Welcome to the

CONTECH® ENGINEERED SOLUTIONS

Unique Accelerated Construction Projects Utilizing Prefabricated Technologies

Presented by Kevin Grant, Senior Regional Bridge Consultant

Metro Transit Authority
Long Island Rail Road
Colonial Road Improvement Project

ADAM SCHMIT, Railroad Construction Company

JIM RISEBOROUGH, P.E., PHILIP A. CREAMER, P.E.,
Contech Engineered Solutions, LLC

IBC 18-09

MTA LIRR Colonial Road - rendering

Project Overview

Colonial Road Improvements and Pocket Track Extension

- LIRR Contract # 6151
- 60% Designed Bid Package by HNTB

Railroad Construction Company, Inc.
Contractors - Engineers
Est. 1926

Project Improvement Goals /Requirements:

- Replace Existing Steel Bridge with new roadway
- Install 1500 LF retaining wall
- Install a pocket track to accommodate an additional 12 cars.
- Improvements of the existing Right of Way and Track Drainage deficiencies

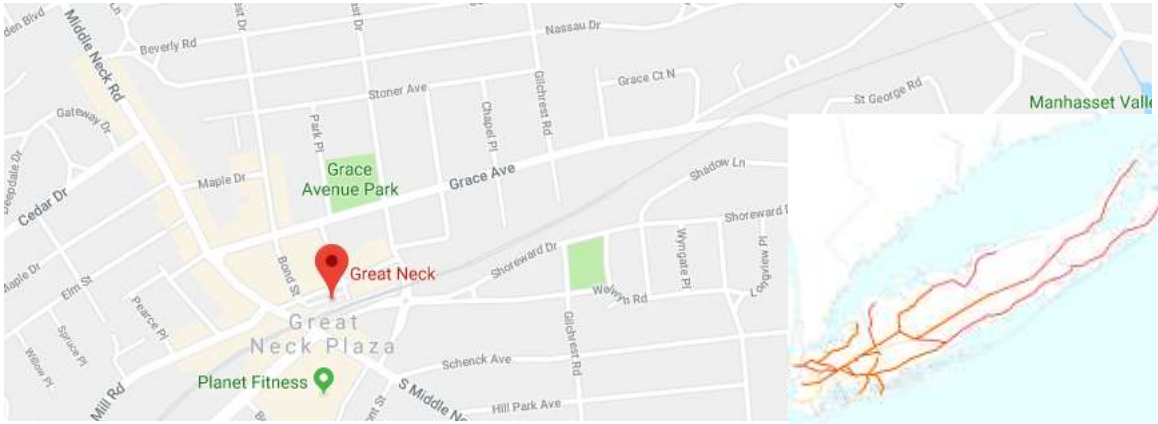
KSE/WSP
A Joint Venture

General Bid Overview

- Design Build Project
- Construction / Engineering team was - Railroad Constriction Company with KS Engineers/ WSP, a Joint Venture.
- Project had 18 Month duration completion period with a 12 Month Roadway Shutdown constraint
- Approx. Cost $25 Million

Project Location

- **Great Neck Long Island – Nassau County, NY**
- **LIRR Port Washington Branch**
- **Residential Area**
- **Next to Senior Center / Day Care Center**



LIRR Operating Restrictions and Site Constraints

- **Active Track Environment = 1 train every 20 minutes**
- **52 Hour Work Outages**
  - **1 for LIRR exclusive use for signal system cutover**
  - **4 for RCC use including bridge demo, bridge install, and track installation**
- **LIPPA/PSEG Moratoriums - Memorial Day through Labor Day**
- **Project was in the neighbors' backyards / work right along property lines.**
  - **Noise constraints, parking restrictions, etc.**
- **Limited work area availability to one side of track at a time**
- **Colonial Road Bridge Maximum Shutdown for One Year**
- **PLA / Union Agreements**
- **Precast Rail Delivery Requirements**

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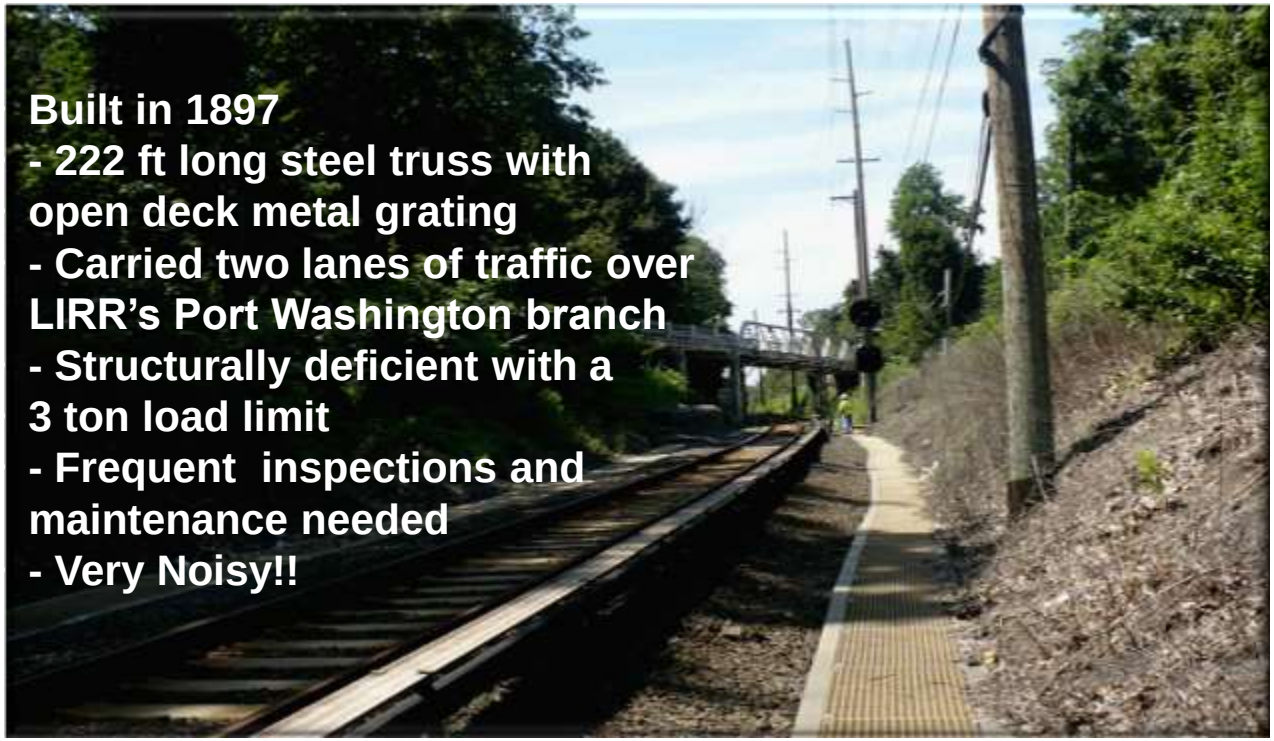
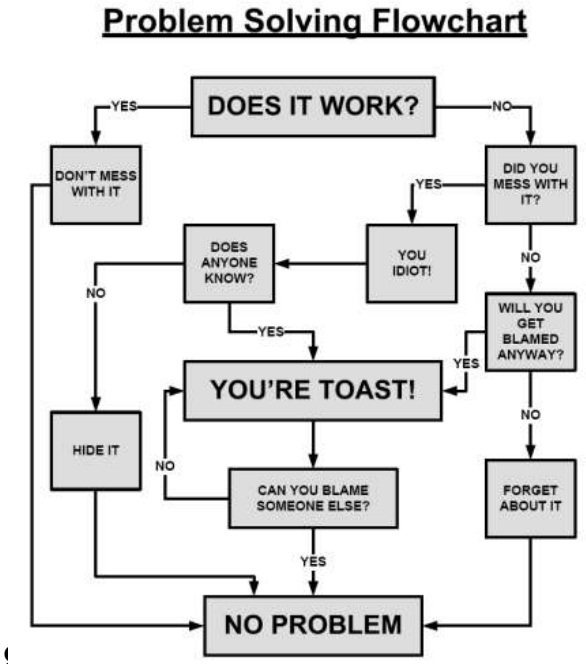
Original Structure



Built in 1897
- 222 ft long steel truss with open deck metal grating
- Carried two lanes of traffic over LIRR's Port Washington branch
- Structurally deficient with a 3 ton load limit
- Frequent inspections and maintenance needed
- Very Noisy!!

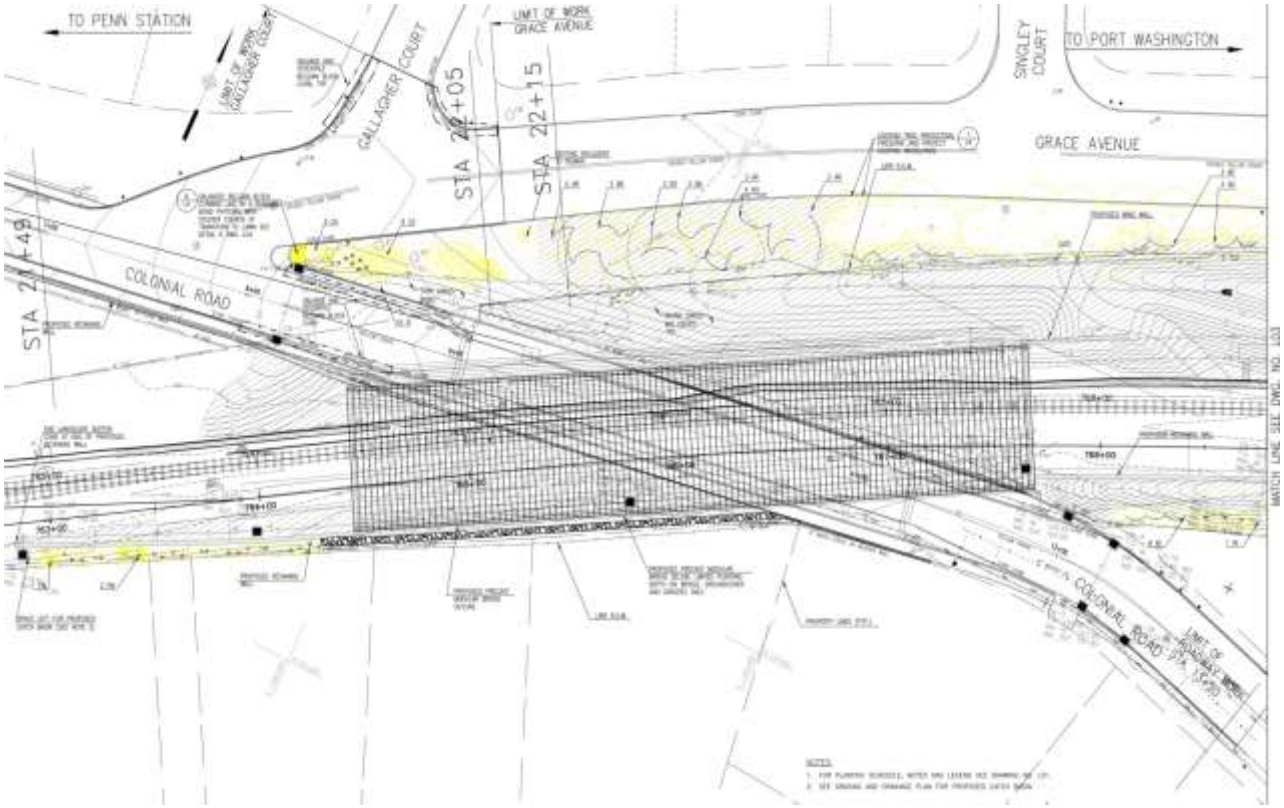
Design Factors for Consideration

- Skewed alignment of Colonial Road and the LIRR
- Roadway / Track Profile Constraints – No Change to vertical & horizontal alignment.
- LIRR train clearance & train line of sight requirements.
- Retaining Wall Construction – Access & Ground Conditions
- Abutment Construction – Overhead utilities / location to active rail.

