WELCOME
TO THE FEBRUARY EDITION
OF THE 2013
M&R SEMINAR SERIES
BEFORE WE BEGIN

• SILENCE CELL PHONES & SMART PHONES

• QUESTION AND ANSWER SESSION WILL FOLLOW PRESENTATION

• PLEASE FILL EVALUATION FORM

• SEMINAR SLIDES WILL BE POSTED ON MWRD WEBSITE

• STREAM VEDIO WILL BE AVAILABLE ON MWRD WEBSITE
(www.MWRD.org: Home Page ⇒ MWRDGC RSS Feeds)
Brad Bacilek, PE

Current: Resident Project Manager, Alfred Benesch & Company, Chicago, IL

Experience: More than 15 years of construction engineering experience

Assistant Resident Engineer:
- Wacker Drive I-290 and Congress Interchange
- IDOT Reconstruction and widening of IL 59

Resident Engineer:
- Several Wisconsin DOT local roads projects
- Construction Manager/Resident Engineer, Denver, CO
- A 170-foot, three span, post-tensioned twin bridge structure,
- Widening of a mountain access road through a national forest
- Several residential development projects

Education: B.S. in Civil Engineering, Bradley University, Peoria, IL

Professional: PE Licensed in Illinois, Wisconsin and Colorado
- A registered member of the Illinois Society of Professional Engineers.
WACKER DRIVE
CONGRESS PARKWAY
INTERCHANGE

MWRD RELOCATION
Project Location
Existing Interchange Configuration

- Trough Sections
- Short Accel/Decel Lengths
- Franklin to WB 290 Movement
PROPOSED PLAN
North-South Wacker Drive: Proposed Interchange Improvements
North-South Wacker Drive: Design Challenges

Major Underground Elements
Existing Tunnel VS Proposed
North-South Wacker Drive: Design Challenges

NFPA Code Compliance
Tunnel E / MWRD Construction
Project Scale

- 18,000 Cubic Yards of High Strength High Performance Concrete
- 5.8 Million Pounds of Rebar
- 350,000 Pounds of Post-Tensioning tendons
- 20,000 Square Yards of Concrete Pavement
Project Scale – Deep Foundations

- 592 H-piles / Average Length of 84 Feet
Project Scale – Deep Foundations

• 168 Total Caissons Used – Majority in Tunnels

• 192 Total Caissons used in the Burj Khalifa in Dubai, U.A.E.
Tunnel E / MWRD Construction
MWRD Relocation

Conflicts with Existing MWRD
MWRD Relocation

- Junction Chamber / Jacking Pit Construction
MWRD Relocation

- Earth Pressure Balance Tunnel Boring Machine
MWRD Relocation

• Tunnel Boring Operation
  – Initial Bore/machine assembly / Production mining / Monitoring & Controls
MWRD Relocation

- Concrete Box Culvert
MWRD Relocation

- Tie-in Procedure
MWRD Relocation

• Issues and Lessons Learned
Tunnel Boring Operation

- Why Tunnel Boring
  - Maintain 2-way traffic on Congress Parkway
Tunnel Boring Operation

- Why Tunnel Boring
  - Maintain 2-way traffic on Congress Parkway
  - Proximity to Harrison Street
Tunnel Boring Operation

• Why Tunnel Boring
  – Maintain 2-way traffic on Congress Parkway
  – Proximity to Harrison Street
  – Efficiency of Tunnel Boring instead of hand mining and shoring
Junction Chamber/Jacking Pit

- Base Slab / Rails / Portal
Junction Chamber/Jacking Pit

- Thrust Block
Junction Chamber/Jacking Pit
Concrete Pipe Segments

- 12’ ID Reinforced Concrete Pipe
- 91 EA 8’ Segments Used
- 12 CY Concrete / Section
- 500 LB of WWM / Section
- Fc = 7000 psi @ 28 days
- Anticipated Jacking Force = 2500 psi
Concrete Pipe Segments

49,000 LB per Section

= Total weight of every football player in the NFC North
EPBTBM
(Earth Pressure Balance Tunnel Boring Machine)
Earth Pressure Balance Tunnel Boring Machine

Hydraulic Ram

Cutting Head

Lead TBM Section

Middle TBM Section
Earth Pressure Balance Tunnel Boring Machine

Computer Aided Guidance

Hydraulic Pressure Controls

Main Bearing and Mechanics

Drive Motors
Earth Pressure Balance Tunnel Boring Machine

Transformer

Control Cabinets

Electrical Assembly

Conveyor
Tunnel Boring Production

Remove Clay

Setting Pipe Sections

Restore All Connections

Jack Pipe
Tunnel Boring Production – Turn at JC 3

Entry to Junction Chamber 3

Drive TBM into Junction Chamber 3

Turning TBM to E-W Alignment

Begin Western Bore
Tunnel Boring Production – Completion at JC 1

Entry to Junction Chamber 1

Split Sections in Junction Chamber 1

Extracting Equipment from Receiving Pit

Cutting Head and Lead Section
Constructing Junction Chambers 3 & 4

Base Slab in Junction Chamber

Wall Steel and Formwork

Stripped Junction Chamber

Roof Steel
12’ x 8’ Concrete Box Culvert

• 31 – 8’ Segments of 12x8 CBC
• Installed in Open Cut Trench
Installing Box Culvert

Seated CBC with Skid Loader

Internal Gasket

External Sealing Wrap

Backfilled
## Cut-over Procedure

1. Transition flow through JC 1 area while JC 1 is constructed
2. Construct JC 1 to spring line (top of bench)
3. Bulk head end of box culvert
4. Release flow into new alignment by bypassing pumping JC 2
5. Construct JC 2 and complete JC 1 up to top of walls
6. Remove bulk heads and bypass pumping equipment
7. Pour roof slabs on JC 1, 2 and pour risers and caps
Cut-over Procedure - Step 1

1. Transition flow through JC 1 area while JC 1 is constructed
Cut-over Procedure - Step 2

Construct Junction Chamber 1 to spring line
Cut-over Procedure - Step 3

Bulk head end of box culvert
Cut-over Procedure - Step 4

Release flow into new alignment by bypassing pumping JC 2
Cut-over Procedure - Step 5

Construct JC 2 base slab, walls and channelization
Cut-over Procedure - Step 6

Remove bulk heads and bypass pumping equipment
Cut-over Procedure - Step 7

Pour roof slabs on JC 1, 2 and pour risers and caps
Issues and Lessons Learned
Issues and Lessons Learned
Questions?