

THE ABC'S OF BRIDGE 1-438



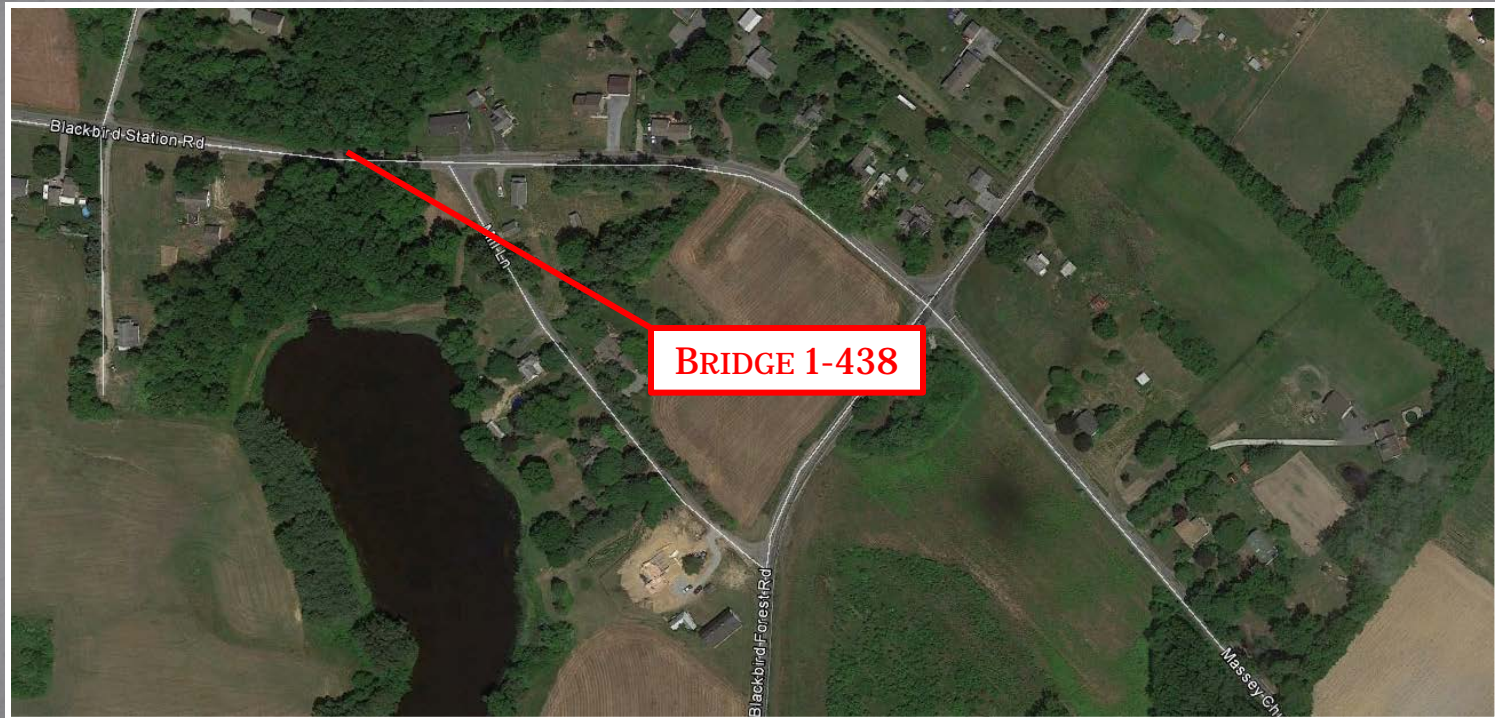
NICHOLAS DEAN

DELDOT BRIDGE DESIGN



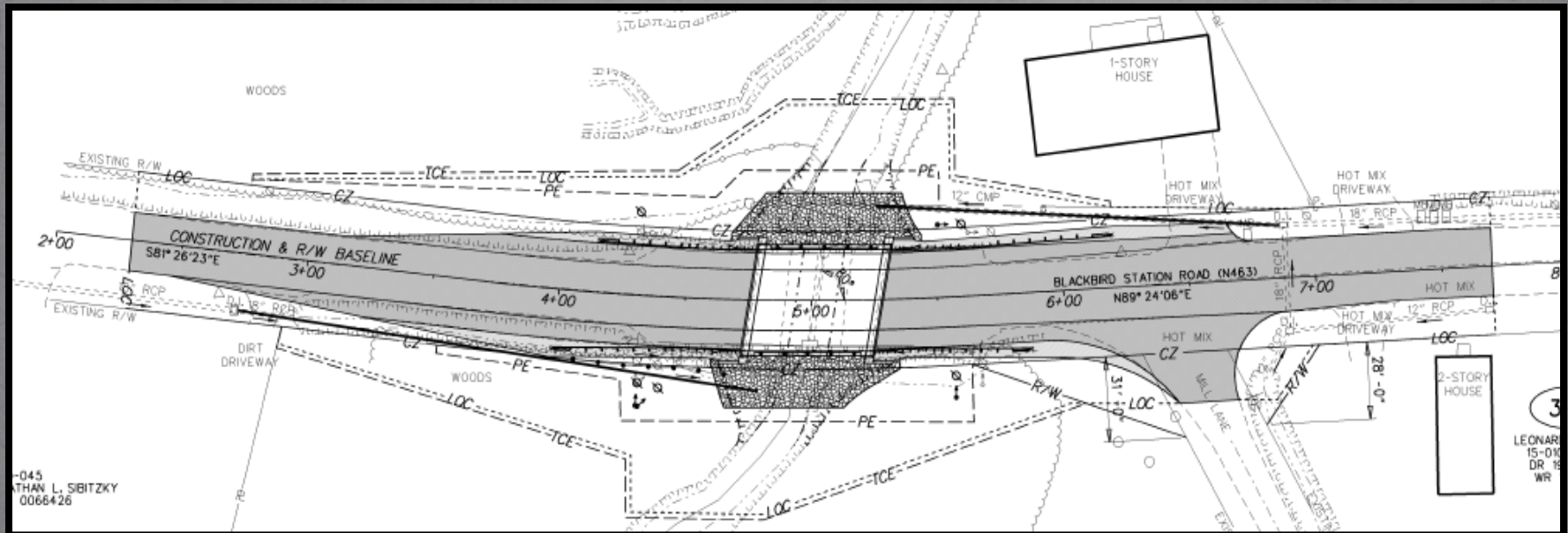
EXISTING CONDITIONS OVERVIEW

- N463 BLACKBIRD STATION ROAD TOWNSEND
- REPLACING (2) 7'-0" HIGH x 10'-8" WIDE CORRUGATED METAL PIPE ARCH
- A.A.D.T. : 1,700 VEHICLES
- DESIGN SPEED: 40 MPH



