Birmingham CBD Interstate Project

Utility Coordination Issues and Innovative Measures
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Project History

- Constructed in 1978.
- 2 Mile Urban Section on Structure between Route Interchange I-65 / I-59 & I-20 and Freeway Interchange at Red Mountain Expressway.
- Designed for 60,000 ADT current traffic 130,000 ADT

I-20 Bridge Section

Bridge Could Not Just Be Repaired

- The Entirety of the Bridges Between the Interchanges Would Need to Be Replaced!!!

Improving Traffic Flow

- Downtown I-20 Made a Through Route
- Intermediate Ramps Removed.
- One way in and out of downtown from each interchange.
- Modifications to Route Interchange
- All ramps pull away from mainline, eliminating intermediate weaving.
- Direct flyovers used, with tallest almost 90’ high.
PHASES OF CONSTRUCTION

Schedule

- We need the work to be done quickly
- Safety Issues & Traffic Flow
- Rapid Construction – Matchcast Segmental Bridge
- Incentive/Disincentive
- World Games 2021

I-59/20 Construction Timeline

Construction Sequence

- Replace Bridges on the edges of the project.
- Modify Route Interchange I-65 & I-59/1-20
- Modify Interchange at Red Mountain Expressway (Elton B. Stephens/US-31).
- Cast Segmental Bridge Sections & Store.
- Finish Entrance/Exit from Downtown Birmingham @ Both Interchanges.
- Close I-20 Between the Interchanges and take down existing bridge.
- Rebuild CBD Bridge Section & Reopen.

Utility Challenges

- Evolving Design – Plans went from 7 Phases to 4.
- Can't determine and address conflicts until design is final.
- Accelerated Construction Schedule
- ROW Issues.
- Historical Areas – Civil Rights Era Homes
- Limited space to relocate in urban setting.
  - Dictated where some utilities relocated.
  - Adjusted D/A line to accommodate relocation.

11th Annual World Games - 2021

- 10 Days of Competition in Non-Olympic Sports
- 3500 Athletes
- Over 100 Countries Represented
- Over 30 Different Sports
Utility Challenges

- Old Utilities
- Unknown Age listed a P21
- Cast Iron Pipe.
- Inaccurate Company Records.
- Despite Utilities w/ GIS, significant number of utilities no longer there.
- Underground Electric Transmission Line
- Telecommunication Duct Bank Attached to Bridge
- Sanitary Sewer in Receivership.

Traditionally Non-reimbursable Utilities would be reimbursable under Interstate Funding.
- Retaining Walls Designed Atop Utilities.
- Load Restrictions to Avoid Utility Damage.
- Vibration Issues that Could Damage Utilities.

105.12 Oversize/Overweight Vehicle Permit & Load Restrictions.

b) LOAD RESTRICTIONS.

- The Contractor shall comply with all legal load restrictions in the hauling of materials on public roads beyond the limits of the project. In the hauling of materials on city streets or county roads, it shall be the responsibility of the Contractor to regulate his loads so that damage does not occur, regardless of the legal or posted load limit.
- Within the project limits, loads shall be so regulated that damage will not occur to base or pavement layers and structures, but in no case shall loads exceed the legal load limit unless permitted in writing by the Engineer under special conditions.

107.12 Protection and Restoration of Property, Landscape and Utility

(b) UTILITIES.

- 1. Where the Contractor's operations are adjacent to utilities or other property, damage to which might result in expense, loss, or inconvenience, work shall not be begun until all arrangements necessary for property protection has been made.
- The Contractor shall be responsible to the owners and operators of such property for any damage, loss, or inconvenience.

This will be the most expensive project in ALDOT history!
Employed Best Practices

- 3 C's of Utility Relocation Work
  - Communication
  - Coordination
  - Cooperation

Communication-Met with Bridge Designers

- Extra Consideration Given to Avoid UT Conflicts
  - Segmental Bridge Piers Placed Midway between cross streets.
  - Ramp Piers adjusted to miss utilities where possible.
    - Level B SUE data collected to determine some conflicts.
    - Drilled shafts used where UT in close proximity to piers.
    - UG 115kv Electrical Line had to be missed.

Ramp Pier/Span Adjustments

Met Monthly w/ Utilities

- Discussed Procedures with Traditionally Non-Reimbursable Utilities.
- Stressed Schedule and Status of Plans & Agreement.

Internal Meetings Every 2 Weeks

- All parties met to discuss the status of every component of the project:
  - Environmental
  - Right-of-Way
  - Plan Design
  - Bridge Design
  - Utilities
  - Lighting
  - Construction
  - Materials
  - Region
  - Etc.

