Sunshine Skyway Bridge

Yesterday, Today and Tomorrow

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May 2006
Sunshine Skyway Bridge Location

Gulf of Mexico

Pinellas County

Old Tampa Bay

Tampa Bay

Sunshine Skyway Bridge Location
Sunshine Skyway Bridge

History

- **SEPT. 6, 1954:** The $22 million, 4-mile Sunshine Skyway bridge opens with two lanes between Manatee and Pinellas counties.
- **MAY 19, 1971:** A second two-lane Skyway span is added at a cost of $25 million. Built west of the original span, it carried southbound traffic.
- **MAY 9, 1980:** A phosphate freighter strikes a Skyway pier during a severe storm. A huge section of the span built in 1971 crumbles into the Bay killing 35 people.
- **MAY 11, 1980:** The undamaged northbound span of the bridge reopens for two-way traffic.
- A signature replacement bridge was envisioned by then Governor Bob Graham.
- **APRIL 30, 1987:** A new, $244 million Sunshine Skyway opens. It is touted as safer than the old bridge. The shipping channel is widened about 50 percent.
- The bridge is considered the “flag bridge” of the State.
- The bridge receives significant local and national media attention.
- The bridge rates Travel Channel’s No. 3 of “Top 10 Bridges.”
- **NOV. 21, 2005:** Bridge named The Bob Graham Sunshine Skyway Bridge.
Sunshine Skyway Bridge

Yesterday...
Sunshine Skyway Bridge

Summit Venture
Bridge Impact 1980
Sunshine Skyway Bridge

Bridge Geometry

Total Bridge length: 4.14 miles
Sunshine Skyway Bridge

Bridge Geometry

Total Length: 13,000 ft
Sunshine Skyway Bridge

Bridge Geometry

- Total length: 5,000 ft
- Post-Tensioned Segmental Box Girders
- Vertically Post-Tensioned Segmental Columns
Sunshine Skyway Bridge

Bridge Geometry

- Total length: 4,000 ft
- Post-Tensioned Precast Segmental Box
- 42 Continuous Stay Cables, 21 per Pylon
Sunshine Skyway Bridge

High Level Approaches
Pre-Cast Column
PT Segments

PE Ducts
Sunshine Skyway Bridge

High Level Approaches
Superstructure
PT Segmental Construction
Sunshine Skyway Bridge
Main Span
Pre-Cast
PT Segments

June 1984...
Sunshine Skyway Bridge

PT Cable Stays
Sunshine Skyway Bridge

Main Span

Stay Cable Dampeners
Sunshine Skyway Bridge

Yesterday and Today...
Sunshine Skyway Bridge
Yesterday's Gone...
Sunshine Skyway Bridge

Today…

Skyway Run January 11, 1987
Over 15,000 people

Open to Traffic
April 30, 1987
Sunshine Skyway Bridge

Today...
Sunshine Skyway Bridge

Non-Routine Maintenance

Armored Joint
Sunshine Skyway Bridge

Non-Routine Maintenance

Teflon Joint Replacement 1993
Sunshine Skyway Bridge

Non-Routine Maintenance

Spot Paint Project 1997
Sunshine Skyway Bridge
Non-Routine Maintenance
Modular Joint Replacement
2001
Sunshine Skyway Bridge
Non-Routine Maintenance

Access Stairs
Segmental Transition
2003
Sunshine Skyway Bridge
Non-Routine Maintenance

PT Investigation
Corrosion at Column 133 NB
September 2000

9/27/2000
Sunshine Skyway Bridge
Non-Routine Maintenance

PT Investigation
NDT- Non-Destructive Testing

PT Tendon Vibration Testing

Academia Collaboration
Corroded and failed strand

Partially filled grout

Strands pitting corrosion

Cracked PE duct

Non-Routine Maintenance

PT Investigation

Location of Corrosion

Severe strands corrosion

Corroded strands in the zone of 2 ft below the column cap (11 out of 17 – 0.5" strands were failed)

Corroded and failed strand
Sunshine Skyway Bridge
Non-Routine Maintenance

PT Investigation

High Level Approach
Superstructure Inspection
Sunshine Skyway Bridge
Non-Routine Maintenance

Main Span Superstructure Inspection

PT Investigation
Sunshine Skyway Bridge
Non-Routine Maintenance

PT Investigation
Stay Cables
Vibration Testing
PT Investigation Summary

- Tendon Corrosion
- Tendon Failures
- Split/Crack PE Duct
- Grout Voids
- Contaminated Grout
- Salt Water in Hollow Columns
- Segmental Joint Leaks
- Concrete cracks
- Suspect PE Duct Quality
PT Repair and Maintenance Strategy

