I-44 Bridge Replacements with Buried Bridges

Lawrence County, Missouri

A Case Study For
The SSSBA Steel Bridge Essentials Webinar Series
Designing Cost Effective and Resilient Bridges
June 6, 2022

Joel Hahm, PE
Senior Engineer
Contech Engineered Solutions, LLC

CONTECH®
ENGINEERED SOLUTIONS

Deep Corrugated Steel Buried Bridges

I-44 over Route 96 Entrance Ramp & CR1147 – Lawrence County, Missouri

Fabricator:	Big R Bridge / Contech Engineered Solutions
Contractor:	Emery Sapp & Sons
Design Engineer:	Lochmueller Group / Parsons Engineering

Existing Structures to be replaced – Precast & Steel Beam Bridges

I-44 over Entrance Ramp from Route 96

I-44 over CR 1147

Deep Corrugated Steel Buried Bridges

- Design–Build team led by Emery Sapp & Sons
- Collaborative Design Process
- Key Structure Selection Factors
  - Accelerated Construction / staged construction / eliminate detours
  - Build new bridges without removing existing bridges
  - Installed cost & life cycle cost savings
  - 75 year design life
- Buried Bridges selected over concrete girder and precast structure options

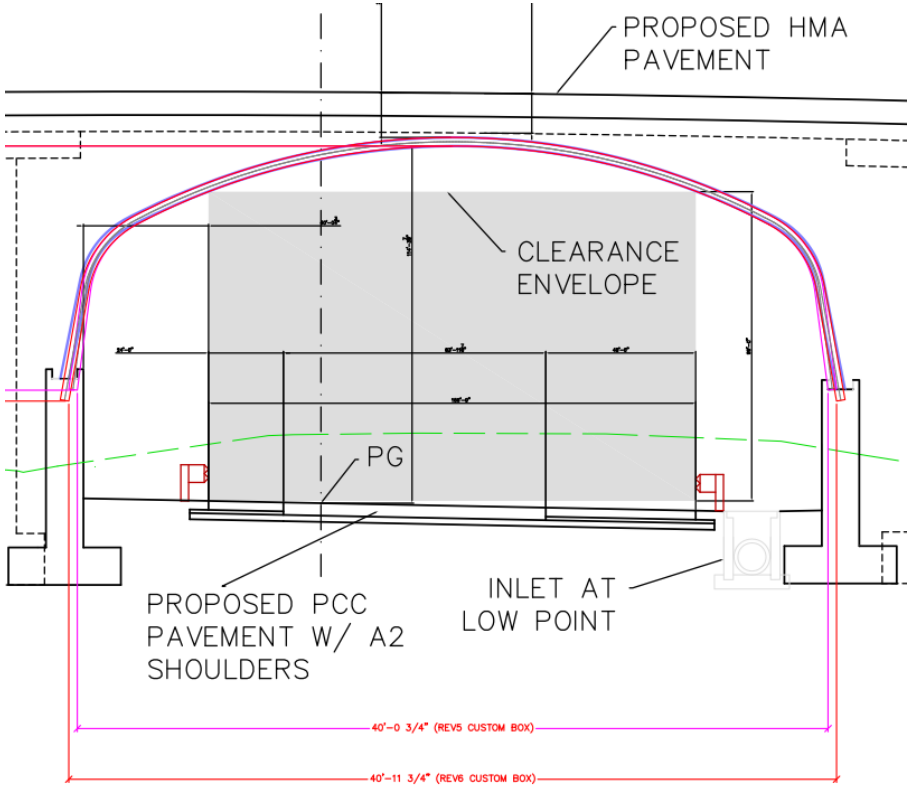
I-44 over Entrance Ramp from Route 96

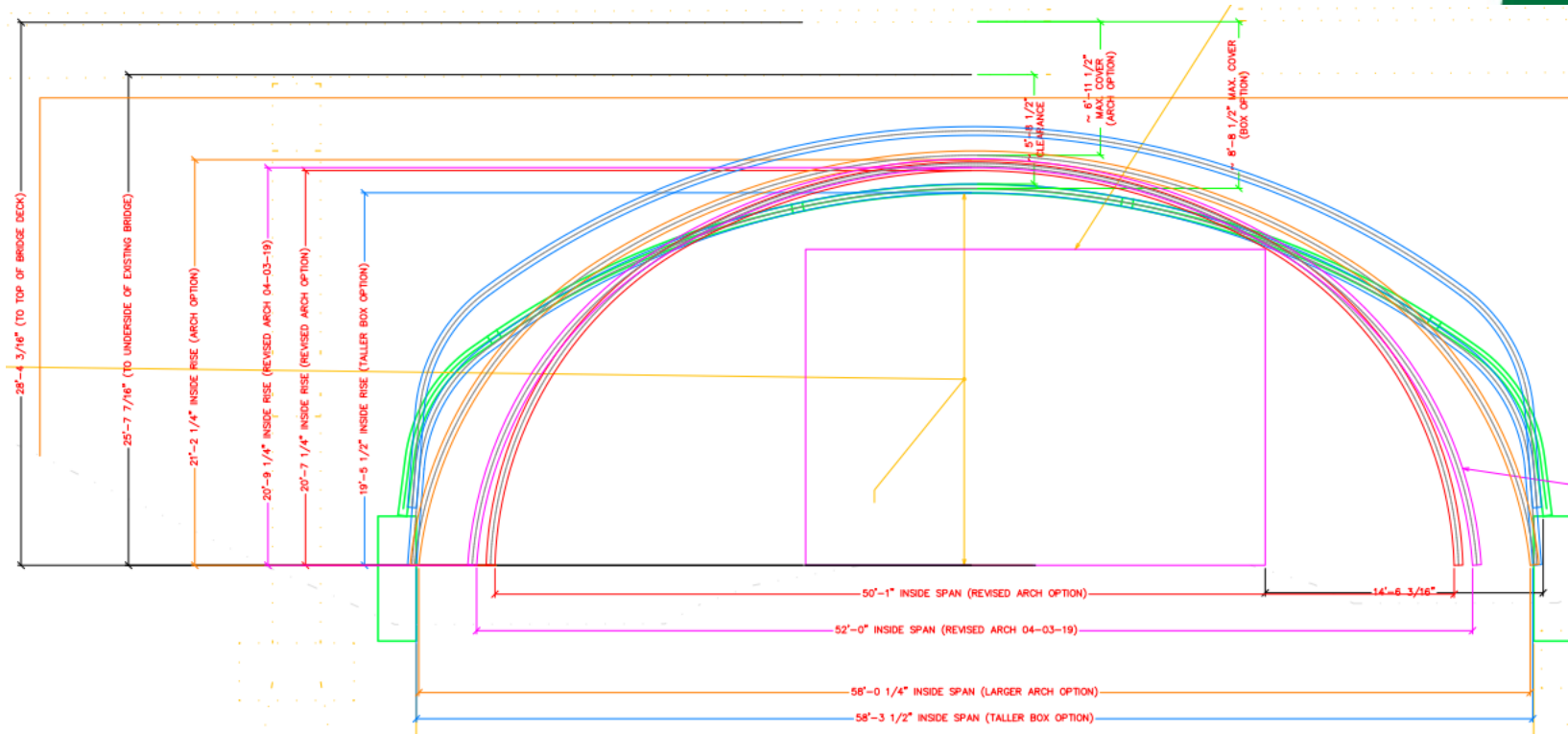
I-44 over CR 1147

Deep Corrugated Steel Buried Bridges

Development of Custom Structure Geometries (iterative process)

