# 2023 Spring Conference at Rocky Gap Resort
# Flintstone, Maryland
# B&A Rail Trail Over Joyce Lane Bridge Rehabilitation

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May 12, 2023

# BIOGRAPHY

- Director of Structures, Brudis & Associates, Inc.
- PhD University of Maryland College Park
- 24 Years of Experience with Design, Construction Support, and Inspection of Transportation Structures
- Design-Build Certified Professional

# ABSTRACT

## B&A Rail Trail Over Joyce Lane Bridge Rehabilitation

**Project Overview:**

- Engineering services for the inspection and subsequent rehabilitation to the existing 84’ single span prefabricated steel truss pedestrian bridge on the B&A Rail Trail over Joyce Lane.
- The 13-mile B&A Trail is a vital active transportation pedestrian corridor.
- Provided inspection, repairs to safely secure the bridge until the structure was reconstructed.
- Developed construction documents and provided construction engineering support for on-call task order contractors.

**Key Areas of Insight:**

- Bridge Inspection and Rehabilitation
- Truss Shortening
- Innovative Contracting
- Teamwork

- 1.0 PDH

# PROJECT DESCRIPTION

## FACILITY

- Baltimore & Annapolis Rail Trail (13 mi.)
- Stretches from Boulters Way in Annapolis to Dorsey Road in Glen Burnie, Maryland.

## PROJECT LOCATION

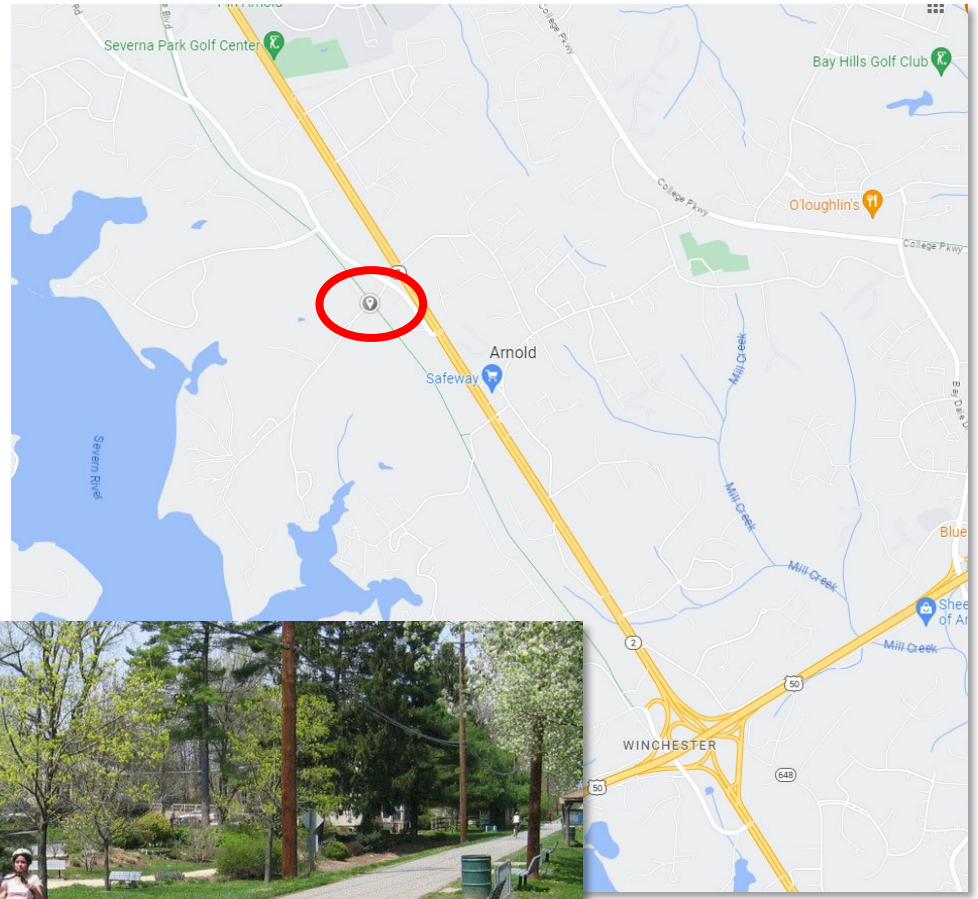
- Arnold, Maryland

## OWNER

- Anne Arundel County Recreation & Parks (AAR&P)

## CONTRACT MANAGER

- Anne Arundel County Department of Public Works (AADPW)




## STRUCTURE

- HSS tube pre-fabricated bridge built in 1990
- Span – 84’
- 14 Bay Pratt Truss
- Weathering Steel
- Floating Timber Decking
- Joyce Lane (19’ Clear Width)

# INITIAL TASK

## PROBLEM

- AAR&P Maintenance crews found a broken diagonal bracing member.

## TASK

- Perform an in-depth hands-on bridge inspection
- Prepare an inspection report
- Develop truss repair plans