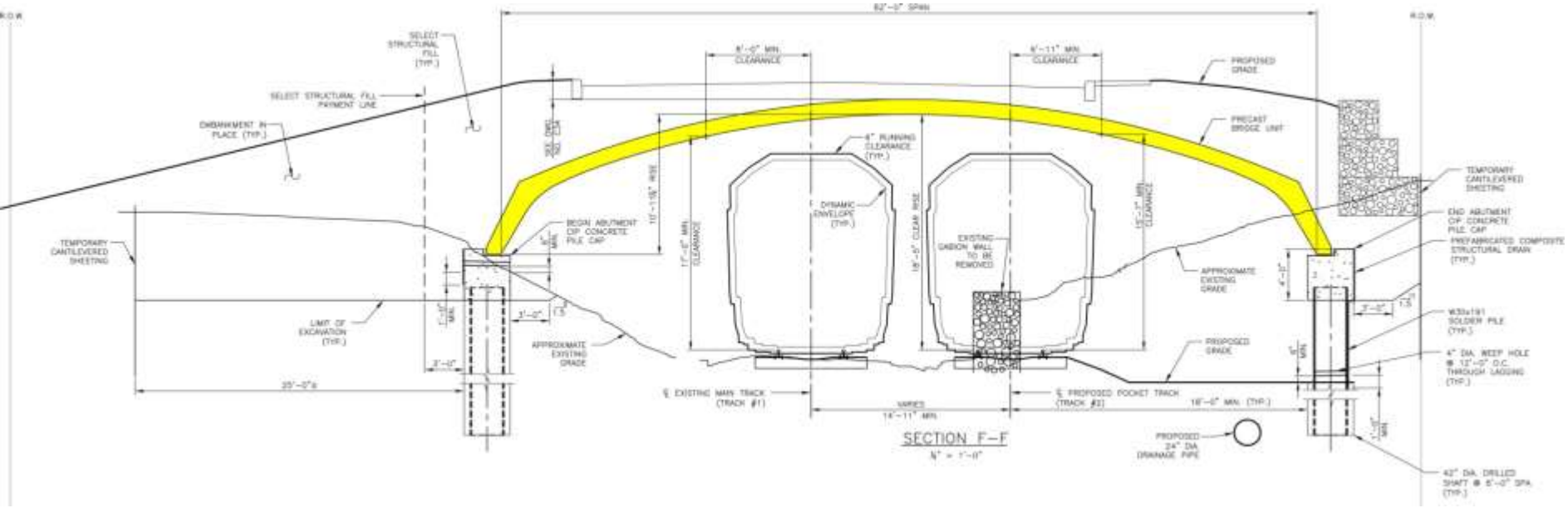


Skewed Alignment

- The roadway is at a 70 degree skew with the rail line below
- The horizontal and vertical alignments of the road and track could not be modified



Roadway Profile & LIRR Clearance Requirements



Only 3 ft. vertical clearance from the profile grade of Colonial Road to the top of the track

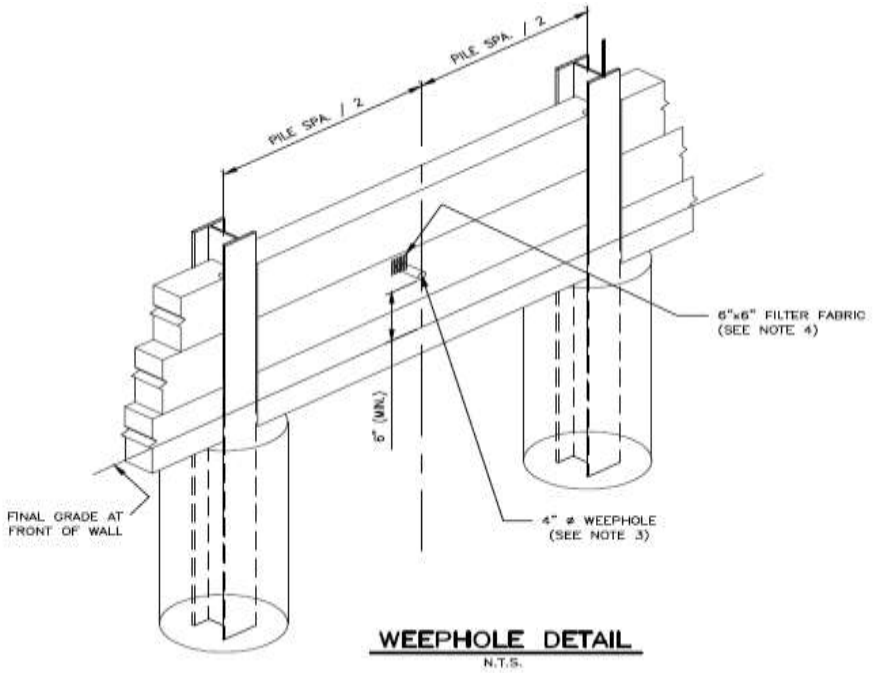
Retaining Wall Construction

Original 60% design

- Retaining walls were designed as soldier piles with precast lagging.

Issues/Concerns

- Cost to Drill & Handle Spoils
- Lagging cost – Timber & Concrete due to existing grade a tight property lines.

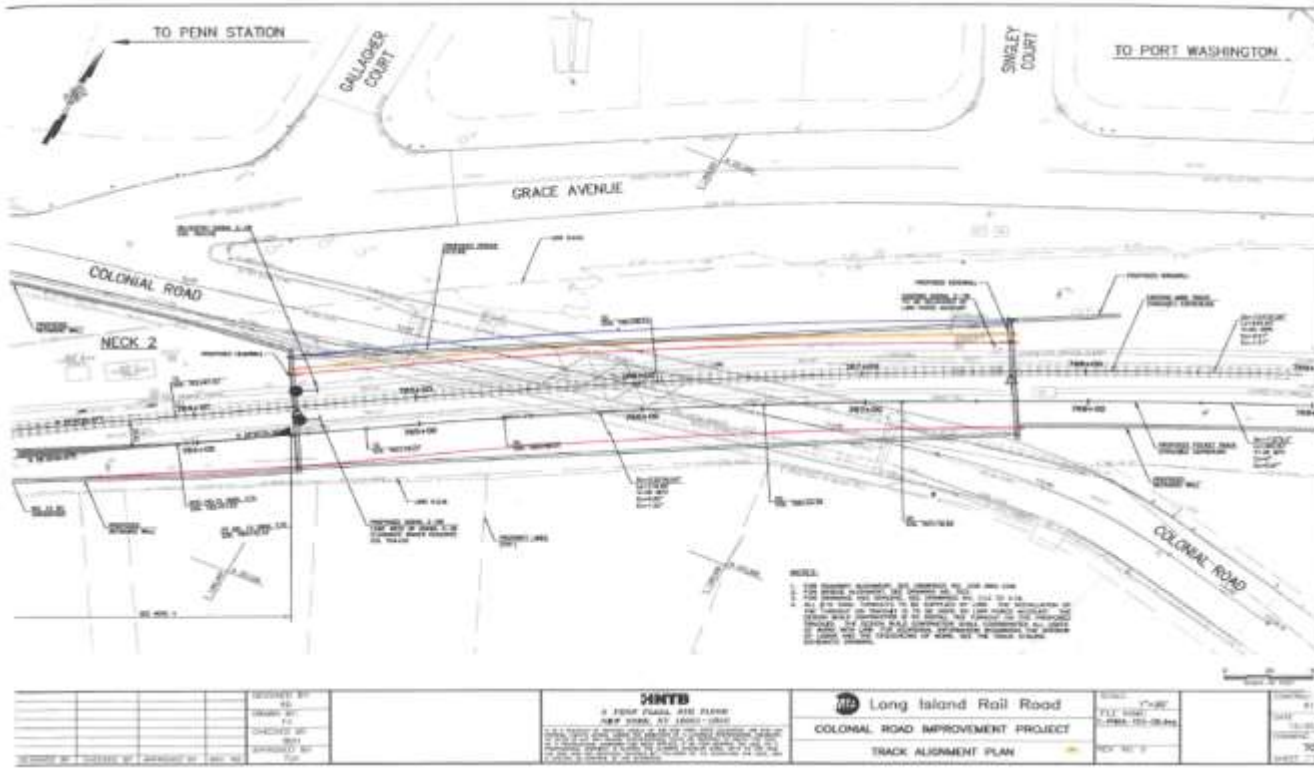


Design Modifications

1. Straight Bridge Structure vs. a Curved Structure
2. Adjustments to Bridge Span & Length
3. Abutment Footing Modifications
4. Cantilever Sheet Pile & H Beam Retaining Wall with CIP Encasement.

