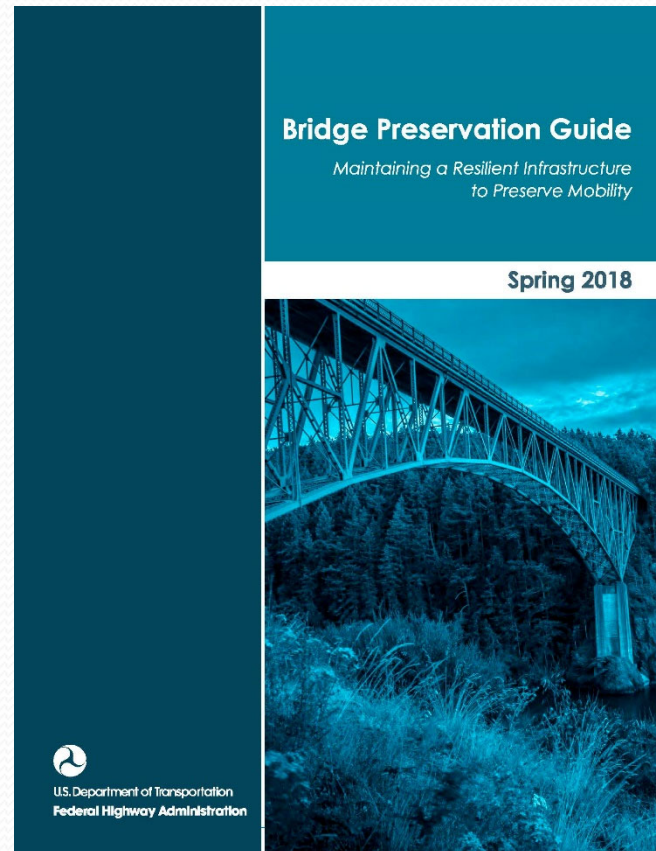
# Preventive Maintenance

- Remove snow load
- Clear debris / beaver dams





# Bridge Preservation Guide



- <https://www.fhwa.dot.gov/bridge/preservation/>



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# Prioritization

- A performance-based, data driven project selection and prioritization framework that maximizes the transportation value delivered to Vermont taxpayers.
- Beginning with Highway Safety and Design in 2021 and expanding to Bridges in 2022, there are two paths for a project to be added to the Capital Program. Highway Safety and Design
  - Asset and Safety Driven
  - Regionally Driven



# Prioritization

- Transportation Value is a fair, consistent, and reliable way to place communicate “Best-Value” combining this criteria.
  - Safety (20 points)
  - Asset Condition (20 points)
  - Mobility / Connectivity (15 points)
  - Community (10 points)
  - Economic Access (10 points)
  - Environment (10 points)
  - Resiliency (10 points)
  - Health Access (5 points)







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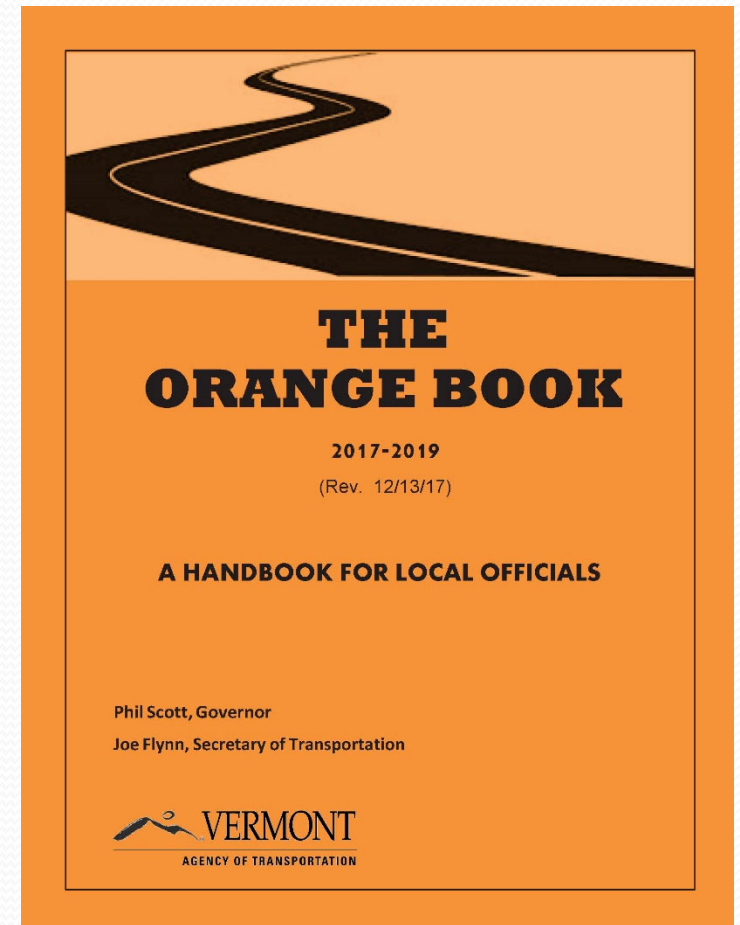
# Programs

- Town Highway Bridge Program (Project Delivery Bureau)
  - For major rehabilitation or reconstruction on class 1, 2, or 3 highways
  - Selection based on prioritization system and regional input
  - \$ no maximum; 2.5% - 10% share
- Structures Grant Program (Maintenance & Fleet Bureau)
  - Competitive program based on recent awards
  - Projects are selected from applications submitted annually attempting to provide equitable distribution of funds allotted
  - \$175,000 maximum; 10% - 20% share
- Bridge owners need to preserve their own structures and cannot afford to defer maintenance or preventive maintenance treatments



# Vermont Grants & Statutes

- VTrans administers three separate appropriations which provide grant to municipalities for roads and bridges. The statute governing these grant programs is 19 V.S.A. § 306 (d), (e), and (h)
  - Town Highway Structures
  - Class 2 Town Highway Roadway
  - Town Highway Emergency
- 19 V.S.A. § 306. Appropriation; State aid for town highways
- 19 V.S.A. § 309a. Local highway work uniform local share; exceptions
- 19 V.S.A. § 309b. Local match; certain town highway programs





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# Questions?

- Pamela M. Thurber, P.E.  
Bridge Management & Inspection Program Manager  
Vermont Agency of Transportation - Highways  
Asset Management & Performance Bureau  
One National Life Drive  
Montpelier, VT 05633-5001
- telephone number: (802) 595-2270
- email: [pam.thurber@vermont.gov](mailto:pam.thurber@vermont.gov)

