

Lessons from the FIU Bridge Collapse

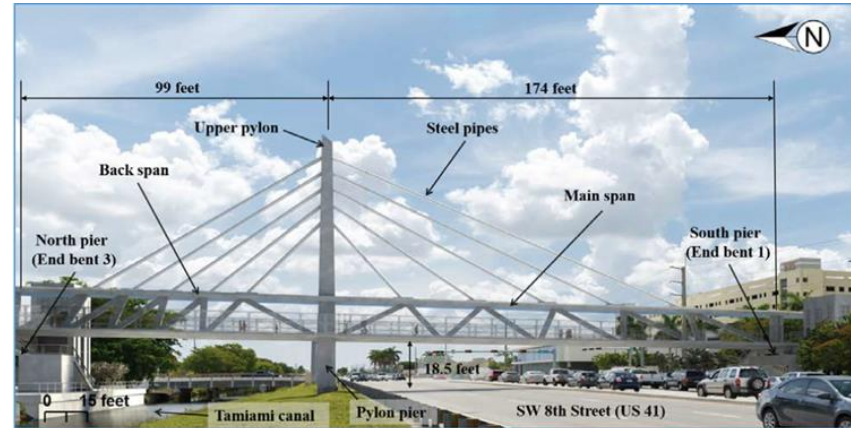
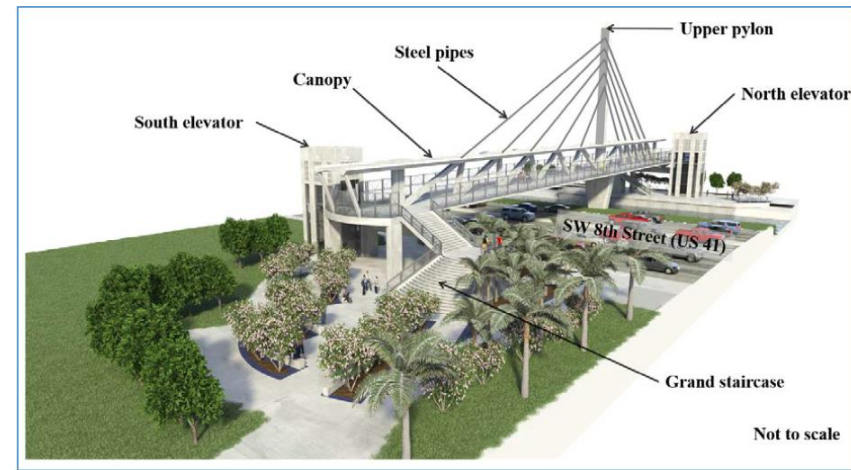
Aaron J. Mann, Esq.

Principal, General Counsel – Risk Management & Litigation

Terracon Consultants

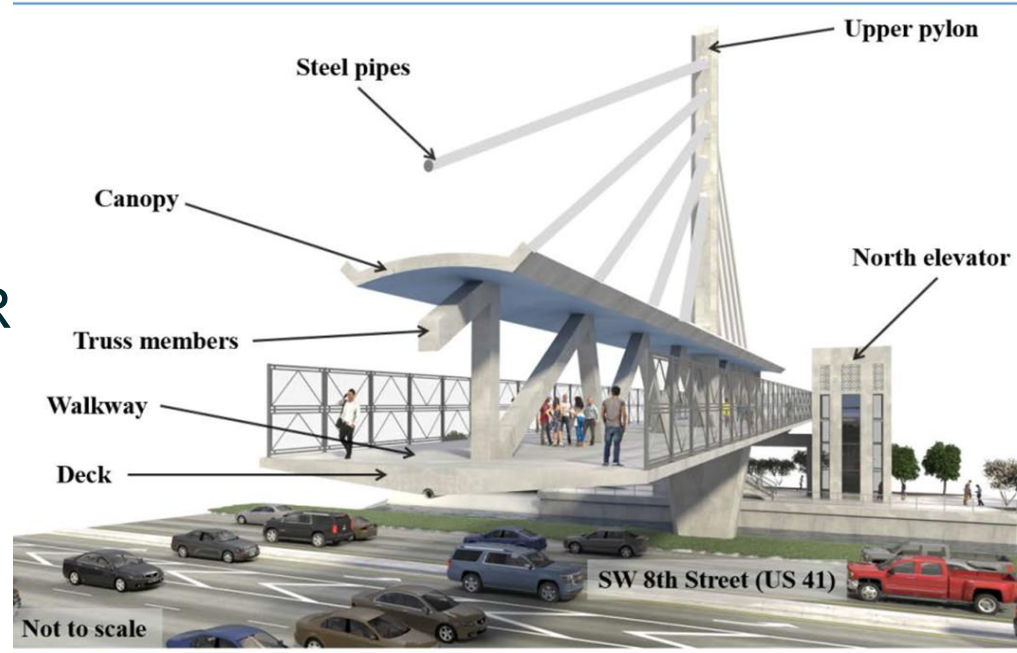
The Project

- Design and construction of \$12M pedestrian bridge for Florida International University to assist students crossing a busy street and canal
- FDOT funded but administered by FIU
- Design-build