Design Modification # 1 & 2
Curved Structure & Reduced Span Width

- Hold horizontal train clearance dimensions on both sides
- Hold vertical clearances above the trains
- Meet conductor line of site requirements



Precast Arch System Benefits

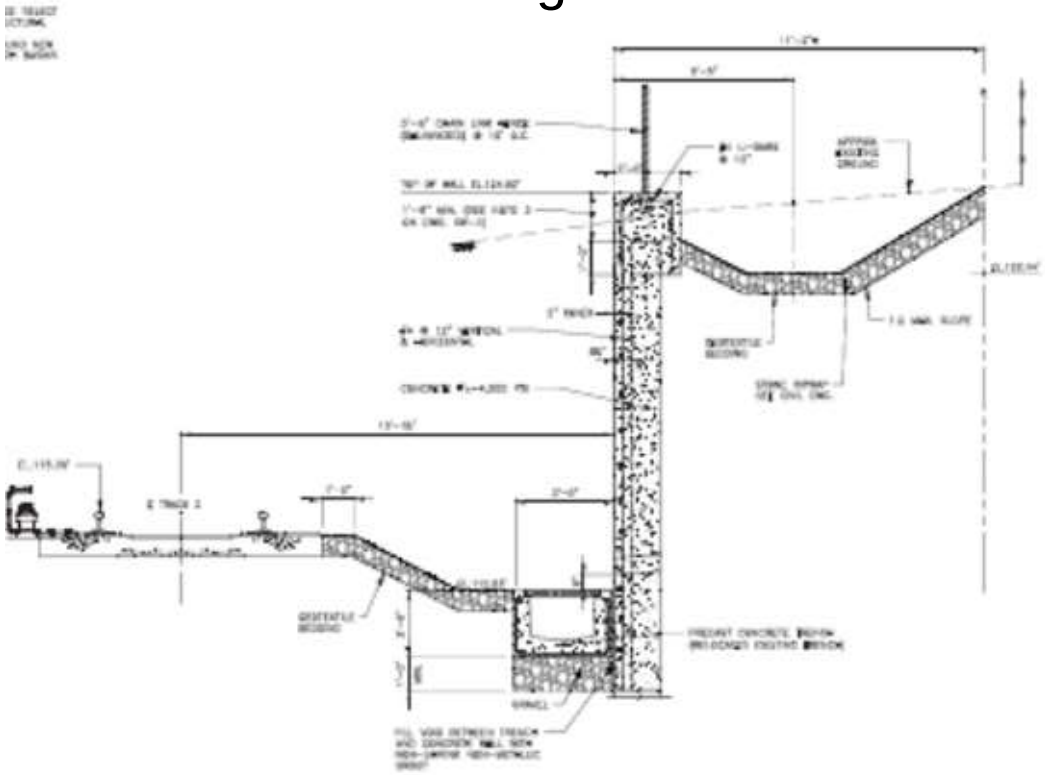
- Precast arches could be designed to span the track perpendicularly vs the much longer skewed length
- Thin concrete sections with minimal cover would meet railroad clearance requirements
- Modular arch elements can be manufactured offsite and installed quickly during the two allowed closure weekends
- Buried structure buffers noise from trains going through structure.
- Precast arch elements allow backfill operations to immediately progress after units and joint seals where installed.

Design Modification # 3 - Retaining Wall Review

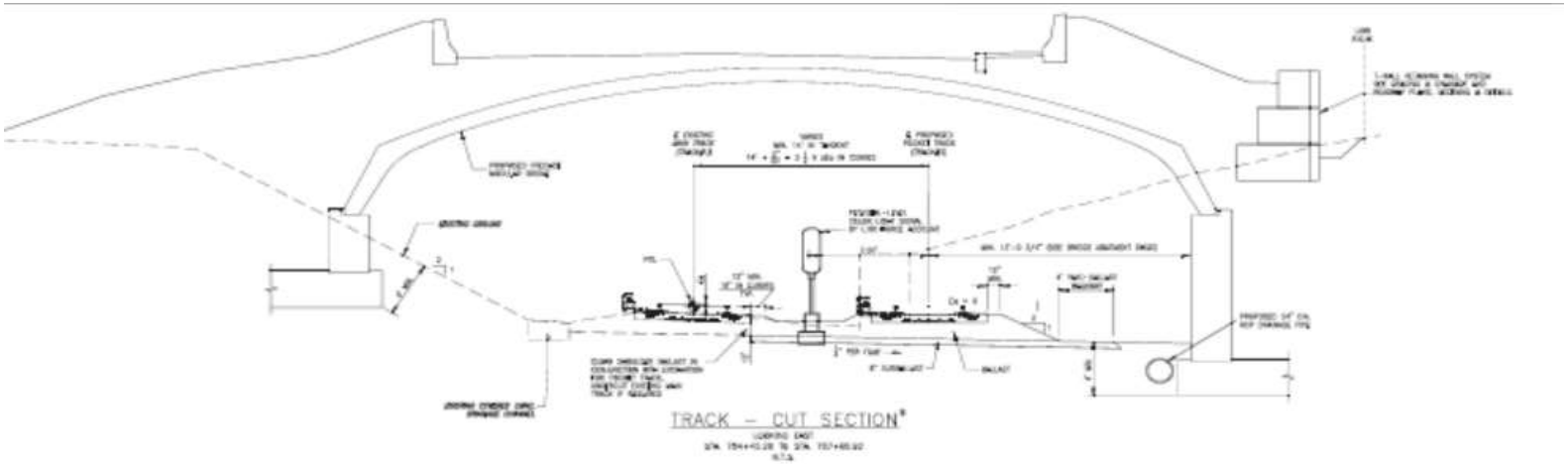
Drill Shaft with Soldier Piles → Concrete encased

Precast Lagging System → Steel Sheeting/Pile

- Better aesthetics and use of continuous formliner
- Increased sound absorption with use of wall system
- Improved construction schedule



Design Modification # 4 - Pedestal Spread Footing

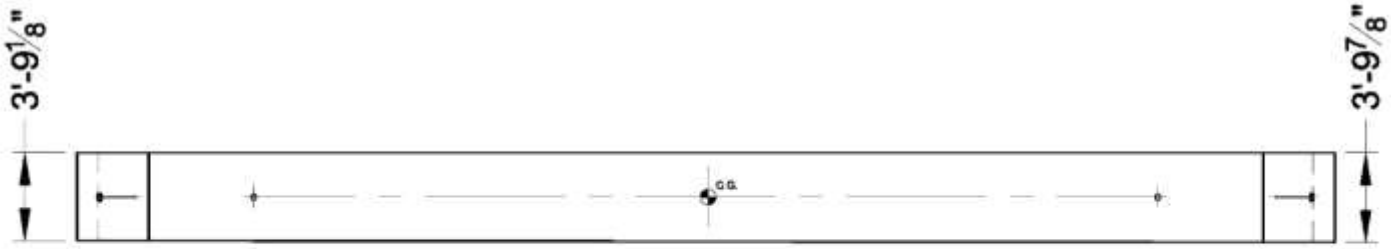


- Original design required high mast equipment that would cause potential delay
- Redesign of foundations to spread foundations was considered better suited for safe track operations and less utility interference
- New design follows the curved alignment of track and precast arches

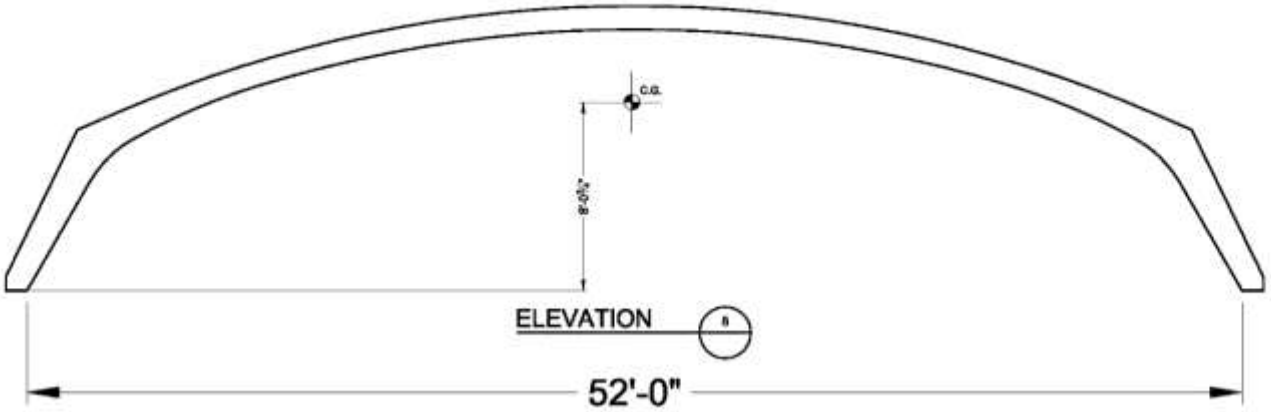
Arch Manufacturing

- Form system modified for small taper to create radius
- Cast 2 units per day

Arch Dimensions



PLAN - C3
TOTAL WEIGHT = 19.8 TONS




CONSPAN
O-SERIES
C52
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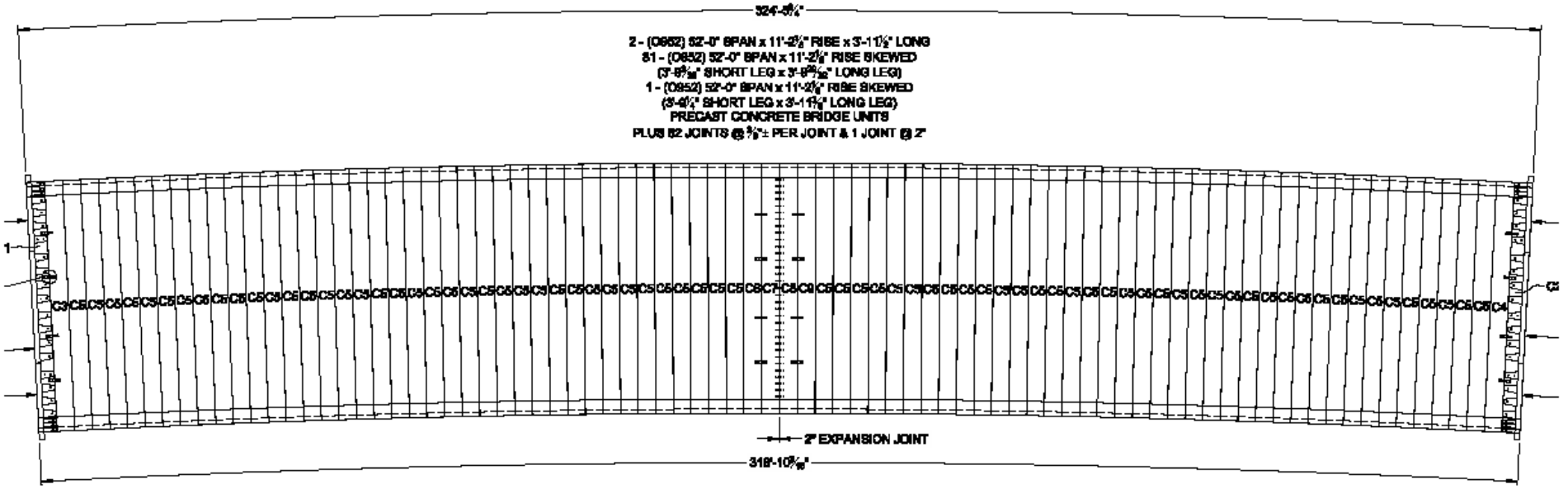
Bridge Final Layout

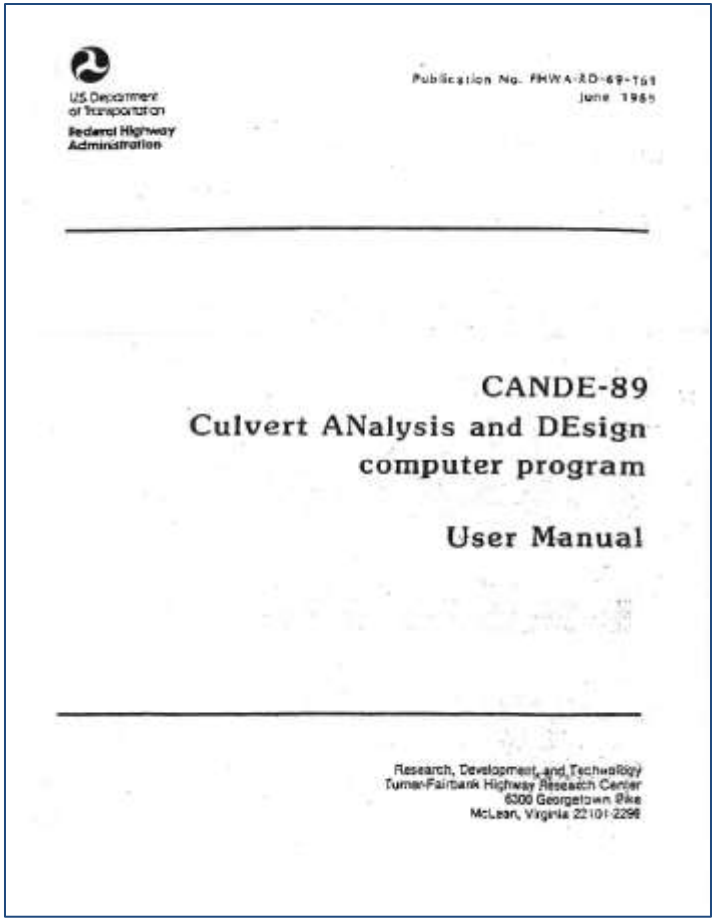
(2) End units 3’ 11-½” long with detached headwalls, 21 T ea.
(82) Tapered units, 3’-9 3/32” short leg, 3’-9 29/32” long leg, 20 T ea.



