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Preserving Signature Bridges in Texas

Kevin Pruski, PE

TxDOT – Bridge Division

"Signature Bridge" is a Subjective Term

- TxDOT does not keep a list of Signature Bridges
- BRG has a small list of Bridges we realize take Special Emphasis for Preservation
  - We have made some determination based on visibility and need.
  - Feel free to offer suggestions to Bridge Management Section (tie it to funding)
- BRG realizes a Signature Bridge often means Expensive to Preserve but Worth Keeping and Preserving
- Signature can mean "a good place to focus on preservation/preventative maintenance"


Gus Rios

What is a Preservation Plan

- Starts with an Understanding of the Structure
- Develop General and Specific Actions that can be done for Preservation
  - General Actions: Expansion Joint Maintenance, Deck Maintenance, …
  - Specific Actions: Spot/Zone Painting, Joint Replacement, Structure Repair, …
- Establish the frequency of preservation actions.
- Communicate with BRG-BMS need for funding and utilize programs available.
- Don’t forget about the plan and execute the contracts.
- Maintain record of work and expenses.

Pennybacker Bridge (LP360 Austin)

The folks of Austin would call this a Signature Bridge.

Very little noticeable things needing maintenace.

- Built in 1983
- Weathering steel arch and floor system
- Preservation Plan
  - Focus on deck (10-year cycle, crack seal & silane)
  - Maintain Suspender Cables/Connections
  - Address issues inside boxes (exterior graffiti)
- Preservation Work – 2022 – Deck, Steel, Painting

Pennybacker - Corrosion Issues

Inside Arch Rib

Inside Floor Beam Box

Queen Isabella Causeway (PR100 - South Padre Island)

Maybe not a beautiful landmark but highly important bridge accessing island.

- Built in 1974 (51-year old bridge)
- PS Approach Spans & 3 Span Cont. Stl Main Unit
- Reinforced Concrete Substructure & PS Piling
- Marine Environment (Severe)
- Only Bridge Connecting South Padre Island

Keep an Accounting Record

Year	Description of Work	Cost
1997	CATHODIC PROTECTION (BENT 19-24)	$478,000
1997	REHAB/PAINT MAIN SPAN	$618,602
2001	EMERGENCY REPAIRS (SPAN 29-33)	$5,918,013
2003	CONCRETE REPAIR, CATHODIC PROTECTION	$4,161,455
2003	EARLY WARNING DETECTION	$842,861
2003	PIER PROTECTION & FENDER SYSTEM	$3,262,255
2003	PIER PROTECTION & FENDER SYSTEM	$6,589,207
2004	CATHODIC PROTECTION	$1,296,103
2007	DOLPHIN & FENDER REPAIRS	$1,084,750
2010	REHAB/PAINT MAIN SPAN/CATH PROTECTION	$3,940,365
2010	REPLACE ILLUMINATION POLES/FIXT	$410,857
2010	DOLPHIN & FENDER REPAIRS	$13,336
2010	DOLPHIN & FENDER REPAIRS	$17,001
2012	DOLPHIN & FENDER REPAIRS	$263,909
2013	STRUCTURE REPAIRS, RAIL RETROFIT, SILANE	$2,811,844
2020	STRUCTURE REPAIRS, CP SYSTEM, JOINT REPL, PAINT STEEL, FENDER REHAB	$13,100,000

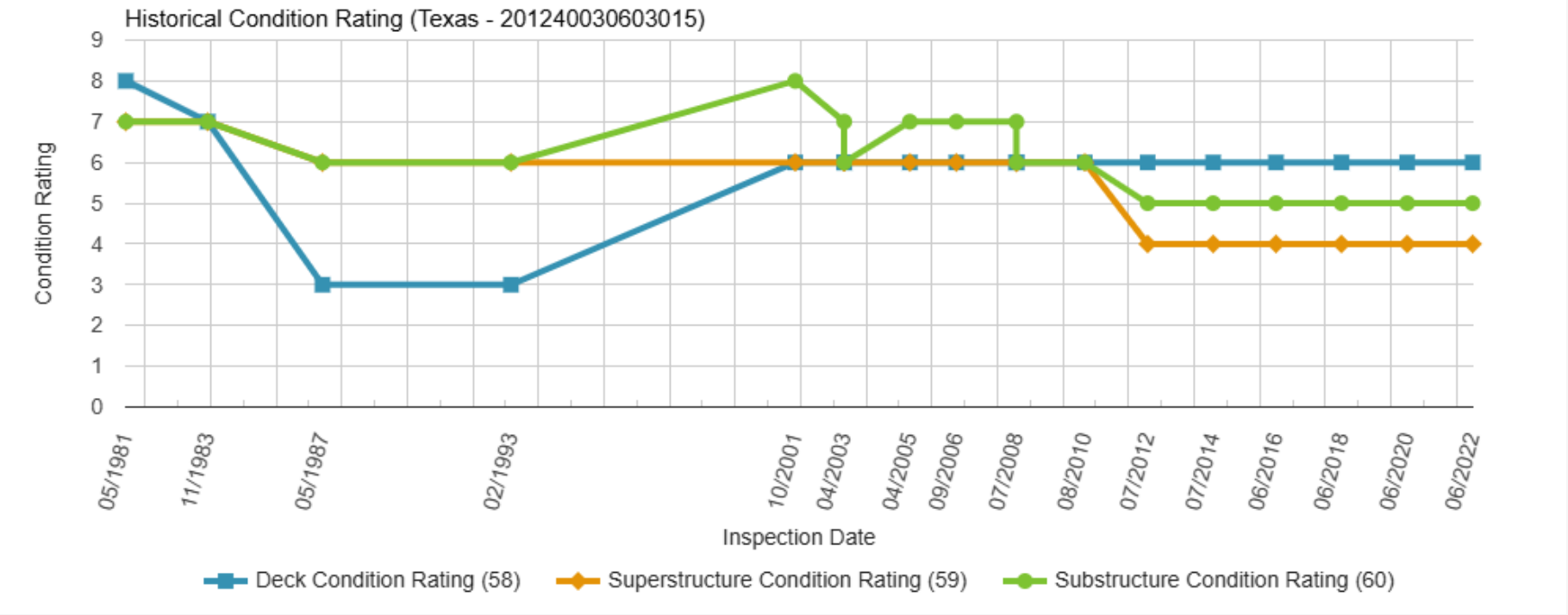
- There may be things left undone – as was the case with the 2020 project. Start planning the next project with was left undone.