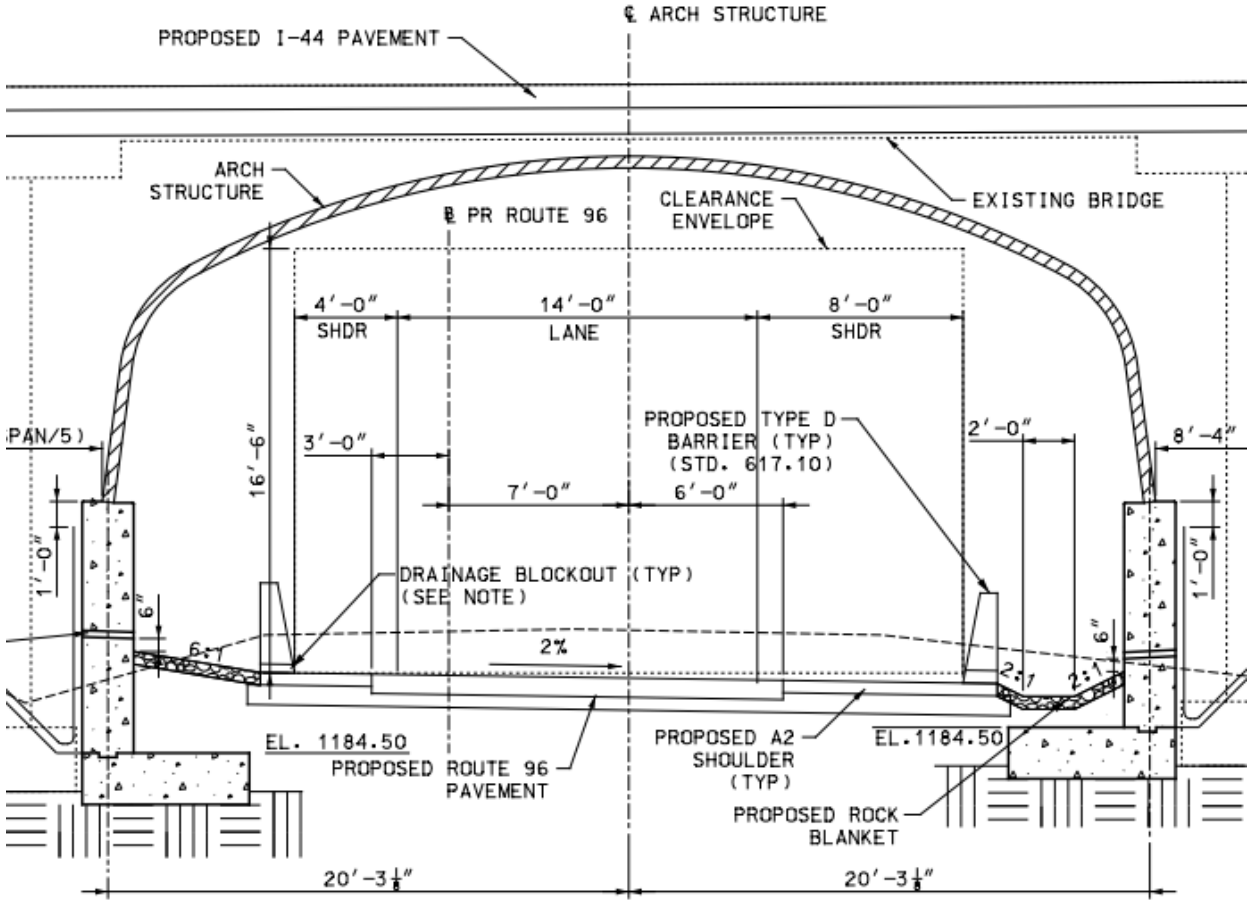
- Minimum inside clearance for vehicles
- Final top of road elevations, AASHTO cover requirements
- Avoid conflicts with existing bridge elements & site features