# FINDINGS

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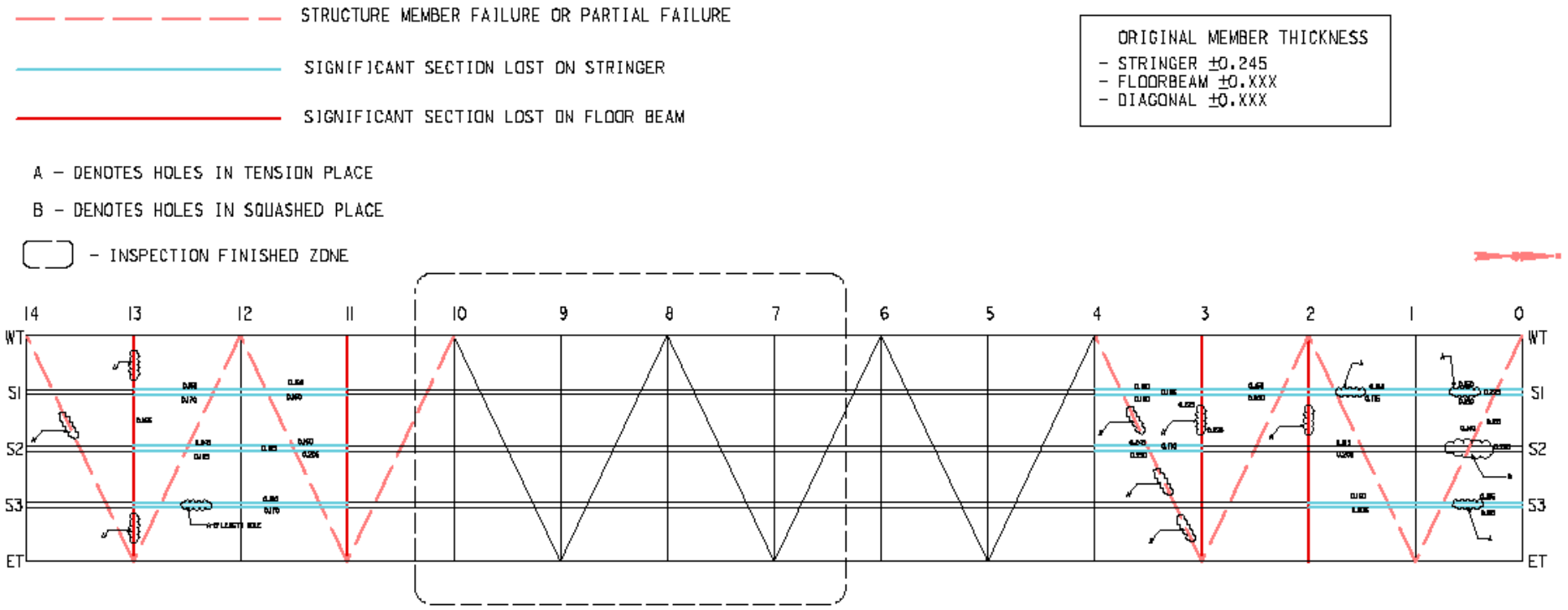
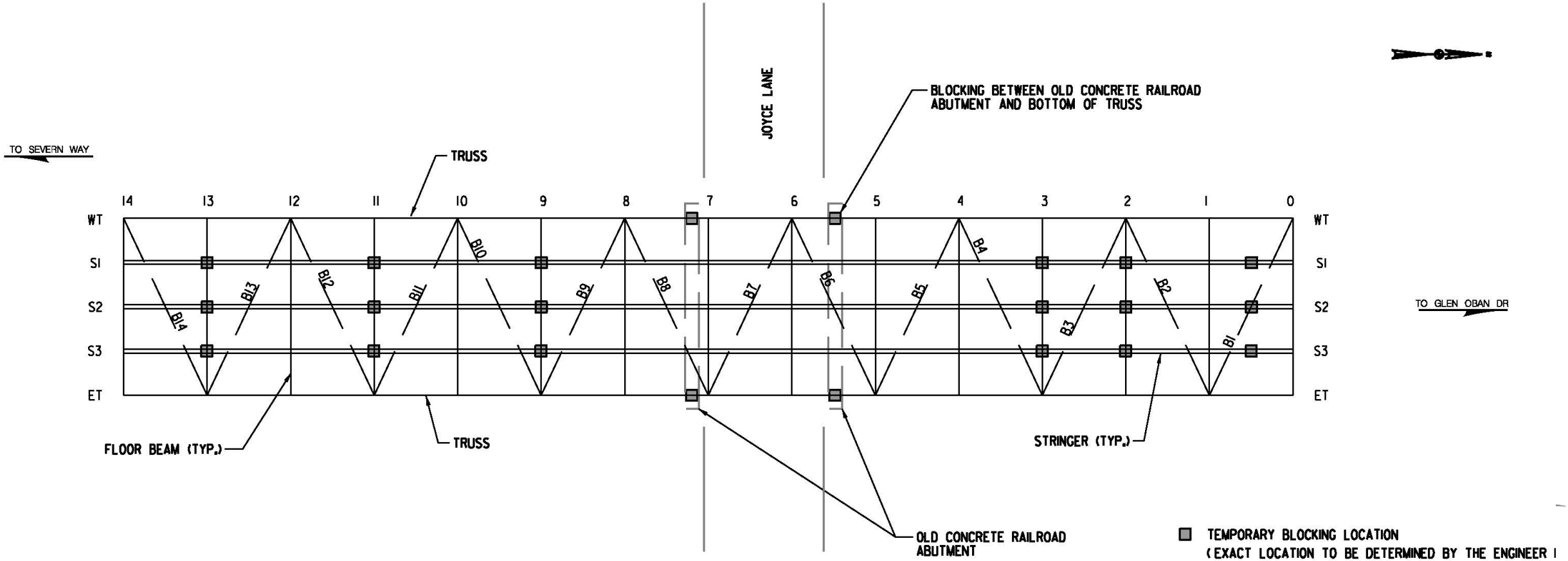



# FINDINGS

- Floor beam, Stringers and Lateral Bracing exhibited severe section loss in:
  - Bays 1 to 4
  - Bays 12 to 14

# Emergency Work

- Bridge Inspection – Closed the Bridge to all traffic
- BAI developed a shoring / blocking plan to reopen to pedestrian traffic only