Rainbow Bridge

Built in 1939 and a city exists because of it "Bridge City".

- 7707' Steel Bridge – Mostly Truss Spans
- Marine Environment
- Preservation History
  - 1954 Spot Paint (15 years)
  - 1970 Repaint Steel Below Deck (31 years)
  - 1976 Repaint Steel Above deck (37 years)
  - 1992 Major Rehabilitation and Repainting
  - 2016 Repaint all Steel and Steel Rehab ($28.4 mil)
  - 2025 Spot/Zone Paint and Steel Rehab ($10.9 mil)

InfoBridge – GCR Rating History



Rainbow Corrosion Issue

Issue:
Corrosion of Main Gusset Plate

Assess:
- Two Plates
- % Section Loss
- Difficulty of Repair
- Check C/D Ratio

Solution:
- Plenty of Capacity
- Install Maintainable Corrosion Resistant Coating
- Still will Be GCR - 5

HRCSA – On Bearings

Cable Stay Preservation

Normal Preservation Items

Boots, Guide Pipes, Dampers

Stays

Cable Stay Preservation (continued)

Modular Joint Deterioration

Modular Joints Preservation

Modular joints have been specified when expected joint movements are large:

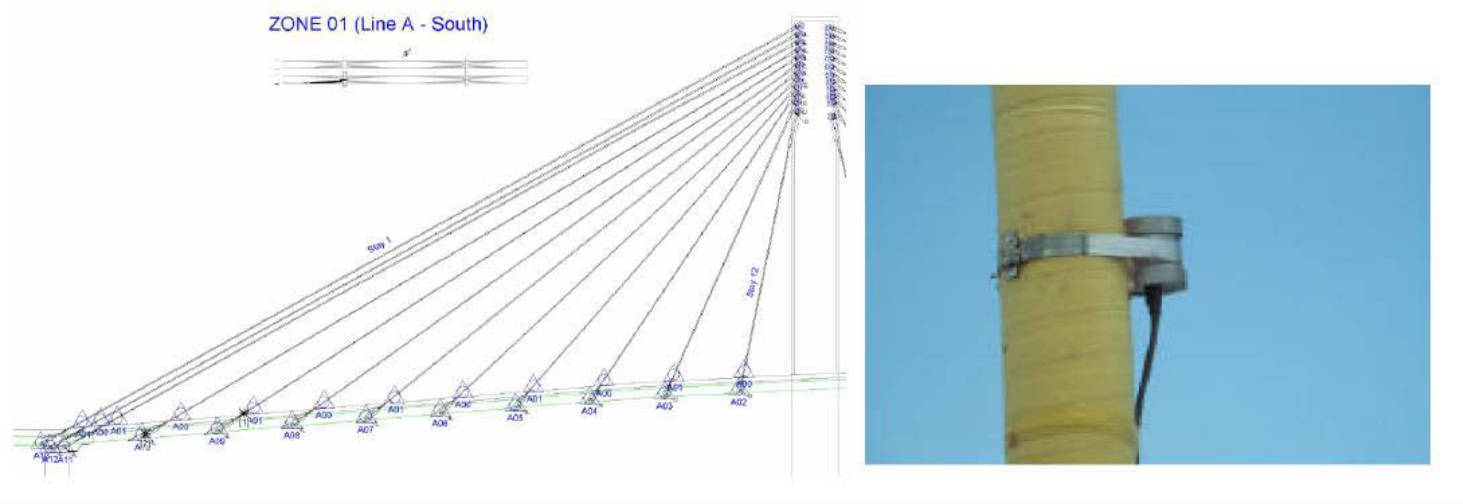
- Fred Hartman Completed 1992
- Two Major Joint Replacement Projects
- Last one in 2020 - $2.8 million plus disruption to traffic
- Need periodic inspection and maintenance.
- Consider the need for such large joint types.
  - Appears calculated movements are not realistic
  - Added risk when these are used.