KEY PLAN

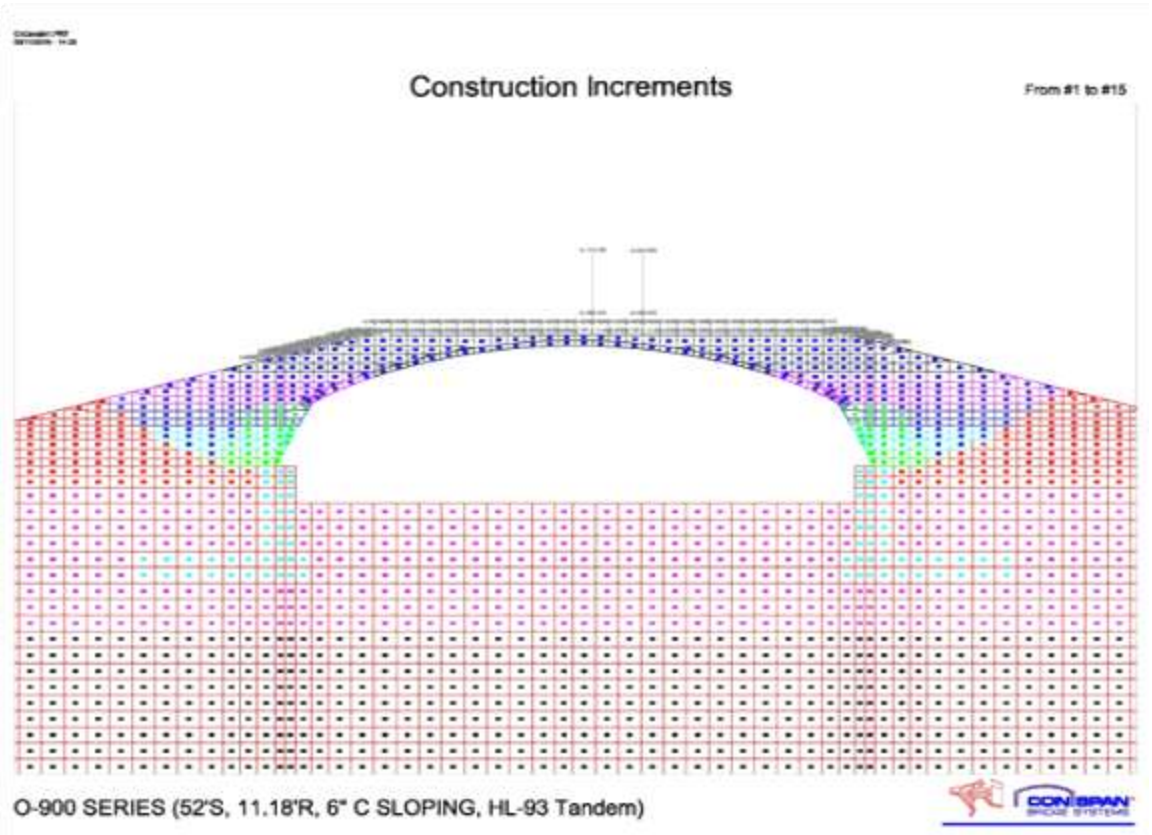
Bridge Analysis and Design

- Use CANDE - Culvert Analysis and Design Program
- Finite Element Approach
- Soil-Structure Interaction Analysis



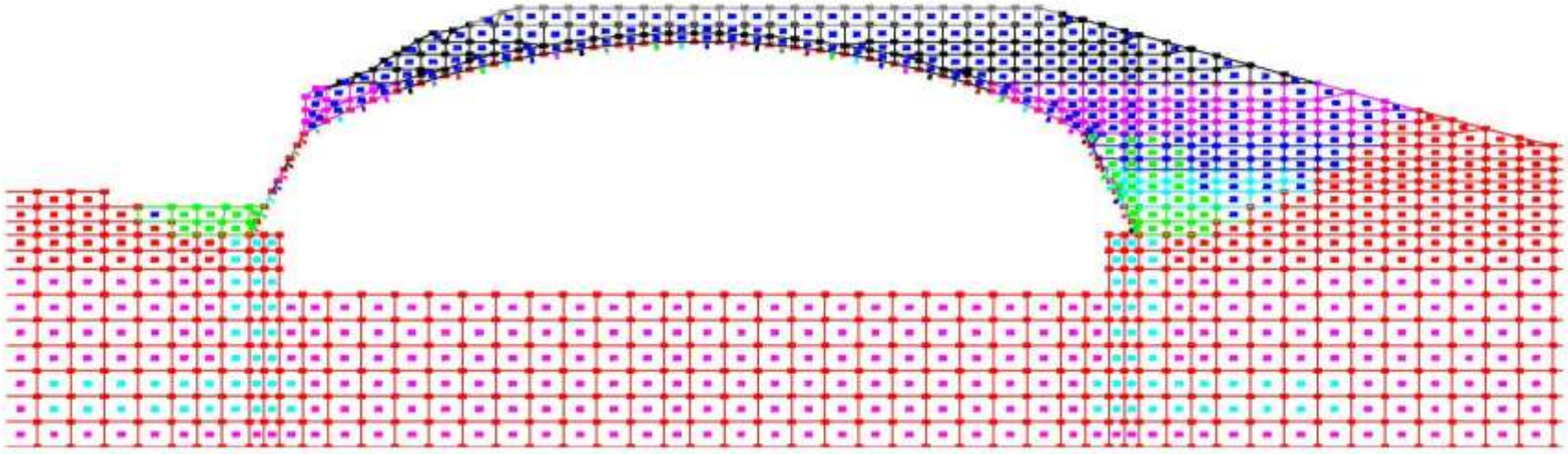
Arch Standard Design

- AASHTO HL-93 LIVE LOAD
  - Truck & Tandem
  - Multi Directions Analysis due to skew of road



Arch Backfill Special Case

Special Case Design – warped fill



Construction Phasing

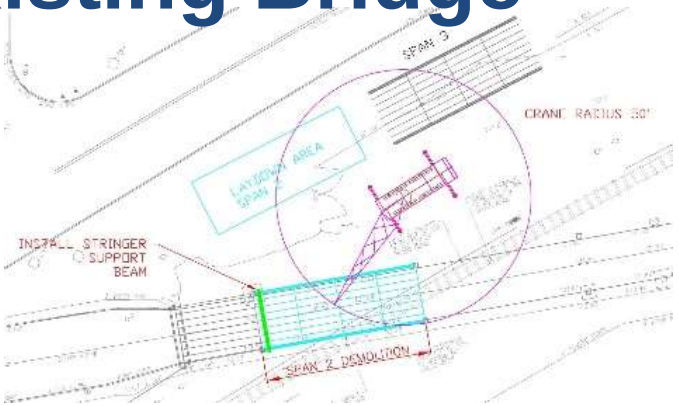
- Build Footers While Existing Bridge is still in Place
- Remove existing bridge prior to precast arch delivery.

Construction Phase – Spread Footing Abutments

North Abutment was constructed with trench box SOE

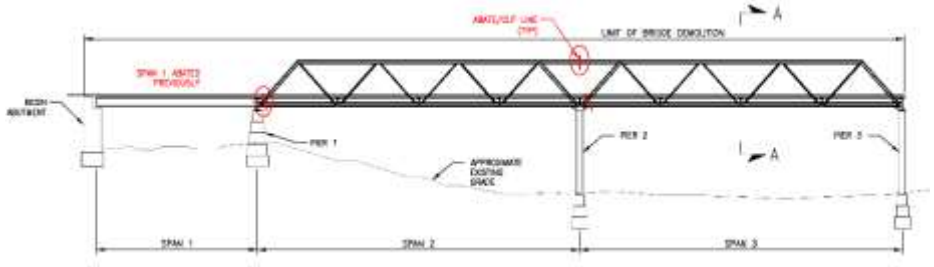
South Abutment had to be Constructed in a cofferdam system

Construction Phase – Existing Bridge Removal



Existing Bridge Removal 1st Weekend Outage

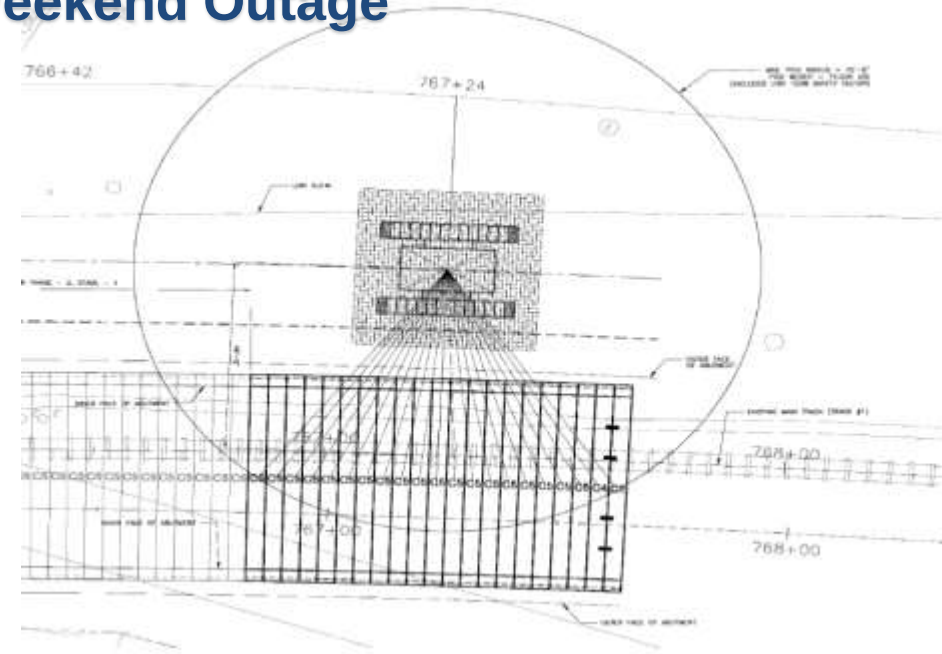
1. Install Track Protection
2. Lead Abatement of Bridge Cut points
3. Demolition of Span 1-3 of Existing Bridge approx 50 ton lifts
4. Demolition of Concrete Piers
5. Removal of Existing North Abutment and Wingwall
6. Removal of Track Protection
7. Track Crossing of Drainage @ Sta 771+90