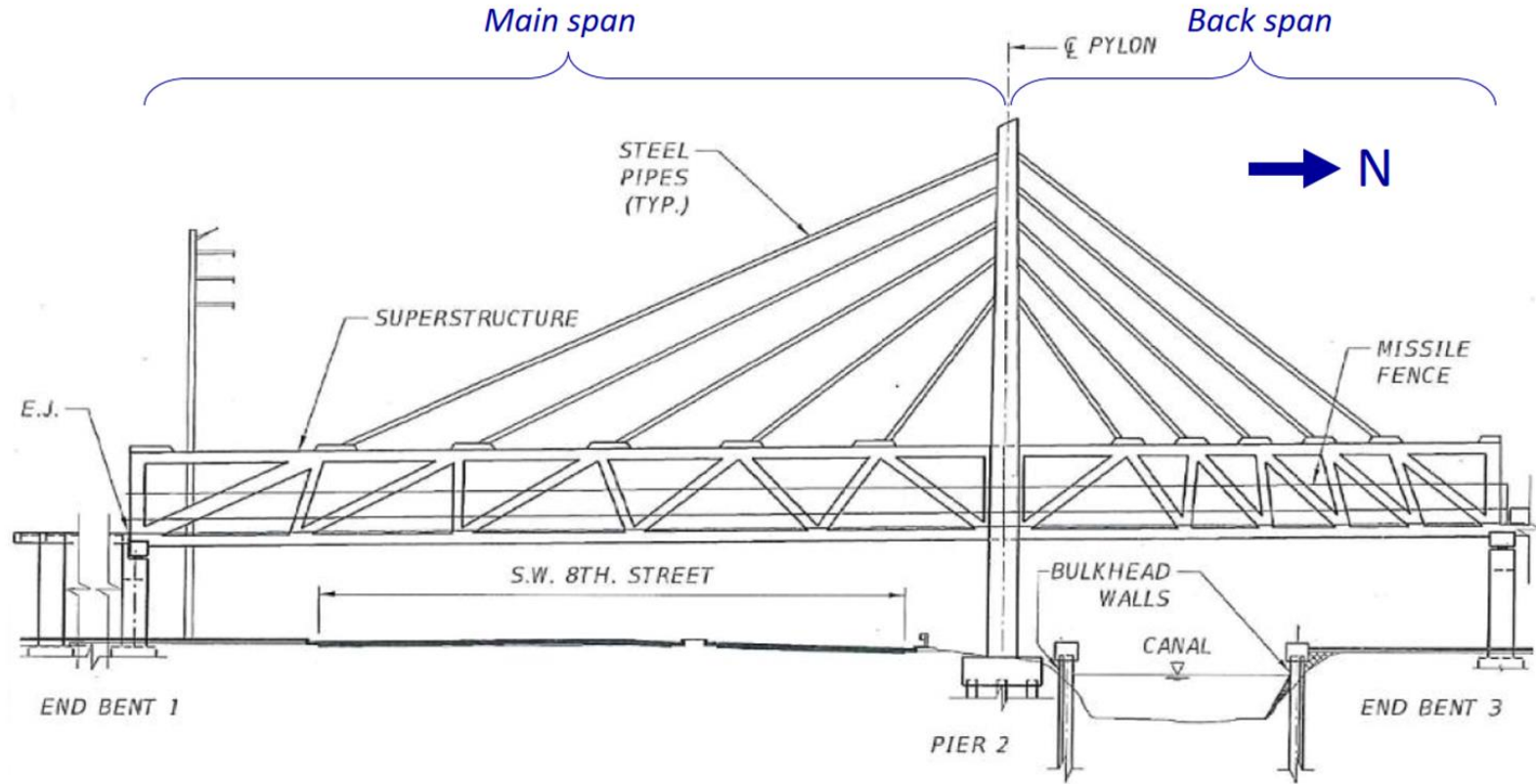


The Team

- **FIU/FDOT** – Owner
- **Munilla Construction Mgt. (MCM)** – Design-Builder/GC
- **FIGG** – Prime Designer/SEOR
- **Louis Berger** – Design Peer Review
- **Bolton Perez & Assoc.** – CEI

