

Drainage, Accessibility, Structures Three Challenges in One Project

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HNTB
Stanley Consultants

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Presentation Outline



Project Team

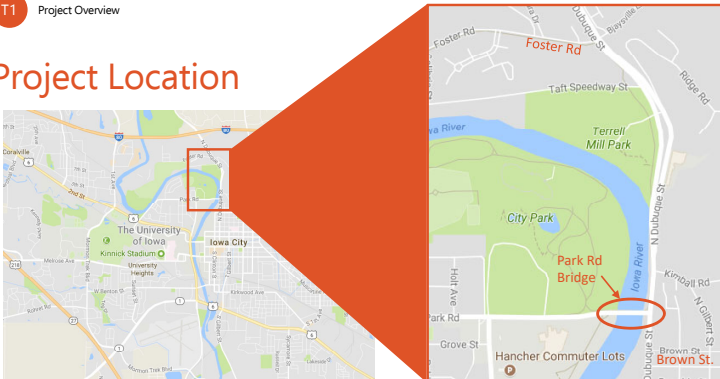


TOPIC 1 Project Overview



T1 Project Overview

Project Location



T1 Project Overview

Project Limits



Normal Conditions



2008 Flood



Project Scope

- NEPA Environmental Process
- Dubuque Street Replacement
- Utility Corridor
- 42" Sanitary Sewer Trunk Line
- New Bridge across Iowa River
- 1800' Retaining Wall
- Keep Traffic Moving
- Access to Mayflower Hall



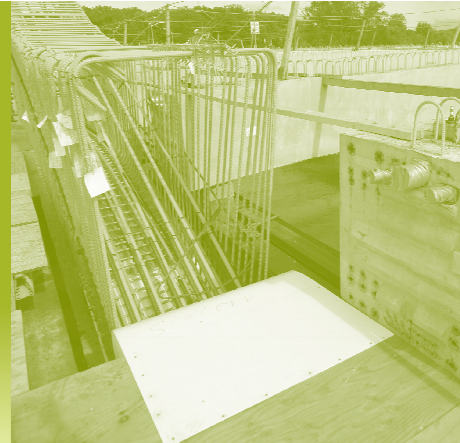
Design Criteria

- Community Involvement
- University of Iowa Involvement
- Aesthetic Appeal
- Roadway: 1' above 100yr flood
- Bridge: 1' above 200yr flood
- Elevate Roadway 8ft
- Elevate Bridge 3ft



TOPIC 2

Drainage Design Challenges



Drainage Design Statistics

- Box Culverts = 1,200 Linear Feet (6 Installations)
- Drainage Structures = 160 Each
- Storm Sewer = 8,800 Linear Feet

Roadway Length = 6,300 feet

Enhancing Natural Drainage Way



- Replace aging culverts
- Increase capacity
- Preserve natural stream
- Channel restoration

T2 Drainage Design Challenges

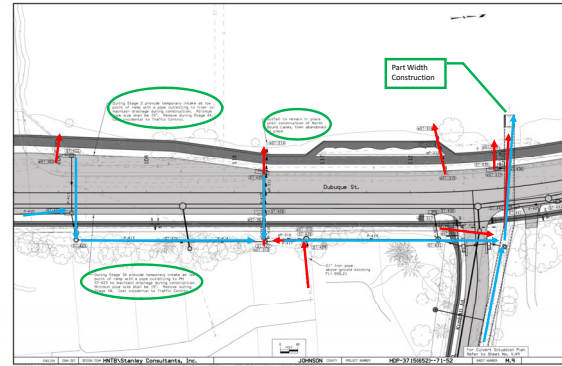
Draining to the river



- Reduced flood wall penetrations from 8 down to 2 in 1,800 feet
- Fill for roadway creates low areas near bluff.

T2 Drainage Design Challenges

Staging for Drainage



T2 Drainage Design Challenges



- Consolidate Outfalls
- Enclose drainage on Kimball Road
- Provide positive drainage behind east curb line.