PROPOSED BRIDGE REPLACEMENT

- ADJACENT BOX BEAM BRIDGE
- 50'-0" SINGLE SPAN
- IMPROVEMENTS TO THE EXISTING ROADWAY ALIGNMENT



WHY IMPLEMENT ACCELERATED BRIDGE CONSTRUCTION TECHNIQUES?

- PILOT PROJECT
 - INITIATIVE BY FHWA
 - TYPICAL CONSTRUCTION TIME: 60 – 75 DAYS
 - ANTICIPATED CONSTRUCTION TIME: 30 DAYS
 - LEARNING EXPERIENCE

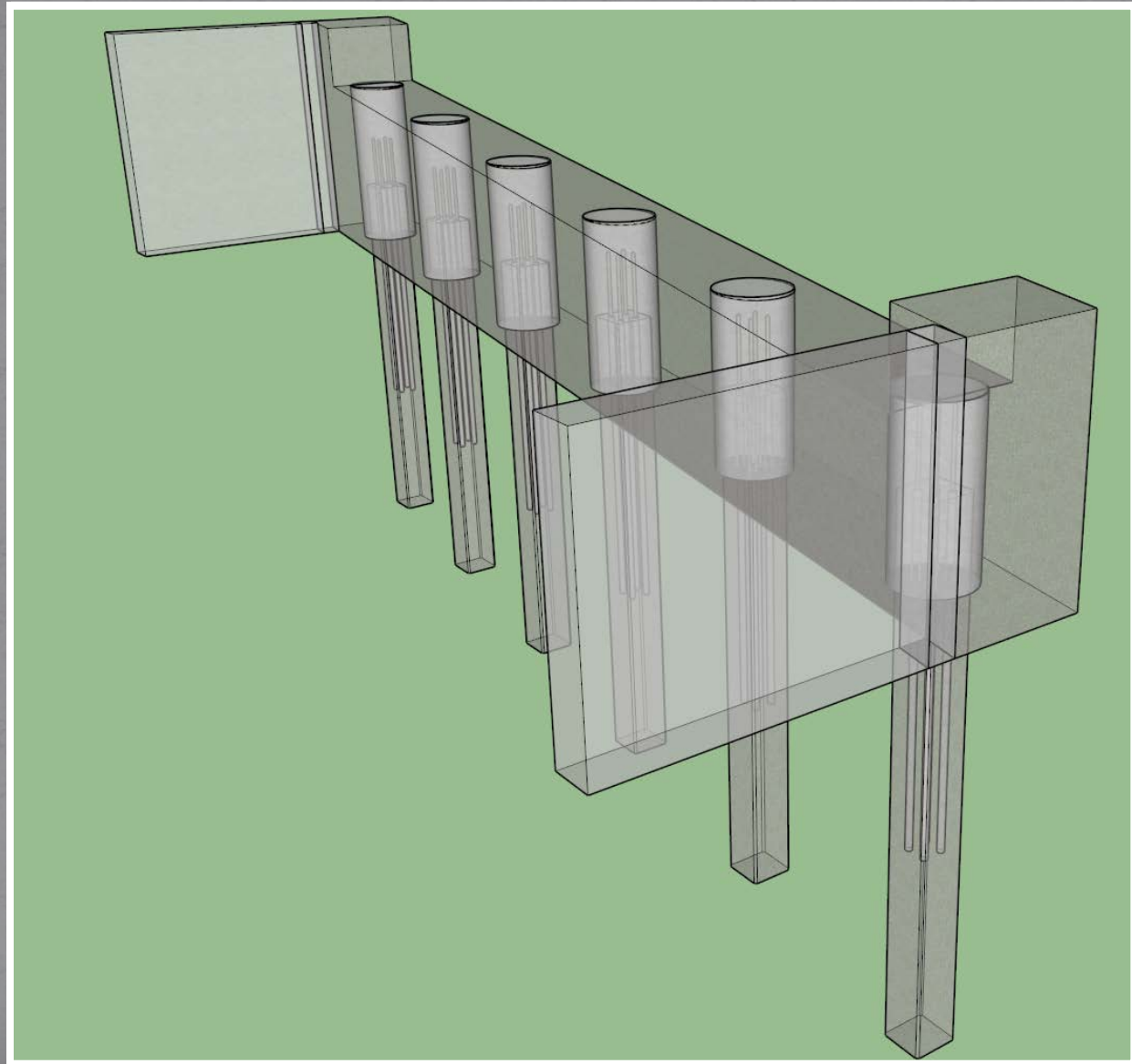


ACCELERATED BRIDGE CONSTRUCTION TECHNIQUES

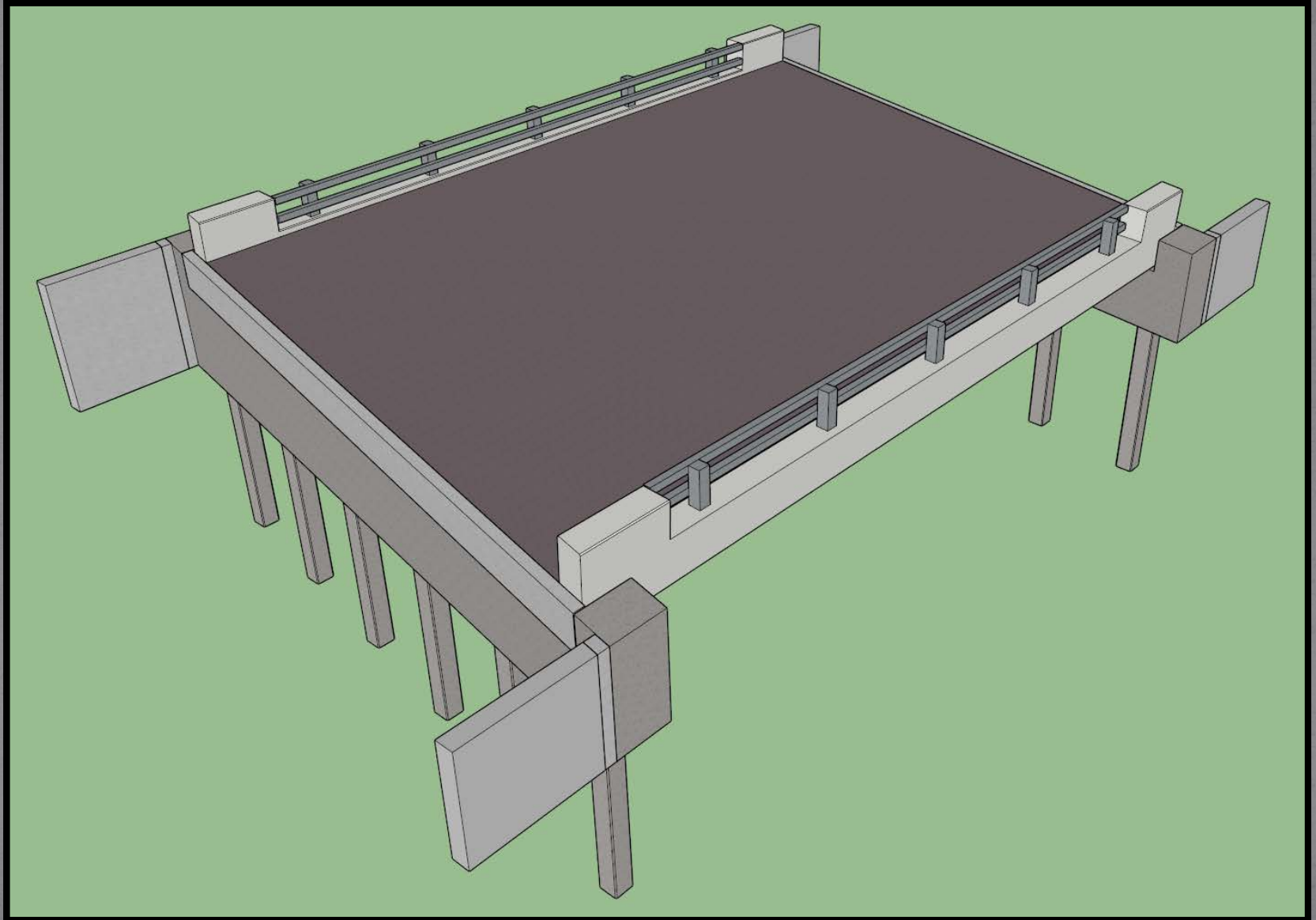
- 100% PRECAST BRIDGE ELEMENTS
- USE OF ULTRA HIGH PERFORMANCE CONCRETE (UHPC)
 - ABUTMENT & WINGWALL CLOSURE POURS
 - BEAM SHEAR KEYS & BACKWALL POUR
- POLYESTER POLYMER CONCRETE (PPC) OVERLAY



BRIDGE 1-438 MODEL



BRIDGE 1-438 MODEL



CHALLENGES

- “DEVIL IS IN THE DETAILS”
 - RESEARCH
 - ROADWAY & SITE GEOMETRY
 - ABUTMENT & WINGWALL DETAILS
 - BEAM DETAILS
 - SHEAR KEY
 - EXTERIOR BEAM
 - UHPC BACKWALL

The image displays a dense collection of mathematical formulas, primarily related to complex analysis and conformal mapping. Key elements include:

- The Schwarz-Christoffel transformation: $f(z) = \int \sqrt{z} dz$ and $G(u) = \prod_{k=1}^n (u + u_k) G_0(u)$.
- The Riemann zeta function: $\zeta(s) = \sum_{n=1}^{\infty} \frac{1}{n^s}$.
- The Dirichlet eta function: $\eta(s) = \sum_{n=1}^{\infty} \frac{(-1)^{n+1}}{n^s}$.
- The Hurwitz zeta function: $\zeta(s, a) = \sum_{n=0}^{\infty} \frac{1}{(n+a)^s}$.
- The polygamma function: $\psi(x) = \frac{d}{dx} \ln \Gamma(x)$.
- The digamma function: $\psi(x) = -\gamma - \frac{1}{x} - \sum_{n=1}^{\infty} \left(\frac{1}{n+x} - \frac{1}{n} \right)$.
- The trigamma function: $\psi'(x) = \sum_{n=0}^{\infty} \frac{1}{(n+x)^2}$.
- The Riemann zeta function at $s=2$: $\zeta(2) = \frac{\pi^2}{6}$.
- The Riemann zeta function at $s=4$: $\zeta(4) = \frac{\pi^4}{90}$.
- The Riemann zeta function at $s=6$: $\zeta(6) = \frac{\pi^6}{945}$.
- The Riemann zeta function at $s=8$: $\zeta(8) = \frac{\pi^8}{789375}$.
- The Riemann zeta function at $s=10$: $\zeta(10) = \frac{\pi^{10}}{93555360}$.
- The Riemann zeta function at $s=12$: $\zeta(12) = \frac{691 \pi^{12}}{638512875}$.
- The Riemann zeta function at $s=14$: $\zeta(14) = \frac{77643 \pi^{14}}{135287437500}$.
- The Riemann zeta function at $s=16$: $\zeta(16) = \frac{1763165 \pi^{16}}{12092256000000}$.
- The Riemann zeta function at $s=18$: $\zeta(18) = \frac{77643 \pi^{18}}{12092256000000}$.
- The Riemann zeta function at $s=20$: $\zeta(20) = \frac{1763165 \pi^{20}}{12092256000000}$.
- The Riemann zeta function at $s=22$: $\zeta(22) = \frac{77643 \pi^{22}}{12092256000000}$.
- The Riemann zeta function at $s=24$: $\zeta(24) = \frac{1763165 \pi^{24}}{12092256000000}$.
- The Riemann zeta function at $s=26$: $\zeta(26) = \frac{77643 \pi^{26}}{12092256000000}$.
- The Riemann zeta function at $s=28$: $\zeta(28) = \frac{1763165 \pi^{28}}{12092256000000}$.
- The Riemann zeta function at $s=30$: $\zeta(30) = \frac{77643 \pi^{30}}{12092256000000}$.
- The Riemann zeta function at $s=32$: $\zeta(32) = \frac{1763165 \pi^{32}}{12092256000000}$.
- The Riemann zeta function at $s=34$: $\zeta(34) = \frac{77643 \pi^{34}}{12092256000000}$.
- The Riemann zeta function at $s=36$: $\zeta(36) = \frac{1763165 \pi^{36}}{12092256000000}$.
- The Riemann zeta function at $s=38$: $\zeta(38) = \frac{77643 \pi^{38}}{12092256000000}$.
- The Riemann zeta function at $s=40$: $\zeta(40) = \frac{1763165 \pi^{40}}{12092256000000}$.
- The Riemann zeta function at $s=42$: $\zeta(42) = \frac{77643 \pi^{42}}{12092256000000}$.
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- The Riemann zeta function at $s=60$: $\zeta(60) = \frac{1763165 \pi^{60}}{12092256000000}$.
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- The Riemann zeta function at $s=70$: $\zeta(70) = \frac{77643 \pi^{70}}{12092256000000}$.
- The Riemann zeta function at $s=72$: $\zeta(72) = \frac{1763165 \pi^{72}}{12092256000000}$.
- The Riemann zeta function at $s=74$: $\zeta(74) = \frac{77643 \pi^{74}}{12092256000000}$.
- The Riemann zeta function at $s=76$: $\zeta(76) = \frac{1763165 \pi^{76}}{12092256000000}$.
- The Riemann zeta function at $s=78$: $\zeta(78) = \frac{77643 \pi^{78}}{12092256000000}$.
- The Riemann zeta function at $s=80$: $\zeta(80) = \frac{1763165 \pi^{80}}{12092256000000}$.
- The Riemann zeta function at $s=82$: $\zeta(82) = \frac{77643 \pi^{82}}{12092256000000}$.
- The Riemann zeta function at $s=84$: $\zeta(84) = \frac{1763165 \pi^{84}}{12092256000000}$.
- The Riemann zeta function at $s=86$: $\zeta(86) = \frac{77643 \pi^{86}}{12092256000000}$.
- The Riemann zeta function at $s=88$: $\zeta(88) = \frac{1763165 \pi^{88}}{12092256000000}$.
- The Riemann zeta function at $s=90$: $\zeta(90) = \frac{77643 \pi^{90}}{12092256000000}$.
- The Riemann zeta function at $s=92$: $\zeta(92) = \frac{1763165 \pi^{92}}{12092256000000}$.
- The Riemann zeta function at $s=94$: $\zeta(94) = \frac{77643 \pi^{94}}{12092256000000}$.
- The Riemann zeta function at $s=96$: $\zeta(96) = \frac{1763165 \pi^{96}}{12092256000000}$.
- The Riemann zeta function at $s=98$: $\zeta(98) = \frac{77643 \pi^{98}}{12092256000000}$.
- The Riemann zeta function at $s=100$: $\zeta(100) = \frac{1763165 \pi^{100}}{12092256000000}$.