PLAN - TEMPORARY SUPPORT BLOCKING

# EMERGENCY WORK


## Why?

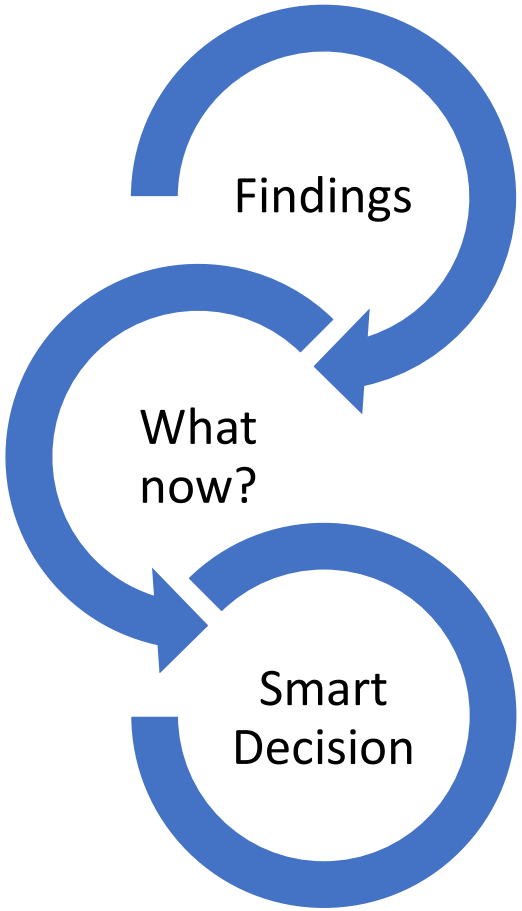
Existing Bridge Deficiencies

- Weathering Steel used close to the ground
- Vegetation trapped in moisture

## Midspan Comparison

- Less corrosion

# Change in Direction




- Why?
  - Due to the extensive level of deterioration, repair was not economical
- Options:
  - Replacement
  - Rehabilitation
- **Opportunity to address all long-term needs**

## Issues

### Overhead utilities along Joyce Lane and B&A Rail Alignment

- Limits lifting equipment (no relocation of utilities)
- Major time delays / cost (relocating utilities)

### High Traffic Volume

- Construction between November and March

### Time due to Condition

- Work needed to be done as soon as possible
- Long lead items needed to be minimized

### Noise complaints from Adjacent Property Owner

- Banging deck plank on existing bridge

### Life Cycle Cost

- Current structure's service life (~30 years)

# Option 1: Replacement

- Pros
  - Options on replacement structure type
  - Reuse existing abutment
- Cons
  - Large crane needed for setting the new structure
  - Long lead time on truss structure
  - Does not address cause of corrosion

# Issues

| | |
|---|---|
| • Overhead Utilities | Needs to be moved or shielded |
| • High Traffic Volume | Quick installation |
| • Construction Timing | Uncontrollable due to lead time for truss |
| • Noise Mitigation | Could be addressed in specification |
| • Life Cycle Cost | Similar life expectancy to existing structure |

# Option 2a: Rehabilitation

- Pros
  - Eliminate long lead items (use common steel sizes)
  - Reduce lifting needs
  - Eliminates relocation of utilities
  - Reuse the deck planks (good condition)
- Cons
  - Does not address cause of corrosion

# Issues

| | |
|---|---|
| • Overhead Utilities | No relocation |
| • High Traffic Volume | Slower installation |
| • Construction Timing | Available for winter construction |
| • Noise Mitigation | Could be addressed in design |
| • Life Cycle Cost | Similar life expectancy to existing structure |

# Option 2b: Rehabilitation (Truss Shortening)

- Pros
  - Eliminate long lead items (use common steel sizes)
  - Reduce lifting needs
  - Eliminates relocation utilities
  - Reuse the deck planks (good condition)
  - **Addresses cause of corrosion**
- Cons
  - Installation of new abutments

## Issues

| | |
|---|---|
| • Overhead Utilities | No relocation |
| • High Traffic Volume | Slower installation |
| • Construction Timing | Available for winter construction |
| • Noise Mitigation | Could be addressed in design |
| • Life Cycle Cost | Similar life expectancy to existing structure |

# Decision - Rehabilitation with Truss Shortening

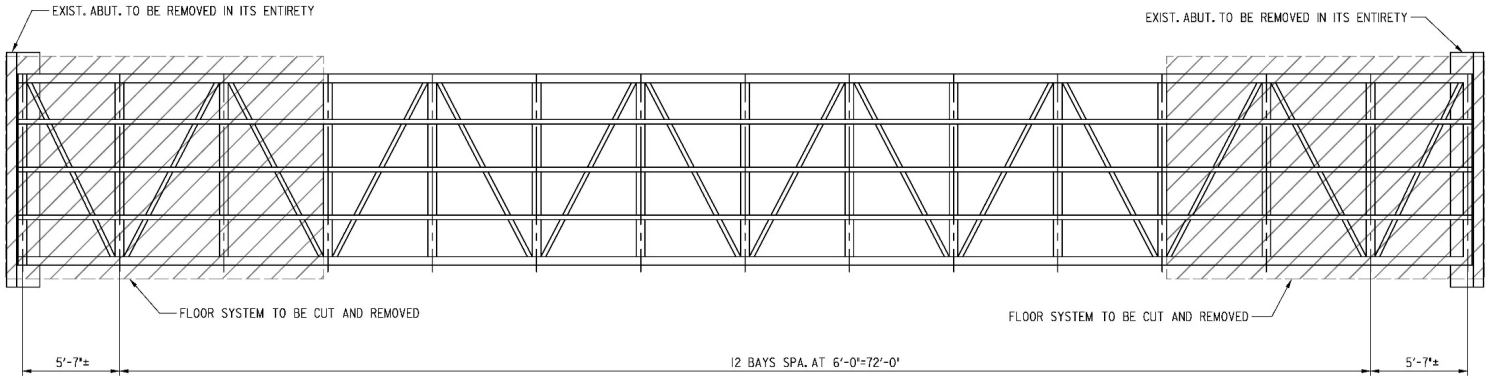
## Scope

- Shorten truss / modify truss bearing location
- Replace floor system (floor beams and stringers)
- Replace lateral bracing
- Reinstall planks with bolt down details
- New abutments / slope protection
- Erosion and Sediment Control
- Rework approaches
- Safety fencing

