District Department of Transportation

*ABC in DC*

*(Accelerated Bridge Construction in Washington, DC)*

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Agenda

About DDOT
Eastern Avenue over DC-295
  • DDOT’s First ABC Project
  • Award Winning ACEC Design
New York Avenue over Amtrak, CSX and Metro
  • Design-Build Project
16th Street over Military Road
  • Completed in 2015
  • Award Winning CMAA, ABC
27th Street over Broad Branch
  • Completed in 2015
  • Award Winning CMAA
DDOT is Born

May 2002 – DC Council passes the District Department of Transportation Establishment Act of 2002, creating a cabinet-level agency responsible for the management of transportation infrastructure and operations. Prior to the Act, transportation was managed under the Department of Public Works.
DDOT by the Numbers

DDOT, born in 2002 out of DPW and multiple DC administrations

- 61 Square Miles Land Area
- 228 Bridges (209 vehicle, 19 pedestrian)
- 16 Tunnels
- 1,392 Linear Miles of Roadways (interstate, highways and neighborhood streets)
- 358 Linear Miles of Alleys
- 1,495 Linear Miles of Sidewalks
- 150,000 Street Trees
DDOT Mission

- The mission of the District of Columbia government's Department of Transportation (DDOT) is to enhance the quality of life for District residents and visitors by ensuring that people, goods, and information move efficiently and safely with minimal adverse impact on residents and the environment.
DC Impediments to ABC

- Dense urban environment
- Strict DC noise ordinance (night work)
- High traffic volumes on all major roadways
- Lack of lay-down areas and assembly/production yards
- Likely involvement of National or DC Parks, U.S. Reservations
- Low number of bridges; difficulties in “bundling” similar bridge types
- Contractor’s reluctance to stop using “tried and true” methods and start using riskier ones
- Transporting pre-fabricated bridge components through arterial streets
Eastern Avenue over Kenilworth Avenue

By the Numbers

ADT: 
Eastern Avenue – 37,000 vpd, 7 percent trucks
Kenilworth Avenue – 155,000 vpd, 7 percent trucks

Existing Bridge: 84-ft Single-span, Concrete I-Beams, 14-0 Vertical Clearance

Preferred Alternative: Two-spans reduced structure depth and raised profile increases Vertical Clearance to 16-0

Contract: $8.7 Million and 360 Calendar Days
Eastern Avenue over Kenilworth Avenue

TRAFFIC CONTROL PLAN
Full bridge closure

Detours:
- Eastern Avenue: Diverted to service roads as shown. About 21,000 vpd used the 1.5-mile northerly detour; 12,000 used the 1.8-mile southerly.
- Kenilworth Avenue: Provide space for construction of the pier in the median by diverting one lane in each direction from mainline Kenilworth Avenue onto the Kenilworth Avenue ramps and service roads and shifting the remaining two lanes in each direction to the right.
Eastern Avenue over Kenilworth Avenue

Median Pier and Abutment/Rетaining Wall Construction

Substructure:
• Cast-in-place footings
• Rehabilitated stone-faced retaining walls

Unanticipated Challenges:
• Poor subgrade under a portion of footing
Eastern Avenue over Kenilworth Avenue

Median Pier and Abutment/Retaining Wall Construction (continued)

Median Pier:
• Precast piers units
• Mechanical connectors

Abutment reconstruction:
• new bridge seat, backwall, and bearings,

Unanticipated Problems:
• Too-tight space for mechanical connectors
Eastern Avenue over Kenilworth Avenue

Superstructure Construction

Deck Panel Installation:
- Off-site fabrication
- Pre-erection yard “fit-up”

Crane erection
- 50 ton per unit
- Nighttime installation

Unanticipated Problems:
- None
Eastern Avenue over Kenilworth Avenue

Construction Recap

Construction Costs:
• Baseline $5.5 M
• Actual ABC $8.7 M (HfL $1 M)

Duration of Closure:
• Baseline Two Seasons (±630 Days)
• Actual ABC 260 Days

Calculated Delay Cost Savings Using ABC:
• $668 M
New York Avenue over Amtrak, MARC and VRE Rail

By the Numbers

Road: New York Avenue – 87,000 vpd

Rail: Amtrak, MARC, VRE - 6 tracks (3 electrified catenary)
   - 130 trains per day