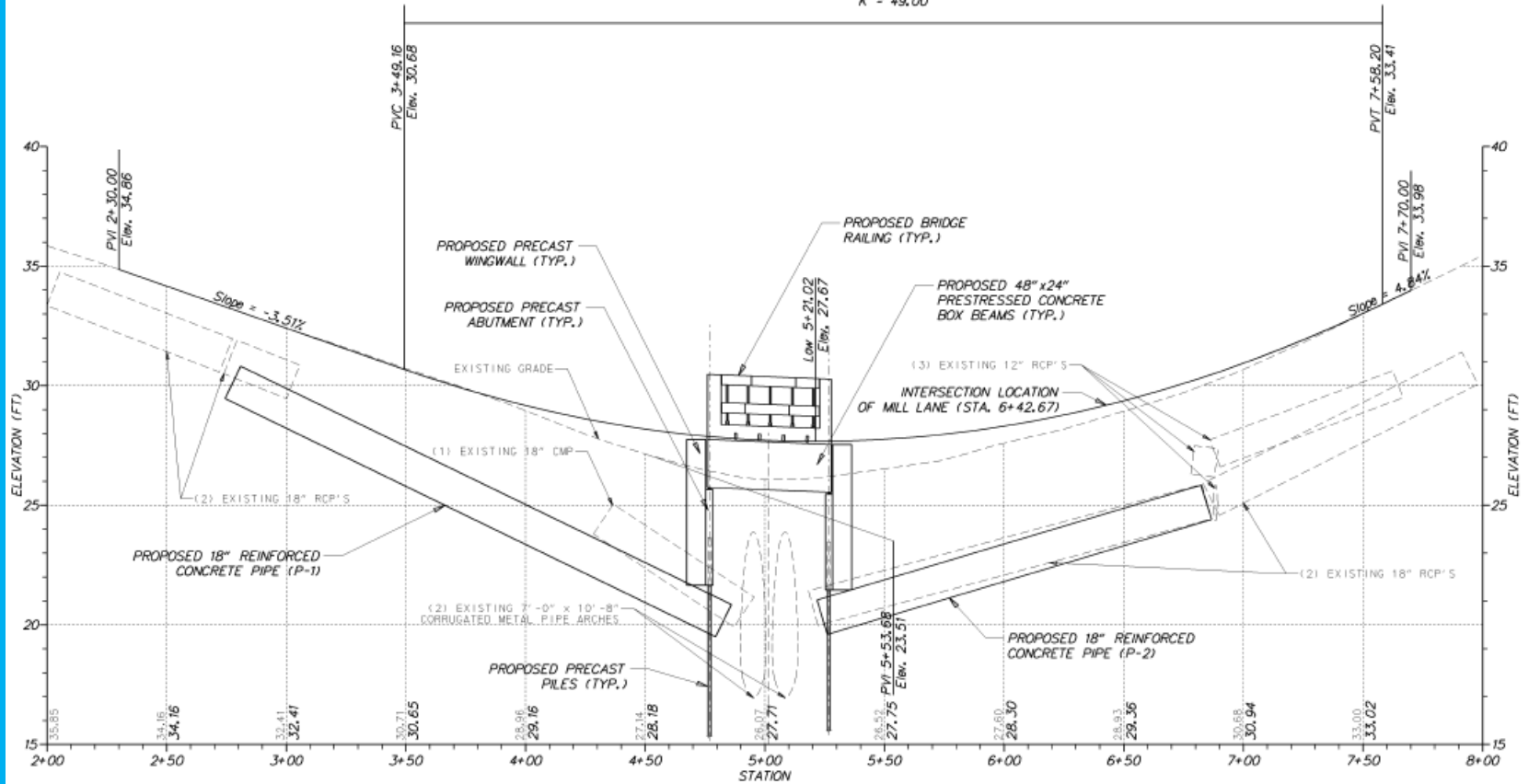
PEOPLE HELPING PEOPLE

- BENJAMIN BEERMAN, BENJAMIN GRAYBEAL, & DENNIS O'SHEA, FHWA – UHPC & SHEAR KEY DETAILS
- BARRY AXELROD & CARMEN SWANWICK, UTAH DOT – PRECAST ABUTMENT DETAILS
- THOMAS ANDRES, FLORIDA DOT – PRECAST ABUTMENT DETAILS



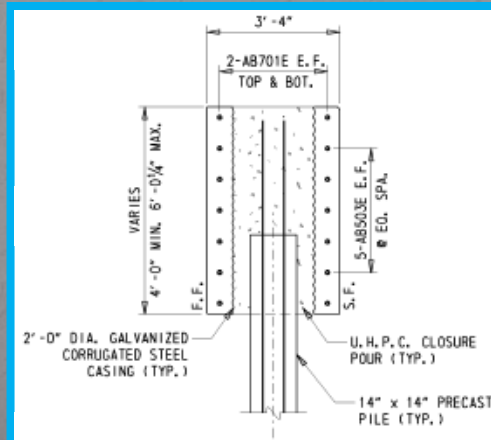
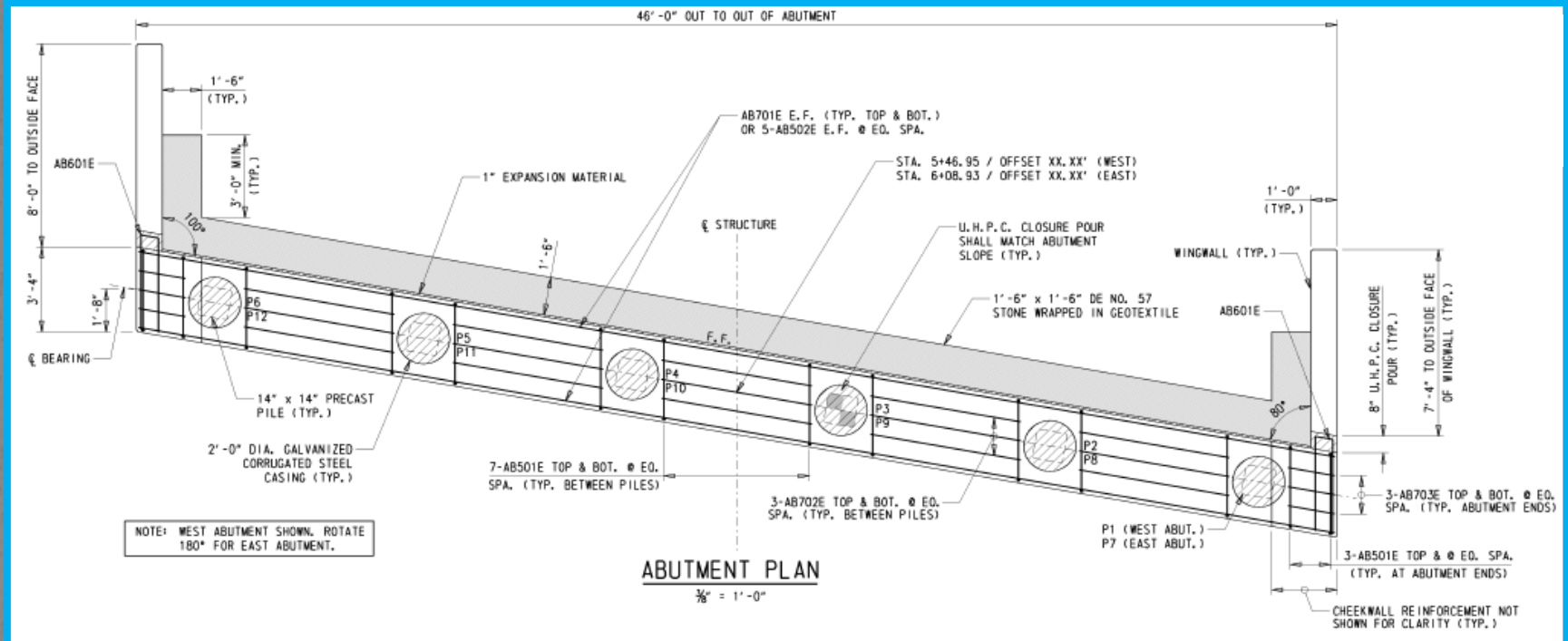
ROADWAY GEOMETRY

Type of Curve = Symmetric Parabola
 Direction = Sag
 Length = 409.04'
 L1 = 204.52'
 L2 = 204.52'
 G1 = -3.51%
 G2 = 4.84%
 SSD = 249.92'
 K = 49.00

