

Structure and Bridge Division
Status of the Commonwealth's Structures
September 2007

Presentation Outline

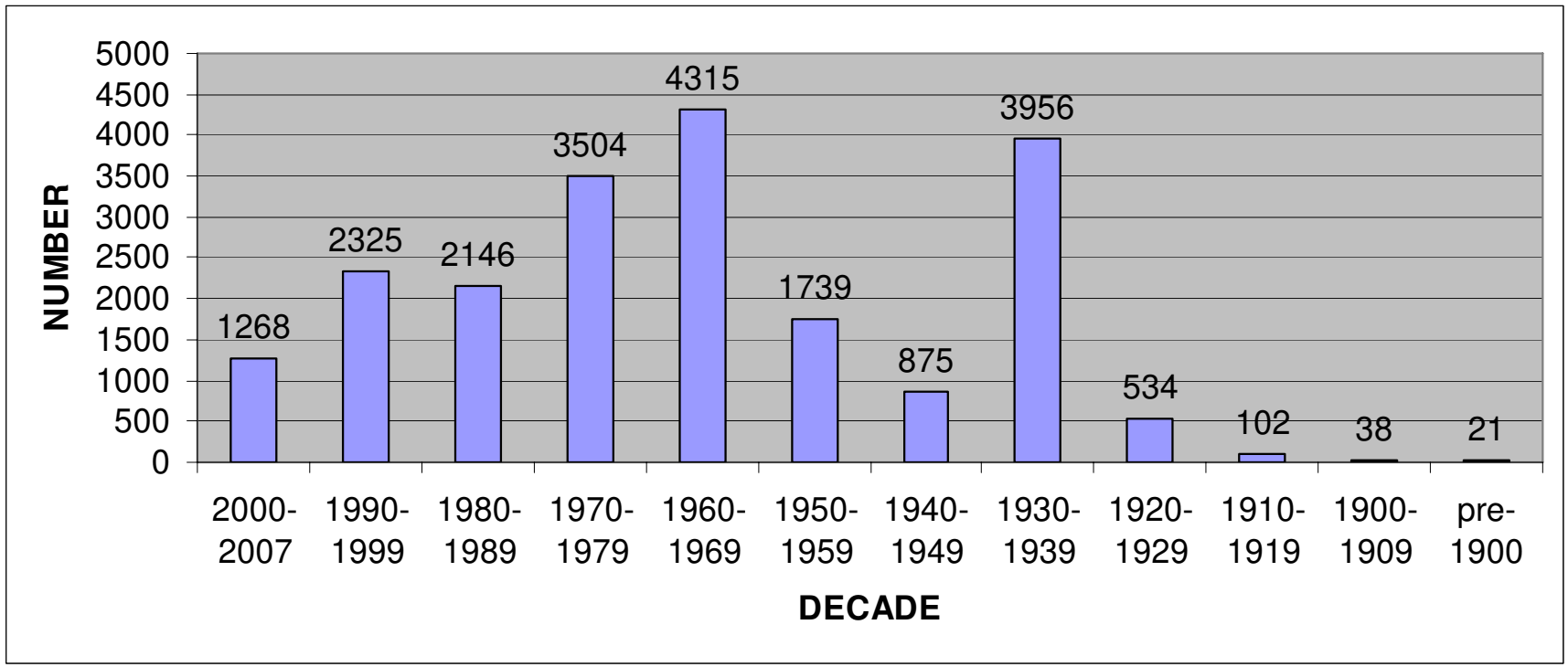
- Commonwealth's Structure Inventory
- Bridge Project Information
- VDOT's Inspection Practices
- How did VDOT react to I-35W Bridge collapse?