TOPIC 3

Accessibility and Multi-Modal Accommodations



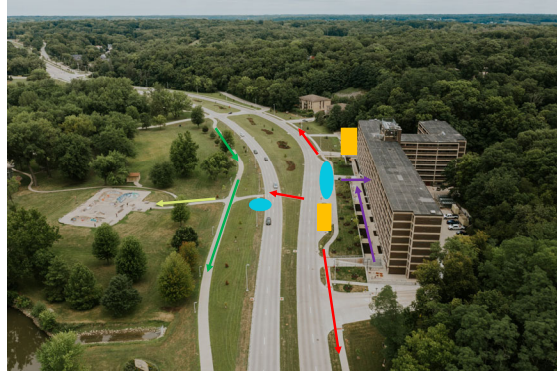
T3 Accessibility and Multi-Modal Accommodations

Multi-Modal User Features

- 50+ Sidewalk Ramps
- 10 Bus Stops
- Sidewalks on both sides of Dubuque Street and Park Road throughout.
- Bike Trail improvements along Dubuque and connections to the Park.
- Enhanced parking and drop-off facilities at Mayflower Residence Hall.

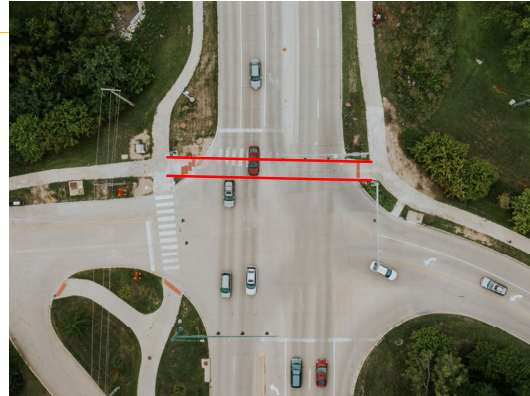
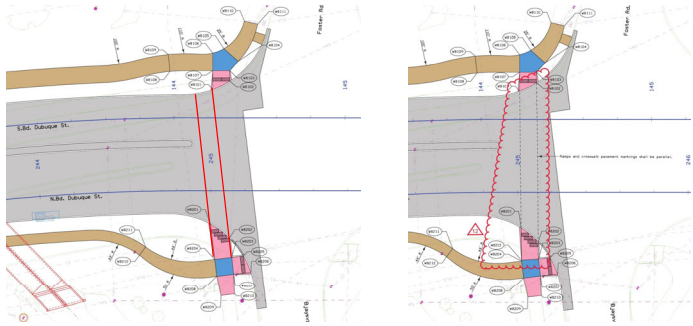
T3 Accessibility and Multi-Modal Accommodations

Complete Streets for Users



- Pedestrians
- Bicycles
- Buses
- Parking/Drop-Off
- Enhanced Access to corridor amenities
- Enhanced Entry Experience