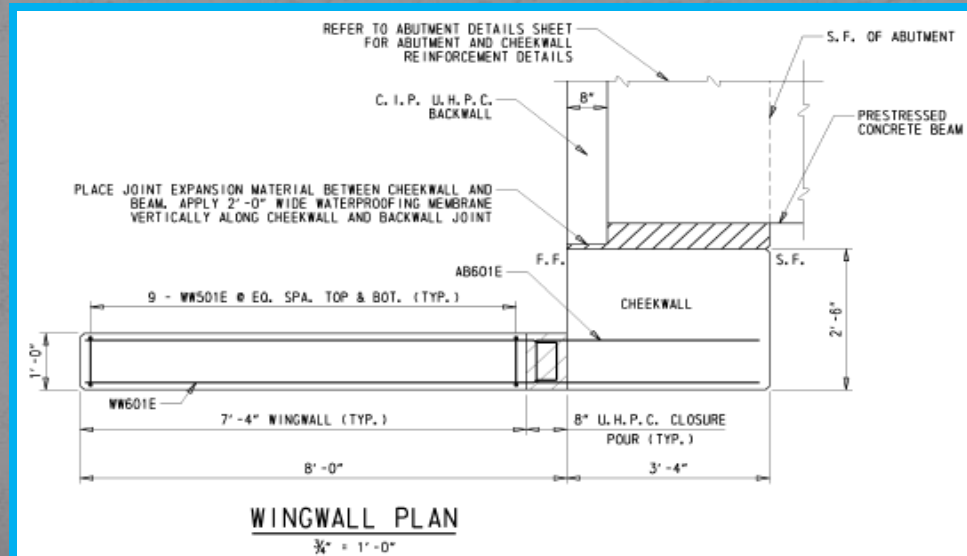
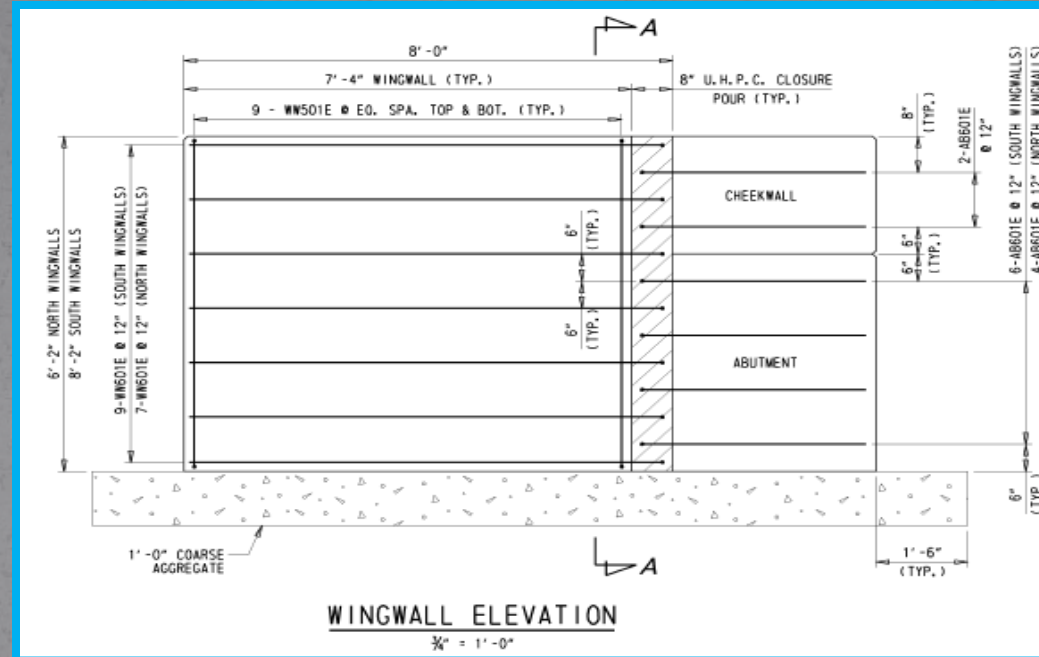