Structural Redundancy

Restoration of Corrosion Protection
- PT Duct Wrapping
- PT Void Grouting

New Levels of Corrosion Protection
- Surface Coatings
  - Pour-backs
  - Caps
  - Main Span Median
- Watertight Joints
- New PT Corrosion Protection Strategies

Localized or Universal Repairs as Applicable

Monitoring Program
Sunshine Skyway Bridge
Non-Routine Maintenance

PT Corrosion Engineering Evaluation

Geotechnical:
• Review of existing pile driving records
• Review of boring log
• Evaluate the existing foundation capacity (Florida Pier)

Structural:
• Global time dependent analysis model
• Finite element analysis
• Vessel Collision Risk analysis
• Evaluate structural capacity of existing column and new repair options
• FDOT PT Corrosion Protection Improvement Strategies

Materials:
• Mass concrete with fly ash or slag
• PT bars (45 mm diameter)
• Approved pre-packaged grout material
• Improve PT details
• Polymer coating (polyurethane)
Sunshine Skyway Bridge

Non-Routine Maintenance

FDOT PT Corrosion Protection Improvement Strategies

- 2001: Revised grouting specifications
- 2001: FDOT allowed only Non-Bleed approved prepackaged grout materials
- Since 2002: FDOT New Direction for Florida Post-Tensioned Bridges
- FDOT Five Strategies
  - Strategy 1: Enhanced PT Systems
  - Strategy 2: Fully Grouted Tendons
  - Strategy 3: Multi-Layered Anchor Protection
  - Strategy 4: Watertight Bridges
  - Strategy 5: Multiple Tendon Paths
Sunshine Skyway Bridge

Non-Routine Maintenance

Vertical Tendon Grouting
Mock-Up Test Set-Up
2003

PT Repairs

01/11/2003
Sunshine Skyway Bridge

Non-Routine Maintenance
Universal Repairs 2003

PT Repairs

01/26/2003

02/20/2003
Sunshine Skyway Bridge
Non-Routine Maintenance

PT Repairs
Inserting Bars into Box Girder
Sunshine Skyway Bridge
Non-Routine Maintenance

PT Repairs

Pier Cap Coating and Crack Injection
Sunshine Skyway Bridge
Non-Routine Maintenance

PT Repairs

Protective Sealing Repair
Sunshine Skyway Bridge

PT Repairs

Non-Routine Maintenance

Shrink Wrap Sleeve

PE Duct
Today’s Maintenance Plan

Sunshine Skyway Bridge

Maintenance Steering Committee
- Maintenance Continuity for Expected Long Life

Asset Maintenance Contract
- Inspection and Monitoring Services
- Routine Maintenance MMS 800 Series Activities
- Non-Routine (Periodic)

Non-Routine Maintenance
- Asset Maintenance
- Project Specific
- Emergency
- Fast Response

Engineering, Planning and Construction Management Support

Maintenance Steering Committee
September 1999
Sunshine Skyway Bridge

Asset Maintenance

Routine Maintenance
Sunshine Skyway Bridge

Today’s and Tomorrow’s Maintenance Plan

In Summary

- Maintenance Steering Committee
- Asset Maintenance Contract
- Non-Routine Maintenance
- Engineering, Planning and Construction Management Support

Graph showing connections:
- Survey & Mapping
- Structures Design Office
- District 1&7 Structure & Facilities
- Academia
- State Materials Lab
- Asset Maintenance
- Consultant Support
Sunshine Skyway Bridge

Immediate

- Lightning Protection System Minor Upgrade
- Cable Stay Painting and Barrier Wall Coating
- Lighting Rehabilitation
- AASHTO Beam Repairs
- Additional Global Positioning System (GPS) and Automatic Total Stations (ATS)

Longer Term

- Continuing PT Monitoring
- Corrosion Monitoring
- Elevator Upgrade
- Security/Emergency Table Top Exercise
- Calibration of Analysis Models
- Aesthetics
Sunshine Skyway Bridge

Media Attention

Travel Channel’s Top 10 Bridges
1. Golden Gate Bridge, San Francisco, California
2. Akashi Kaiyko Bridge, Kobe, Japan
3. Sunshine Skyway Bridge, St. Petersburg, FL
5. Firth of Forth Bridge, Queensferry, Scotland
6. Brooklyn Bridge, Brooklyn, NY
7. Chesapeake Bay Bridge-Tunnel, Virginia Beach, VA
8. Sydney Harbour Bridge, Sydney, Australia
9. Leonard P. Zakim Bridge, Boston, MA
10. London Bridge, Lake Havasu, AZ

Gene Figg
1937 - 2002

Pepe Garcia

Tampa Bay's
10
News at Ten

St. Petersburg Times

FOX

THE TAMPA TRIBUNE

moretv32

WMNF 88.5 FM
Community Radio
Bob Graham Sunshine Skyway Bridge

Questions?