Cable Oscillation

- The bridges experienced significant cable oscillation after completion of construction.
- Oscillations occurred during rain events with light to moderate wind.

Acoustic Monitoring (Health Monitoring)

- A total of 576 sensors were installed to monitor 192 cables at Fred Hartman Bridge and a total of 336 sensors were installed at Veterans Memorial Bridge on 112 cables.
- Acoustic Monitoring System was installed in 2002 and was in continuous service till 2022.



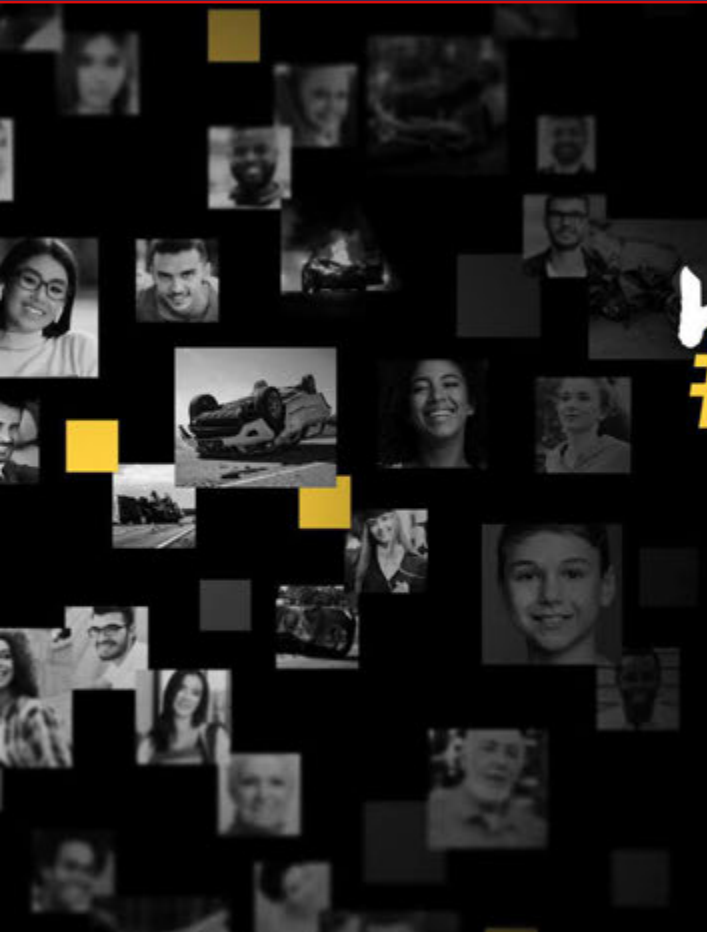
Cable Stay Bridge Monitoring

Health Monitoring

Exploring quantitative methods to determine health of bridge:

- Performed NDE on Stays
- Surveyed deck to generate baseline profile.
- Measure cable force.
- Performed modal analysis by capturing response of bridge from normal traffic loading.
- Investigating satellite displacement monitoring technology.
- No current active monitoring system in-place.

		Activity	Frequency	Approx. Unit Cost	Approximate Next Schedule
Deck	Riding surface	Deck sweeping maintain drainage (slots in concrete barrier)	As needed (preferably annually)		
		Discrete crack sealing	10 years	$50/LF	2033/2043/2053
	Joints	Clean	1 year	$10/LF	2024/2025/2026
		Seal	10 years	$20/LF	2033/2043/2053
Collapse Detection System	Electronics, Signs, Lights, and Gates	Inspection and Testing	6 months	In-house Forces	
Superstructure	Bearings	Washing	2 years		2025/2027/2029
		Lubricating	2 years		2025/2027/2029
		Painting	10 years		2033/2043/2053
		Washing	2 years		2025/2027/2029
	Protective coating (Steel)	Zone/spot painting	5 years	$50/ft^2 /$50,000	2028/2033
		Blast and repaint	15 to 20 years/ as needed	$4,000,000	2038-2043
Substructure	Abutment cap	Remove Debris/Clean/ Apply Silane	10 years	$20/SY	2033/2043/2053
	Interior Bents	Apply Silane	10 years	$20/SY	2033/2043/2053
Cathodic Protection System	Pile Jackets	Check Wiring/Junction Boxes	Yearly	In-house Forces	
	Footing Bulk Anodes	Check Wire Connectivity	Yearly	In-house Forces	
	Remote Monitoring System	Monitor and Maintain System	6 Months	In-house Forces	



HELP
#EndTheStreakTX

End the streak of daily deaths on Texas roadways.

TxDOT.gov
#EndTheStreakTX Toolkit