

**Ten Year Renewal and Replacement Plan  
and  
Twenty Year Estimated Capital Expenditures  
for  
Current and Recommended Plans**

**Newport/Pell  
and  
Mount Hope Bridges**

## **RITBA SUMMARY OF CAPITAL EXPENDITURE PLANS**

### **NEWPORT/PELL BRIDGE**

#### **INTRODUCTION**

The following is a brief narrative of the 25 items currently in the Rhode Island Turnpike and Bridge Authority's (RITBA) Ten Year Renewal and Replacement Plan for the Newport/Pell Bridge. The intent of this document is to provide an overview of the issues associated with each item and summarize how each item is treated in the Twenty Year Estimate of Capital Expenditure Plans (Current and Recommended) that are used in this Fiscal Integrity Study.

The photographs that accompany the narrative include documentation of existing conditions, conditions that have been repaired, and conditions in the process of being repaired sometime in the recent past.

# RITBA SUMMARY OF CAPITAL EXPENDITURE PLANS

## 1.0 BRIDGE DECK EVALUATION



**Photo No. 1.1**

**Description:** A view of the westbound traffic on the main span roadway.

The concrete roadway deck experiences direct contact with car, truck, and oversized permit loads, storm runoff, seasonal deicing salts, and the wear associated with each. The roadway is also the bridge element that all revenue customers contact directly. The aesthetic appearance of the roadway and the smoothness and comfort of the ride have an immediate impact on these end users.

The original concrete cast-in-place roadway deck is over 37 years old and has continually been inspected and repaired as part of a preventive maintenance program (TYP Items 2,

3, 4, 5 and 6). The evaluation of the concrete deck is a more in-depth determination of the deck condition including material testing such as taking samples for chloride ion levels (salt intrusion). The material testing is compared to previous evaluations (performed in 1989, 1991 and 1999) and the in-depth evaluation is used to identify areas requiring rehabilitation and repair.



**Photo No. 1.2**

**Description:** Span 5 West Westbound Travel Lane. Concrete shows previous repairs and new rupture at expansion joint.

The roadway is evaluated using a variety of methods that include visual inspection to identify uneven or cracked pavement, mechanical sounding of the deck with a hammer to locate hollow areas below the roadway surface, and laboratory analysis of concrete samples to determine the amount of chloride (deicing salt) intrusion into the deck. Chloride intrusion into the deck can initiate corrosion of the internal steel reinforcing bars and cause them to expand and crack the concrete. Both visual and mechanical monitoring is performed from beneath the deck as well.

## RITBA SUMMARY OF CAPITAL EXPENDITURE PLANS

### 1.0 BRIDGE DECK EVALUATION

#### Current Plan:

This plan assumes that evaluation costs will take place on a 7-year cycle and two cycles completed in plan years 1-10. A place holder with no costs is assumed for work generated as a result of these tests.

#### Recommended Plan:

This plan assumes that areas previously identified for priority repairs for partial depth deck replacement in previous TYP's are replaced with a full-depth deck replacement in years 1-10. Areas assumed for full depth deck replacement are the entire suspended bridge (main and side spans) and steel girder spans 15E-21E and concrete girder spans 39E to the East Abutment of the bridge.

## RITBA SUMMARY OF CAPITAL EXPENDITURE PLANS

### 2.0 BRIDGE DECK SEALING



**Photo No. 2.1**

**Description:** West Side Span, Panel 33 West. A pop-out (spall) on the bottom surface of the concrete deck with exposed reinforcing steel.

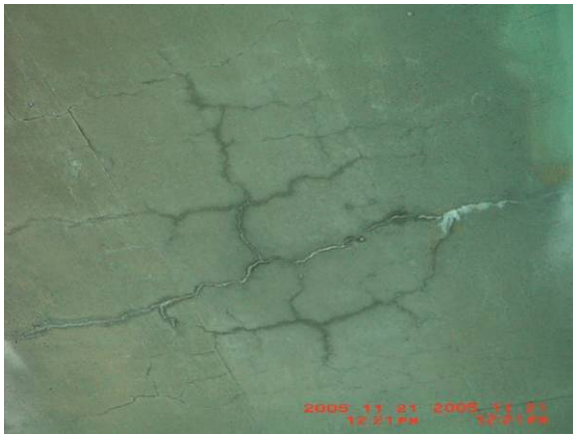
corrosion on the reinforcing steel that is embedded in the concrete. The surface layers of the steel expand as they rust. As the steel expands it exerts a force that causes the concrete to separate, creating a void within the pavement or causing the surface concrete to fail, exposing the reinforcing steel (see Photo No. 2.1). These voids are enlarged during the winter season as moisture fills the void and expands when the water freezes.

Protecting the bridge deck with a concrete sealer that has been tested and approved by the highway industry is a routine maintenance task that protects and extends the life of the deck.

The deck of the Newport/Pell Bridge was cleaned and coated with a sealer in 1988 and again in 1999.

The primary function of the sealer is to form a barrier that repels moisture and limits chloride intrusion (deicing salts). Both moisture and deicing salts cause

Sealers are typically expected to be effective for at least three to four years, and up to approximately seven years and the Ten Year Plan includes the cleaning of the deck and application of sealer at seven year intervals. This approach is expected to prolong the service life of the deck, reducing costs for rehabilitation or replacement of the deck and reduce repair costs associated with spalling concrete.



**Photo No. 2.2**

**Description:** East Side Span. Crack formation on the bottom surface of the concrete deck with efflorescence (white salts in the cracks).

## RITBA SUMMARY OF CAPITAL EXPENDITURE PLANS

### 2.0 BRIDGE DECK SEALING

#### Current Plan:

This plan assumes that sealing is performed on a 7-year cycle, with two sealing cycles in plan years 1-10.

#### Recommended Plan:

This plan assumes a more aggressive sealing schedule of three sealing cycles in years 1-10, and two additional cycles are estimated for years 11-20.

## RITBA SUMMARY OF CAPITAL EXPENDITURE PLANS

### 3.0 BRIDGE DECK SLAB PARTIAL DEPTH REHABILITATION



**Photo No. 3.1**

**Description:** *Hydro-demolition of the upper three inches of the roadway surface for the partial depth pavement replacement in the west approach spans.*

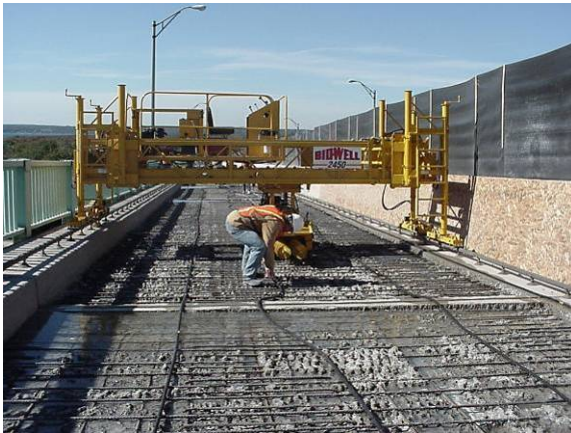
Partial depth replacement of the concrete deck is an economic alternative to replacing the entire deck. The costs and time when lanes are out of service for revenue customers are significantly reduced.

