

## Hampton Roads Bridge Tunnel Completed, Ongoing, and Routine Testing Efforts

Completed Work Efforts	Facility	Start	Completed	Cost
Replace Fire Pumps, Motors, Valves & Piping	HRBT	2003	2003	\$ 100,000
Portal Flood Gate Rehabilitation	HRBT	2004	2005	\$ 420,000
High Voltage Feeder Cable Replacement	HRBT	2004	2005	\$ 156,000
Ventilation Analysis (All tunnels)	All Tunnels	2004	2006	\$ 56,750
Ventilation Fan Sprinkler System Replacement (Eastbound)	HRBT	2005	2005	\$ 31,000
Sidewalk & Handrail Replacement	HRBT	2005	2006	\$ 3,658,000
Air Supply Vent Cleaning	HRBT	2005	2006	\$ 640,000
Ventilation Fan Damper Louver Repairs (Eastbound)	HRBT	2005	2006	\$ 49,000
Fire Main Repairs and Hydrant Valve Replacement	HRBT	2005	2007	\$ 1,518,000
Ventilation Fan Sprinkler System Replacement (Westbound)	HRBT	2006	2006	\$ 31,000
Life-Safety Mechanical & Electrical Systems Report (All tunnels)	All Tunnels	2006	2007	\$ 142,000
Electrical Switchgear Battery Replacement	HRBT	2007	2007	\$ 45,300
Tunnel Lighting-Emergency Power Supply	HRBT	2007	2007	\$ 46,000
Hydrocarbon Detection System	HRBT	2007	2008	\$ 47,000
Labeled Emergency Telephones	HRBT	2008	2008	\$ 500
Ventilation Fan Damper & Controls Replacement (Westbound)	HRBT	2008	2009	\$ 1,285,000
Norfolk Water Main Supply Line Repair	HRBT	2009	2009	\$ 5,000

Sub-Total \$ 8,230,550

Ongoing / Scheduled Work Efforts	Facility	Start	Estimated Completion	Cost
Ventilation Fan Rehabilitation (Partial East & West)	HRBT	2008	2009	\$ 528,000
Ventilation Building Structural Repairs (Westbound)	HRBT	2009	2009	\$ 439,000
Carbon Monoxide Sensor Replacement	HRBT	2009	2010	\$ 31,600
Ventilation Fan Rehabilitation (Partial East & West)	HRBT	2009	2013	\$ 3,000,000
Tunnel Roadway Lighting Replacement (Eastbound)	HRBT	2009	2001	\$ 9,200,000
Electrical Switchgear, Generators & Controls Replacement	HRBT	2009	2013	\$ 33,000,000
Tetsing & Calibration of Fire Suppression System	HRBT	2009	2009	\$ 3,000
Installation of Submersable Pumps-Mid-River	HRBT	2010	2011	\$ 1,500,000
AM/FM Rebroadcast System Replacement	HRBT	2010	2011	\$ 500,000
Upgrade Interior Floodgate Vent Building Lighting	HRBT	2010	2011	\$ 40,000
Installation of Water Monitoring & Detection Systems	HRBT	2009	2010	\$ 45,000
Fire Main Evaluation and Recommended Repairs or Replacement	HRBT	2010	2011	\$ 250,000
Repair E & W Bound Heat Trace System to Incoming Water Lines	HRBT	2011	2012	\$ 1,000,000

Sub-Total \$ 49,536,600

Total \$ 57,767,150

Ongoing Maintenance & Testing	Facility	Periodicity	Last Complete @ HRBT
Fire Main Hydrostatic Pressure Testing (NFPA 25)	All Tunnels	5 years	2006
Fire Main Flow Rate Testing (NFPA 25)	All Tunnels	5 years	2006
Ventilation Fan Sprinkler System Testing (NFPA 25)	All Tunnels	3 years	2007
Portal Flood Gate Operational Testing	HRBT & ERT Midtown	6 months	Jun-09
Electrical Switchgear Equipment Calibration	All Tunnels	5 years	2004

**Elizabeth River Tunnels-Downtown  
Completed, Ongoing, and Routine Testing Efforts**

<b>Completed Work Efforts</b>	<b>Facility</b>	<b>Start</b>	<b>Completed</b>	<b>Cost</b>
Fire Main Repairs and Hydrant Valve Replacement	Downtown	2004	2006	\$ 300,000
Ventilation Analysis (All tunnels)	All Tunnels	2004	2006	\$ 56,750
Ventilation Fan Damper Replacement	Downtown	2004	2005	\$ 370,000
Fire Pump Controller Replacement	Downtown	2004	2005	\$ 350,000
Control Room HVAC Replacement	Downtown	2005	2006	\$ 175,000
Westbound Tunnel Ceiling Panel Replacement (Partial)	Downtown	2005	2007	\$ 780,000
HVAC Roof Platform Rating	Downtown	2005	2006	\$ 5,000
Life-Safety Mechanical & Electrical Systems Report (All tunnels)	All Tunnels	2006	2007	\$ 142,000
Hydrocarbon Detection System	Downtown	2007	2008	\$ 47,000
Structural Inspection of Upper Air Duct	Downtown	2008	2008	\$ 43,000
Spare Fan Shaft Purchase	Downtown	2008	2008	\$ 16,000
Labeled Emergency Telephones	Downtown	2008	2008	\$ 500