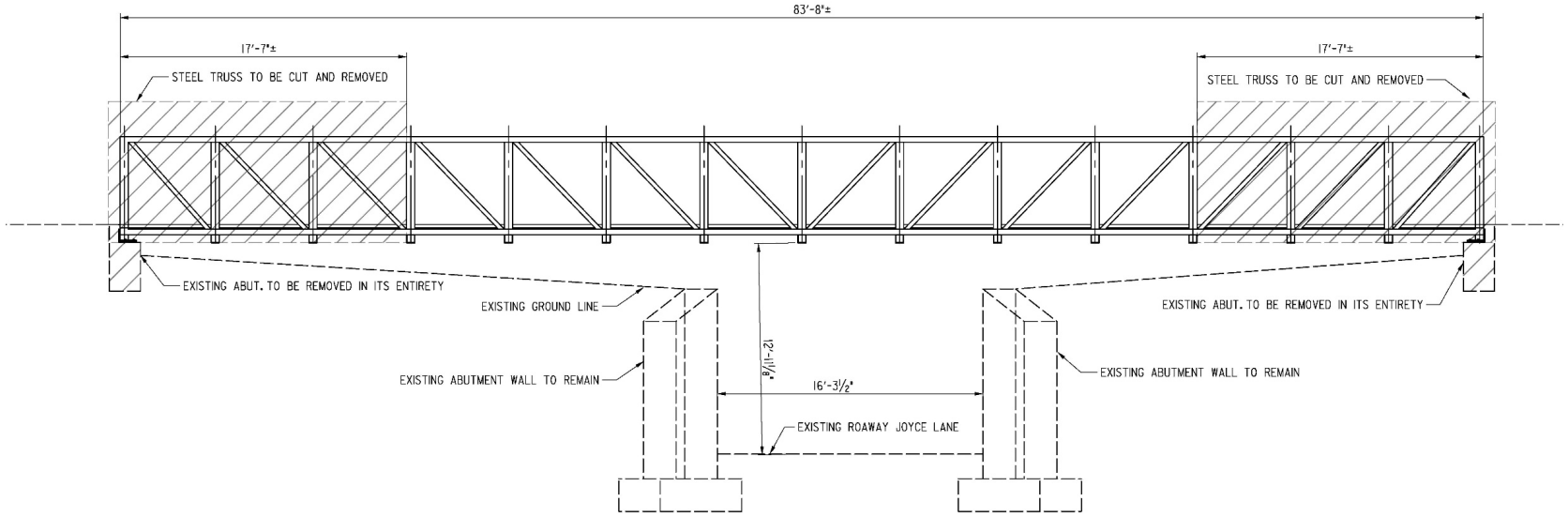
## Risks

- Speedy Design – Straight to final structural review (90%)
- No geotechnical borings