Site Visits

- One Call
- Verify Locations with Utility Representatives
- Identified Locations to Collect SUE Data
Utilities Have an Added Interest in the Project

- In addition to being reimbursable.
- Most of the Utilities Have a Corporate Office in Downtown Birmingham.
  - Spire Energy (Alabama Gas Corporation)
  - Alabama Power Company (Distribution & Transmission)
  - AT & T
  - Birmingham Water Works Board
  - Jefferson County Environmental Services (Sewer)

Coordination

- Addressed Nearly all Utility Conflicts in advance of Phase III Project.
- Included Water & Sewer Relocations in Roadway Contract.
- Streamlined Outsourced Engineering – ALDOT directly hired engineer for W & S Design.
- Made extensive use of SUE data. Collected SUE data in areas for soil borings for bridge design to avoid utility damage.

Creative Solutions Employed
MS Access DB to Track UT Approval Process

12th Avenue Bridge (Phase A)

• Retaining Wall Proposed on top of 8” water line.
• Water line will be attached to the bridge.
  • Difficult to bore under I-20.
  • More cost effective solution.

12th Ave Water Line

12th Avenue Bridge (Phase A)

• Water line will be attached to the bridge.

12th Court Bridge (Phase II)

12th Court Bridge – AT & T

Duct Bank under 12th Court Bridge

12th Court Bridge – AT & T
Why is the Pipe Green?

ATT Line @ 17th St. Ramp (Phase II)

- Concrete Slab over clay duct.
- Under MSE wall.

INNOVATION

Visualizaition Group

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3D Modeling Process

LandAir created Existing 3D model

- Descartes (LiDAR)
- SUE Data
- Autodesk Revit
- 3D Reshaper
- MicroStation
- SS3 3D tools

ALDOT VIZ Group Created 3D of Proposed Design

- Modeled from 2D plans & design files
- InRoads SS2
- MicroStation SS3
- Clash Analysis
Data Collected

- Conventional Survey
- GIS Data
- LiDAR Scans
- Fixed wing
- Helicopter
- Terrestrial
- SUE Data
- Roadway & Bridge CADD Design Files

Model is Scalable

* Allowed us to measure the vertical clearance of overhead utilities over Proposed Design

Sewer Conflict?

Alabama Power Overhead Transmission Line

1-65

CLASH DETECTION

Clash Detection
- Hard Clash
- Soft Clash
3D Utility Assumptions

- Unknown UT Depths Assumed to be 30 inches.
- Minimum Diameter of Utilities 6 inches.
- Unknown Connecting Utilities
  - Field Verification
  - Engineer Verify

HG TV Moment

- Drama in Home Improvement
- Mold
- Asbestos
- Aluminum Wiring

Relief Drainage Culvert

Clash Detection

- Would have run clash to determine conflict with highway design if model was ready.
- Ran to determine conflict with drainage design.
- Ran again after the culvert was added.
- Final run to determine conflicts with proposed location of utilities.
  - Adjusted sewer design to eliminate conflict with fo. line.

I-59/20 & I-65 Interchange

South View

EXISTING

PROPOSED
Project Status

Phase A – Let 3/27/15

STPBH-1020(349)

$19,281,545

31st St. Bridge Complete, 12th Ave under construction
Project Status

Phase I – Let 6/25/15

STPBH-CMAQ-I065(457)

$7,416,165

I-65 Ramp Improvements
Complete

Phase II – Let 1/22/16

ACIMF-I059(383)

$208,611,848

$10 million incentive to finish by 8/31/18.
If not finished on time $200,000/day penalty

Underway
On Schedule?

Phase II – I-65 @ 12 Court North of Route Interchange
Phase II – I-65 – I-59/-20 Interchange Looking South

Project Status
Phase III – Let 11/4/16

ACIMF-1059(385)
Bid $564 MILLION

Bid Award Delayed

- Bids Greatly Exceeded Estimate.
- Project Value Engineered to Reduce Project Cost.
- Gave Us More Time to Complete or Work.

TOTAL COST APPROX. $800 MILLION

Utility Relocation Cost

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Utility Cost is Relatively Small

- <2% of Estimated Construction Cost
- Testament to Efforts to Avoid UT Conflicts
Utility Work is Well Underway

• Should Not Cause a Delay to the Project.

Epilogue: Lessons Learned

• Collecting SUE Data was very valuable.
  • Strengthened 3-D Model
  • Eliminated utility facilities there are no longer there, but part of company records.
  • Avoided damage to existing utilities when boring for bridge foundations.
  • Helped refine the utility conflict identification.
  • We shared SUE data with utilities to update Company Records.

Epilogue: Lessons Learned

• Flexibility in Bridge Design greatly reduced the utility conflicts.
• Hiring the Design Engineer directly helped speed the process for water & sewer design.
• Helped for design engineer to also produce the utility sheets for the contract plans.

Epilogue: Lessons Learned

• 3-D Model was a valuable tool.
  • Clash Detection helped identify subtle conflicts between drainage design and existing and proposed locations of utilities.
  • Sewer design was modified to avoid conflict with f.o. line.
  • Model would have been more valuable if developed sooner.

Communication
Cooperation
Creativity
& Innovation

Led to a Successful Utility Outcome