The lower portion of the deck must be in relatively good condition to be a suitable candidate for this procedure. If the intrusion of chlorides (de-icing salts) are of highest concentration in the top several inches of concrete, this concrete can be removed and replaced with a high density, lower permeability concrete. This approach removes chlorides that would continue to migrate through

the deck, causing damage to the full depth of the deck, and provides a less permeable top layer to prevent future intrusion of chlorides.

When high concentrations of deicing salts are found throughout the concrete, from the top surface to the bottom surface of the roadway deck, the only suitable option is full depth deck replacement.

In 2000, RITBA performed a partial deck replacement of 800 feet of roadway deck on the west approach of the Newport/Pell Bridge.



**Photo No. 3.2**

**Description:** *Preparing reinforcing steel for partial depth replacement of the concrete pavement in the west approach spans. The concrete has been removed to a depth of about 3 inches (below the top level of reinforcing bar).*

The deck evaluation (TYP Item 1) including testing of concrete samples from other deck locations will identify priority areas for partial depth and/or full depth replacement. The current Ten Year Plan includes an assumption (based on the findings of the 1999 Deck Evaluation) that specific sections of the deck will be rehabilitated by partial depth replacement.

## RITBA SUMMARY OF CAPITAL EXPENDITURE PLANS

### 3.0 BRIDGE DECK SLAB PARTIAL DEPTH REHABILITATION

#### Current Plan:

This plan assumes that areas previously identified for priority repairs for partial depth deck replacement in previous TYP's are replaced with partial-depth deck replacement in years 1-10. Areas assumed for partial-depth deck replacement are the entire suspended bridge (main and side spans) and steel girder spans 15E-21E and concrete girder spans 39E to the East Abutment of the bridge.

#### Recommended Plan:

This plan assumes a smaller cycle of partial-depth deck replacement, one in year 1-10 and a second cycle in years 11-20. Areas of partial-depth deck replacement are smaller due to the amount of full-depth deck replacement performed in this plan under item 1.0.

## RITBA SUMMARY OF CAPITAL EXPENDITURE PLANS

### 4.0 BRIDGE DECK PATCHING: ROADWAY/APPROACHES



**Photo No. 4.1**

**Description:** Twelve inch diameter spall in the pavement surface.

Roadway concrete deck patch repair is an annual component of the Newport/Pell Bridge maintenance schedule.

This program helps maintain the structural integrity of the concrete and a smooth riding surface, and helps prolong the life of the deck by limiting moisture and deicing salt intrusion.

At a minimum, the annual program includes spall repair, which is the replacement of pop-outs that appear on the top surface of the pavement (see Photo No. 4.1).

As is the case of recent and ongoing Contracts 03-2, 03-2A, and 03-2B, the program involves sounding the surface of the deck using a hammer or chain drag, to identify hollow sounding areas of delaminated concrete for repair in addition to spall repairs. This more aggressive approach is a pro-active measure to prolong the service life of the deck.

### 4.0 BRIDGE DECK PATCHING: ROADWAY/APPROACHES

#### Current Plan:

This plan assumes original and patched deck will require patching as part of normal maintenance due to chloride intrusion and wear and tear.

#### Recommended Plan:

This plan assumes the Current Plan concrete patching costs in years 1-10, and somewhat lower costs for patching in remaining un-rehabilitated areas for years 11-20 due to implementation of full-depth deck replacement.

## RITBA SUMMARY OF CAPITAL EXPENDITURE PLANS

### 5.0 BRIDGE DECK JOINT AND HEADER REPAIRS



**Photo No. 5.1**

**Description:** Span 5 West, Westbound Travel Lane. Concrete rupture at expansion joint.

Expansion joints are located at reoccurring intervals along the concrete roadway deck. They allow the bridge to expand and contract seasonally with changes in temperature. Construction joints are narrower joints that were installed during original construction based on concrete placement limitations.

Joints are made up of three primary components: the gap between deck sections, the header on each side of the gap, and the joint seal.

another begins, allows for the movement. The portions of the concrete deck on each side of the joint are referred to as headers. They are often deeper (thicker) than the adjacent deck concrete and function as beams to support the deck and the vehicle loads. The rubber joint seal that fills the gap between the adjacent deck sections prevents water from flowing onto the supporting structural steel beneath.

The gap between deck sections, where one deck section ends and another begins, allows for the movement. The portions of the concrete deck on each side of the joint are referred to as headers. They are often deeper (thicker) than the adjacent deck concrete and function as beams to support the deck and the vehicle loads. The rubber joint seal that fills the gap between the adjacent deck sections prevents water from flowing onto the supporting structural steel beneath.



**Photo No. 5.2**

**Description:** Preparation of an expansion joint for a partial depth concrete repair.

The roadway deck and expansion joint components experience significant wear due to the impact of vehicles crossing the bridge, particularly the heavy truck traffic. The concrete is less resilient and is prone to cracking at the joint locations (see Photo No. 5.1).

The deck, header, and joint seal at expansion joints require special maintenance in order to provide a comfortable ride, remain structurally sound, and to protect the structural steel from corrosion due to storm water runoff.

## RITBA SUMMARY OF CAPITAL EXPENDITURE PLANS



**Photo No. 5.3**

**Description:** Preparation of an expansion joint for a partial depth repair.

This maintenance might include a partial depth repair of the deck and replacement of the joint seal (see Photo Nos. 5.2 and 5.3). In certain instances the repair would involve a full depth replacement of the headers and deck.

### 5.0 BRIDGE DECK JOINT AND HEADER REPAIRS

#### Current Plan:

This plan assumes sporadic joint header repairs due to normal wear and tear on the concrete deck.

#### Recommended Plan:

This plan assumes a somewhat more aggressive repair schedule in preparation for, and in conjunction with, a more aggressive bridge painting schedule in years 1-10. Repairs in years 11-20 are assumed to be lower due to full depth deck replacements including full replacement of joint headers.

## RITBA SUMMARY OF CAPITAL EXPENDITURE PLANS

### 6.0 REHABILITATION OF WEST APPROACH ROADWAY PAVEMENT



**Photo No. 6.1**

**Description:** Westbound West Approach at Structure "E". Cracking and settlement of the pavement in the westbound travel lane.

An asphalt overlay replacement study for the west approach of the Newport/Pell Bridge between the bridge and the toll plaza has been performed with the aid of RIDOT in providing manpower and equipment to take asphalt cores.

The condition of the asphalt in the westbound lane was characterized by surface cracking and settlement of the pavement (see Photo No. 6.1).



**Photo No. 6.2**

**Description:** Asphalt core removed from the west approach for analysis.

Asphalt cores revealed that the eastbound lanes require only shallow-depth overlay replacement of the asphalt (see Photo No. 6.2).

The westbound lane is in poorer condition and requires a full-depth asphalt replacement (to a depth of 18 inches).

### 6.0 REHABILITATION OF WEST APPROACH ROADWAY PAVEMENT

#### Current Plan:

This plan assumes that the two westbound lanes are repaved in years 1-10 where pavement has cracked and settled.

