



# KINGSLEY COVERED BRIDGE

CLARENDON BO 1443(55)  
TH 39, BRIDGE NO. 28 OVER MILL RIVER

HCBPC PRESENTATION

OCTOBER 14, 2020

# PRESENTATION OUTLINE

- Purpose and Need
- Background
- Inspection Findings
- Rehabilitation Alternatives
- Right of Way, Utilities, Fire Protection
- Summary
- Questions



Vermont Agency of Transportation  
Clarendon BO 1443(55)

# PURPOSE AND NEED

## Purpose

- Evaluate the Kingsley Covered Bridge for continued Special Use on Roads crossing the Mill River and to extend its service life

## Need

- Continue to provide access for vehicles across Mill River in the eastern part of the Town of Clarendon





# BACKGROUND

- Bridge constructed in 1836, Rehabilitated in 1949 & 1987
- Listed in National Register of Historic Places in 1974
- Town Lattice Trusses:
  - 121' Long (Portal to Portal)
  - 15'-7" On Center
  - 12'-1" Vertical Clearance
  - Posted Weight 3 Tons
- Substructures: Reinforced Concrete Abutments Founded on Bedrock



# INSPECTION FINDINGS

- National Bridge Inspection Standard Condition Ratings
  - 9 = Excellent
  - 0 = Failed Condition - Closed
- Overall bridge condition is rated 5 or fair.
  - Deck condition is rated 7 or good.
  - Superstructure condition is rated 5 or fair.
  - Substructure condition is rated 7 or good.
  - Channel condition is rated 8 or very good.



# INSPECTION FINDINGS: METAL ROOF

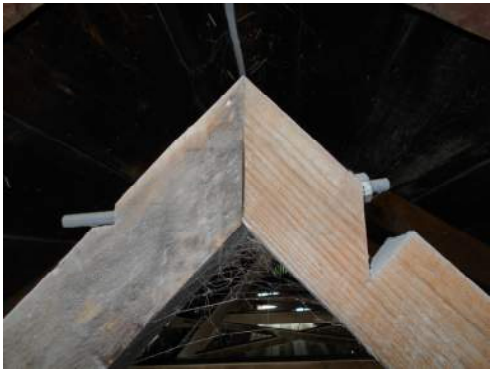
Paint Blistering,  
Fading, Ridge  
Cap Attached  
with Nails &  
Screws, Trees  
Overgrown



Vermont Agency of Transportation  
Clarendon BO 1443(55)

# INSPECTION FINDINGS: ROOF MEMBERS

Splits, Breaks,  
Rot,  
Overcuts,  
Insect  
Damage



Vermont Agency of Transportation  
Clarendon BO 1443(55)



# INSPECTION FINDINGS: BRACING MEMBERS

Guy wires  
not well  
anchored





# INSPECTION FINDINGS: LATTICE MEMBERS

Large Gaps at  
Previous  
Splices, Splits,  
Breaks, Rot,  
Insect  
Damage



Vermont Agency of Transportation  
Clarendon BO 1443(55)

# INSPECTION FINDINGS: TOP CHORD MEMBERS

Out of Plumb,  
Splits, Breaks,  
Rot, Insect  
Damage



# INSPECTION FINDINGS: BOTTOM CHORD MEMBERS

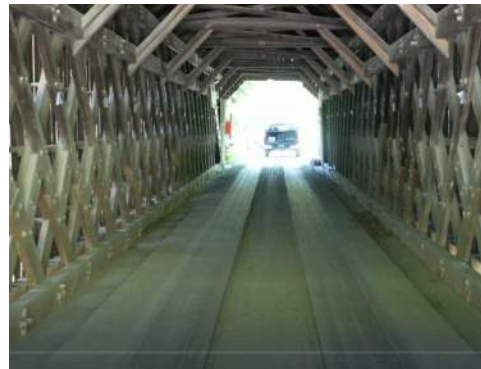
Bedding  
Timbers  
Rotted,  
Settling of  
Trusses,  
Rusting of  
Bolts



Vermont Agency of Transportation  
Clarendon BO 1443(55)

# INSPECTION FINDINGS: FLOOR MEMBERS

Runners Trap  
Debris,  
Ramps Each  
End



Vermont Agency of Transportation  
Clarendon BO 1443(55)