Commonwealth's Structure Inventory

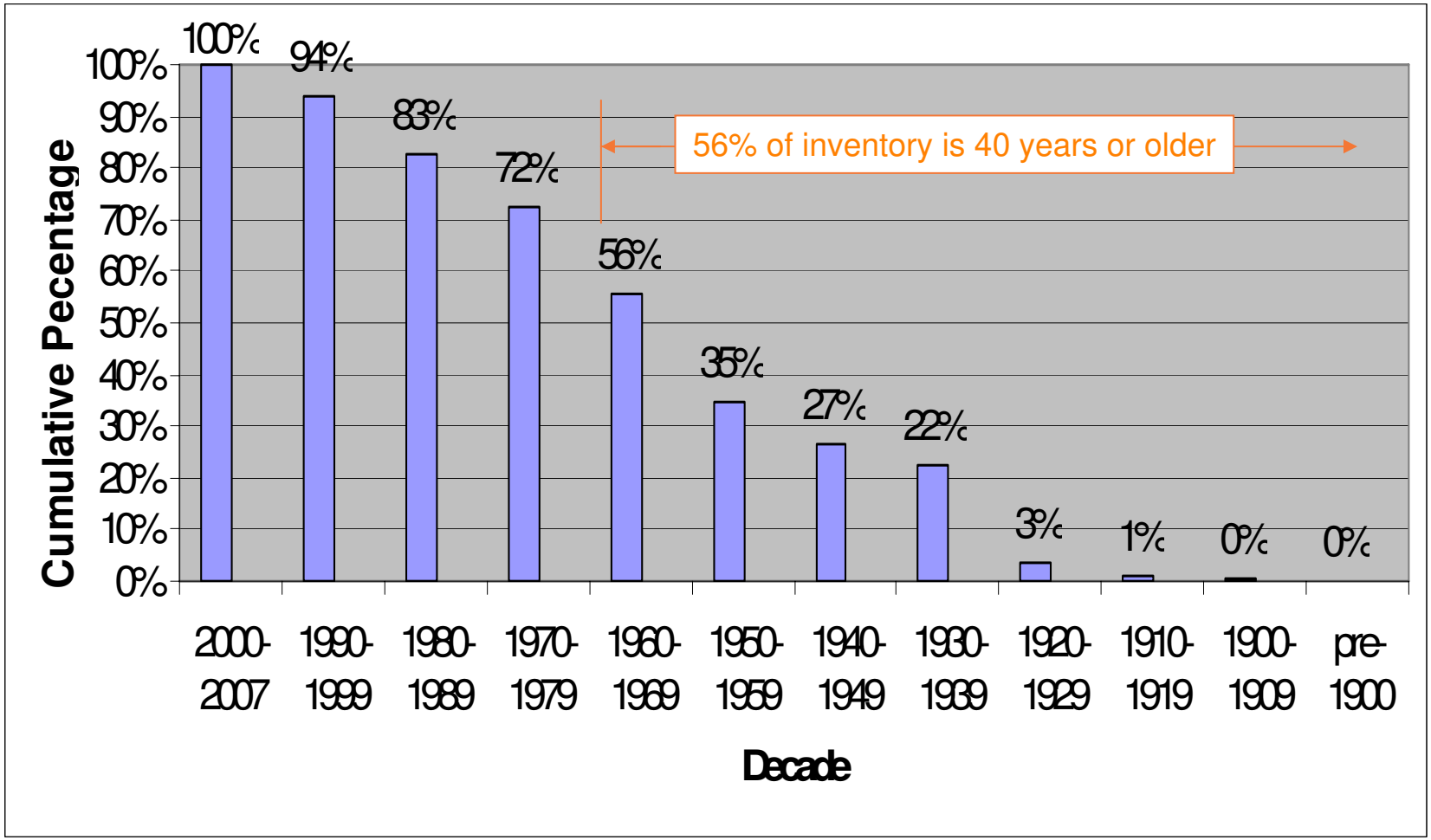
- NBI = National Bridge Inventory
- FHWA requires the states to provide only NBI data
- VDOT provides FHWA with NBI data in the month of April annually
- NBI structures include bridges and culverts that are more than 20 feet long (measured along the centerline of the road)
- Non-NBI structures include bridges that are equal to or less than 20 feet long and culverts that have an opening ≥36 SF

DISTRICT	No. of Structures		
	NBI	Non-NBI	Total
Bristol	1,846	1,430	3,276
Salem	1,802	1,246	3,048
Lynchburg	1,392	739	2,131
Richmond	1,964	681	2,645
Hampton Roads	1,390	321	1,711
Fredericksburg	519	286	805
Culpeper	1,023	670	1,693
Staunton	1,834	1,647	3,481
NOVA	1,348	685	2,033
Total =	13,118	7,705	20,823

Age of Inventory



Cumulative Percentage of Structures



Bridge Sufficiency Rating Formula

- The **Sufficiency Rating Formula** is a method of evaluating factors that indicate a bridge's sufficiency to remain in service. The result of the formula is a percentage in which 100 percent represents an entirely sufficient bridge and zero percent represents an entirely insufficient or deficient bridge. The sufficiency rating is never less than 0 or more than 100.