#### Recommended Plan:

This plan assumes that both westbound and eastbound lanes are repaved in years 1-10 where pavement has cracked and settled.

## RITBA SUMMARY OF CAPITAL EXPENDITURE PLANS

### 7.0 REHABILITATION OF STRUCTURE "E" BRIDGE DECK



**Photo No. 7.1**

**Description:** Structure "E", Westbound Lanes. General view showing patch deck repairs and a spall in the westbound travel lane.

At the request of RITBA, PB is currently completing a deck rehabilitation study for Structure 'E', the bridge structure located within the west approach between the Newport/Pell Bridge and the toll plaza. Structure 'E' is a simple span bridge with eight rolled steel multi-girders and a composite 7-1/2" thick reinforced concrete deck.



**Photo No. 7.2**

**Description:** Structure "E", Westbound Lanes. Close up view of a spall with exposed reinforcing steel in the westbound travel lane.

The existing reinforced concrete deck is in poor condition (see Photo Nos. 7.1 and 7.2).

The majority of the riding surface has partial depth patch repairs and additional partial depth concrete patching is typically required on Structure "E" on an annual basis.

The study has found that the chloride levels in the bottom portion of the Structure "E" deck are not so high as to preclude a partial depth deck replacement approach to extend the life of the deck, provided this occurs in a timely manner. The

Ten Year Plan includes costs associated with performing a partial depth replacement of the deck at Structure "E".

## RITBA SUMMARY OF CAPITAL EXPENDITURE PLANS

### 7.0 REHABILITATION OF STRUCTURE "E" BRIDGE DECK

#### Current Plan:

This plan assumes partial-depth deck replacement for Structure "E" carried out in years 1-10.

#### Recommended Plan:

This plan assumes full-depth deck replacement for Structure "E" carried out in plan years 1-10.

## RITBA SUMMARY OF CAPITAL EXPENDITURE PLANS

### 8.0 REMOVAL OF LOOSE HAUNCHES



**Photo No. 8.1**

**Description:** *Loss of concrete haunches below the concrete deck.*

The concrete deck is supported by steel beams called stringers that are oriented in the same direction as the traffic flow above.

Between the top of the steel stringer and the bottom of the concrete deck is a space filled with concrete, called a haunch, that was provided during original construction to control the geometry of the bridge deck.

The haunches on the Newport/Pell Bridge extend about 3-½ inches past the edge of the steel stringer. The haunches are prone to

cracking and falling into the channel below. This condition poses a hazard to boat and ship traffic.

RITBA in-house maintenance staff, bridge inspectors, and contractors remove loose haunches as they are found while performing tasks near the underside of the deck. The Ten Year Plan includes costs for haunch removal packaged with other work that is performed in the area of the haunches.

### 8.0 REMOVAL OF LOOSE HAUNCHES

#### Current Plan:

This plan assumes normal removal of loose haunches as a part of on-going contract work in years 1-10.

#### Recommended Plan:

This plan assumes a somewhat more aggressive schedule for removing loose haunches as part of increased contract work in years 1-10.

## RITBA SUMMARY OF CAPITAL EXPENDITURE PLANS

### 9.0 CONCRETE REPAIRS ON PIERS, ABUTMENTS AND ANCHORAGES



**Photo No. 9.1**

**Description:** Contractor installing concrete forms on a pier column during contract 03-4.

Work performed during Contracts 01-8 and 03-4 included repairs to the land and water piers, the abutments and the anchorages (see Photo No. 9.1). Based on this work being completed the Current Ten Year Plan does not include costs for this item.



**Photo No. 9.2**

**Description:** Pier 21 East, South Column – Steel jacket has deteriorated, the concrete is missing, and the reinforcing steel within the column is exposed.

Future repairs locations have been identified or are anticipated based on deterioration of materials over time on other portions of the bridge (see Photo No. 9.2).

## RITBA SUMMARY OF CAPITAL EXPENDITURE PLANS

### 9.0 CONCRETE REPAIRS ON PIERS, ABUTMENTS AND ANCHORAGES

#### Current Plan:

Concrete repairs to piers and abutments were performed in 2001. This plan assumes that no new concrete repairs will be performed in the next 10 years of the TYP.

#### Recommended Plan:

This plan assumes that additional concrete patch repairs to the piers and anchorages will be required in years 1-10.

## RITBA SUMMARY OF CAPITAL EXPENDITURE PLANS

### 10.0 PLACING PROTECTIVE CONCRETE JACKETING ON WEST PROTECTION CELLS



**Photo No. 10.1**

**Description:** *West Protection Cells with protective splash zone coating.*

There are cofferdam protection cells under the main suspension cables at their low point where the cables enter each of the anchorages.

These protection cells are intended to protect the cables from damage due to an errant ship. The cells consist of circular corrugated steel cofferdams filled with backfill material and concrete. Inspections of the cells, including measurements of the thickness of the steel, indicated heavy section loss to the East Protection Cell steel in the splash zone area and moderate section loss to the steel at the West Protection Cells in the

splash zone area in 1996. The splash zone areas are prone to corrosion due to exposure to wetting and drying under tidal and wave action. In 1997 the East and West Protection Cells were repaired, with the heavier corroded East Cells being jacketed by concrete. The West Protection Cells had a special protective splash zone material applied at that time. Photo 10.1 (taken recently) shows the existing splash zone compound on the West Protection Cells is beginning to deteriorate, and continued corrosion of the steel is taking place in these areas. The Ten Year Plan includes a provision to place concrete jacketing at the West Cells to preclude further deterioration.

### 10.0 PLACING PROTECTIVE CONCRETE JACKETING ON WEST PROTECTION CELLS

#### Current Plan:

This plan assumes that this work is carried out in years 1-10.

#### Recommended Plan:

This plan makes the same assumptions as the Current Plan.

## RITBA SUMMARY OF CAPITAL EXPENDITURE PLANS

### 11.0 PAINTING OF STEEL SUPERSTRUCTURE



**Photo No. 11.1**

**Description:** Main Span, Panel Point 54 East. Floor truss at expansion joint with surface rust and corrosion visible on floor truss elements, stringers and diaphragms.

The effective useful life span of a bridge is a function of the quality and frequency of structural maintenance. For a steel structure, like the Newport/Pell Bridge, no single maintenance activity is as critical as maintaining the integrity of the overall paint system.

The effective life of the paint system on different bridges varies significantly due to variations in climate, proximity to a marine environment, and the effectiveness of the drainage system and its ability to divert storm flows away from the steel.

The effective life of the paint system on a single bridge varies significantly as well. Paint on steel members located beneath a leaking deck joint, as exhibited in Photo No. 11.1, deteriorates more rapidly than paint that is protected from storm runoff, as shown in the background of the same photo.



**Photo No. 11.2**

**Description:** Span 5E. Paint failure and surface corrosion on steel truss and bracing members.

Photo 11.2 shows the typical condition of steel under previously open finger joints at deck truss spans. As part of Contract 01-7, drainage troughs were installed under these joints to stop water from falling onto and rusting the steel below. This work was intended to be performed prior to painting to ensure that newly painted steel would not be subjected to continued corrosion from the open joints.