# INSPECTION FINDINGS: SUBSTRUCTURE

Concrete  
Cracks,  
Spalling,  
Delamination,  
Efflorescence  
Staining



# REHABILITATION ALTERNATIVES

- Bridge Rehabilitation is feasible based on:
  - Current condition of bridge.
  - Deterioration type and level of section losses observed.
- Rehabilitation includes:
  - Repair, Strengthening or Replacement of bridge members
- Bridge Loads
  - Snow – 50 PSF Ground, 27 PSF Roof Applied
  - Wind – 22 PSF
  - Live Load – H3, H12, H15 and H20



# ROOF MEMBERS



# ROOF MEMBERS – RECOMMENDED WORK

## Roof Framing

- New Standing Seam Metal Roof
- Rafters are 3”x5” or 4”x5” Eastern Spruce
- Roof Boards are 1” thick Eastern Hemlock
- 20% Replacement of Existing Roof Boards (PTN 2)
- 12 Rafters (19%) to be Replaced due to Condition (PTN 2)
- 5 Rafters to be Epoxy Repaired (PTN 3)





# LATERAL BRACING MEMBERS



# LAT. BRACING MEMBERS – RECOMMENDED WORK

## Lateral Bracing Members

- Upper Bracing Includes 8”x9” Crossbeams, 4”x5” “X” Braces and 4”x4” Org. Knee Braces and 4”x5” Knee Braces
- Bracing Members are Eastern Spruce
- 3 Crossbeams (27%) to be Replaced due to Condition (PTN 2) and 5 Epoxied Repaired (PTN 3)
- 3 Braces (15%) to be Replaced due to Condition (PTN 2)
- 5 - 4”x5” Knee Braces (23%) and 2 - 4”x4” Knee Braces (9%) to be Replaced due to Condition (PTN 2)