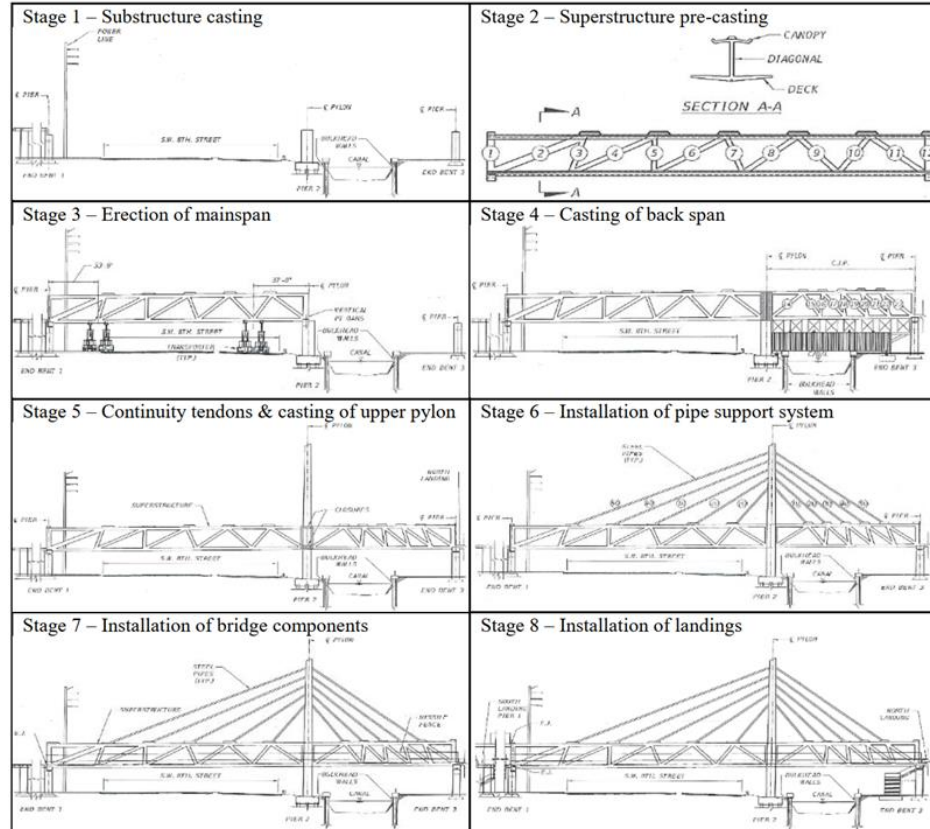


The Design



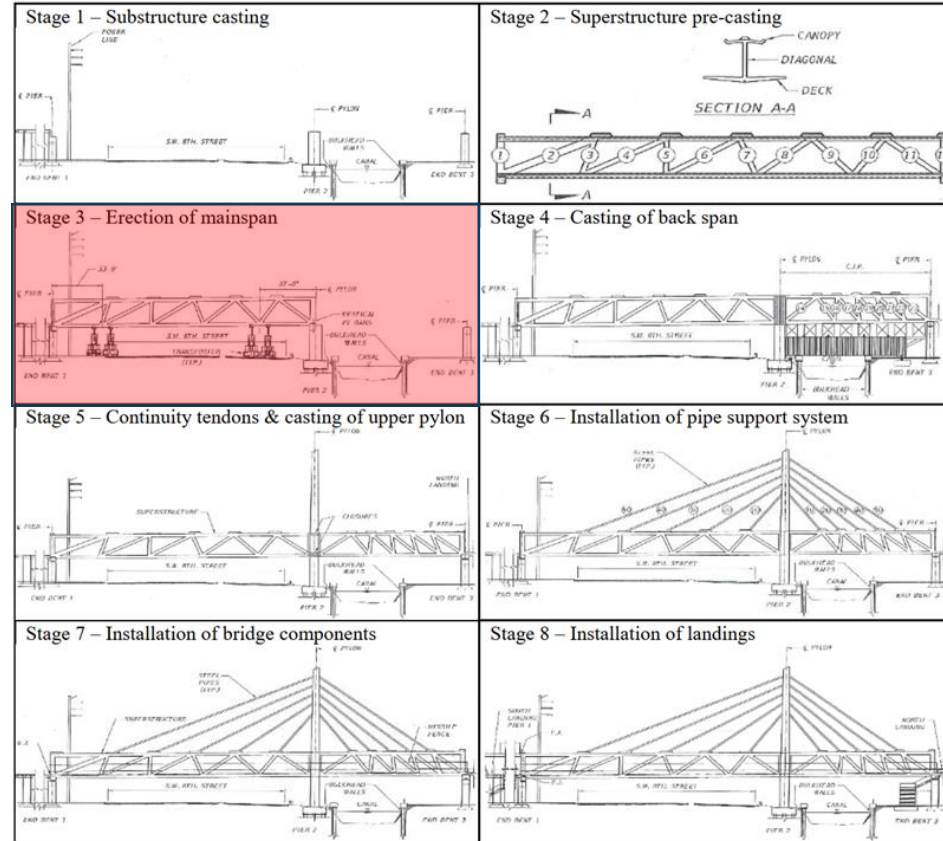
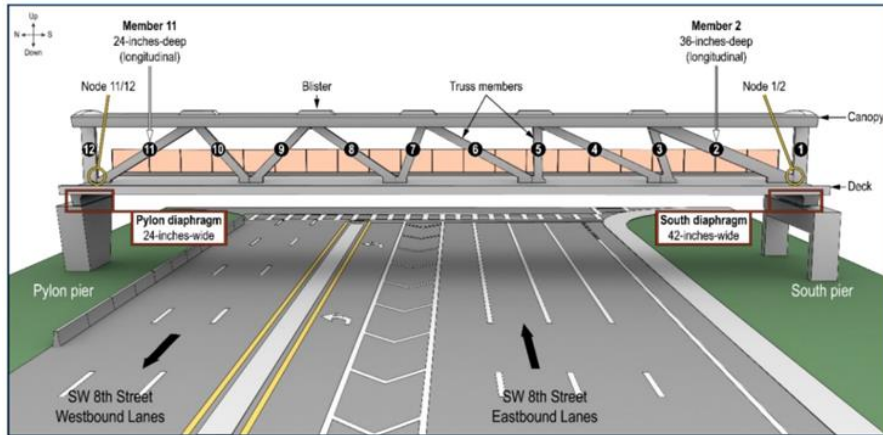
Eight Stages of Construction