Installation of Precast Arches

Preparation Completed Prior to Weekend Outage

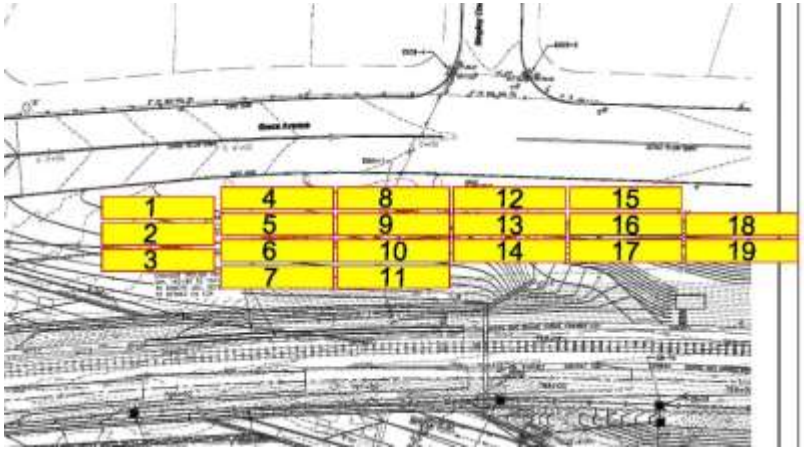
- Completion of Cast-in-Place Abutment Walls and Footings
- Crane Pick Plan and Work Plan Approval
- Delivery of Precast Arches – 41 Arches on Trailer
- Position and setup crane
- Include KS Engineers Approval and Sign-off on Location
- Survey Layout of Arch Placement
- Precast Arch Inspection Report – Pre & Post Delivery



LOCATION 2 CRANE CRITERIA					
Max Pick Actual Weight (Kips)	Rigging Actual Weight (Kips)	Total Actual Weight (Kips)	Crane Capacity (Kips)	Factor of Safety Required (LIRR)	Factor of Safety Actual
41.4	29.7	71.1	179.0	1.50	2.52

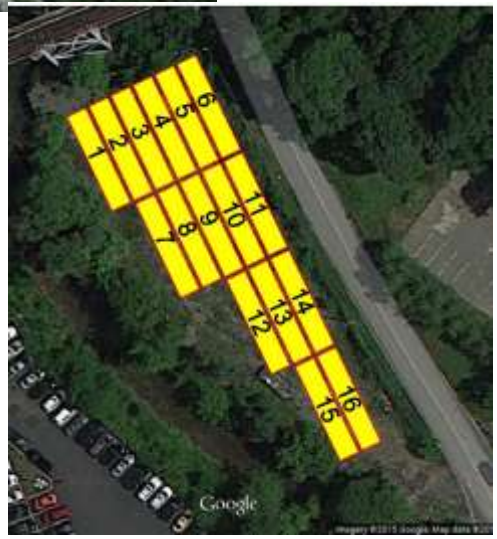
Construction Phase - Installation of Precast Arches

Precast Arch Storage Areas



On-Site Trailer Layout

- NCPD has been contacted and will provide escort from Bayview Yard to site.



Bayview Yard Trailer Layout

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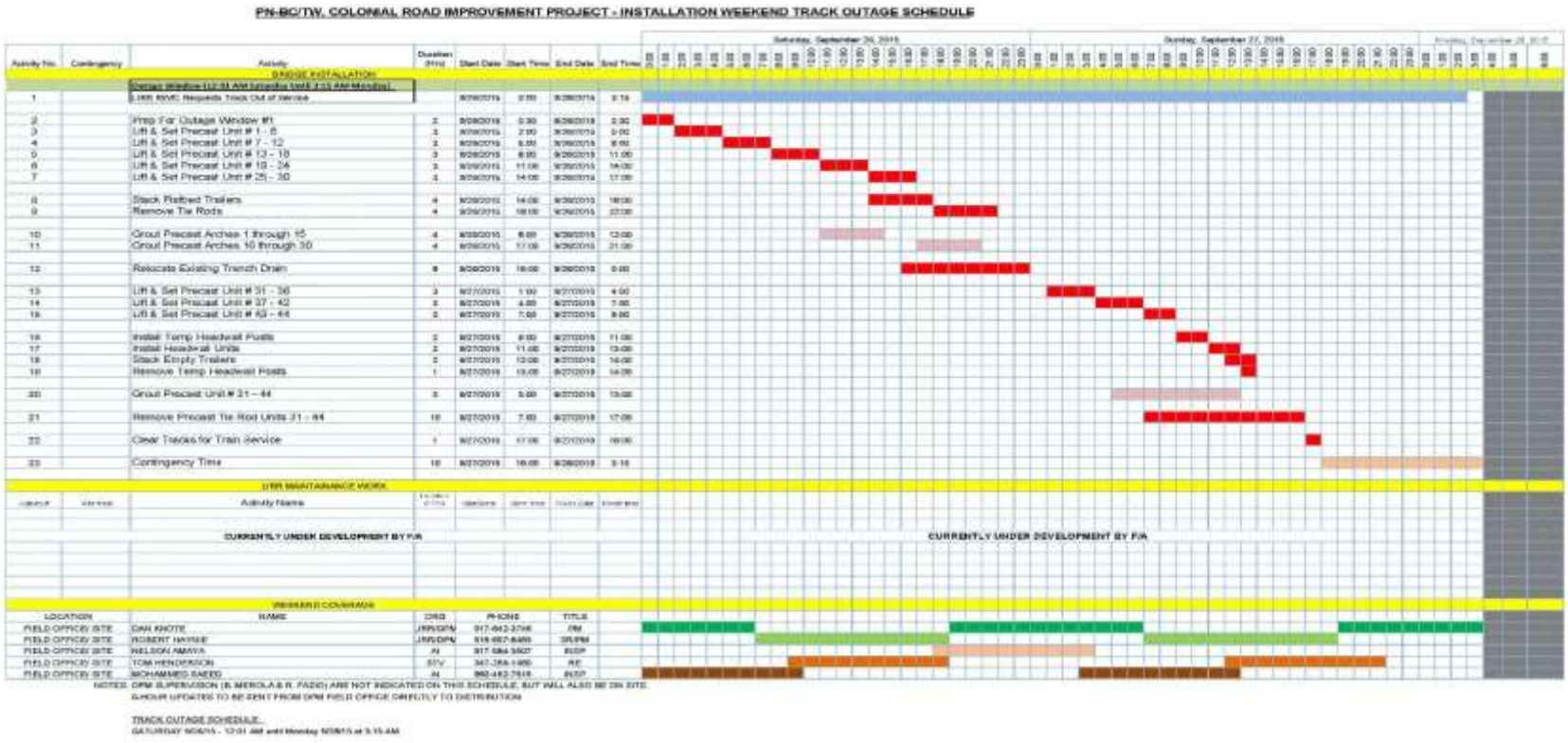
Weekend Track Outage Work Schedule



Construction Phase – Arch Install Weekend # 1 Complete

- Install 41 Arch Elements
- Install 3 Head Wall Units
- Install Arch Grout
- Remove Tie Rods & Head Wall Supports.

Construction Phase – Arch Install Weekend # 2 Complete

- Install 41 Arch Elements
- Install 3 Head Wall Units
- Install Arch Grout
- Remove Tie Rods & Head Wall Supports.

Summary of Structure

- Total – 82 Arch Elements Installed
- 325 LF Long

Construction Phase – Retaining Wall Installation

Retaining Wall

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ASCE New York Metropolitan Section 2017 Design/Build Project of the Year

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Project Partners:

Designer/Engineer:
KSE/WSP (a Joint Venture)
Owner:
MTA Long Island Rail Road
General Contractor:
Railroad Construction Company
Precast Provider:
Contech Engineered Solutions

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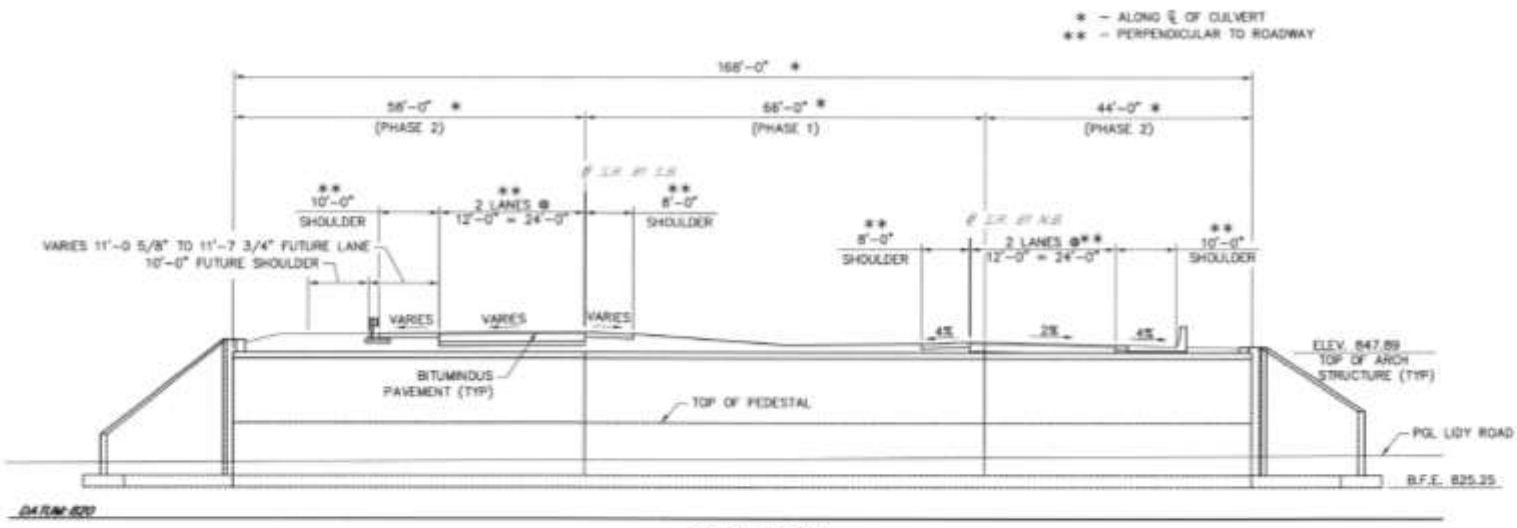
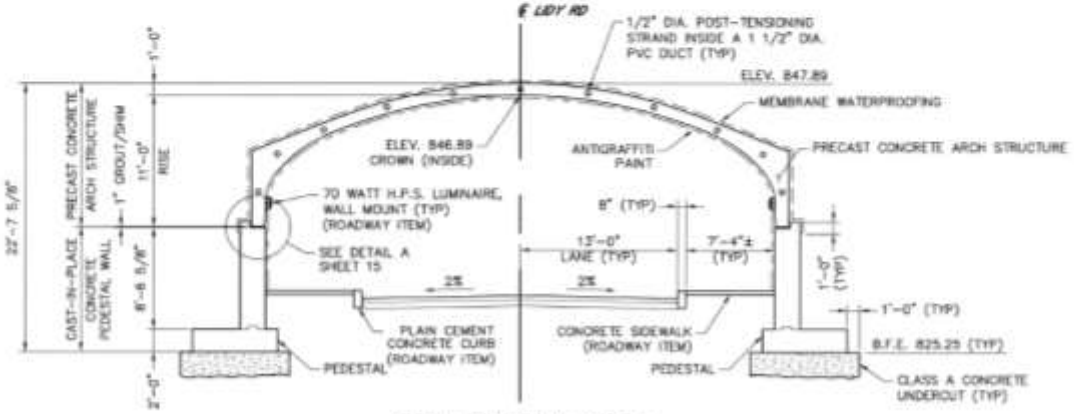
PennDOT District 4-0
SR-0081-255 over Lidy Road

CON/SPAN PRECAST BRIDGE SYSTEM
NATIONAL HIGHWAY SYSTEM APPLICATION

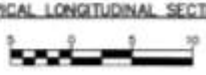
EOR: McTish, Kunkel & Assoc.