- **Federal Bridge Funding**

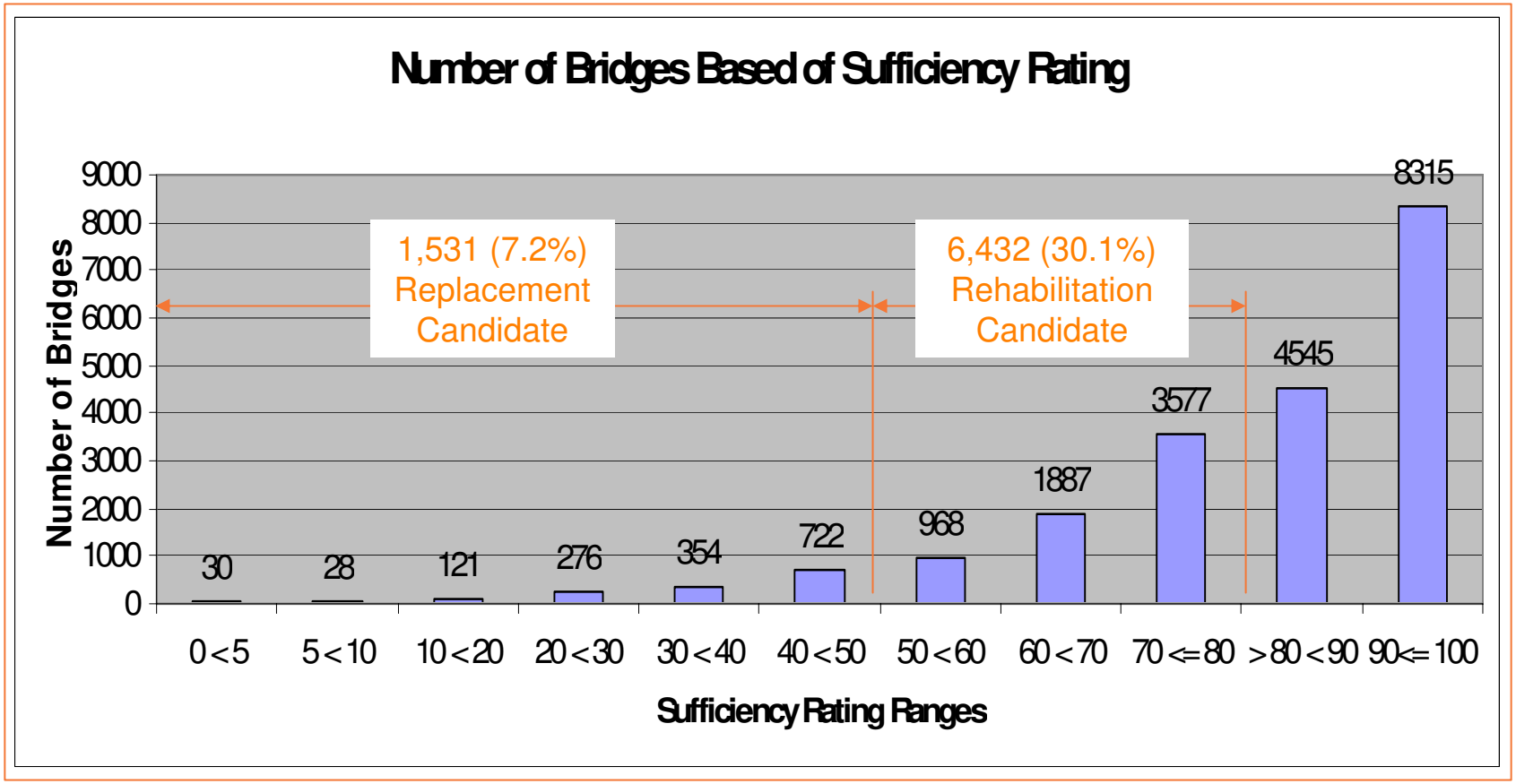
  - Applies only to NBI Structures (Bridges and Culverts > 20 feet in length)

  - Structure Replacement
    - Structure requires a Sufficiency Rating of less then 50

  - Structure Rehabilitation
    - Structure requires a Sufficiency Rating of less then or equal to 80

  - Ten Year Rule
    - Structures built or reconstructed within the last 10 years are not counted by FHWA as structurally deficient (SD) or functionally obsolete (FO).