1. Substructure
2. Superstructure pre-casting
3. Erection of main span
4. Casting of back span
5. Continuity tendons & casting of upper pylon
6. Pipe support systems
7. Bridge components
8. Landings



Eight Stages of Construction

3. Erection of main span



Main Span Construction Method



- “Accelerated Bridge Construction” (ABC) method
- Constructed offsite with post-tensioning completed in casting yard
- Transported to site and placed over south pier and north pylon

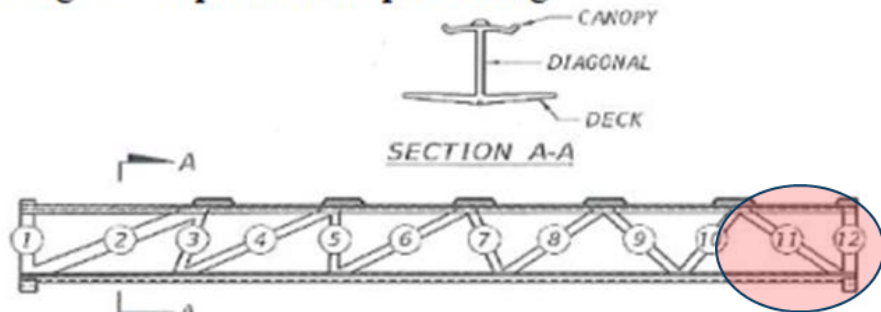
March 10, 2018 – 11:30 a.m.

- Transported to site and placed over south pier and north pylon
- 6 PEs from FIGG present during move, including president of the company
- MCM, BPA, and FIGG examined, no issues reported
- Bracing is removed from truss & supported only by pile/pylon (as designed)



March 10, 2018 – Afternoon

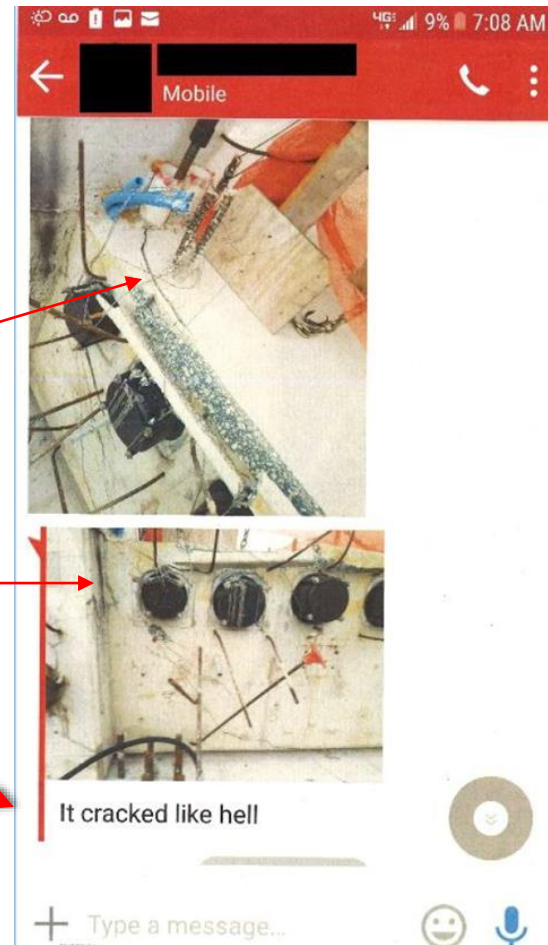
Stage 2 – Superstructure pre-casting



- Per design, certain diagonals (2 and 11) were de-stressed by VSL (post-tension contractor)
- Immediately after de-stress, cracks appear at diagonal 11