ADA Challenges - Direction



ADA Challenges - Slope

- Kimball Profile is 12%
- Target ADA slope on ramp is 6.5%



- Better Geometry
- Complete Streets Accommodation



- Riverfront Improvements
- Hidden Utilities



- Connections to amenities

TOPIC 4

Bridge Structural Design



T4 Bridge Structural Design

Bridge Type Options



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T4 Bridge Structural Design

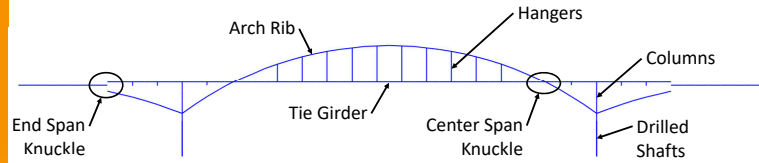
Partial Through Tied Arch



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T4 Bridge Structural Design

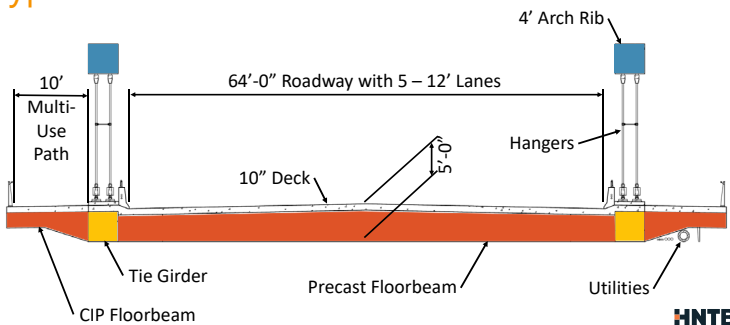
Structural Framing System



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T4 Bridge Structural Design

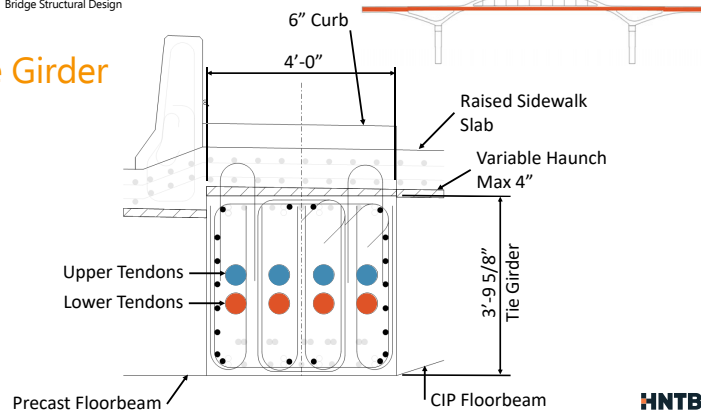
Typical Section



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T4 Bridge Structural Design

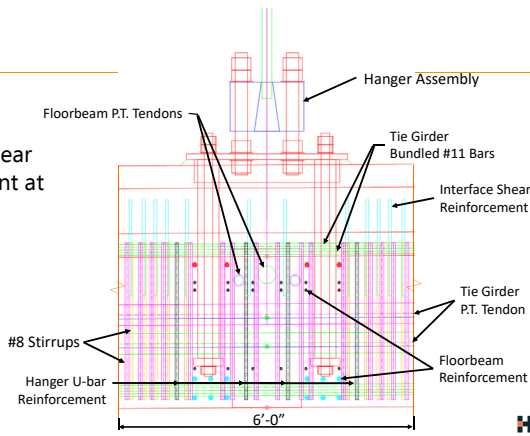
Tie Girder



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Tie Girder

- Tie Girder Shear Reinforcement at Hanger



Tie Girder



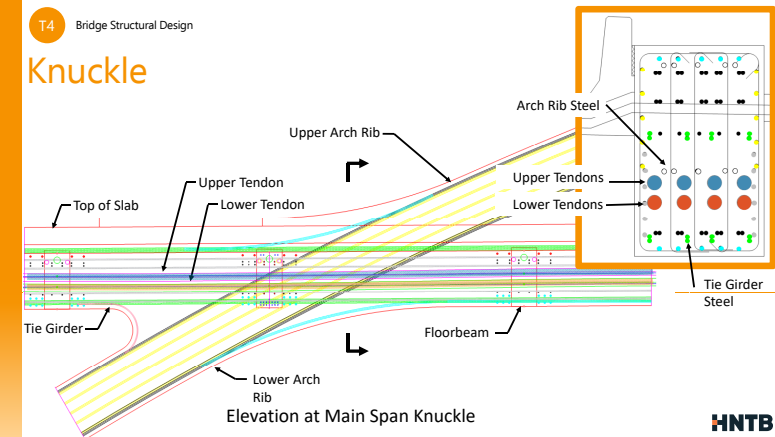
Arch Rib and Knuckle



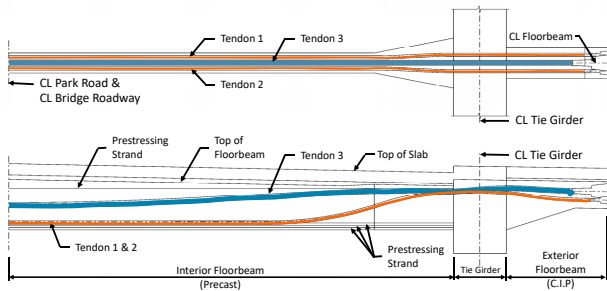
$f'c = 8,000$ psi



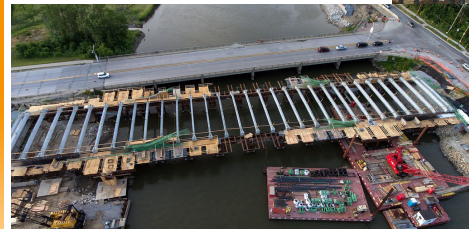
Knuckle



Floorbeams



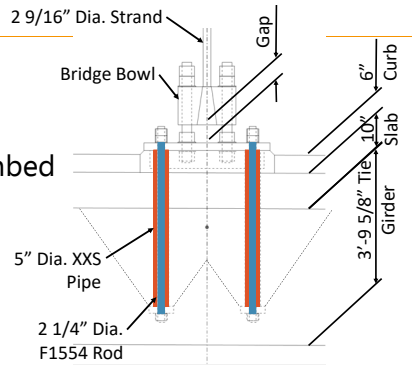