# DESIGN – TRUSS SHORTENING

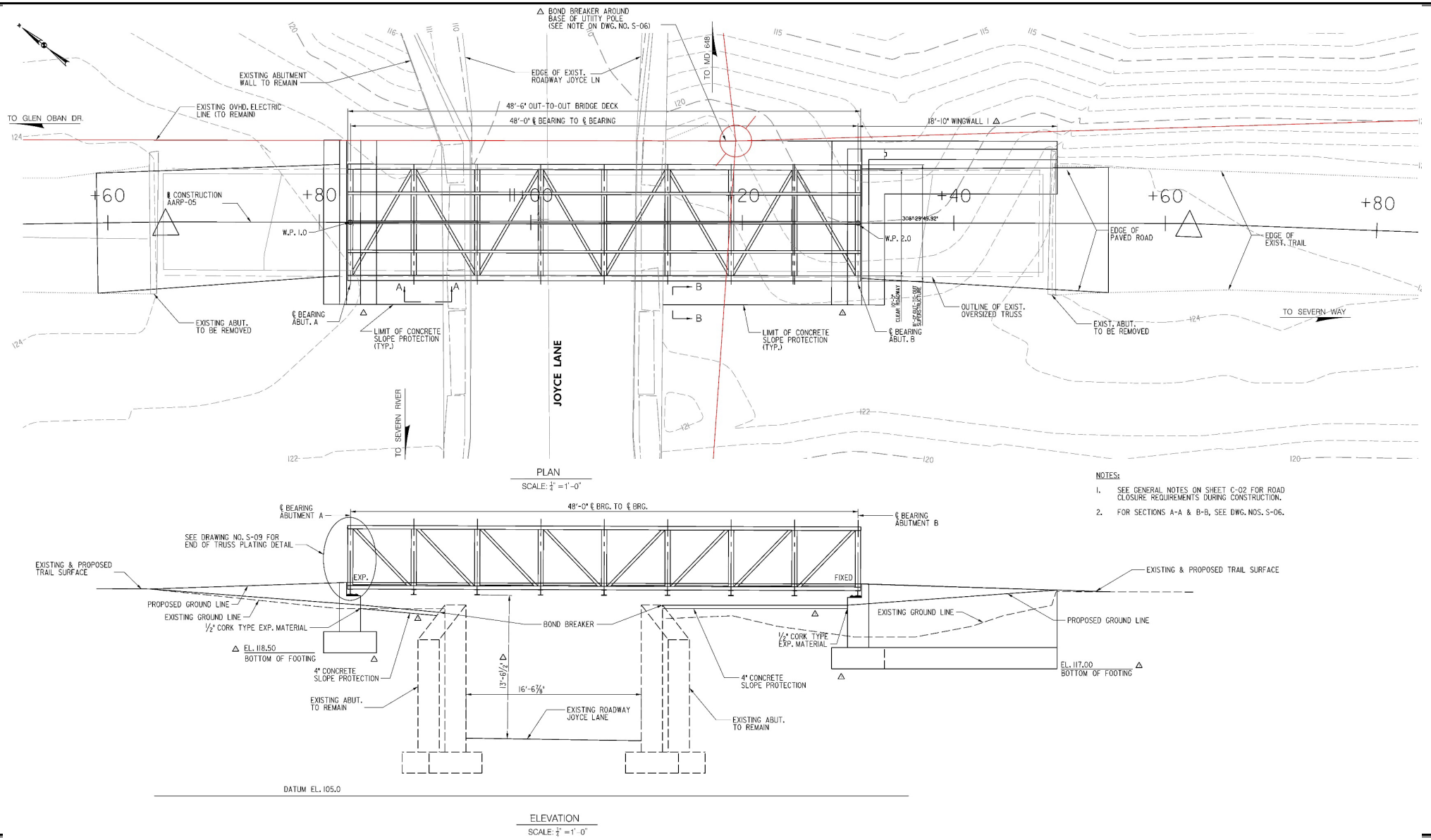



PLAN
SCALE: 1/4" = 1'-0"

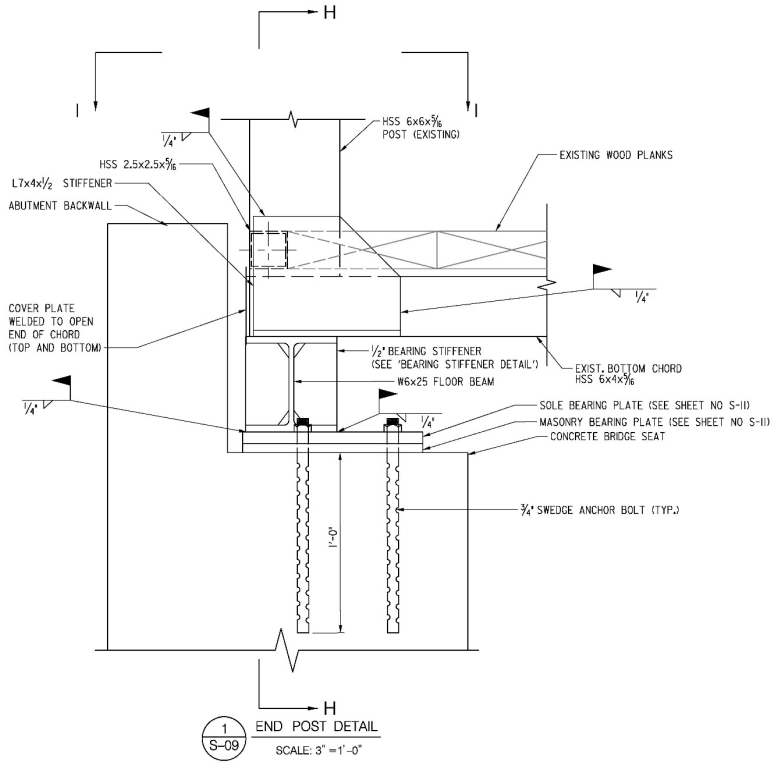



ELEVATION
SCALE: 1/4" = 1'-0"

# DESIGN – TRUSS SHORTENING



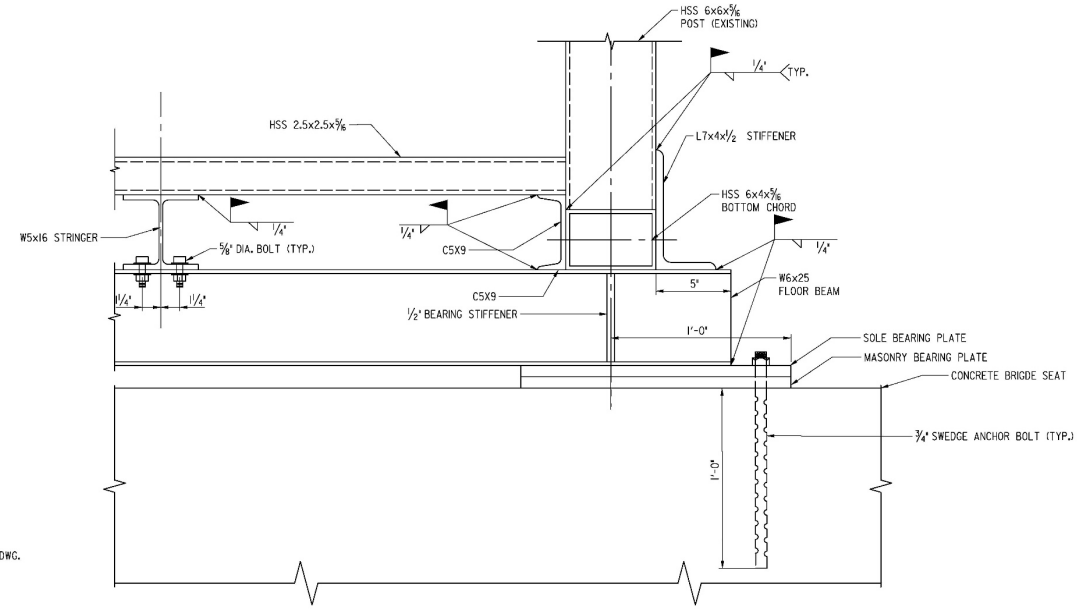
# DESIGN – TRUSS SHORTENING




1 S-09 END POST DETAIL

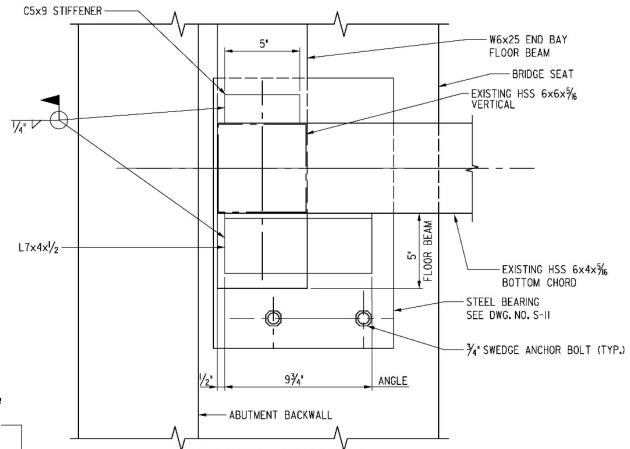
SCALE: 3" = 1'-0"

NOTE:
CHAIN LINK FENCING NOT SHOWN FOR CLARITY. SEE DWG. NO. S-11 FOR DETAILS.