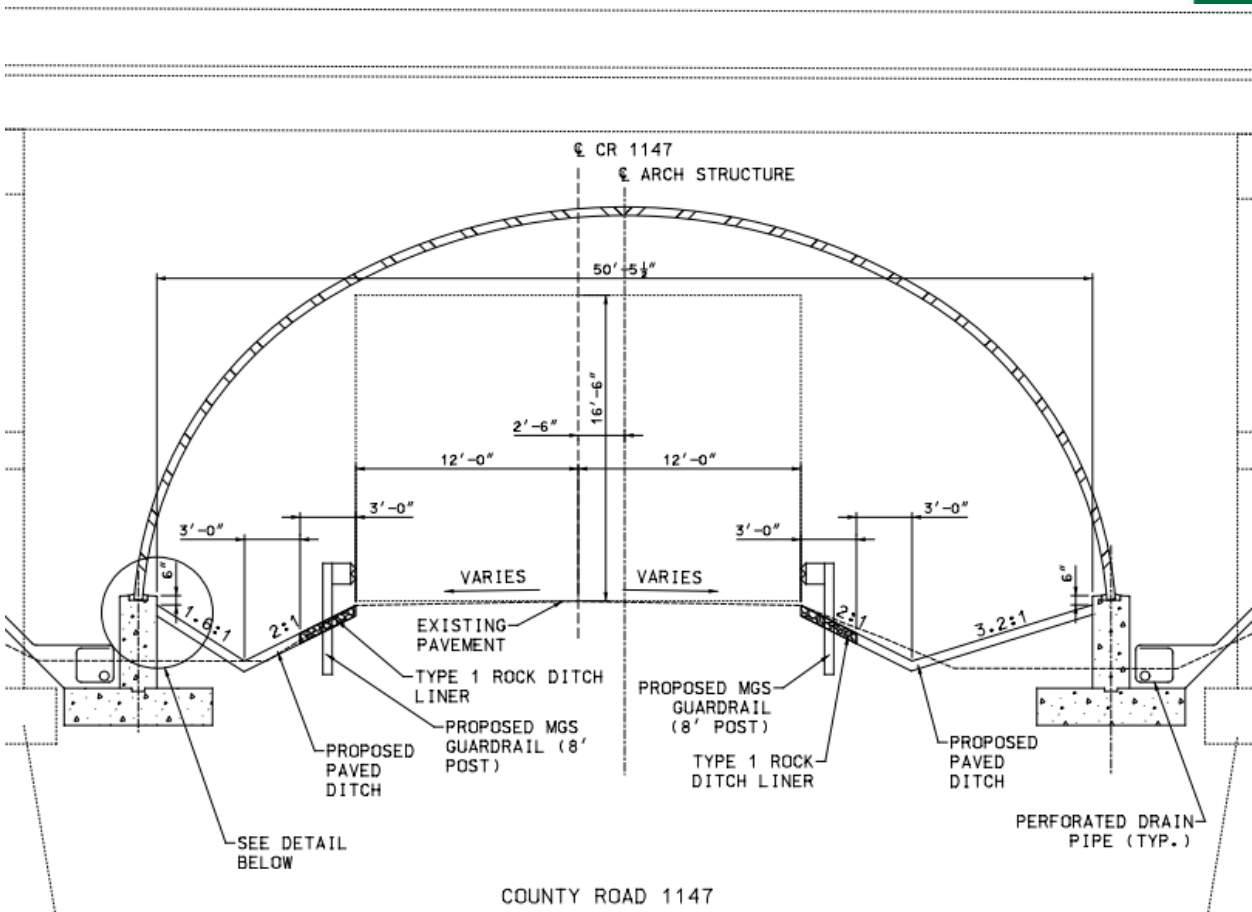




Deep Corrugated Steel Buried Bridges

Final Geometries: Box shape for Rt 96 & Arch for CR 1147

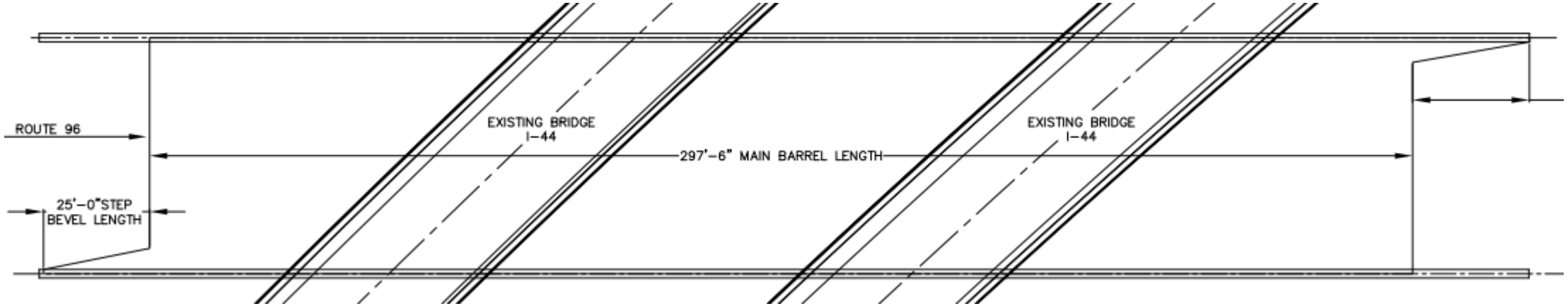


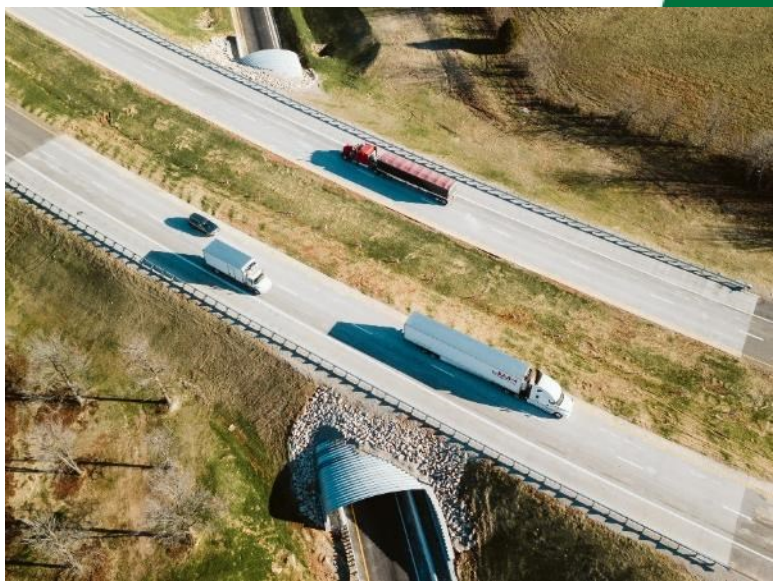


Deep Corrugated Steel Buried Bridges