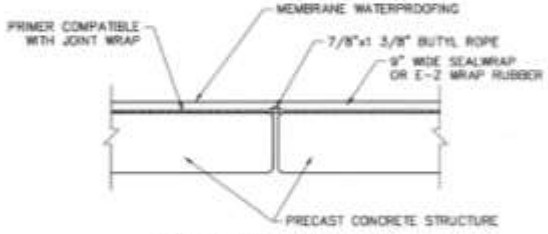


TYPICAL SECTION
S.R. 81



TYPICAL LONGITUDINAL SECTION





TYPICAL JOINT SEAL DETAIL
N.T.S.

Mark	Description	By	Chk'd	Rem'd	Date
REVISIONS					

S.R. 81 PREVIOUSLY KNOWN AS L.R. 1005

LEGEND
B.F.E. = BOTTOM OF FOOTING ELEV.

COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF TRANSPORTATION
LUZERNE COUNTY
S.R. 81, SEC. 255
SEG. 1770 OFFSET 2088 N.B. / SEG. 1771 OFFSET 2009 S.B.
S.R. 81 STA. 1969+50.75 N.B. / STA. 1969+44.12 S.B.
OVER LIDY ROAD
PRECAST CONCRETE ARCH STRUCTURE
GENERAL PLAN

RECOMMENDED _____ NOV 05 2008

SHEET 2 OF 27

S-28279

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SR-81 over Lidy Road – Finished Photo

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Main Street Rehabilitation
Norristown, PA
EOR: Transystems, Inc.

- Structurally deficient, 159 year old structure
- Location: Norristown, Main Street near SR 202
- Carries 20,000 vehicles per day, too much traffic to detour.
- Structure was deemed historical and could not be replaced.
- PennDOT Specifies a 37’-10” x 12’-11” 3 Gage plate structure, 76’-6” in length and provide HS-25 Loading.
- Contractor chooses alternate aluminum material

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Main Street Rehabilitation

Site Conditions

- 8’ of standing water under the bridge.
- Record rainfall of 23” in the previous month
- Flash flooding occurred frequently in the bridge area.

Means And Methods

- Built-in-Place method used, due to use of light weight material and generous annular space between structures.
- Assembly was completed in six days.
- Grouting was completed in a phased approach over a 10 days.

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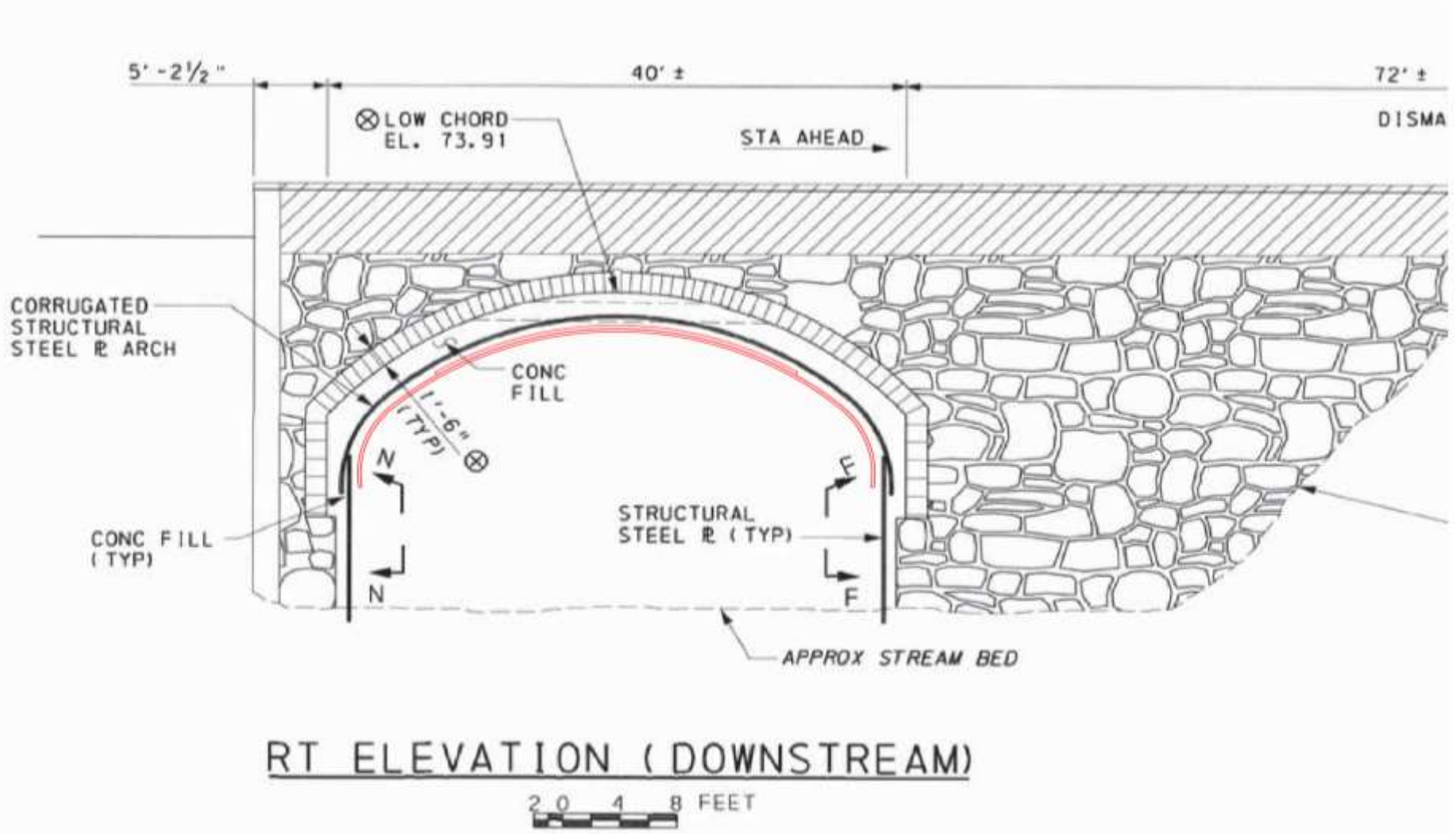
Main Street Rehabilitation



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Main Street Rehabilitation

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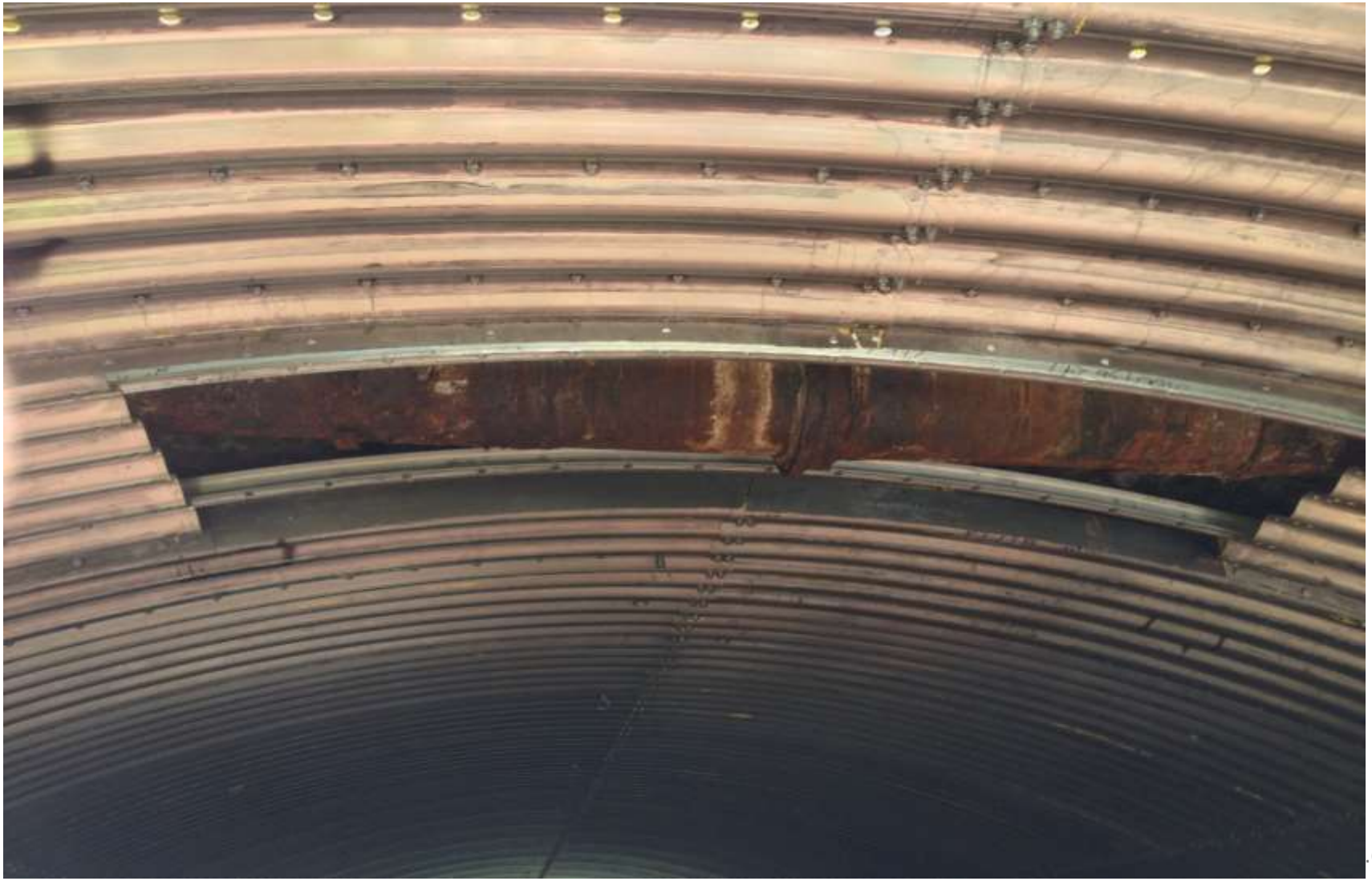
Main Street Rehabilitation



