Constructing a New Utility Tunnel on an Active Medical Campus

Walter Reed National Military Medical Center
Bethesda, Maryland
Presenters

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Description of Walter Reed

• History
  – National Naval Medical Center 1939
  – Expanded During WW2
  – Walter Reed Scheduled to Close in 2005
  – Combined with National Naval Medical Center In 2011
  – Currently Serves as Medical Facility for Wounded Vets, Congress and President
  – 243 Acre Campus
  – Located In Bethesda, MD
  – Now Known as the Walter Reed National Military Medical Center
Current Complex

- Nearly 8,500 Employees
- 2.4 Million SF
- Serves over One Million patients per year
- 288 Beds
Project Objective

• Site Enabling for a New 600,000 sf Hospital Facility Includes Demolishing Buildings 2, 4, 7, & 8

• Construct New Modern Medical Facility
  – Two Phase Construction
  – Temporary Medical Facility
  – 500 ft. Pedestrian Tunnel

• Relocate Utilities to Enable Demolition
  – Base Wide Communications Hub
  – Primary Medium Voltage Electrical Feeds to Most of the Campus
  – Demolished 2 Major Sewer and Storm Drain Pipes
  – Chilled Water and Steam to Serve Several Buildings
  – Total Construction Cost $38,490,000
Design Build Success

• **Contractor Support During Design**
  – Constructability Reviews
  – Cost Control

• **Engineer Support During Construction**
  – UFC/Code Requirement Compliance
  – Timely and Cost Effective Resolutions
  – Designer on Board for Owner Coordination
Project Requirements - Tunnel

- 1200 Feet of Tunnel
- Up to 20 - 5” Medium Voltage Ducts
- Up to 36 - 4” Communications Ducts
- 2 – 8” Redundant Steam Pipes
- 6” Condensate Pipe
- 6” Fire Suppression
- 4 – 4” PEVCO
Project Requirements – Other Utilities

- 1500 ft. Storm Drain
  - 600 ft. Jack & Bore
- 1300 ft. Sanitary
  - 600 ft. Jack and Bore
- 250 ft. Water Main
- 900 ft. of Gas
- 220 ft. Electric Ducts
- 1100 ft. Communications Ducts
Relocation of Electric and Communications

- Trench in Crawl Space of STEM
  - Medium Voltage Feeders
  - Over 80 Communications Cables
  - New Tunnel Will Cut Trench in Half
Traffic Control

- Pedestrians
  - 3 Large Parking Garages Adjacent to Active Construction Area
  - Significant Nos. of Patients, Staff and Visitors
- Vehicular
  - Close Roads
  - Active Garage Entrances
Future Pedestrian Tunnel Crossing
Under an Existing Building
Construction Challenges - Rock

- Extremely Hard - >20,000 psi
- Extensive in Excavation Below 20’
- 5 Months to Complete 775 Cubic Yards of Excavation

Line Drill
3-31-2016

Hoe Ram
4-20-2016

Hoe Ram
6-15-2016

Close!!
7-13-2016
Construction Challenges - Rock
Construction Challenges Jack and Bore

- Rock Boring – Multiple Breakdowns, 6 months to complete two (2) 270LF crossings
- Dewatering
- Shoring-of-Excavation (SOE) Conflicts
Construction Challenges – Site Logistics

- Boring & Tunneling Took Place Between Occupied Buildings
- Pedestrians and Vehicular Traffic
- Laydown Yard ½ Mile from Site
- Site broken up between 6 main areas and miscellaneous interior work
• Utility Tunnel designed to be completely enclosed (no exterior sumps)
• Multiple areas not able to be immediately enclosed resulted in waterproofing replacement
• Ground spring (or broken water line?) required fiberglas sump insertion and chemical grout injection along with multiple concrete re-pours.
Construction Challenges – Existing Utilities

• Condition of existing utilities on a 80 year old installation was a major headache
• More utilities than not were missing from as-builts, and ended up being found the hard way!
• Tie-ins and shut-downs had to be carefully sequenced to allow operations to be maintained continuously
Construction Challenges - Scheduling

- Sequencing had to be well defined during preconstruction to identify the correct critical path
- “Domino” effect plagued the job for the duration of the project
- Quality control, labor management and safety inspections became challenging with so much going on
- Building structural as-builts were not accurate, and required quick redesign of shoring system to allow the tunnel to continue on schedule

- Underpinning pits were required where tunnel traveled underneath existing buildings

- Innovative shoring solution required underneath connectors with turn-down slabs and caissons
Questions & Answers