## RITBA SUMMARY OF CAPITAL EXPENDITURE PLANS



**Photo No. 11.3**

**Description:** *East Side Span, Panel Point 5 East. Section loss to top flange of floor truss top chord adjacent to hand-hole.*

In extreme instances members with failed paint systems may need to be rebuilt or replaced in order to perform their intended function. The corrosion at the hand hole in the truss member in Photo No. 11.3 shows paint failure that resulted in corrosion that has eventually resulted in localized 100% loss of plate thickness. This localized condition is not currently a structural issue, however continued deterioration such as this can result in requiring structural repairs in addition to painting.

Maintenance cleaning and painting of steel has health and environmental implications, since all paint systems include some level of toxic materials that can be released during removal. The containment of removed paint to prevent it from entering sources of water, as well as for health monitoring of workers performing the work, require careful preparatory work and attention to detail for inspection and monitoring, recordkeeping, and reporting of data. This required containment and environmental and health protection provisions add considerable cost to painting.

The most recent painting performed on the bridge was in 1994 when the spans 5W to 11W were painted. Much of the remainder of the steel on the bridge was last painted in the late 1980's and early 1990's. The typical expected life of a paint system is approximately fifteen years. The Ten Year Plan includes provisions for painting isolated areas of the steel, such as areas underneath expansion joints.

### **11.0 PAINTING OF STEEL SUPERSTRUCTURE**

#### Current Plan:

This plan assumes that a targeted paint program is used to coat and protect the bridge steel, mainly at more deteriorated areas near and adjacent to bridge expansion joints. 100% containment of removed paint is assumed. All work in a targeted paint program is assumed to occur in years 1-10.

#### Recommended Plan:

This plan assumes complete repainting of the bridge from abutment to abutment, with the complete repainting taking place in years 1-10, and a less significant amount of repainting work assumed to take place in the second half of years 11-20. 100% containment of removed paint is assumed.

## RITBA SUMMARY OF CAPITAL EXPENDITURE PLANS

### 12.0 STEEL SUPERSTRUCTURE REPAIRS/RETROFITS



**Photo No. 12.1**

**Description:** Span 1, Panel Point 48 East, Stringer S8. Crack has formed below the diaphragm connection plate weld on Stringer S8.

During the 2005 Annual Inspection of the Newport/Pell Bridge, inspectors observed a crack on the end of a steel stringer beneath a weld. Stringers are steel beams that are oriented in the same direction as traffic and support the roadway deck. (see Photo Nos. 12.1 and 12.2).

Subsequently, during the 2006 Annual Inspection, 30 percent of the locations with this type of weld exhibited similar cracks (see Photo No. 12.3).



**Photo No. 12.2**

**Description:** Span 1, Panel Point 48 East, Stringer S8. . Close up view of crack that has formed below the diaphragm connection plate weld on Stringer S8.



**Photo No. 12.3**

**Description:** West Side Span, Panel Point 25 west, Stringer S2. Stringer exhibits a 6-½ inch long crack on the near side below the diaphragm connection plate weld located on the far side. A 4 inch long crack has formed above the bottom flange fillet.

These cracks have been identified on other similar bridges of this era and are due to a combination of out of plane bending (due to highway traffic) and localized corrosion. The cracks do not pose a current structural problem to the bridge, however, retrofits to these members are required to mitigate further deterioration of the floor system. The Ten Year Plan includes a placeholder for structural steel repairs/retrofits. The cost of this work will be subject to the

## **RITBA SUMMARY OF CAPITAL EXPENDITURE PLANS**

identification of any other steel repairs that are required based on the completion of the in-depth inspection in 2007.

### **12.0 STEEL SUPERSTRUCTURE REPAIRS/RETROFITS**

#### Current Plan:

Engineering costs are assumed for the Current Plan as a result of the Autumn 2006 in-depth inspection, and a placeholder with no costs is assumed for work generated as a result of engineering work.

#### Recommended Plan:

This plan assumes that steel repairs are made to the suspended spans in years 1-10 as a result of the Autumn 2006 in-depth inspection of the suspended spans.

## RITBA SUMMARY OF CAPITAL EXPENDITURE PLANS

### 13.0 MAIN CABLE UNWRAPPING, INSPECTION, TESTING & REPAIRS CONTACT 06-7



**Photo No. 13.1**

**Description:** East Anchorage, North Splay Chamber, Cable Entry Portal. Two of the north cable wires are broken.

The main cables are the bridge's most important non-redundant structural members, and their condition cannot be fully assessed without unwrapping them, wedging them open, and inspecting them. The cable is over 37 years old and its inspection at this time is consistent with good engineering practice and industry standards.

Contract 06-7 has recently been awarded to perform a pilot unwrapping and inspection of the main cables.



**Photo No. 13.2**

**Description:** Main Span, North Cable. Circumferential crack in cable wrapping.

While the cable wrapping system has been inspected annually and generally appears to be in good condition, the wrapping has cracked in several locations, and caulking has cracked at the interface of the wrapping at each cable band (cable bands are attached to the cable at each suspender location). This breach in the cable wire protective system can allow water and salts to infiltrate the cable and initiate corrosion.

## RITBA SUMMARY OF CAPITAL EXPENDITURE PLANS



**Photo No. 13.3**

**Description:** North cable, West Side Span, Cable Band 1NW – Peeling paint and surface corrosion on bottom surface of the cable band.

Depending on the cable's ability to drain condensation/water out of the drainage splits in the bottom of each cable band, combined with localized breaches in the protective system, localized areas of corrosion are possible. Note the icicle at the bottom of the cable band at left (signifying water intrusion into the cable), and paint corrosion on the band itself.

### 13.0 MAIN CABLE UNWRAPPING, INSPECTION, TESTING & REPAIRS CONTACT 06-7

#### Current Plan:

The cost for performing the pilot inspection under Contract 06-7 is included in the Current Ten Year Plan, and a placeholder is provided for the costs of any additional inspection or repairs in years 1-10 that are identified as necessary based on the inspection.

#### Recommended Plan:

The cost for performing the pilot inspection under Contract 06-7 is included in this plan for years 1-10, and additional funds are estimated for the costs of any additional inspection or repairs in years 1-10 that are identified as necessary based on the inspection. A second cable inspection is included early in years 11-20 with a placeholder provided for costs of additional inspection or repairs in years 11-20 that are identified as necessary. The cost of a complete cable rehabilitation is assumed as a placeholder at this stage.

## RITBA SUMMARY OF CAPITAL EXPENDITURE PLANS

### 14.0 TOWER LINK REPAIRS AND CABLE BENT PIN REPAIRS



**Photo No. 14.1**

**Description:** Tower 1 East, Northwest Compression Link.

There are four compression links located at each tower leg, two on the side span side of the tower and two on the main span side of the tower for a total of eight compression links. The compression links connect the bottom chord of the truss to an outrigger bracket on the towers.

The purpose of the links is to maintain the vertical alignment of the roadway between the tower and the suspended span. The links transfer vertical load from the truss to the tower (See Photo No. 14.1).