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Main Street Rehabilitation

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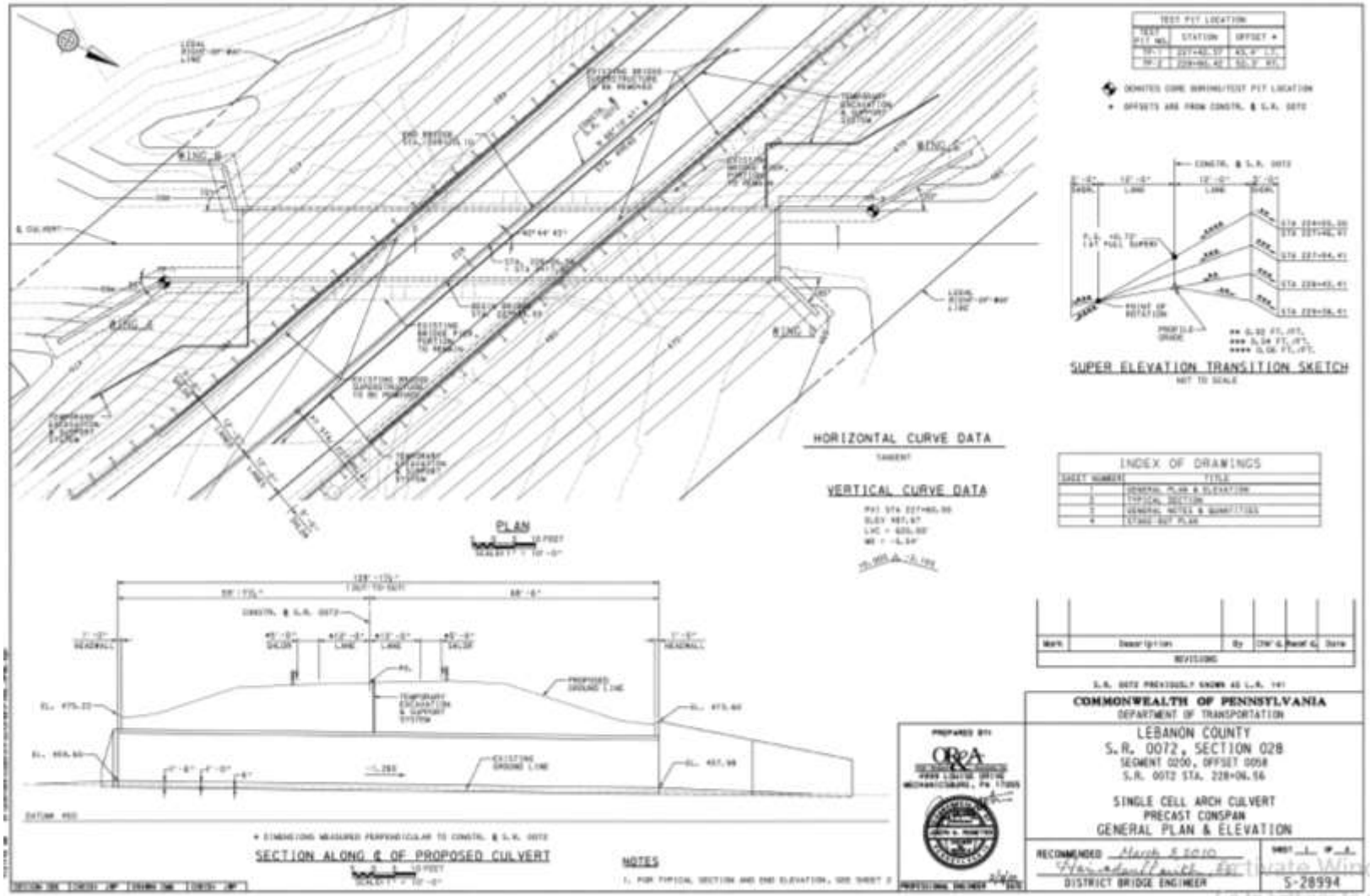
Main Street Rehabilitation – finished photo

SR 0072-028 PennDOT District 8-0 – existing bridge
CON/SPAN Concrete Arch
EOR: Orth-Rodgers and Assoc.

CONTECH ENGINEERED SOLUTIONS

SR 72- PennDOT District 8-0
CON/SPAN Concrete Arch



CONTECH®
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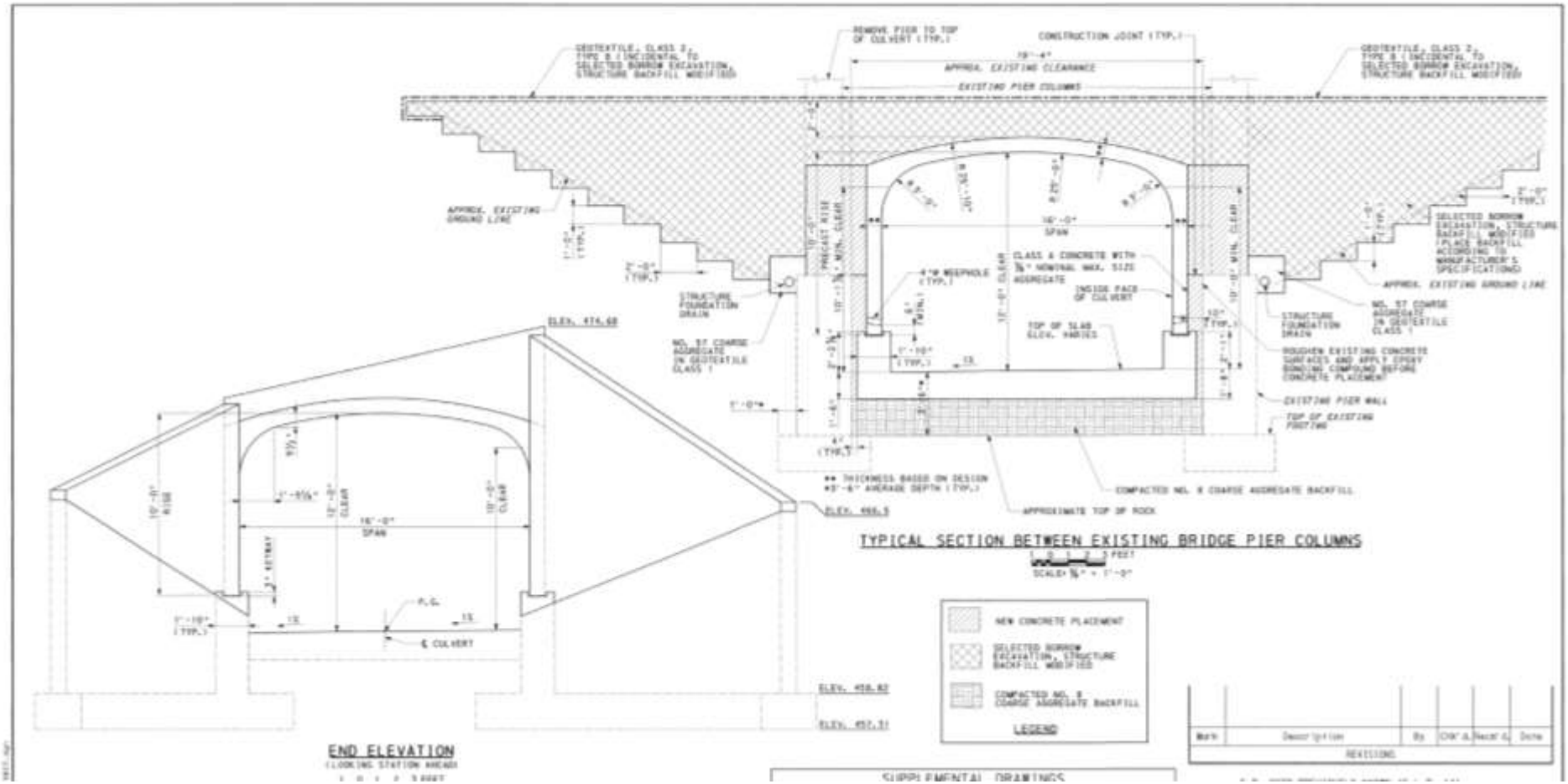
SR 72- PennDOT District 8-0
CON/SPAN Concrete Arch



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SR 72- PennDOT District 8-0
CON/SPAN Concrete Arch

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SR 72- PennDOT District 8-0
CON/SPAN Concrete Arch

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SR 72- PennDOT District 8-0
CON/SPAN Concrete Arch – finished photo

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SEPTA R5 – Existing Structure
EOR: SEPTA

Design Challenges:

- Obtain 24’ x 12’ Clearance Box
- Commuter Service Out for Less than Four Days
- Design for AREMA E-80 Railroad Loading

Solution Development

- ✓ Project Design Worksheet
- ✓ Structure Selection
- ✓ Siting & Layout
- ✓ Engineer Estimate
- Site Simulation

Design Support

- ✓ Specifications
- ✓ Contract Drawings
- ✓ Structural/Fabrication Drawings
- ✓ Custom Shape Development
- ✓ Horizontal/Vertical Alignment
- Foundations

Installation

- ✓ Preconstruction Meeting
- ✓ On-Site Installation Assistance
- Logistics Coordination

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SEPTA R5 – Replacement Structure

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New York DOT I-90 Albany, NY
CON/SPAN Rebuild of Steel Beam Bridge
EOR: NYSDOT Region 1

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New York DOT I-90 Albany, NY
CON/SPAN Rebuild of Steel Beam Bridge