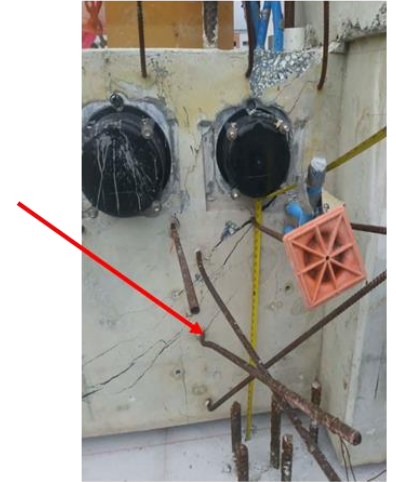
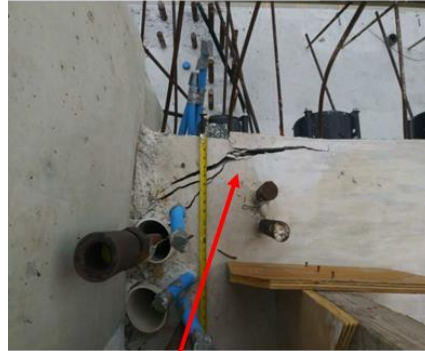
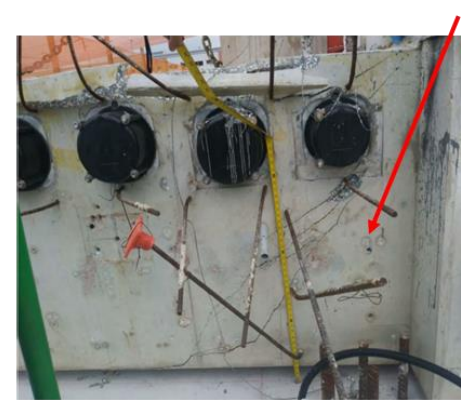
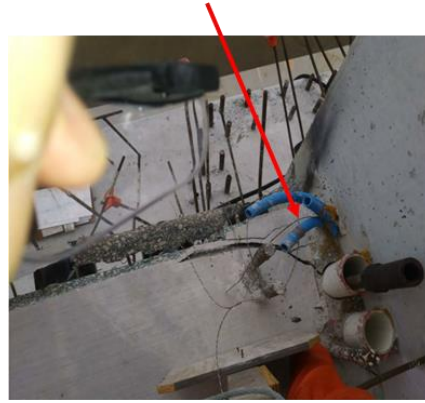
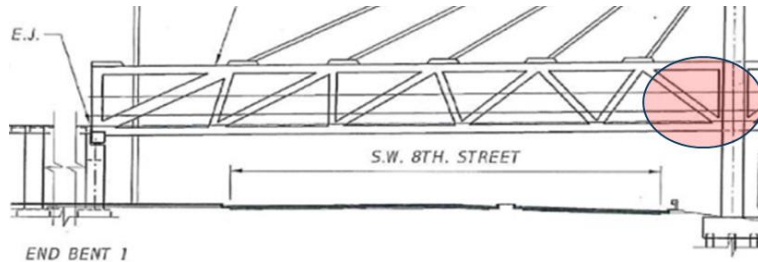
March 10, 2018 – Afternoon

- VSL texts photos of cracking at 11 after de-stressing.
- “It cracked like hell”



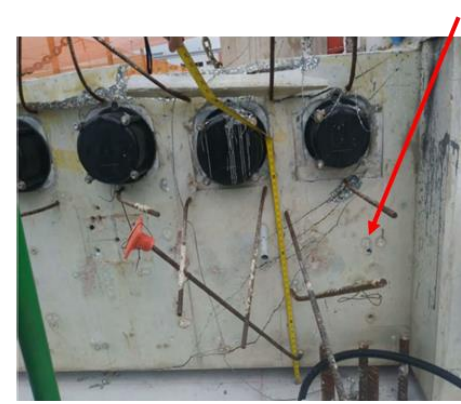
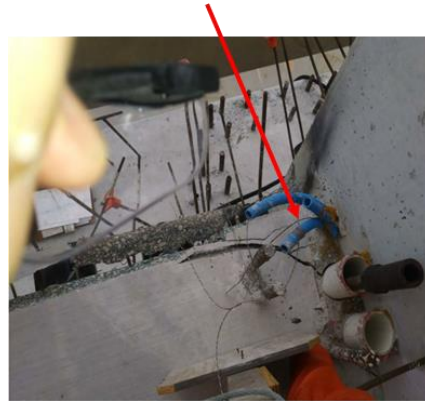
March 12, 2018

- MCM sends pictures of cracks to FIGG asking them to review and comment “as quickly as possible”



March 13, 2018

- FIGG opens e-mail 8:30
- 9:45 FIGG instructs by e-mail to put plastic shims in “right away” but no jacking is required
- “We do not see this as a safety issue”