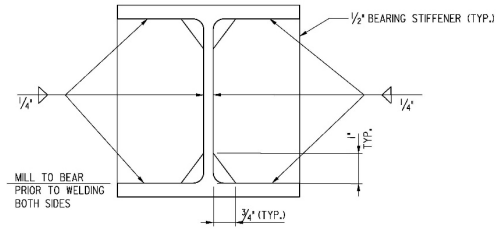

END POST – SECTION H–H

SCALE: 3" = 1'-0"



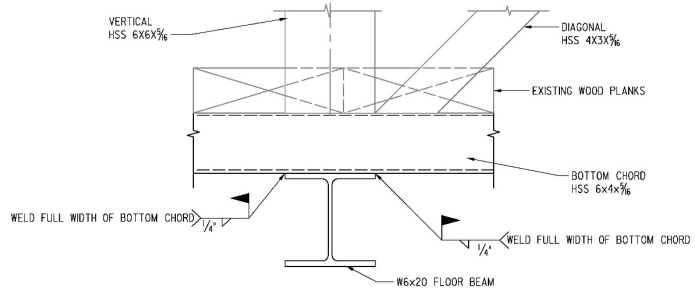

END POST – SECTION I–I

SCALE: 3" = 1'-0"




BEARING STIFFENER DETAIL

SCALE: 6" = 1'-0"




2 S-09 TYPICAL FLOOR BEAM CONNECTION

SCALE: 3" = 1'-0"

PROFESSIONAL CERTIFICATION: I, MICAH CEARY, CERTIFY THAT THESE DOCUMENTS WERE PREPARED BY OR APPROVED BY ME AND THAT I AM A DULY LICENSED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF MARYLAND LICENSE # 29893 EXPIRATION DATE 01/11/2022