Sufficiency Ratings of Inventory



FHWA Deficient Structures

The Federal Highway Administration (FHWA) identifies a deficient structure as being either structurally deficient (SD) or functionally obsolete (FO).

	Structures in Inventory	Total # of SD	Total # of FO	Total # of SD and FO
NBI	13,118	1,197 (9%)	2,199 (17%)	3,396 (26%)
Non-NBI	7,705	542 (7%)	904 (12%)	1,446 (19%)
Total =	20,823	1,739 (8.4%)	3,103 (14.9%)	4,842 (23.3%)

Structurally Deficient Structures

- **Structurally Deficient** means there are elements of the bridge that need to be monitored and/or repaired.
  - An element (deck, superstructure or substructure) receives a general condition rating of a 4 or less (poor or worse condition)
  - Structural Condition or Waterway Adequacy rated a 2 or less
    - Very low load rating and bridge needs replacement
    - Frequently floods causing traffic delays

Structurally Deficient Structure Example



Superstructure



Deck



Substructure

Functionally Obsolete Structures

- **Functionally Obsolete** means that the bridge was built to standards that are not used today.

- **Examples:**
  - Deck Geometry (Shoulder requirements have increased)
  - Load Carrying Capacity
  - Horizontal and Vertical Clearances
  - Approach Roadway Alignment
  - Waterway Adequacy