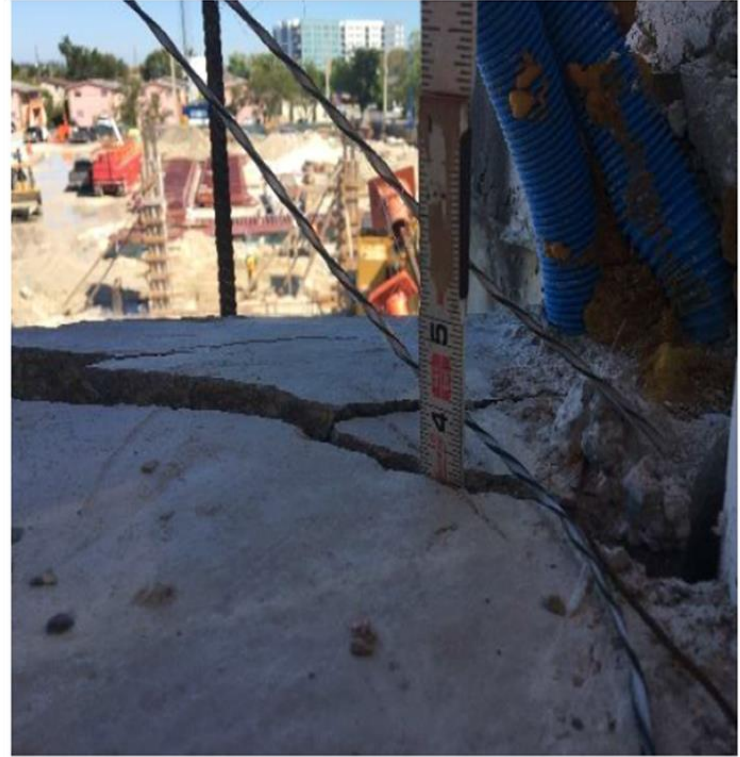


March 13, 2018

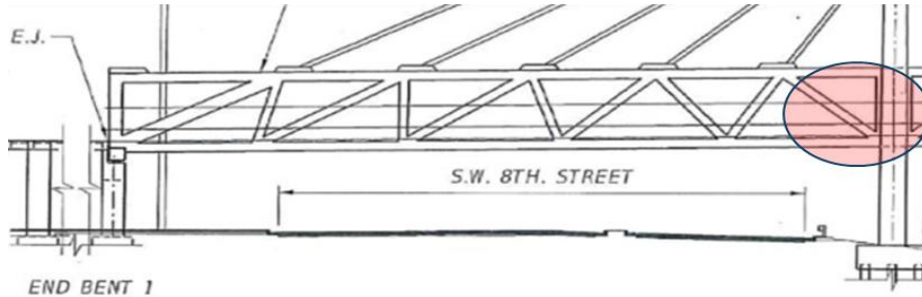


- FIGG leaves message for FDOT about cracking but says “we don’t see that there’s any [safety] issue there, so we’re not concerned about it from that perspective”
- 5:18 FIGG e-mails MCM “we have evaluated further and confirmed this is not a safety issue”
- FIGG recommends to restress PT rods at member 11 but VSL crew couldn’t be back on site until March 15

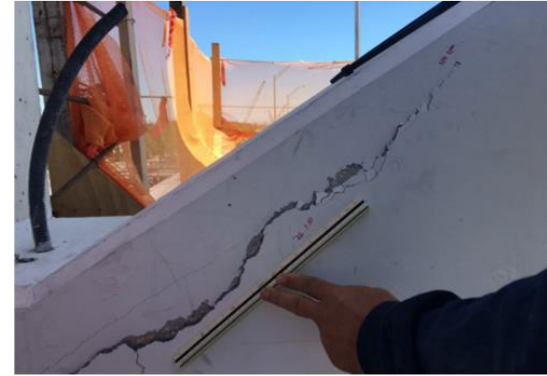
March 14, 2018



March 14, 2018 – Construction Joint at Deck & 11



March 14, 2018 – Longitudinal Cracking at 11



March 14, 2018 – West and East Sides



West side



East side

March 14, 2018

- MCM sees cracks growing
- Calls meeting with FIGG and others for morning of March 15 to discuss FIGG's findings on cracks
- FIGG analyzes, works on presentation for meeting
- VSL told to mobilize for re-tensioning on March 15



March 15, 2018 – 7:45 a.m.

- Two FIGG structural engineers examine cracks (incl. EOR) with MCM and BPA . Told cracks have grown.

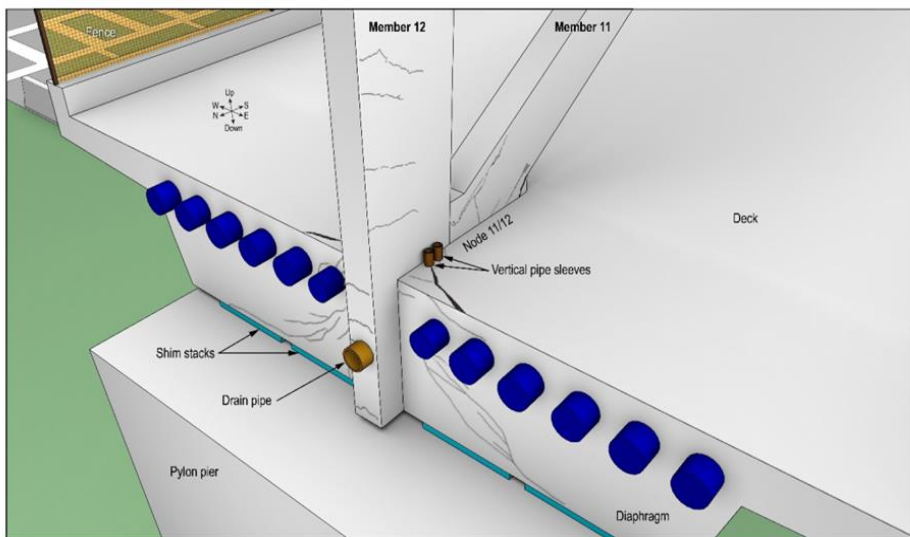


Figure 33. South and west view of extent of cracking at member 11/12 nodal region, deck, and diaphragm, indicating structural distress.