| REVISIONS # | DESCRIPTION | APPROVED BY | DATE |
|---|---|---|---|

GP# _____ DWG NO: S-09

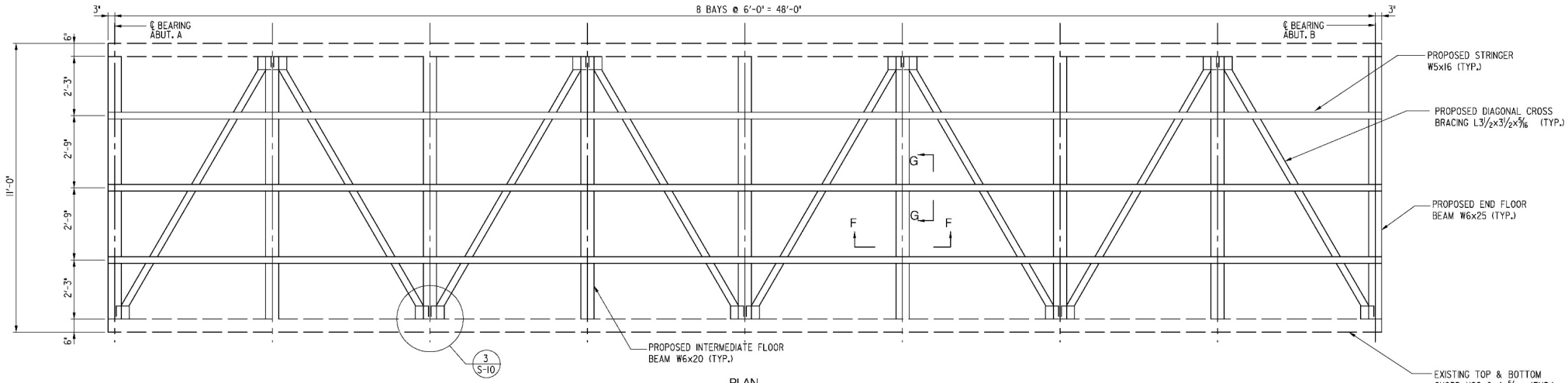
ANNE ARUNDEL COUNTY

DEPARTMENT OF PUBLIC WORKS

APPROVED DATE APPROVED DATE SCALE: AS SHOWN

STRUCTURAL DETAILS

# DESIGN – FLOOR SYSTEM REPLACEMENT

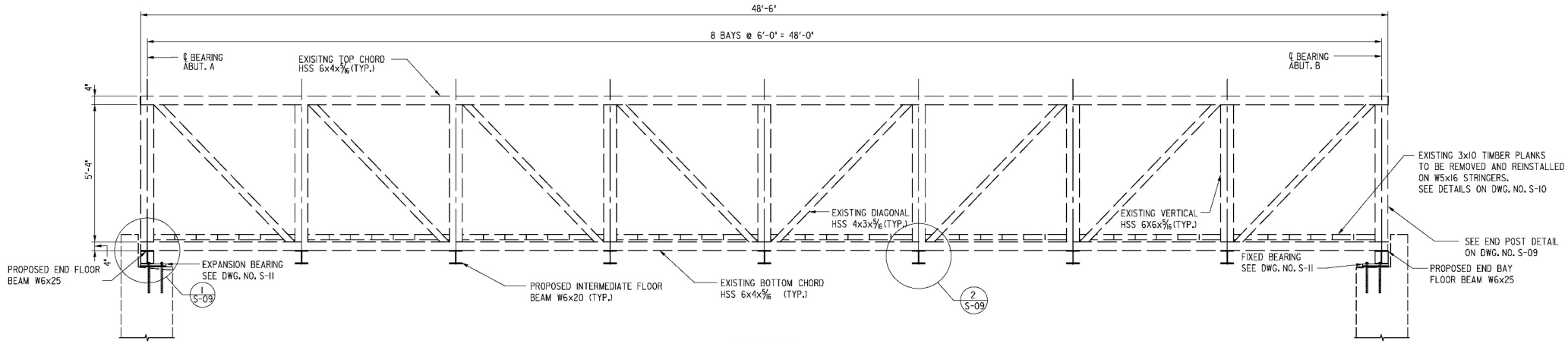



PLAN

SCALE: 1/2" = 1'-0"

NOTE:

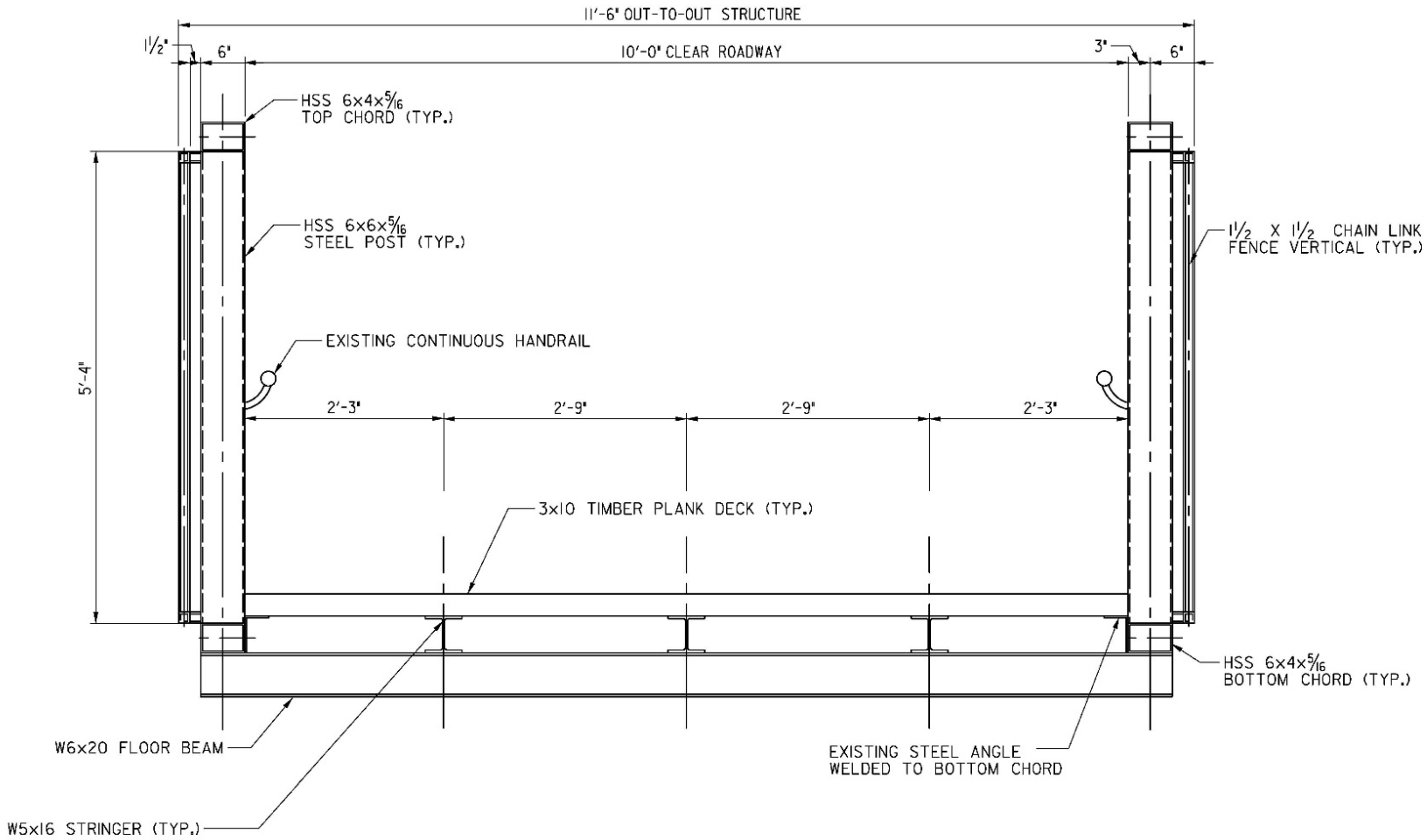
1. CHAIN LINK FENCE NOT SHOWN FOR CLARITY. SEE DWG. NOS. S-07 & S-11 FOR DETAILS.
2. FOR SECTIONS D-D & E-E, SEE DWG. NO. S-10.