N463 - BLACKBIRD STATION ROAD

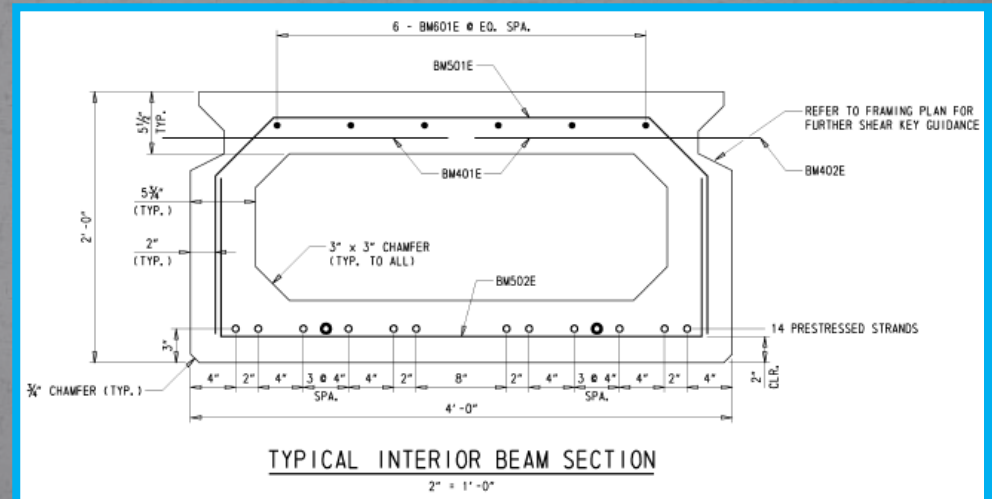
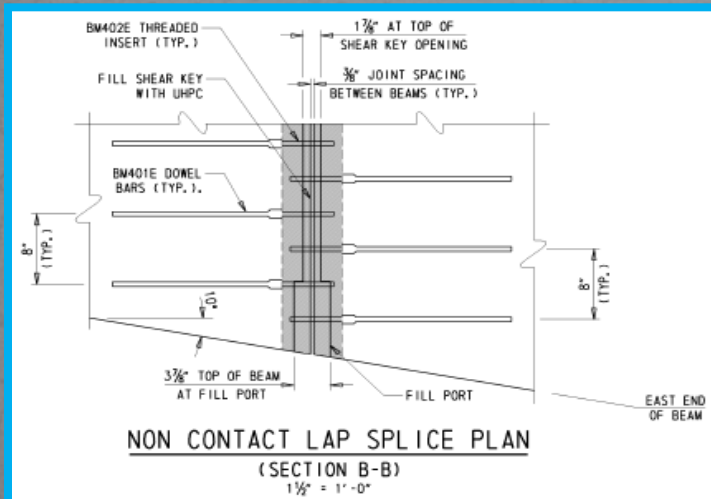
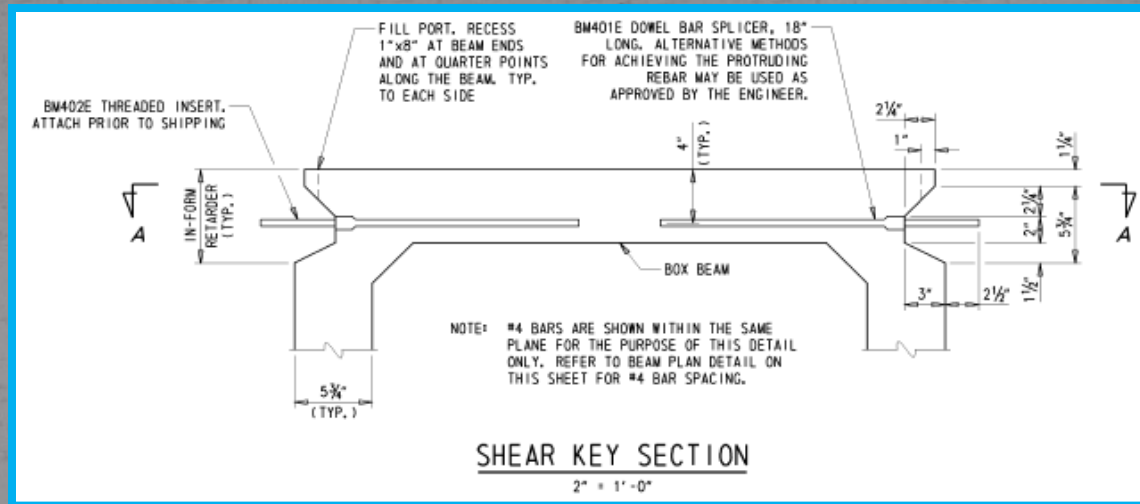
PRECAST ABUTMENT DETAILS