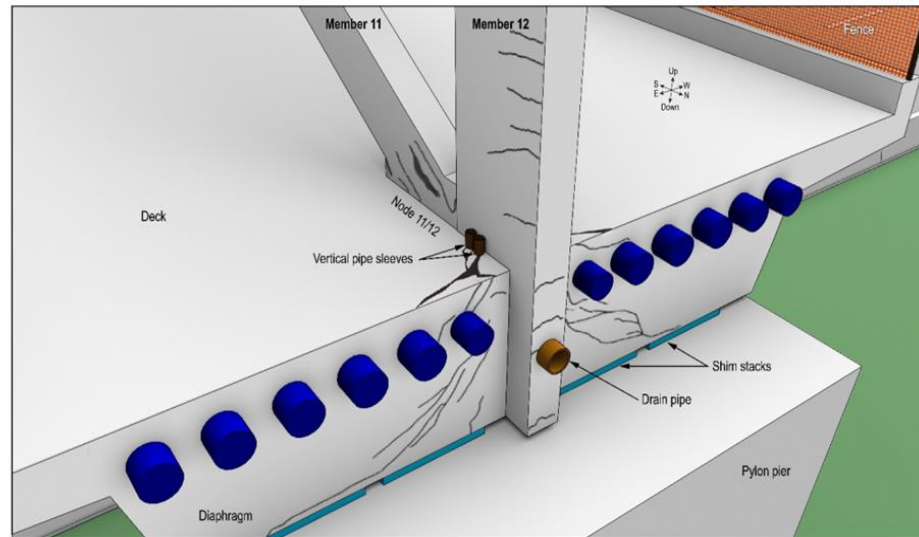


Figure 34. South and east view of extent of cracking at member 11/12 nodal region, deck, and diaphragm, indicating structural distress.

March 15, 2018 – 9:00 a.m.

- Meeting in trailer with MCM, FIGG, FIU, FDOT, and BPA
- FIGG gives presentation – “Cracks look more significant in person,” “No safety concerns” and only a “temporary loading condition.”
- FIGG couldn’t explain cracks – “Not replicated by engineering analysis.”

March 15, 2018

“No one expressed concern with safety of the span suspended over the road.” - Meeting minutes.



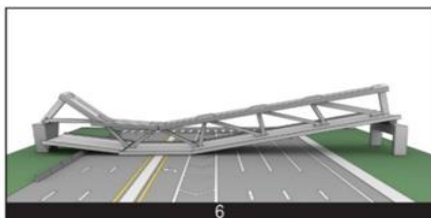
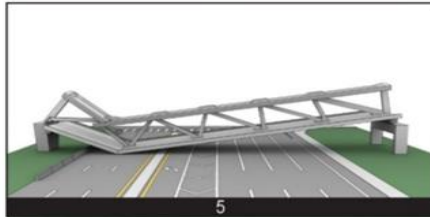
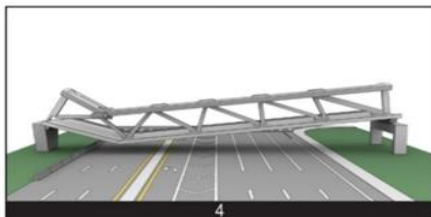
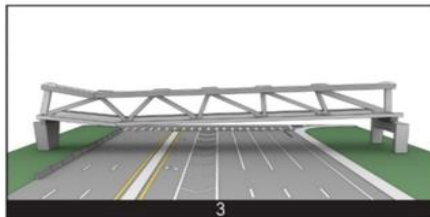
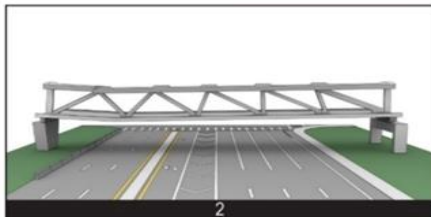
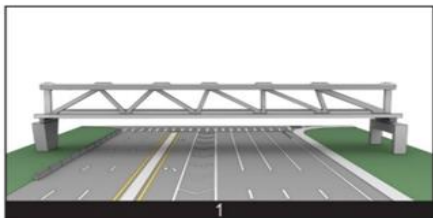
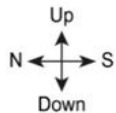
March 15, 2018

- VSL mobilizes to begin post-tensioning work on diagonal 11.



March 15, 2018
1:46 p.m.





March 15, 2018

- Span “experienced a blow-out of concrete [at] diagonal 11 and column 12.”
- Span fell 18 feet to the ground.

Personal Impact

- **Six people killed**
 - Five motorists and one VSL technician standing on deck.
- **Five workers injured**
 - One VSL technician permanently disabled.
- **Five motorists injured**



Professional Impact

- Lawsuits from victims
- OSHA & NTSB investigations
- Potential criminal charges
- Possible PE board investigation
- Reputational harm



Lawsuits

- All resolved except one
- 25 parties paid a total of \$103M plus \$9.5M to FIU
- FIGG and all design team members (except peer reviewer) paid confidential settlements assumed to be policy limits
- Louis Berger peer review case pending



OSHA & NTSB Investigations



“The bridge was talking to them. It wasn’t just talking — **it was screaming** that there was something definitely wrong with this bridge. Yet **no one was listening.**”