WMATA - 3 tracks (electrified 3rd rail)
   - Metro train every 2 minutes, peak/every 5 minutes off-peak
   - Shutdown 12 AM to 5 AM, trains to Metro Shops

Existing Bridge: 2-Parallel 468-ft 6-spans, with 2-Riveted Steel Girders

Preferred Alternative: Rehabilitate substructure, add 3rd girder each side

Contract: $39.4 Million and 1,095 Calendar Days
New York Avenue over Amtrak, Metro and CSX Rail

TRAFFIC CONTROL PLAN

Half-at-a time Staging, “Bridge Bucks”

Roadway:

• New York Avenue: Reduced from 3-lanes each way to 2-lanes each way. Existing sidewalk relocated.

Railroads:

• Uninterrupted, shielding not required. Electric catenary support maintained on existing girders.

Metro:

• Shielding required.
• Night work and periodic shutdowns.
New York Avenue over Amtrak, MARC and VRE Rail

Retrofitting and reengaging substructure:

Substructure:
• Retrofit pier columns,
• Use retrofitted piers to temporary shore existing girders,
• Post-tensioned pier cap beams supported on multi-rotational disk bearings.

Unanticipated Challenges:
• Existing girders carried rail catenary wires
New York Avenue over Amtrak, MARC and VRE Rail

Superstructure completely rehabilitated:

- Existing girders remain in place; existing “grillage” (floorbeams and stringers) reconfigured to become longitudinal load carrying system using girders and diaphragms.
New York Avenue over Amtrak, MARC and VRE Rail

Superstructure Rehabilitation (continued):

• Existing floorbeams and stringers were removed,
• New girder added between existing girders of the same stiffness in each parallel structure
• Uninterrupted railroad services would be maintained by shoring the existing girders that support the catenaries.

Unanticipated Problems:
• None
New York Avenue over Amtrak, MARC and VRE Rail
Superstructure Rehabilitation (continued):

- The existing cantilevers accommodated by the use of full-depth, two-way deck panels of post-tensioned, precast concrete.
- Typical deck panel 49-ft 10-in long by 8-ft wide.
- Panel allowed shear studs to enforce composite behavior with the steel girders

Unanticipated Problems:
- WMATA cancelling or delaying planned nighttime shutdowns ($1,200/hour cost to DDOT).
New York Avenue over Amtrak, MARC and VRE Rail

Construction Recap

Construction Costs:
- Baseline N/A
- Actual ABC $39.3 M

Duration of Lane Closures:
- Baseline 7-9 Years
- Actual ABC 3 years

Calculated Delay Cost Savings Using ABC:
- N/A
16th Street over Military Road

By the Numbers

ADT: 16th Street – 33,000 vpd, Military Road – 19,000 vpd

Existing Bridge: 72-ft Single-span, Concrete Frame/Arch, 15-0 Vertical Clearance

Preferred Alternative: Single-span with reduced structure depth increases Vertical Clearance to 16-0

Contract: $15.8 Million and 330 Calendar Days (110 Days Closure)
16th Street over Military Road

TRAFFIC CONTROL PLAN
16th Street: Half-At-A-Time Bridge Closure;
25 MPH Speed Limit

Recommended Alternate Route:
- Georgia Avenue: From Georgia and 16th Street intersection in Montgomery County, MD to Georgia and Arkansas intersection to Arkansas 16th Street intersection.
- Oregon Avenue
- 14th Street
- 13th Street

Military Road: Reduced from 4-lanes to 2-lanes; 25 MPH Speed Limit
16th Street over Military Road

Support of Excavation (SOE) and Abutment Construction:
Limited staging areas – Rock Creek Park, NPS used with Special Use Permit (SUP)

Support of Excavation (prior to closure):
• Augured shafts for W18 piles for timber lagging,
• Installed overnight; lanes plated and opened the next day,

Unanticipated Challenges:
• Weak subgrade under corner of footing
16th Street over Military Road
Support of Excavation (SOE) and Abutment Construction (continued):

Demolition:
• Weekend closure of Military Road,
• Special demolition equipment with back-up,
• Continuous monitoring of noise by DDOT staff.