As the term “compression link” suggests, the tower outrigger bracket is located below the bottom chord of the truss and the traffic load and the truss weight exert a compression force on the link. The compression links act as hinges, with an 8-inch diameter forged steel pin located at each end of the link, one at the bottom chord of the truss and one at the tower outrigger. The pins allow the compression link to rotate at each end and accommodate the longitudinal expansion and contraction of the suspended spans. The pins are threaded on their ends and nuts hold them in place.

Future repairs to the compression links are anticipated based on the historical performance of these elements and have been included in the Ten Year Plan. Three conditions, first observed during the 1989 In-Depth Inspection, have required repairs and are given special emphasis and are monitored on an annual basis.



**Photo No. 14.2**

**Description:** Tower 1 West, Northeast Compression Link, Upper Inside Pin. Drilled dimples in the pin and pin nut, nominally at the 3 o'clock position permit tracking of the relative movement of the pin and the pin nut.

The first condition is cracking of the vertical elements. To date, four of the eight compression links have been replaced due to cracking. Empirical evidence indicates that the cracks are caused by the introduction of bending forces when the pins have frozen in one position

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and can no longer accommodate longitudinal expansion and contraction. The links that have been replaced include grease fittings to help maintain movement at the pins.

The second condition that is checked regularly is a differential rotational

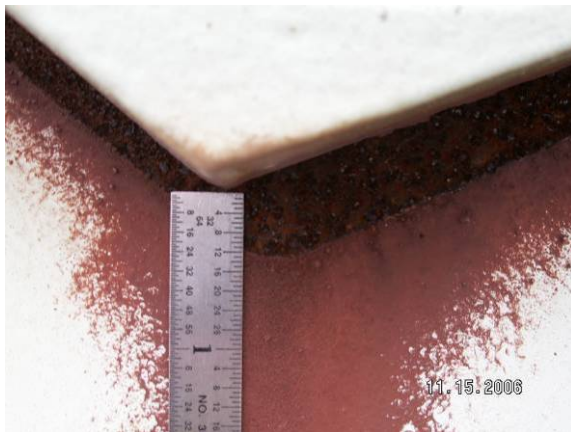


**Photo No. 14.3**

**Description:** Tower 1 West, Northwest Compression Link, Upper Inside Pin. The pin nut has been replaced and welded to the pin.

movement between the pins and the pin nuts. Whereas rotational movement of the pin assemblies is necessary for the compression links to perform as designed, the pin nuts should rotate as a unit with the pins (see Photo No. 14.2).

Differential rotation allows the pin nuts to loosen. In two instances, the nut drifted and backed off the pin completely. In each case, a new nut was installed and welded to the pin.



**Photo No. 14.4**

**Description:** East Tower, Southwest Compression Link, Upper Outside Pin Nut. The pin nut exhibits nominally 1/2 inch vertical displacement

The third condition that is monitored is wear to the pin assemblies. This is important, because excessive or uneven wear in the links can cause the roadway deck to drop slightly or cause misalignment at the roadway finger joints at the main towers.

Wear is observed by noting the vertical movement of the pin nut relative to its adjacent supporting steel. The original location of the pin nut is apparent from surface rust that has formed on the gusset where moisture is trapped between the gusset plate and the pin nut. As wear occurs, the pin nut moves relative to the surface corrosion.

## RITBA SUMMARY OF CAPITAL EXPENDITURE PLANS

### 14.0 TOWER LINK REPAIRS AND CABLE BENT PIN REPAIRS

#### Current Plan:

This plan assumes that two tower links are repaired in years 1-10.

#### Recommended Plan:

This plan assumes that two tower links as well as cable bent pin repairs are carried out in years 1-10. No work is assumed for years 11-20.

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### 15.0 SEISMIC VULNERABILITY STUDY AND UPGRADE

Significant advances have been made in the engineering industry's understanding of seismic (earthquake) design of bridges since the Newport/Pell Bridge was completed in 1969. Bridges constructed prior to 1983, when the AASHTO Guide Specification for Seismic Design of Highway Bridges was issued, are good candidates for seismic retrofit.



**Photo No. 15.1**

**Description:** Pier 30 East, Bearing 7. Bearings The expansion bearings in Span 30 East (on east side of pier) are overextended.

It is considered good practice to upgrade existing structures to meet today's design criteria for performance during a seismic event. The existing criteria are defined in the current AASHTO, "LRFD Bridge Design

Specifications", 2006 Interim Revisions.

Areas of potential concern on the Newport/Pell Bridge would include:

- The rocker bearings located on the east approach spans. These bearings do not meet current standards for seismic design.
- The bridge's expansion joints require evaluation to determine if they offer sufficient room for movement during a seismic event and preventing spans from impacting each other with enough force to damage them severely.
- The compression links at the towers, like the expansion joints, require evaluation to determine if they offer sufficient room for movement during a seismic event.
- The connections that secure the superstructure to the substructure in the approach spans need to be sufficiently robust to hold the superstructure in place during a seismic event.

## RITBA SUMMARY OF CAPITAL EXPENDITURE PLANS

### 15.0 SEISMIC VULNERABILITY STUDY AND UPGRADE

#### Current Plan:

This plan assumes that the engineering work for a vulnerability study is carried out in years 1-10, with a placeholder for bridge retrofits needed as a result of the study.

#### Recommended Plan:

This plan assumes that the engineering work for a vulnerability study is carried out in years 1-10, with estimated construction costs assumed in years 1-10 for replacement of all bearings and retrofitting of all column bases.

## **RITBA SUMMARY OF CAPITAL EXPENDITURE PLANS**

### **16.0 SECURITY ASSESSMENT, SECURITY CAMERAS AND SECURITY MONITORING**

In the 2003, PB in conjunction with Parsons Transportation Group performed a vulnerability assessment of the Mount Hope and the Newport/Pell Bridges. The assessment report made recommendations and RITBA has been implementing upgrades when appropriate.

Construction Contract 03-3, Catwalk Steel Repairs and Miscellaneous Steel Repairs, provided for security upgrades to the main cable entrances at the roadway level.

Construction Contract 05-12, Security and Electrical Upgrades, is providing for additional security measures at the anchorages.

### **16.0 SECURITY ASSESSMENT, SECURITY CAMERAS AND SECURITY MONITORING**

#### Current Plan:

This plan includes the costs for security upgrades currently being performed under Contract 05-12.

#### Recommended Plan:

This plan includes those of the Current Plan and provision for additional future security measures in years 1-10.

## RITBA SUMMARY OF CAPITAL EXPENDITURE PLANS

### 17.0 ELECTRICAL INSPECTION & REPAIRS, AND ANCHORAGE DEHUMIDIFICATION AND DRAINAGE REPAIRS - CONTRACT 05-12



**Photo No. 17.1**

**Description:** West Anchorage, North Socket Room, Sump. Two inches of standing water adjacent to sump.

The on going construction Contract 05-12, Security and Electrical Upgrades, provides for repairs, upgrades and installations to the following items:

- the dehumidification of the anchorage chambers (see Photo 17.1),
- light pole replacement (see Photo 17.2),
- a RACON navigational aid system, and
- a back up generator for the bridge lighting

The main cables enter the anchorages and splay into individual strands of wires that are attached to a heavy block of concrete that fixes the cables in place and acts as a counterweight to support the bridge. These anchorage chambers have historically had high humidity and some standing water in the strand socket areas. Since the cable strands have shown some signs of rusting, the areas are being dehumidified to prolong the life of the main cables.