New York DOT I-90 Albany, NY
CON/SPAN Rebuild of Steel Beam Bridge

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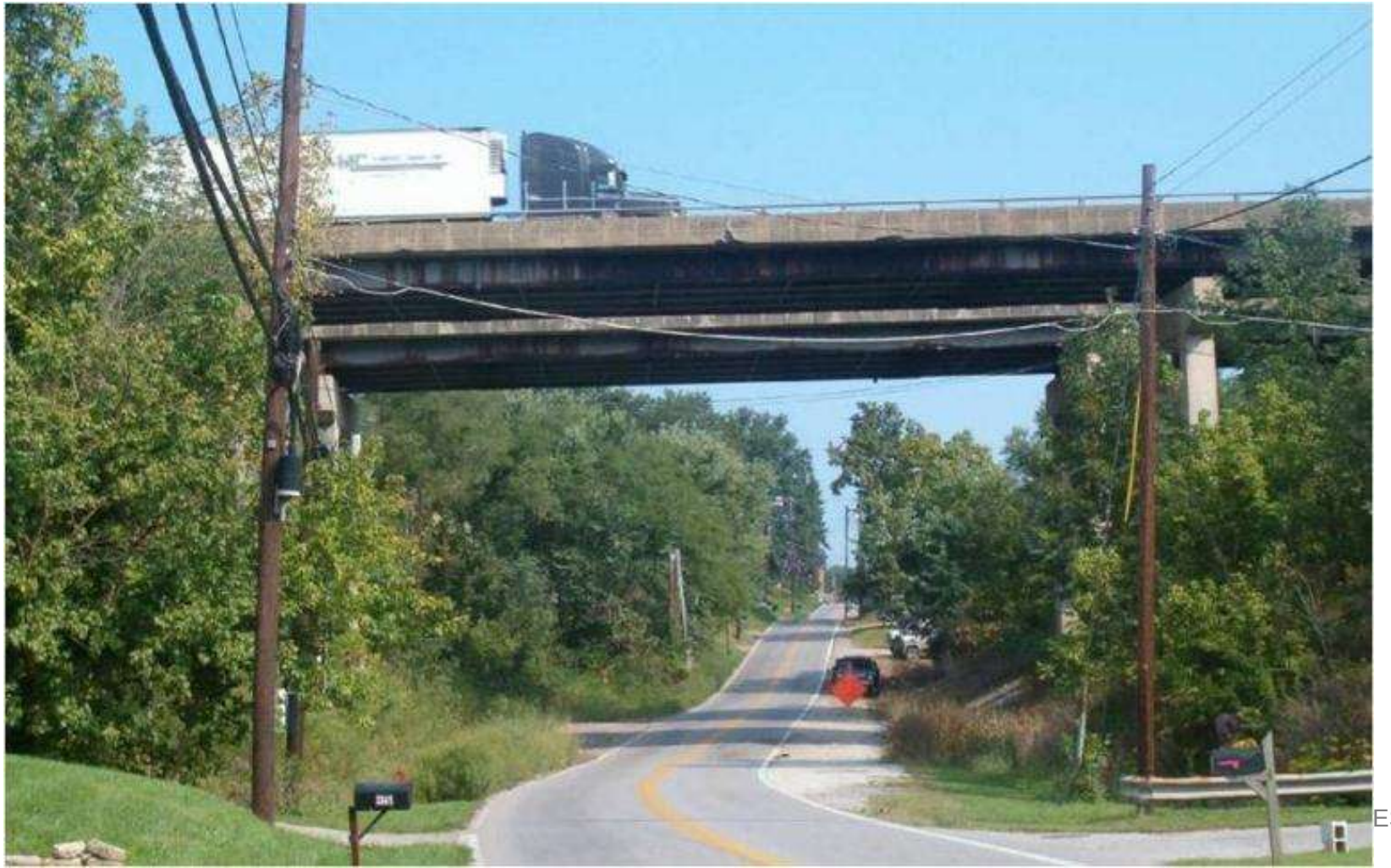
New York DOT I-90 Albany, NY
CON/SPAN Rebuild of Steel Beam Bridge

WV DOT I-64 Huntington, WV
BEBO Concrete Arch Rebuild of a Concrete Beam Bridge – existing bridge



WV DOT I-64 Huntington, WV
BEBO Concrete Arch Rebuild of a Concrete Beam Bridge

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WV DOT I-64 Huntington, WV
BEBO Concrete Arch Rebuild of a Concrete Beam Bridge

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WV DOT I-64 Huntington, WV
BEBO Concrete Arch Rebuild of a Concrete Beam Bridge

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SR 0011-354 – existing bridge
EOR: RETTEW

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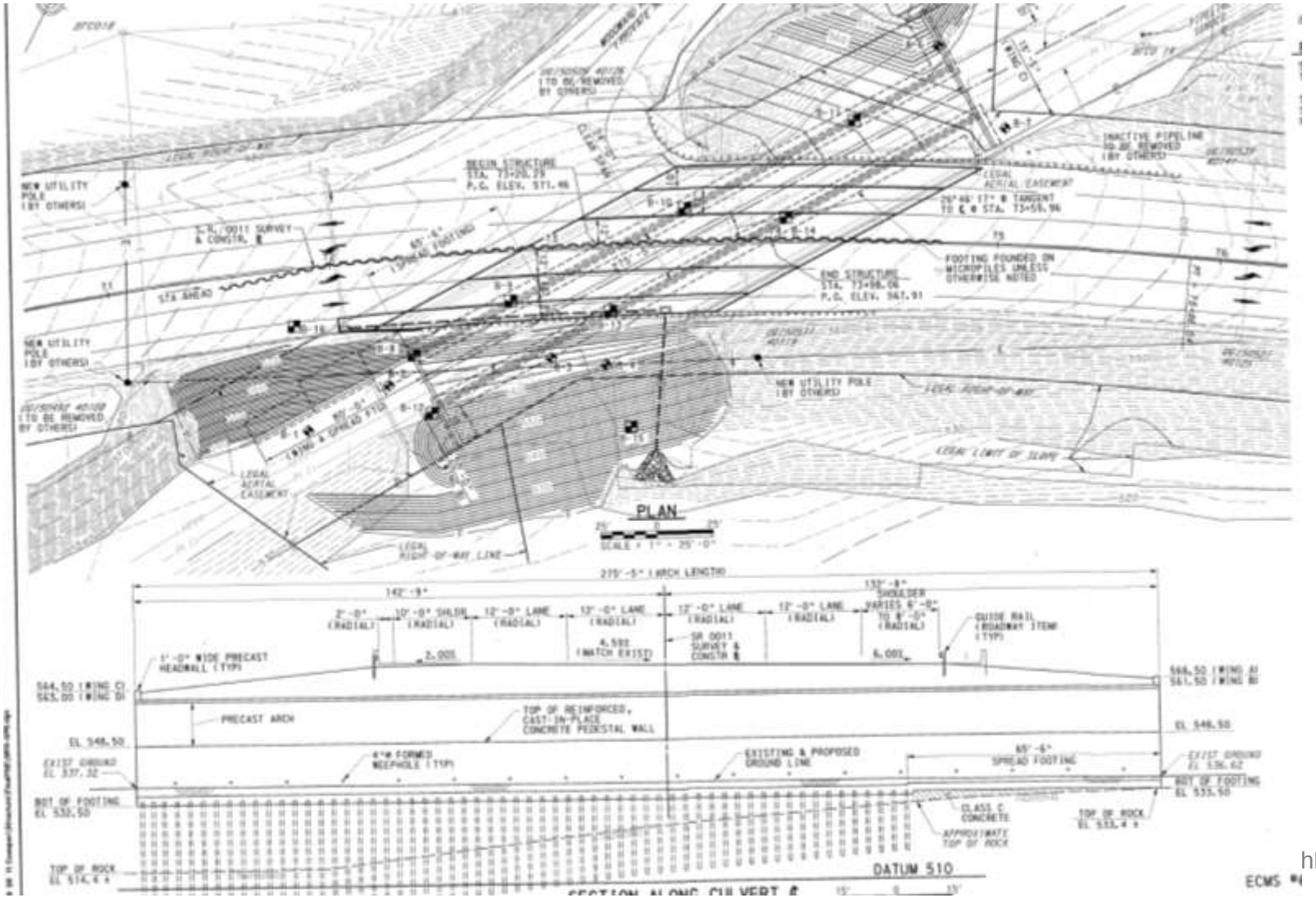
SR 0011-354



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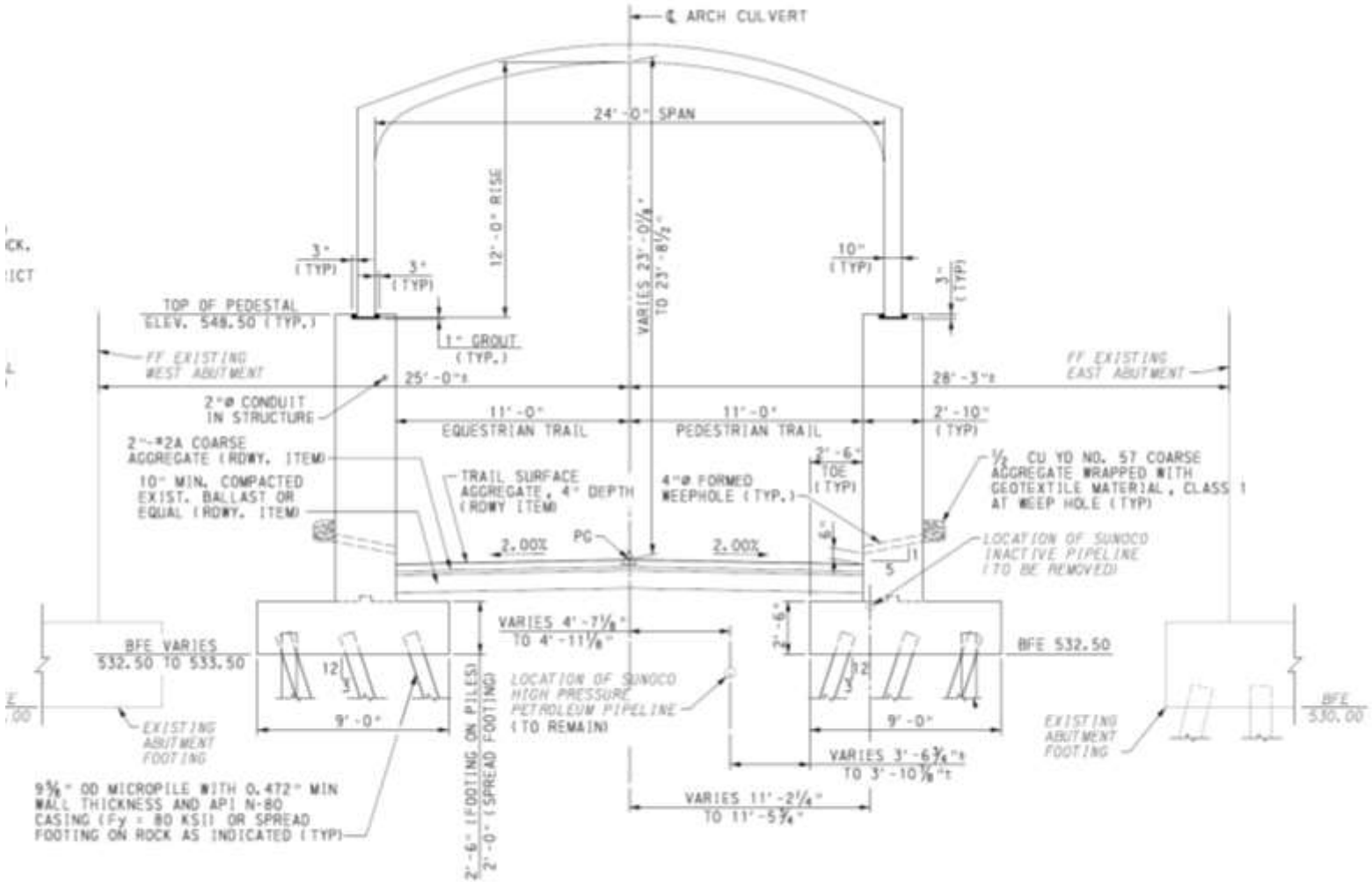
SR 0011-354



TYPICAL ARCH SECTION

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