Unanticipated Challenges:
• Noise complaints from remote locations
16th Street over Military Road

Support of Excavation (SOE) and Abutment Construction (continued):

Substructure:
• Cast-in-place footings,
• Change from precast abutment to cast-in-place using High-Strength Concrete,
• Increase thickness to avoid step-outs,
• Revised joint pattern
• Tie-in to stone-faced retaining walls.

Unanticipated Challenges:
• None
16th Street over Military Road
Superstructure – Deck Panel Construction (continued)

Deck Panels:
• “Arched” end spans,
• Revised edge detail for UHPC joints
• Weekend closure for Military Road,

Unanticipated Problems:
• Civic unrest in Baltimore – no permitted loads in MD – trucks NY to DC via WV and VA.
16th Street over Military Road

Superstructure Construction:

Deck Panel Finishing:
• Ultra-High Performance Concrete (UHPC) joints with FHWA guidance,
• Latex Modified Concrete overlay to cover joint miss-match,
• Relocate fiber optic cables from old to new structure (10 days).

Unanticipated Problems:
• Final weekend shutdown of 16th Street to remove traffic vibrations
16th Street over Military Road

Construction Recap:

Construction Costs:
- Baseline $N/A
- Actual ABC $15.8 M ($8.8 M Bridge; $7.0 M Roadway)
- Incentive Paid $250,000

Duration of Closure:
- Baseline 18 Months (±540 Days)
- Actual ABC 110 Days

Calculated Delay Cost Savings Using ABC:
- $65 M
27th Street over Broad Branch

By the Numbers

ADT: 27th Street – 3,000 vpd,

Existing Bridge: 15-ft Single-span, Concrete T-Beam, 15-0 Vertical Clearance


Contract: $1.4 Million and 70 Calendar Days
27th Street over Broad Branch

TRAFFIC CONTROL PLAN

Full-time Bridge Closure:

Recommended Detour Route:
• Military Road to,
• Nebraska Avenue to,
• Broad Branch Road.

Broad Branch Road: Short-term closures for bridge work.
27th Street over Broad Branch

Stream Diversion and Demolition:
Limited staging areas – Rock Creek Park, NPS used with Special Use Permit (SUP)
Stream Diversion:
• First attempt (dry weather flow),
Demolition:
• Temporarily relocate utilities,
• Saw cut and lift out T-Beams,
• Rubblized stone abutments for reuse.

Unanticipated Challenges:
• Two flash floods in 10 days,
• Noise complaints due to pumping
27th Street over Broad Branch
Reset Stream Diversion and GRS-IBS Abutment Construction:

Super Bags:
• Double height, one side-at-a-time,

GRS-IBS Abutment:
• Recommended by TFHRC,
• Installs very quickly,

Unanticipated Challenges:
• Adding reinforcement in response to flash flooding.
27th Street over Broad Branch

Precast Double-T Beams:
• Fit-up check in casting yard,

Transport to Laydown Area:
• Forming for end diaphragms,
• Forming for utility entrances both exterior units.

Unanticipated Challenges:
• Redesign from NEXT-T to Double-T
• Dispute with contractor over supporting on GRS-IBS to pour diaphragms,
• Time to form, pour diaphragms off-site.
27th Street over Broad Branch

Superstructure – Double-T

Construction:

Double-T’s on GRS-IBC:
- No bearings; end diaphragm bear on compacted stone,
- Transverse post-tensioned strands,
- Standard shear keys,

Unanticipated Problems:
- None
27th Street over Broad Branch
Superstructure Construction (continued):

Pylons, Sidewalk, Railings, Utilities and Wearing surface:
• Commission of Fine Arts approved Railing and Color Scheme,
• Rosphalt (50 LT) waterproof asphalt,
• Water main testing.

Unanticipated Problems:
• Miss-matched railings,
• Poor water quality in NW DC,
• AC Plant shutdowns to produce Rosphalt.
27th Street over Broad Branch

Construction Recap:

Construction Costs:
• Baseline $N/A
• Actual ABC $1.4 M (HfL $104 K)
• Incentive Paid $33,600 (of $42,000)

Duration of Closure:
• Baseline 9 Months (±270 Days)
• Actual ABC 70 Days

Calculated Delay Cost Savings Using ABC:
• $840,000
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References:


Questions?