After a severe storm in December 2005, PB inspected the aluminum light poles on the bridge and approaches, since it was noted that several poles has oscillated wildly during the storm. Cracks in the light pole bases were noted, and several poles were replaced on an emergency basis. Due to their age, the light poles are all being replaced with galvanized steel poles.

A Radar beaCON (RACON) device is being installed at bridge midspan that will actively send out a code to signal ships where the bridge's midspan is, as an aid to navigation and to help reduce the probability of ship collisions during low visibility.



**Photo No. 17.2**

**Description:** Span 7 East, South Fascia, Light Pole 88. Light pole exhibits cracks and missing piece of base on the northwest corner.

## RITBA SUMMARY OF CAPITAL EXPENDITURE PLANS

### **17.0 ELECTRICAL INSPECTION & REPAIRS, AND ANCHORAGE DEHUMIDIFICATION AND DRAINAGE REPAIRS - CONTRACT 05-12**

#### Current Plan:

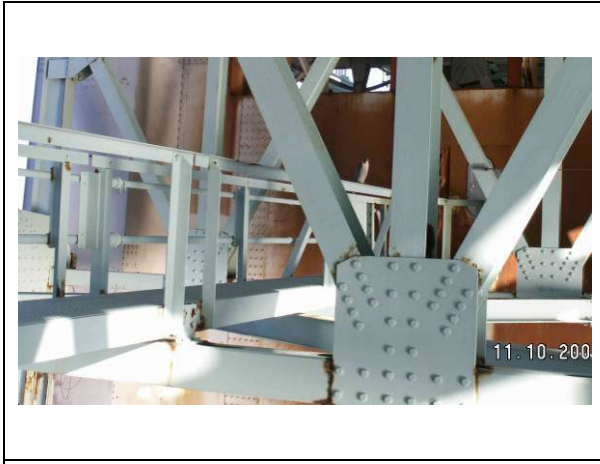
This plan includes the costs for electrical inspection and anchorage dehumidification upgrades currently being performed under Contract 05-12.

#### Recommended Plan:

This plan includes the costs for electrical inspection and anchorage dehumidification upgrades currently being performed under Contract 05-12, in years 1-10. No additional costs are assumed for years 11-20.

## RITBA SUMMARY OF CAPITAL EXPENDITURE PLANS

### 18.0 MAIN BRIDGE - UPGRADING INSPECTION CATWALKS TO OSHA STANDARDS - CONTRACT 05-12



**Photo No. 18.1**

**Description:** *West Side Span, Panel Point 30 West, North Catwalk. General view of existing catwalk and safety railing.*

The original safety railing on the catwalk, that is located below the roadway deck in the suspended spans, does not meet the current Occupational and Safety and Hazard Administration (OSHA) guidelines (see Photo 18.1).

To meet OSHA requirements, the railings must: meet a regulatory minimum height requirement of 42 inches; have a lower kick plate at walking level; and a have a mid-level railing. The existing catwalks are being retrofitted to meet OSHA requirements under Contract 05-12 and the costs of this included in the Ten Year Plan.

### 18.0 MAIN BRIDGE - UPGRADING INSPECTION CATWALKS TO OSHA STANDARDS - CONTRACT 05-12

#### Current Plan:

This plan includes the costs for inspection catwalk railing upgrades currently being performed under Contract 05-12.

#### Recommended Plan:

This plan includes the costs for inspection catwalk railing upgrades currently being performed under Contract 05-12, in years 1-10. No additional costs are assumed for years 11-20.

## RITBA SUMMARY OF CAPITAL EXPENDITURE PLANS

### 19.0 IN-DEPTH INSPECTION



**Photo No. 19.1**

**Description:** West Anchorage, Pier 4 West. Engineers inspecting concrete on the south face of the anchorage with a barae mounted man-lift.

and upgrade contracts.

The objective of an annual inspection program is to evaluate the condition of the items defined in the scope of work for a given inspection year and, based on the findings of the inspection, recommend repairs and improvements to the RITBA. The annual inspections are part of a phased approach to performing an in-depth inspection of all bridge elements. This approach has been adopted by RITBA to proactively pursue implementation of the items on the Ten Year Renewal and Replacement Plan for inspection, maintenance, repair and rehabilitation of the bridge. This approach has allowed the inspections to focus on specific items, and the detailed information from the inspections has been used to prepare comprehensive repair

### INSPECTION HISTORY

The previous six inspections and the scope of inspection that were performed as a part of the phased approach are:

#### **2000 INSPECTION**

- Visual Inspection of the Land Piers
- Visual Inspection of the Concrete, Steel, Deck Joints, and Paint in the Stringers and Girder Spans
- Visual Inspection Above Deck of the all Pre-stressed Concrete Spans with Inspection Below Deck of Spans 40, 41 and 42.
- Visual Inspection of the Deck Truss Spans from the Backstay Portion of the Suspension Cables. The North and South Trusses in Spans 4E to 10E were Inspected with a UB60 Under Bridge Inspection Unit (UBIU).
- The Following Main Span Elements were Inspected: Suspension Cables, Suspender Rope Sockets, Hand Rope Stanchions. Anchorages, Anchor Bolts and Elevators in the Main Towers, Floor System, Wind Tongues, Compression Links, Cable Bents, Expansion Joints, Center Span Cable Tie Down, and the Deck Joints.

## **RITBA SUMMARY OF CAPITAL EXPENDITURE PLANS**

### **2001 ROADWAY AND SUPERSTRUCTURE INSPECTION**

- Roadway Deck
- Land and Water Piers
- Drainage Troughs and Finger Joints
- Pre-stressed Concrete Beam Spans, Superstructure

### **2002 TOWER AND ANCHORAGE INSPECTION**

- East Anchorage Cable Elements
- East and West Anchorage Cable Splay Chambers and Socket Rooms
- Interiors of East and West Towers

### **2004 SECURITY AND ELECTRICAL INSPECTION**

- Security Upgrades
- Bridge Lighting and Electrical Systems
- Main Span Catwalk System

### **2005 ANNUAL INSPECTION**

- Land and Water Piers
- Suspended Span Framing
- Link Assemblies and Wind Locks
- East and West Anchorage Cable Splay Chambers, Cable Splays and Socket Rooms
- Main Cable Wrapping and Cable Bands
- Cable Bents
- Roadway Expansion Joints
- Rocker Bearings
- Concrete Deck

### **2006 ANNUAL INSPECTION**

- Visual inspection of the Main (Stiffening) Trusses
- Hands-on inspection of the Suspender Rope Sockets
- Visual inspection of the Floor Trusses
- Hands-on Inspection of the Stringer and End Diaphragm Fatigue-Sensitive Details at the Floor System Expansion Joints
- Visual inspection of the Cable Bents
- Hands-on inspection of the Compression Links
- Hands-on inspection of the Wind Locks