Sub-Total \$ 2,285,250

<b>Ongoing / Scheduled Work Efforts</b>	<b>Facility</b>	<b>Start</b>	<b>Estimated Completion</b>	<b>Cost</b>
Mid River Pumps Replacement (Submersible)	Downtown	2005	2009	\$ 1,387,000
Fire Main Repairs (Valve Replacement-Portsmouth Vent)	Downtown	2008	2008	\$ 20,000
Tunnel Lighting-Emergency Power Supply Replacement	Downtown	2008	2010	\$ 465,000
Replace Fire Pumps Portsmouth Vent Bldg	Downtown	2008	2008	\$ 80,000
Ventilation Fan Sprinkler System Replacement	Downtown	2009	2010	\$ 35,000
Tunnel Hydrant Connections	Downtown	2009	2010	\$ 323,000
Ventilation Bldg Roof Replacement	Downtown	2009	2009	\$ 180,000
Expansion Joint Repair- EBL	Downtown	2009	2009	\$ 160,000
Relocate Emergency Generator Panel	Downtown	2009	2010	\$ 14,000
Ventilation Fan Motor Controllers Replacement	Downtown	2009	2010	\$ 226,000
Exhaust Ventilation Fan Rehab	Downtown	2009	2011	\$ 850,000
Installation of Portal Door for Fire Control	Downtown	2009	2013	\$ 312,000
Electrical Switchgear Battery Replacement	Downtown	2010	2011	\$ 35,000
Replace Damaged/Faulty Ceiling Tiles and Supports in Tube	Downtown	2010	2011	\$ 1,000,000
Carbon Monoxide Sensor Replacement	Downtown	2011	2012	\$ 57,000
Replace Deluge Valves	Downtown	2011	2011	\$ 20,000

Sub-Total \$ 5,164,000

Total \$ 7,449,250

<b>Ongoing Maintenance &amp; Testing</b>	<b>Facility</b>	<b>Periodicity</b>	<b>Last Complete @ HRBT</b>
Fire Main Hydrostatic Pressure Testing (NFPA 25)	All Tunnels	5 years	2006
Fire Main Flow Rate Testing (NFPA 25)	All Tunnels	5 years	2006
Ventilation Fan Sprinkler System Testing (NFPA 25)	All Tunnels	3 years	2007
Electrical Switchgear Equipment Calibration	All Tunnels	5 years	2004

**Elizabeth River Tunnels-Midtown  
Completed, Ongoing, and Routine Testing Efforts**

<b>Completed Work Efforts</b>	<b>Facility</b>	<b>Start</b>	<b>Completed</b>	<b>Cost</b>
Ventilation Fan Sprinkler System Replacement	Midtown	2004	2004	\$ 35,000
Ventilation Analysis (All tunnels)	All Tunnels	2004	2006	\$ 56,750
Flood Gate Repairs	Midtown	2005	2005	\$ 50,000
Low Voltage Electric Cable Replacement	Midtown	2005	2006	\$ 275,000
Tunnel Ceiling Panel Replacement	Midtown	2005	2006	\$ 50,000
Life-Safety Mechanical & Electrical Systems Report (All tunnels)	All Tunnels	2006	2007	\$ 142,000
Roadway Drainage Shutoff Valve Repair	Midtown	2006	2007	\$ 25,000
Traffic Patroller Walk Way/Cut Thru	Midtown	2007	2007	\$ 5,000
Mid River Drainage Pipe Repair	Midtown	2007	2007	\$ 21,500
Hydrocarbon Detection System	Midtown	2007	2008	\$ 47,000
Labeled Emergency Telephones	Midtown	2008	2008	\$ 500