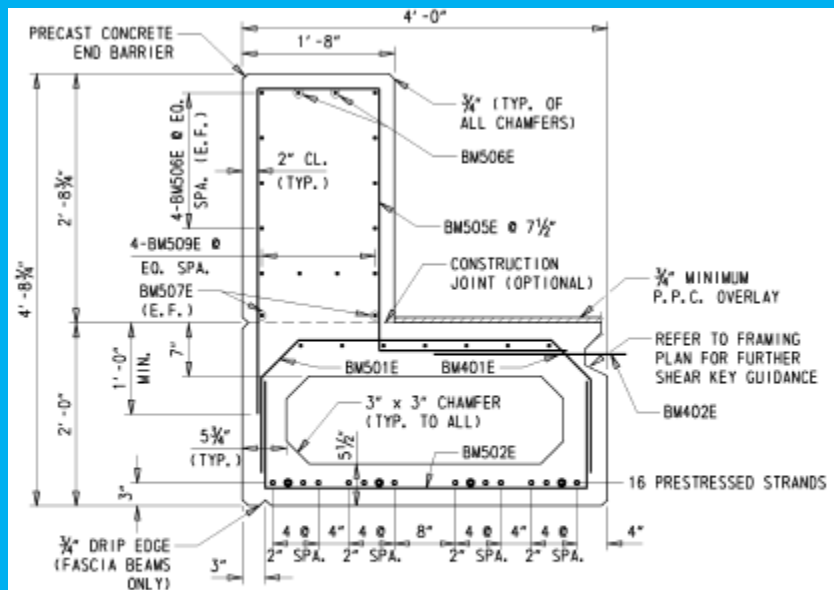
PRECAST WINGWALL DETAILS



SHEAR KEY DETAILS

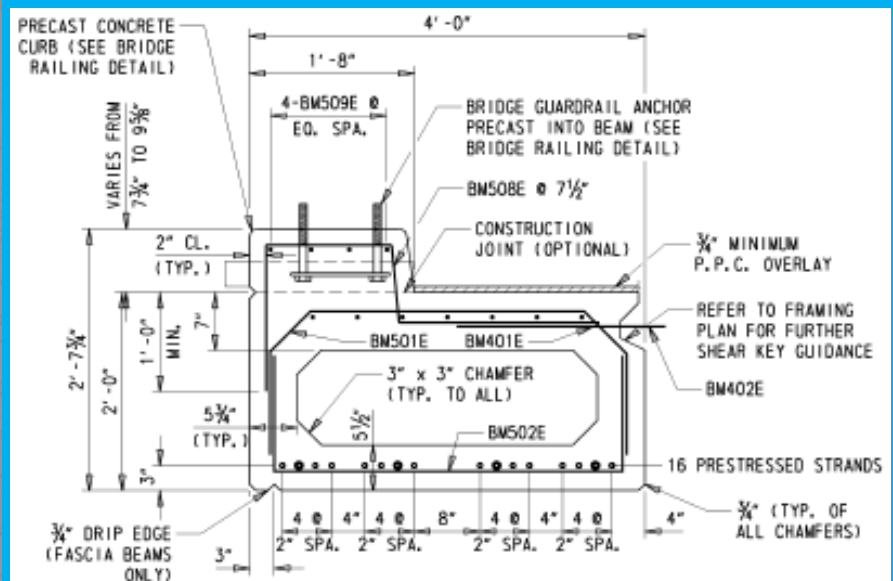


EXTERIOR BEAM DETAILS



**TYPICAL EXTERIOR BEAM SECTION
(AT CONCRETE END BARRIER)**

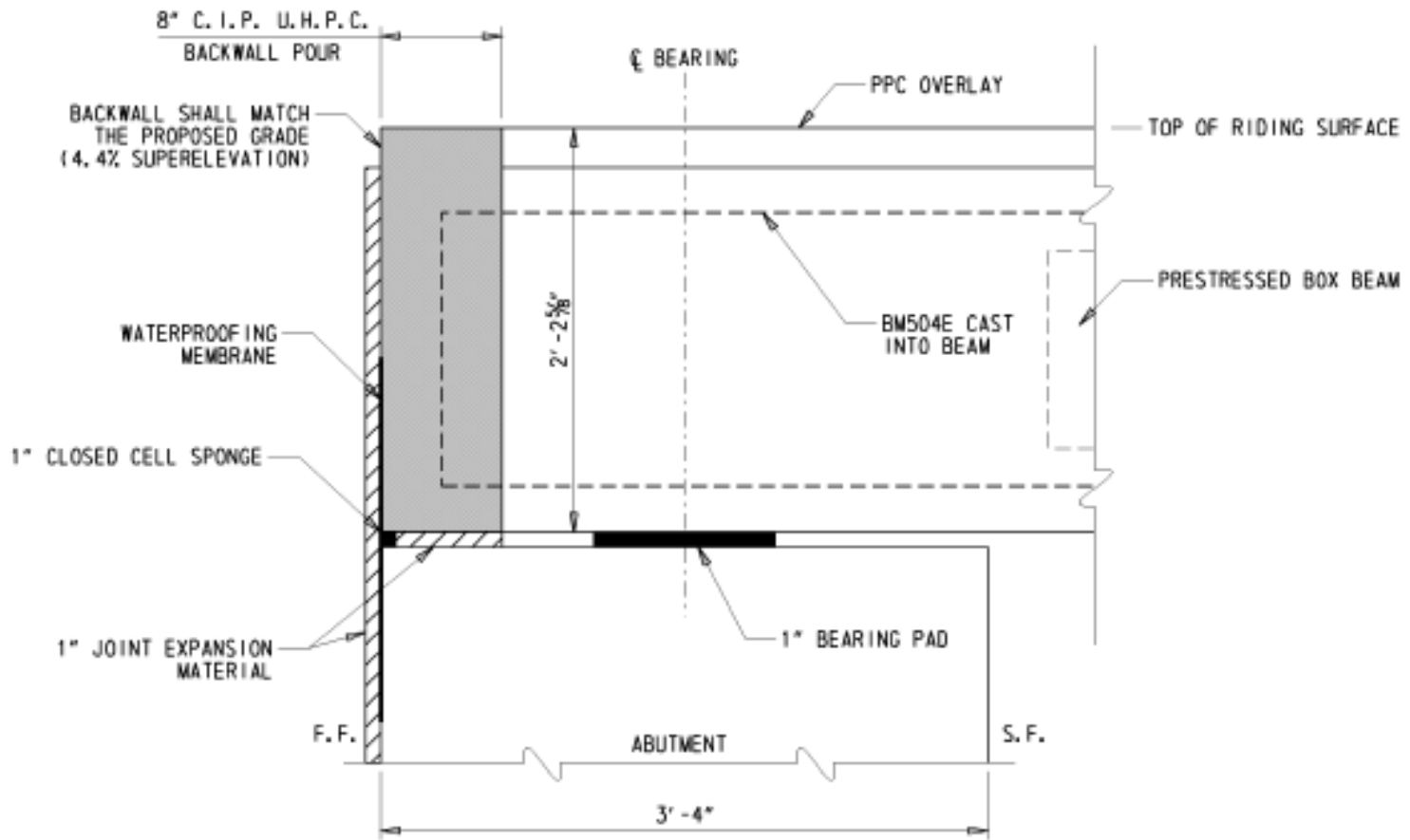
1" = 1'-0"



**TYPICAL EXTERIOR BEAM SECTION
(AT CONCRETE CURB & METAL POST)**

1" = 1'-0"

UHPC BACKWALL