## RITBA SUMMARY OF CAPITAL EXPENDITURE PLANS

### 19.0 IN-DEPTH INSPECTION

#### Current Plan:

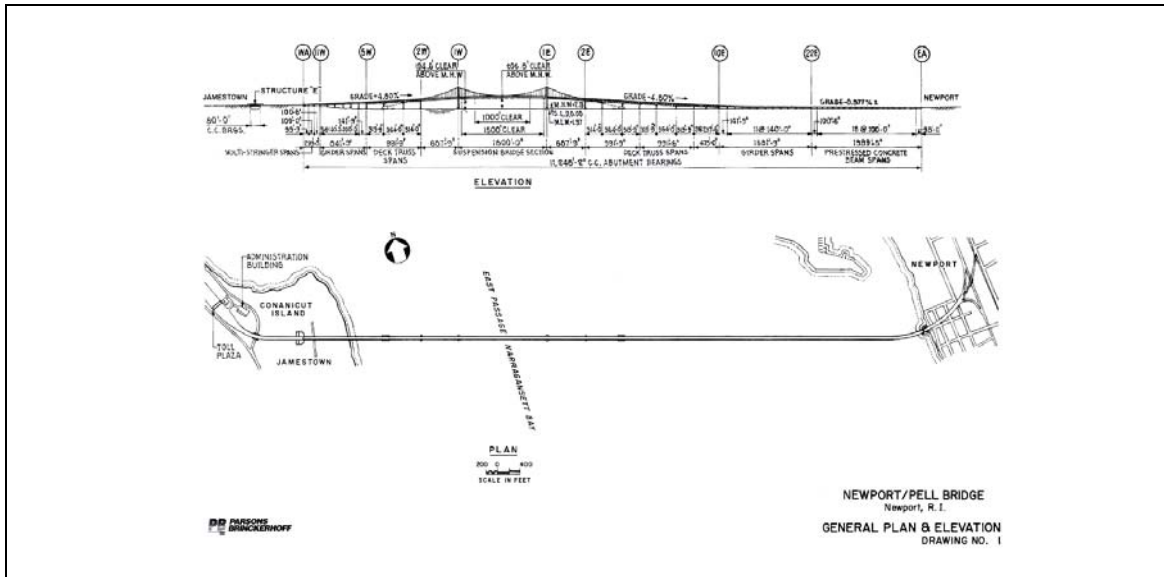
This plan includes the current on-going in-depth inspections as well as additional in-depth inspections in the second half of years 1-10.

#### Recommended Plan:

This plan includes the current on-going in-depth inspections as well as additional in-depth inspections in the second half of years 1-10. Additional in-depth inspections are included in years 11-20.

# RITBA SUMMARY OF CAPITAL EXPENDITURE PLANS

## 20.0 ARCHIVE ORIGINAL DESIGN DRAWINGS & SHOP DRAWINGS



**Figure No. 20.1**

**Description: General Plan and Elevation of the Newport/Pell Bridge**

The RITBA Maintenance Building in Jamestown, RI holds the original hard-copy complete set of historical contract documentation for the construction of the Newport/Pell Bridge in one location. No full redundancy of these documents, and no redundancy in electronic format, exists. It is recommended that the original documentation be scanned and archived for protection and ease of use by the RITBA and the RITBA's consultants.

## 20.0 ARCHIVE ORIGINAL DESIGN DRAWINGS & SHOP DRAWINGS

### Current Plan:

This plan includes estimated costs to perform a minimal level of archiving of key documents in years 1-10.

### Recommended Plan:

This plan includes estimated costs for more complete archiving of documents in years 1-10. No archiving costs are assumed for years 11-20.

## RITBA SUMMARY OF CAPITAL EXPENDITURE PLANS

### 21.0 STUDY FOR UPGRADING TOLL COLLECTION SYSTEMS



**Photo No. 21.1**

**Description:** Toll Plaza in Jamestown on the west approach of the Newport/Pell Bridge.

The RITBA Board of Directors is aware that the state government has endorsed the conversion of toll routes in Rhode Island to EZPass. Since this is a recent development, a placeholder is included in the Current and Recommended Plans for possible future conversion of token technology to electronic technology. Sales of tokens, and maintenance cost savings for tokens and token technology would be offset by Construction costs for conversion to electronic technology, maintenance of the new system, and administration costs of claims. The possible future conversion to electronic technology is treated

more completely in an opportunity matrix as a part of the Fiscal Integrity Study.

### 21.0 STUDY FOR UPGRADING TOLL COLLECTION SYSTEMS

#### Current Plan:

This plan includes engineering work with a placeholder in years 1-10 for toll collection system upgrades needed as a result of the study.

#### Recommended Plan:

This plan includes engineering work with a placeholder in years 1-10 for toll collection system upgrades needed as a result of the study. No costs are estimated for years 11-20.

## RITBA SUMMARY OF CAPITAL EXPENDITURE PLANS

### 22.0 REHABILITATION OF ADMIN BLDG & GROUNDS



**Photo No. 22.1**

**Description:** *Aerial view of the toll plaza, administration building, and maintenance building in Jamestown on the west approach of the Newport/Pell Bridge.*

The RITBA Administration Building has existing deficiencies such as significant roof leaks, inadequate space and does not meet current requirements for handicap accessibility. Mitigating the existing deficiencies and equipping the building externally and internally to meet federal requirements will require building modifications. In addition, to accommodate existing and future needs, recommended scope items include utility upgrades, adding a conference room, and addressing additional space requirements (to meet staffing needs, for physical plant improvements, and to enhance security).

Since the Administration Building is situated in an area susceptible to possible hurricane storm surge flooding, this work item should be studied in conjunction with item 15, Seismic Vulnerability Study and Upgrade.

### 22.0 REHABILITATION OF ADMIN BLDG & GROUNDS

#### Current Plan:

This plan assumes all required accessibility renovations and additional space requirements as well as major maintenance to the building are accomplished in years 1-10.

#### Recommended Plan:

This plan assumes all required accessibility renovations and additional space requirements as well as major maintenance to the building are accomplished in years 1-10. No expenditures are included in years 11-20.

## RITBA SUMMARY OF CAPITAL EXPENDITURE PLANS

### **23.0 STUDY/IMPLEMENTATION OF ADDING A MEDIAN BARRIER**

The Newport/Pell Bridge was originally constructed without a center median barrier. PB is performing a type study of various barrier systems as well as exploring the merits and structural implications of adding a median barrier to enhance traffic safety.

Although the study is not completed, initial findings are that there is a significant number of vehicular accidents that include crossing into opposing traffic lanes. As a means of minimizing the number and severity of crossover accidents a median barrier is required. To install a barrier on the existing bridge, the barrier cross section needs to be of a size and shape that enhances safety without severely reducing lane widths. Also, the added weight of the barrier on the bridge should not adversely affect the bridge's ability to carry traffic loads or change the behavior of the suspended span in high winds. A median barrier configuration also needs to be versatile enough to anticipate and address all the RITBA's anticipated maintenance and security needs.