Functionally Obsolete Structure Example





Vertical Clearance



Functionally Obsolete Structure Example





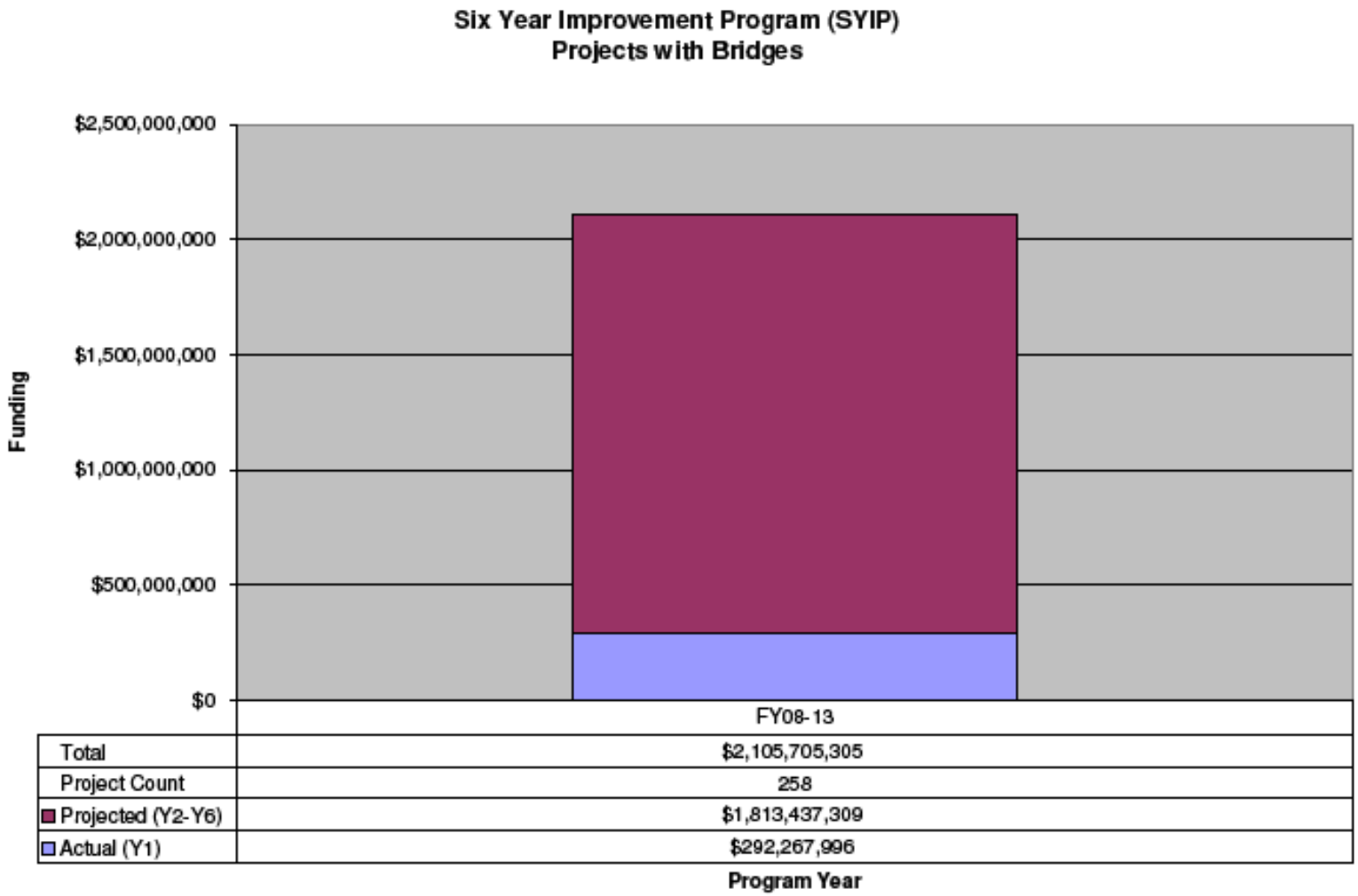
Shoulder Widths

- Do not meet current standards

Historical S&B Construction Activities

Structure Construction Activities	Year Built, Replaced or Rehabilitated						
	2001	2002	2003	2004	2005	2006	Total
New or Replaced Bridges	119	129	115	97	98	94	652
New or Replaced Culverts	78	69	67	83	81	64	442
Bridge and Culvert Rehabilitations	88	95	90	83	73	70	499
Total =	285	293	272	263	252	228	1,593

Construction Investment



Six Year Improvement Program (SYIP) and Secondary Six Year Plans (SSYP) for 2008 - 2013

- 515 bridge projects within the SYIP and SSYPs
- Approximately 555+ bridges
- 228+ Structurally Deficient bridges being addressed by the SYIP and SSYPs
- 72+ Functionally Obsolete bridges being addressed by the SYIP and SSYPs

Bridge Maintenance Investment

	FY07 Expenditures	FY08 Planned Expenditures
Bridge Inspection Program	$13.5 Million	$15.7 Million
Bridge Maintenance Program	$78.2 Million	$131.4 Million

Inspection Practices

- **NBIS = National Bridge Inspection Standards**
  - The Code of Federal Regulations mandate the inventory and inspection of structures and the annual reporting of data to FHWA in accordance with the National Bridge Inspections Standards (NBIS)

  - **NBIS Requirements:**
    - Bridges and culverts measuring more than 20 feet (measured along the roadway Centerline) be inventoried and receive routine inspections at a frequency not to exceed 2 years
    - Bridges with Fracture Critical Members (FCM) to receive a “close-up” inspections at a frequency not to exceed two (2) years
    - Bridges crossing major waterways to receive underwater inspections at a frequency not to exceed five (5) years

  - **VDOT Practices:**
    - VDOT is in full compliance with the NBIS criteria
    - In addition:
      - All bridges are inventoried and inspected regularly regardless of length
      - All culverts having an opening of ≥36 SF are inventoried and inspected regularly
      - Bridges with FCM receive “close up” inspections annually
      - Bridges having fatigue prone details receive “close up” inspections

Inspection Practices

- **District Organization:**
  - Districts are responsible for the inventory and inspections of structures within their district
  - Districts have a dedicated safety bridge inspection engineer that oversees the district wide inspection program
  - Districts have dedicated bridge safety inspection teams
  - 100+ S&B personnel dedicated to the bridge safety inspection program
  - Professional engineers or NBIS certified engineers and technicians perform inspections

- **Central Office:**
  - Dedicated safety inspection section (underwater inspection, QA/QC, inventory)
  - Three (3) regional consultant inspection contracts (12% outsourced)
  - Conducts the statewide underwater inspection program

- **Inspection Program:**
  - 10,377 bridges and culverts were inspected within the last year (8/06-8/07)

- **Quality Assurance:**
  - Central Office conducts an annual QA/QC review of three (3) district bridge safety inspection programs
  - FHWA conducts an annual review of the statewide inspection program
  - FHWA conducts a QA/QC review of one district per year

How has VDOT reacted to I-35W Bridge collapse?