Floorbeams



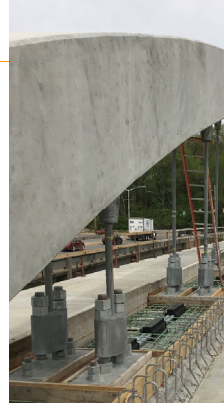
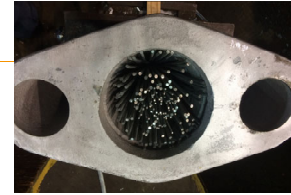
- Precast & CIP
- Post-Tensioned

Hangers

- Rod Vs. Bridge Strand
- Hanger Connection Embed
- Pretension
- Effective Section

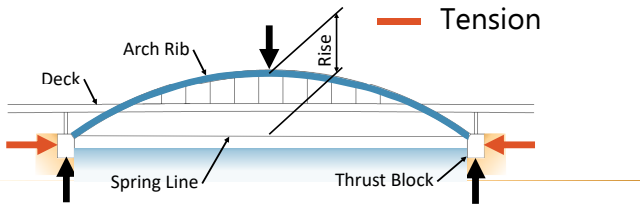


Hangers



True Arch Behavior

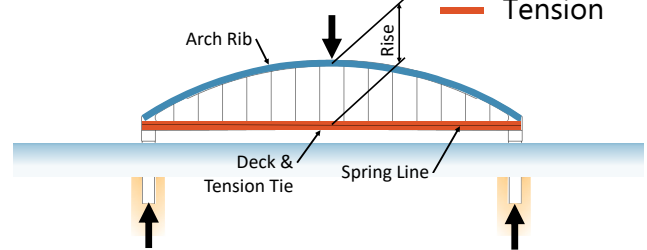
— Compression
— Tension



- Arch Thrust
- Deck system is not in tension

Tied Arch Behavior

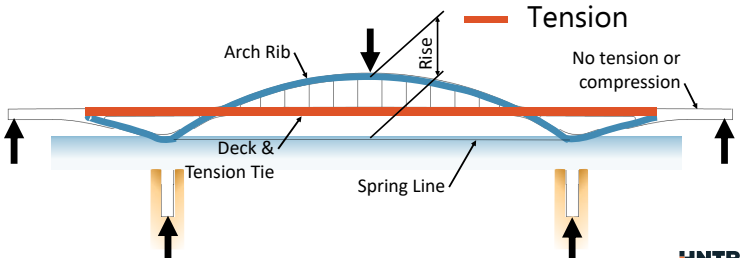
— Compression
— Tension



- Self Supporting Closed System

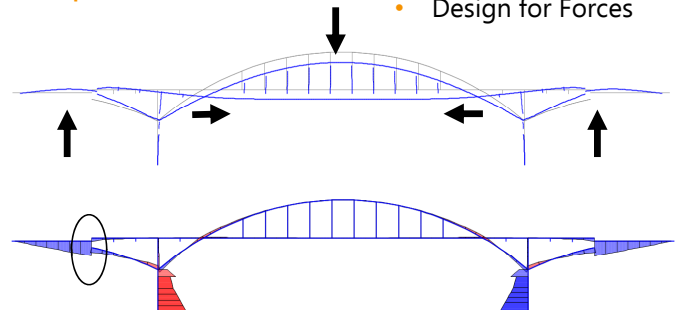
Partial Through Tied Arch Behavior

— Compression
— Tension



Temperature Fall

- Add Hinge in Mainspan
- Add Bearings
- Design for Forces



Vertical Displacement at Abutment



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Bid Tabs

	Peterson Contractors Inc./ Kraemer North America	Contractor 2	Contractor 3	Contractor 4
Roadway	\$27,563,273.10	\$28,355,905.86	\$34,966,342.09	\$39,454,946.86
Bridge	\$12,988,889.68	\$17,201,324.0	\$10,611,671.19	\$13,070,396.89
Total	\$40,552,162.78	\$45,557,230.06	\$45,578,013.28	\$52,525,343.75

- Bridge = \$312 per Sq. Ft.
- Construction Duration
- Built Off Alignment
- River Closed to Traffic

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QUESTIONS