### **23.0 STUDY/IMPLEMENTATION OF ADDING A MEDIAN BARRIER**

#### Current Plan:

This plan includes the current engineering study underway in the first half of years 1-10. A placeholder is included for the capital cost of implementation of a median barrier across the bridge.

#### Recommended Plan:

This plan includes the current engineering study underway in the first half of years 1-10. Estimated capital costs of installing a median barrier are included in the first half of years 1-10. No additional costs are assumed for years 11-20.

## RITBA SUMMARY OF CAPITAL EXPENDITURE PLANS

### 24.0 ROCKER BEARING REPAIRS/RESETTING



**Photo No. 24.1**

**Description:** Pier 40 East in the pre-stressed concrete beam spans in the east approach.

bearings have been observed to be frozen in an overextended position (see Photo No. 24.2) due to age, loss of lubrication, and build-up of rust around the base of the bearing designed to tilt, all preventing the expansion bearings from operating properly.



**Photo No. 24.2**

**Description:** Pier 23 East, Span 25, Expansion Bearings. Overextended bearings.

The 20 approach spans on the east end of the bridge near Newport are pre-stressed concrete beam spans supported on double column pier bents (see Photo No. 24.1).

The nine (9) pre-stressed concrete beams that support the roadway deck in these spans are supported at each pier by an end bearing. On one end is a fixed bearing that remains vertical at all times and an expansion bearing on the other end is designed to tilt to accommodate thermal movement.

At certain pier locations, expansion

bearings have been observed to be frozen in an overextended position (see Photo No. 24.2) due to age, loss of lubrication, and build-up of rust around the base of the bearing designed to tilt, all preventing the expansion bearings from operating properly.

This condition, if left uncorrected, could lead to the bearing “tipping over,” resulting in a dropping of the beam and roadway deck.

RITBA has taken preventive corrective measures to reset the bearings that have been observed to be over extended.

There are currently two piers, Pier 30 East and 35 East, that exhibit overextended bearings and require corrective action. This work is currently included in Contract 06-6.

## RITBA SUMMARY OF CAPITAL EXPENDITURE PLANS

### **24.0 ROCKER BEARING REPAIRS/RESETTING**

#### Current Plan:

This plan includes current costs for contract 06-6 as well as additional capital costs for bearing resettings on a 3-year cycle in years 1-10.

#### Recommended Plan:

This plan includes current costs for contract 06-6 as well as additional capital costs for bearing resettings on a 3-year cycle in years 1-10. It assumes that seismic retrofits are installed under item 15 and no further costs are incurred in years 11-20.

### **25.0 MISCELLANEOUS MAINTENANCE AND REPAIRS**

#### Current Plan:

This plan assumes that on-going maintenance repairs are required and carried out each year in years 1-10.

#### Recommended Plan:

This plan assumes that on-going maintenance repairs are required and carried out each year in years 1-10. The same maintenance costs are assumed for years 11-20.

## RITBA SUMMARY OF CAPITAL EXPENDITURE PLANS

### MOUNT HOPE BRIDGE

#### INTRODUCTION

The Rhode Island Turnpike and Bridge Authority's (RITBA) Ten Year Renewal and Replacement Plan for the Mount Hope Bridge is comprised of 16 items, with three items representing repair contracts already let and currently being completed. The following summary is intended to aid in understanding the scope of work included in the plan by providing a brief narrative of the more significant work items.

#### **2.0 TOWER PIER AND ANCHORAGE REHABILITATION AND BRIDGE SCOUR REMEDIATION**

This work includes the restoration of the two tower bases and the installation of scour protection at the towers based on the findings of previous underwater and in-depth inspections.

#### **5.0 CONTRACT 05-11 - PAINTING AND REHABILITATION OF TOWERS AND EXPANSION JOINTS, PAINTING OF SPANS 1-11, AND REPAIRS OF APPROACHES**

The costs included in the plan are actual costs for this contract which is currently being performed. This contract includes steel repairs such as the replacement of corroded rivets with high strength bolts and the replacement of deteriorated steel lacing bars and repairs to the steel wind tongues. Catwalk access is being provided to the link assemblies under this contract. The steel repairs and catwalk installation are included in the painting contract to maximize the cost effectiveness of the difficult mobilization for repairs in these areas. Spans 1 through 11 and the North Tower were completed in 2006, with the remainder of the work scheduled to be completed in 2007.

#### **7.0 CONTRACT 05-6 - ON-CALL DECK MAINTENANCE**

This is the continuation of a multi-year deck maintenance contract including spall repairs and Chip Seal recoating of the deck. On-Call contracts have been employed by RITBA to minimize ongoing maintenance costs such as deck maintenance by obtaining competitive bids for unit price typical repairs with indefinite quantities.

#### **9.0 SEISMIC VULNERABILITY STUDY AND RETROFIT**

Significant advances have been made in the engineering industry's understanding of seismic (earthquake) design of bridges since the Mount Hope Bridge was constructed 78 years ago. Bridges constructed prior to 1983, when the AASHTO Guide Specification for Seismic Design of Highway Bridges was issued, are good candidates for seismic retrofit.

It is considered good practice to upgrade existing structures to meet today's design criteria for performance during a seismic event. The existing criteria are defined in the current AASHTO, "LRFD Bridge Design Specifications", 2006 Interim Revisions.

## **RITBA SUMMARY OF CAPITAL EXPENDITURE PLANS**

### **11.0 ROADWAY DECK – REMOVE CONCRETE OVERFILL AND REPLACE WITH PAVEMENT**

The roadway deck on the Mount Hope Bridge is a steel grid deck with concrete fill. This type of deck is often utilized as a means to limit the dead load on long span bridges. Grid decks are flexible and subject to cracking which requires regular replacement of the concrete overfill to prolong the life of the steel grid. The plan includes a provision for the removal and replacement of the two inch overfill as a future work item recognizing the importance of maintaining the roadway deck.

### **12.0 SUPERSTRUCTURE PAINTING AND REHABILITATION AND CATWALK UPGRADE (ZONE PAINTING CONTRACTS)**

This work item includes painting of areas excluded from the current Contract 05-11, mainly the North Approach. The contract also provides for the upgrade of the existing catwalk to meet current OSHA safety standards, similar to the work being performed on the Newport/Pell Bridge under Contract 05-12. The catwalk work is packaged with the painting scope to realize cost savings for items that require similar access and mobilization.

### **15.0 ANCHORAGE DEHUMIDIFICATION SYSTEM**

This item recognizes the importance of maintaining the condition of the non-redundant main suspension cable wires. The cable splays of the Mount Hope Bridge within the anchorages are currently oiled to protect them from corrosion. The addition of a dehumidification system in the anchorages is identified as an upgrade item on the plan, which reflects the current effectiveness of the cable oiling. The condition of the wires in the anchorages and the effectiveness of the oiling will be monitored and consideration given to installing a dehumidification system if needed in the future.

### **16.0 CABLE BENT LEGS INTERIOR PAINTING AND REHABILITATION**

After difficulties with access, the interior of the cable bents have recently been able to be accessed for inspection with recommendations made to perform some steel repairs and painting. This work is currently being negotiated to be added to Contract 05-11.