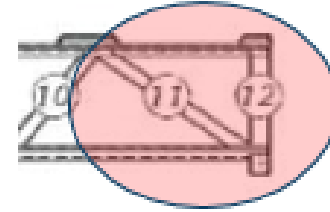
Robert L. Sumwalt, NTSB
Chairman, October 2019

OSHA & NTSB Investigations



- Design errors as primary cause of collapse
- Peer review failed to include staging design
- All parties failed to act on warning signs and cease work

OSHA & NTSB Investigations



- Design underestimated loads at 11/12/deck
- Overestimated capacity at 11/12 to resist shear b/c of incorrect load calculations
- Lack of redundancy in design



OSHA and NTSB – CEI Citation

- NTSB/OSHA were specific in calling out CEI obligations
- Should have recommended to close road to FIU and FDOT despite FIGG's opinion
- OSHA - CEI had “independent professional judgment” requirements in contract*
- NTSB notes CEI had authority working with FDOT to close road
- All parties faulted for inaction

*Even if not in the contract, likely would have been an implied duty given health/safety risk

OSHA and NTSB – Peer Review

- Louis Berger scope/contract clear that it was only reviewing final, in-place design (all supports) – not staging
- “In the beginning, I suggested to do this kind of analysis, to analyze the connections. I'm talking about the nodes, or the joints to analyze the connections. However, the budget and time to do this actually was not agreed upon with the designer.”

NTSB Findings

16. Louis Berger was not qualified by the Florida Department of Transportation to conduct an independent peer review and failed to perform an adequate review of the FIGG Bridge Engineers design plans and to recognize the significant under-design of the steel reinforcement within the 11/12 node, which was unable to resist the horizontal shear between diagonal 11 and the bridge deck.

OSHA Findings

9. The consultant retained by EOR to conduct independent peer review of the EOR's design, as per FDOT requirements, did not check the structural integrity of the bridge under different construction stages, a violation of the FDOT requirements. The independent check was performed only under the final design stage when all segments of the bridge were constructed and completed.

OSHA and NTSB – Peer Review

- FIGG was very fee sensitive – cut LB's fees from \$110,000 to \$60,000 for same scope
- FDOT regs require “comprehensive” review with different design program
- Louis Berger cited by OSHA and NTSB for violating FDOT regs for not reviewing staging design

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Criminal Charges

- Prosecutors still deciding as of last week
- Criminal negligence is a very high bar
- Public pressure is high

Trial scheduled in last FIU bridge-collapse lawsuit. Criminal charges still undecided

BY DAVID OVALLE

OCTOBER 12, 2021 7:00 AM



Gina Duran talks about her daughter, Alexa Duran, 18, who was driving her father's car the day the FIU bridge

Regulatory Action

- Public pressure remains high
- Board has vowed to take “necessary steps”



The screenshot shows the FBPE website. At the top is the FBPE logo with the tagline "Committed to protecting the interest of public health and safety by properly regulating the practice of engineering". Below the logo is a red navigation bar with links: HOME, ABOUT, LICENSURE, LEGAL, MEETINGS & INFO, CONTINUING EDUCATION, and CORPORATE. The main heading is "Regarding the FIU Pedestrian Bridge Collapse". Below this is a breadcrumb trail: Home / News / Regarding the FIU Pedestrian Bridge... The text of the article states: "The Florida Board of Professional Engineers is deeply saddened by the injuries and loss of life caused by the March 15, 2018, collapse of a pedestrian bridge under construction at Florida International University in Miami-Dade County. Local, state, and federal authorities are on location as emergency personnel and crews work to recover victims and remove debris. After the initial work is complete, the National Transportation Safety Board, the Occupational Safety and Health Administration, and others are expected to investigate the cause of the collapse. The bridge was under construction, and workers were present at the time of its collapse onto a highway. Their investigations may take months. FBPE will monitor developments as the other agencies complete their investigations. If the cause is determined to be an engineering issue, FBPE will take any necessary steps, including disciplinary actions, to ensure public health and safety."

Reputational Harm

- MCM is bankrupt; now rebranded as Magnum Construction Mgmt.
- FIGG / BPA / Louis Berger brand damage
- Individual PE reputational harm



Continuing Fallout

- MCM has sued Louis Berger (and new owner WSP)
- “We saw the concern. Every day they documented it. We were assured by a world-renowned designer that it wasn’t a safety concern.” - MCM President.
- Louis Berger preparing for trial
- FIGG 10-year FHWA debarment



Text TerraconLegal247 to 22333

or

Go to PollEv.com/TerraconLegal247

Do you think it was appropriate for NTSB/OSHA to cite Bolton Perez (CEI)?

Yes

No

Start the presentation to see live content. For screen share software, share the entire screen. Get help at pollev.com/app

Do you think it was appropriate for NTSB/OSHA to cite Louis Berger (peer review firm)?

Yes

No

Start the presentation to see live content. For screen share software, share the entire screen. Get help at pollev.com/app

Who (if anyone) should have closed the road?

MCM (Contractor) **A**

Bolton Perez (CEI) **B**

Figg (EOR) **C**

FDOT **D**

No One **E**

Everyone **F**

Start the presentation to see live content. For screen share software, share the entire screen. Get help at pollev.com/app

QUESTIONS