Customized layouts & end treatments to accommodate site configurations:

Rte 96 – unbalanced step bevel to address skewed alignment with I-44

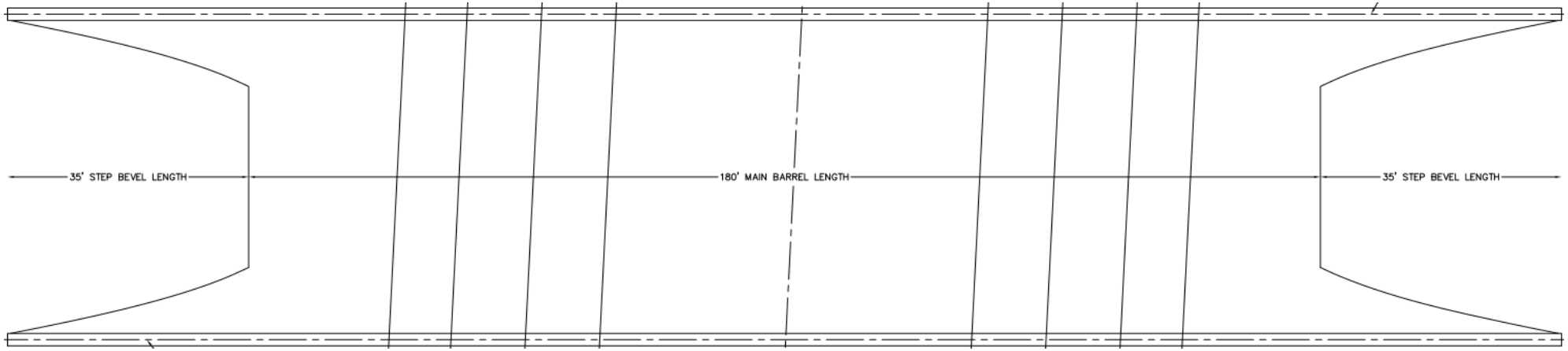




Deep Corrugated Steel Buried Bridges

Customized layouts & end treatments to accommodate site configurations:

CR1147 – step beveled ends to match fill slope



Deep Corrugated Steel Buried Bridges (Rte 96)

Assembly & backfilling took place with existing bridges in service

Deep Corrugated Steel Buried Bridges (CR 1147)

Assembly & backfilling took place with existing bridges in service

Deep Corrugated Steel Buried Bridges

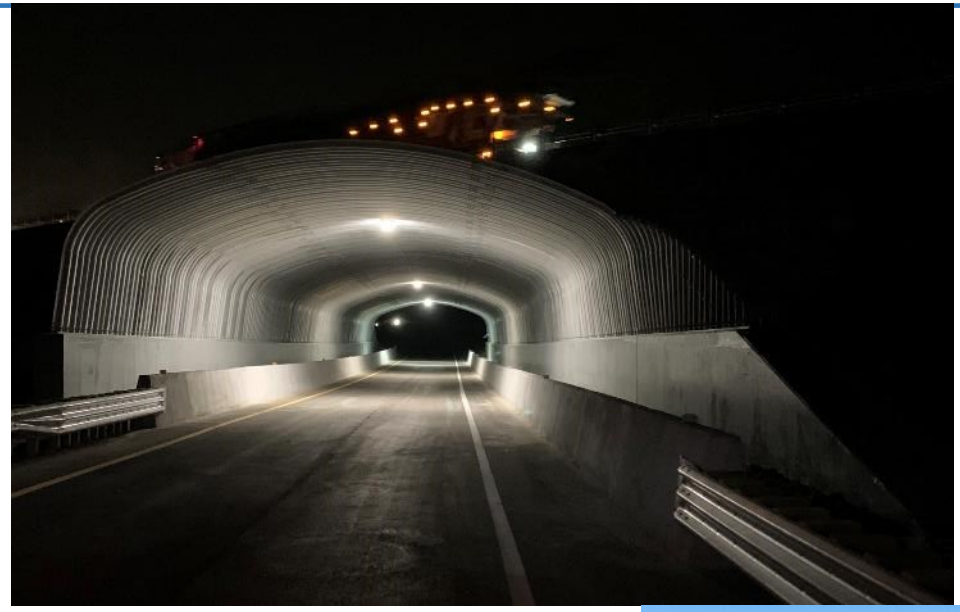
- Structure Selection Factors
  - Weight vs. span capabilities
  - Limited head room to construct below existing bridges
  - Speed of construction
  - Lower cost of maintenance (no bridge deck, bearings, barrier walls, approach slabs, abutments, joints)
  - No head to head traffic during construction
  - Simpler / faster bridge inspection
  - Mowable slopes
  - Ability to extend to add future lanes

- Installed Cost & Time Comparisons
  - Anticipated construction time was 8 months for precast/conventional options vs. 5 months for buried bridges
  - $3.5 million estimated installed cost for precast/conventional options vs. $3.0 million for buried bridges
  - Foundation construction time & cost savings, advantages of spread footings vs. deep foundations
  - Reduction in long term maintenance costs

Deep Corrugated Steel Buried Bridges

Take-Aways – Buried Bridges

- Economical
  - Lighter Superstructure
  - Lighter Equipment
  - Lighter Foundations
- Ease of Erection
  - Modular & Simple
  - Accelerated Bridge Construction
  - No Specialty Contractors needed
- Sustainability / Resilience
  - 100% Recyclable
  - Steel consists of ~90% recycled materials
  - Flexible
  - Reduced Carbon Footprint



Thank You!

Joel Hahm, PE
Senior Engineer
Contech Engineered Solutions, LLC
Joel.hahm@conteches.com