- **Identified all bridges with similar deck truss construction**
  - Total of twelve (12) bridges were identified
  - One (1) bridge is maintained by the Richmond Metropolitan Authority
  - Eleven (11) bridges are maintained by VDOT
  - One (1) bridge has been recently replaced
  - One (1) bridge is being replaced under an active construction contract
  - One (1) bridge is going to advertisement in October 2007

- **FHWA and VDOT reviewed the latest inspection reports of the eleven (11) bridges**
  - Nothing out of the ordinary was discovered during the review
  - All bridges were inspected within the last two (2) years
  - Some were inspected as recently as May 2007

- **Assigned the inspections of all bridges to the three (3) engineering consulting firms**
  - Ensured a different firm performed the inspection since the last inspection

- **The field inspection status:**
  - Five (5) bridge inspections have been completed
  - Four (4) bridges are currently being inspected
  - Two (2) bridges will be inspected in September
  - All inspections reports are due to VDOT by October 2007

Commonwealth Deck Truss Bridges

Steel Deck Truss Inspection Schedule

Sept. 17, 2007

District	County/City	Route	Bridge Name	Crossing	Fed Struc. ID	VA Struc. No.	Inspect By	Begin Inspection Date	Update as of 9/17/07
Salem	Bedford	666		Elk Creek	2781	6087	Clark Nexsen	Week of 08/13/2007	Completed Field Inspections
Salem	Botetourt	817		Craig Creek	3534	6100	Clark Nexsen	September, 2007 - Pending completion of repair work	Completed Field Inspections
Salem	Botetourt	685		Craig Creek	3496	6386	Clark Nexsen	Week of 09/04/2007	Completed Field Inspections
Salem	Patrick	772		Spoon Creek	13399	6153	Schwartz & Associates	September, 2007 - Pending completion of repair work	Completed Field Inspections
Richmond	City of Richmond	95		JAMES RV,RTE 360(60)&CSX	21494	2835	Schwartz & Associates	Week of 08/20/2007 - Week of 09/3/2007	Completed Field Inspections
Richmond	City of Richmond	161	Boulevard (Nickel) Bridge	JAMES RV,SOU RWY,CSXT RR	21528	1826	TRC	Week of 08/27/2007 - Week of 09/17/2007	Inspection in progress - started on 8/27
Hampton Roads	York	17	George P. Coleman Bridge	YORK RIVER & SR 238	19824	1946	Clark Nexsen	Week of 08/20/2007 - Week of 09/10/2007	Completed Field Inspections
Fredericksburg	Middlesex	3	Robert O. Norris Jr. Bridge	RAPPAHANNOCK RIVER	12083	1959	TRC	Week of 08/20/2007	Completed Field Inspections
Staunton	Page	340		JEREMIAHS RUN	13066	1004	Schwartz & Associates	08/18 - 19/2007	Completed Field Inspections
Staunton	Page	340		OVERALL RUN	13087	1990	Schwartz & Associates	08/17 - 18/2007	Completed Field Inspections
Staunton	Warren	522		S F SHENANDOAH RV & N&W	20272	1901	Schwartz & Associates	08/15 - 19/2007	Completed Field Inspections

How has VDOT reacted to I-35W Bridge collapse?

- **Added a link to VDOT's website (http://www.virginiadot.org/info/bridge.asp)**
  - Letters from the Commissioner and other leaders
  - A comprehensive list containing information on all of the 20,823 structures broken down by district
  - Common bridge related definitions and explanations
  - Video clips
  - Web links to other useful sites
- **Responded to extensive requests from the media and the general public**
- **In the process of amending our Road & Bridge Specifications to address FHWA Technical Advisory regarding construction loads on bridges**
- **Restricted the disclosure of inspection reports in response to a national advisory from the Homeland Security Office**

How has VDOT reacted to I-35W Bridge collapse?

- Identified all Fracture Critical Member (FCM) bridges and is in the process of reviewing all inspection reports (305 total)
- Planning to re-inspect some FCM bridges for QA measures…focusing on those districts that did not have deck truss bridges
- Central Office safety and inspection personnel will conduct a special review of the districts inspection program with emphasis on bridges with FCM and fatigue prone details



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