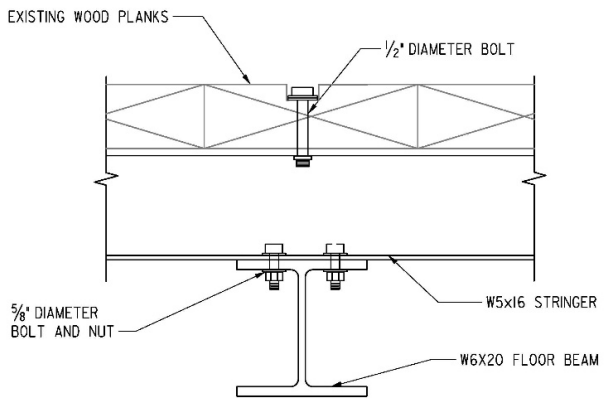

ELEVATION

SCALE: 1/2" = 1'-0"

# DESIGN – FLOOR SYSTEM REPLACEMENT

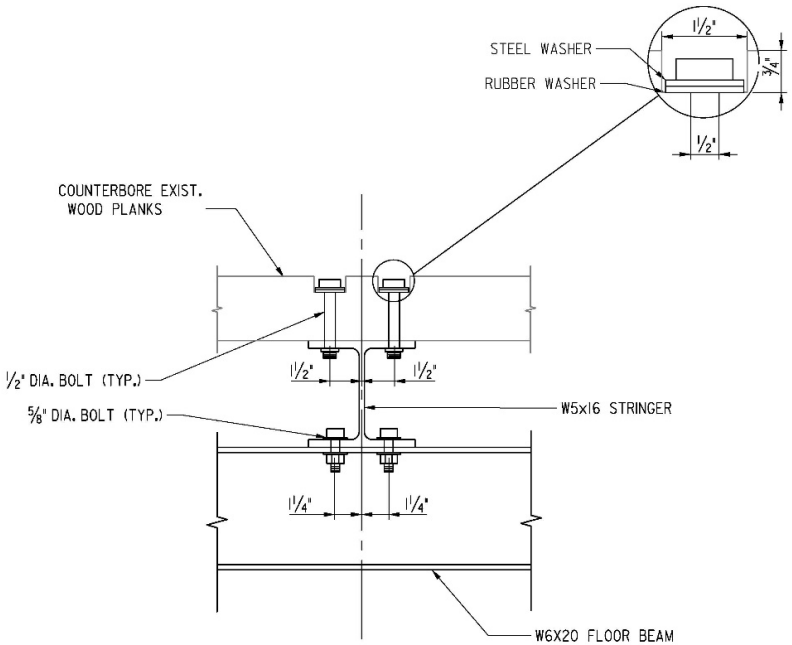


# DESIGN – NOISE MIGATION



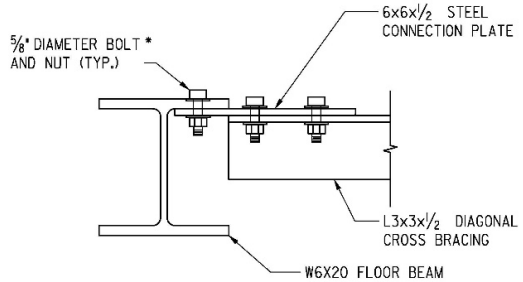

STRINGER – SECTION F–F

SCALE: 3" =1'–0"




STRINGER – SECTION G–G

SCALE: 3" =1'–0"




SECTION J–J – CROSS BRACING

SCALE: 3" =1'–0"


# Questions?

# TEAM

- AADPW acted as Construction Manager
- BAI and Specialized Engineering (material testing / geotechnical testing) acted as construction engineer and QC
- Task Order On-call contractors performed specialized task
  - Brown and Root Industrial Services (Prime) / Heinsohn Contracting
    - Structural
  - Jones of Annapolis
    - Site work
    - Demolition
    - Erosion & sediment control
    - Grading
    - Fencing
    - Paving

# Collaboration / Contractor Means and Methods

- Modifications
  - Jack Truss and Rehabilitate in Place
  - Design a temporary work platform / debris shield over Joyce Lane

# Jack Truss and Rehabilitate in Place

# Jack Truss and Rehabilitate in Place

# Temporary Work Platform / Debris Shield

## Risk – Resolution

- No Geotechnical Borings – Substrate Testing
- North Abutment required subfooting concrete
- Extra cost less than boring and geotechnical investigation

# Addressing Original Issues

- Corrosion due to vegetation / moisture at bridge ends


# Addressing Original Issues

- Noise due to bikes crossing planks


# Outcome

- Project Delivered on time (with weather days factored in)
- Project Team worked with the Owner (AAR&P) and Construction Manager (AADPW) to deliver a project:
  - During the low volume months
    - Addressing the issues of the original structure
      - Corrosion and its cause
      - Noise disturbance
- Improved user experience and safety

# Outcome

Bicycle Advocates for Annapolis & Anne Arundel County
P.O. Box 208, Arnold, MD 21012
www.bikeaaa.org

***Outstanding Work on B&A Trail Joyce Lane Bridge***

Dear Anne Arundel County Recreation & Parks & Public Works:

I am writing to thank and commend you on the the highly successful replacement of the B&A Trail Joyce Lane Bridge.

The 13 mile B&A Trail is a destination for people throughout the region and is also a vital active transportation corridor for people who bike and walk to work, school, shopping, recreation and other destinations. The trail has numerous bridges that cross roadways, ravines and other natural features. The bridge over Joyce Lane is a key crossing near the southern end of the trail towards Annapolis. It incurred structural problems a couple of years ago and you were able to repair it for safe use by cyclists and pedestrians until a permanent replacement could be done. This approach highlighted your sensitivity to the high demand for this trail for both recreation and transportation. When it came time for the permanent replacement, you took great care to communicate with trail users about the timing and duration of the project and we were pleased to be your partner in such community communication. We were particularly grateful that you waited to commence the work after our annual award-winning Anne Arundel County Lifeline 100 bicycle event in October, 2021 and that the work was scheduled for completion during the winter when trail usage is lower. The community received and also reported regular updates on the project and it was completed on time before the big increase in trail users in the spring of 2022. We received loads of positive community feedback about the process and the resulting bridge.

Kudos to your staff, contractors and community partners on a highly successful project!
Sincerely,

Jon Korin
*Jon Korin*

President, Bicycle Advocates for Annapolis & Anne Arundel County


THANK YOU!

# QUESTIONS?

Contact:

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