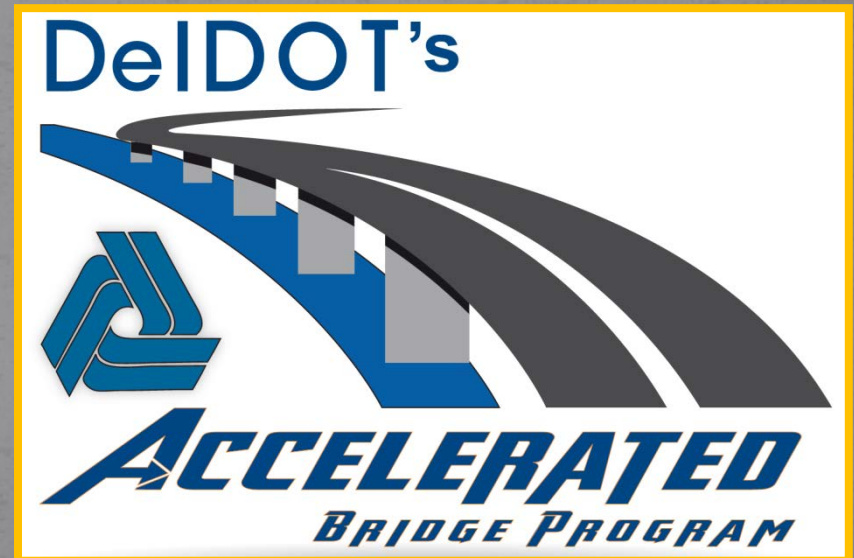


BACKWALL POUR DETAIL

$1\frac{1}{2}" = 1' - 0"$

CONCLUSIONS

- TREMENDOUS POTENTIAL
 - OPPORTUNITY TO INNOVATE
 - DECREASE CONSTRUCTION TIMES
 - IMPROVE PUBLIC PERCEPTION
- DETAILS ARE KEY
 - UTILIZE RESOURCES
 - FELLOW DOT'S
 - COLLEAGUES
 - FABRICATORS
 - OPEN TO NEW IDEAS
- LEARNING EXPERIENCE



QUESTIONS?