Sub-Total \$ 707,750

<b>Ongoing / Scheduled Work Efforts</b>	<b>Facility</b>	<b>Start</b>	<b>Estimated Completion</b>	<b>Cost</b>
Mid River Pumps Replacement (Submersible)	Midtown	2005	2009	\$ 478,000
Lower Duct Air Flu Cleaning	Midtown	2009	2010	\$ 750,000
Tunnel Lighting-Emergency Power Supply Replacement	Midtown	2008	2011	\$ 794,000
Replace Fire Pumps at Norfolk Vent Bldg	Midtown	2008	2008	\$ 12,000
Ventilation Fan Sprinkler System Analysis & Report	Midtown	2008	2008	\$ 24,000
Electrical Switchgear Battery Replacement	Midtown	2009	2010	\$ 34,000
Lane Use Signals Replacement	Midtown	2009	2011	\$ 474,000
Enclose Emergency Generator Panel	Midtown	2009	2011	\$ 35,000
Ventilation Fan Rehab	Midtown	2010	2011	\$ 1,133,000
Rehab Roadway Intake Air Flow Control Systems	Midtown	2010	2014	\$ 3,723,000
Carbon Monoxide Sensor Replacement	Midtown	2010	2012	\$ 83,000
Tunnel Hydrant Connections	Midtown	2011	2011	\$ 80,000
Replace Deluge Valves	Midtown	2011	2011	\$ 15,000

Sub-Total \$ 7,635,000

Total \$ 8,342,750

<b>Ongoing Maintenance &amp; Testing</b>	<b>Facility</b>	<b>Periodicity</b>	<b>Last Complete @ HRBT</b>
Fire Main Hydrostatic Pressure Testing (NFPA 25)	All Tunnels	5 years	2006
Fire Main Flow Rate Testing (NFPA 25)	All Tunnels	5 years	2006
Ventilation Fan Sprinkler System Testing (NFPA 25)	All Tunnels	3 years	2007
Electrical Switchgear Equipment Calibration	All Tunnels	5 years	2004

**Monitor Merrimac Memorial Bridge Tunnel  
Completed, Ongoing, and Routine Testing Efforts**

<b>Completed Work Efforts</b>	<b>Facility</b>	<b>Start</b>	<b>Completed</b>	<b>Cost</b>
Ventilation Analysis (All tunnels)	All Tunnels	2004	2006	\$ 56,750
Ventilation Bldg. Roof Replace	MMBT	2005	2006	\$ 330,000
Entire Fire Main System Replacement	MMBT	2005	2007	\$ 4,528,000
Life-Safety Mechanical & Electrical Systems Report (All tunnels)	All Tunnels	2006	2007	\$ 142,000
Hydrocarbon Detection System	MMBT	2007	2008	\$ 47,000
Labeled Emergency Telephones	MMBT	2008	2008	\$ 500
Replace Telephone Cable	MMBT	2008	2009	\$ 34,000
Electrical Switchgear Battery Replacement	MMBT	2008	2010	\$ 36,300
Ventilation Fan Motor Controllers Replacement	MMBT	2009	2010	\$ 971,000
<b>Sub-Total</b>				<b>\$ 6,145,550</b>

<b>Ongoing / Scheduled Work Efforts</b>	<b>Facility</b>	<b>Start</b>	<b>Estimated Completion</b>	<b>Cost</b>
Ventilation Fan Motor Rehab	MMB T	2009	2009	\$ 169,000
Pavement/Drainage Repairs at Tunnel Entrance & Exits	MMB T	2009	2010	\$ 1,500,000
Ventilation Duct Air Flow Calibration	MMB T	2009	2010	\$ 180,000
Tunnel Lighting-Emergency Power Supply	MMB T	2009	2010	\$ 525,000
Install Security Cameras	MMB T	2009	2010	\$ 17,000
Emergency Generator Modifications & Electrical Upgrades	MMB T	2009	2012	\$ 2,450,000
Ventilation Fan Painting & Repair	MMB T	2010	2011	\$ 808,000
Upgrade and Enlarge Lines at Tunnel Sewer Pumping Station	MMB T	2010	2011	\$ 45,000
Carbon Monoxide Sensor Replacement	MMB T	2010	2012	\$ 62,000
Rehab Roadway Intake Air Flow Control Systems	MMB T	2010	2013	\$ 1,650,000
Hardware and Software Upgrade to Tunnel Traffic Control System	MMB T	2011	2012	\$ 800,000
<b>Sub-Total</b>				<b>\$ 8,206,000</b>
<b>Total</b>				<b>\$ 14,351,550</b>

<b>Ongoing Maintenance &amp; Testing</b>	<b>Facility</b>	<b>Periodicity</b>	<b>Last Complete @ HRBT</b>
Fire Main Hydrostatic Pressure Testing (NFPA 25)	All Tunnels	5 years	2006
Fire Main Flow Rate Testing (NFPA 25)	All Tunnels	5 years	2006
Ventilation Fan Sprinkler System Testing (NFPA 25)	All Tunnels	3 years	2007
Electrical Switchgear Equipment Calibration	All Tunnels	5 years	2004