# LAT. BRACING MEMBERS – RECOMMENDED WORK

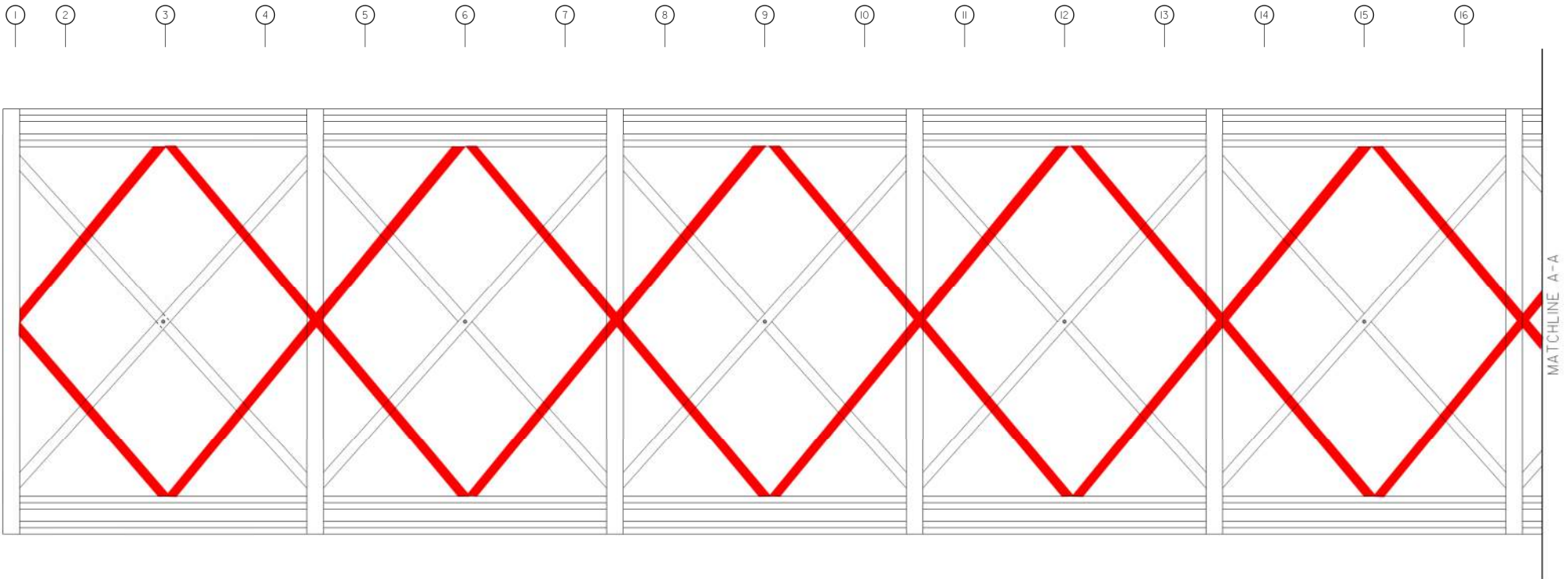
## Guy Wiring Members

- Existing Lateral Bracing not Adequate to allow removal of guy wiring.
- Strengthen Crossbeam to Chord connection or
- Add Additional Lateral Bracing Below the Crossbeam



Green River Covered Bridge, Guilford

# LAT. BRACING MEMBERS – RECOMMENDED WORK



Vermont Agency of Transportation  
Clarendon BO 1443(55)





# FLOOR FRAMING MEMBERS



Vermont Agency of Transportation  
Clarendon BO 1443(55)

Hoyle, Tanner  
& Associates, Inc.

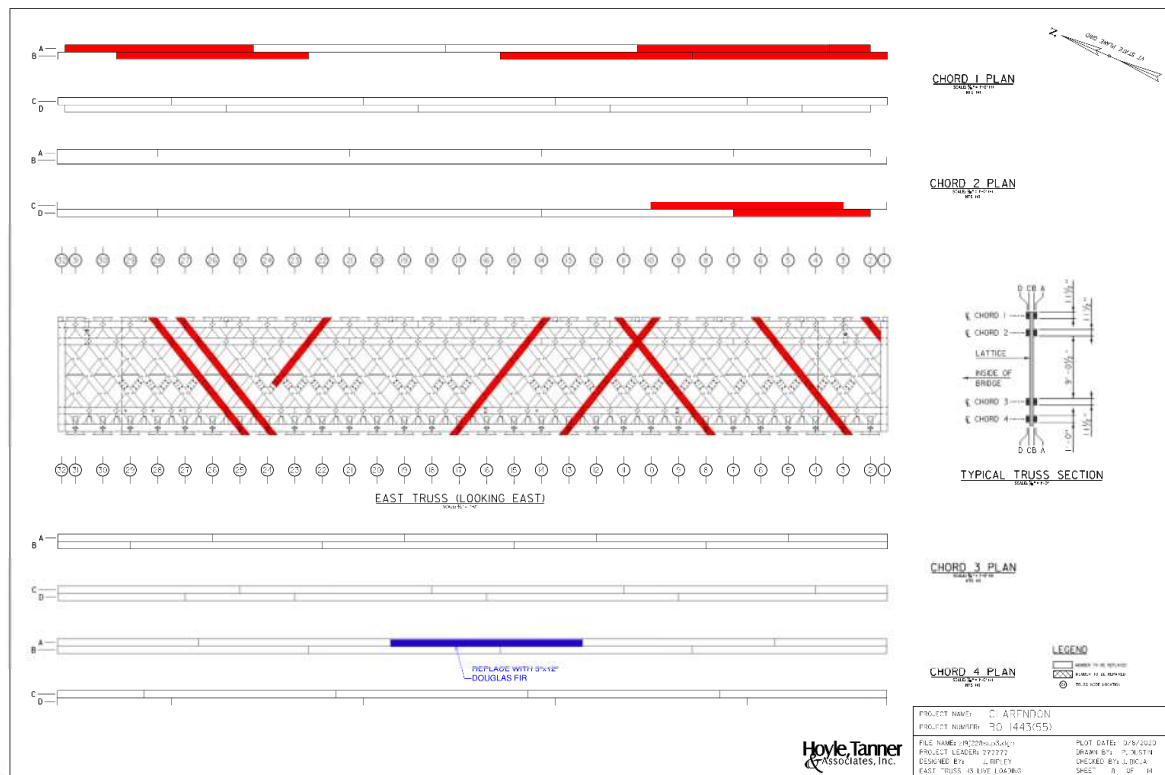
# FLOOR MEMBERS – RECOMMENDED WORK

## Floor Framing Members

- Floor Members Include 8”x14” Floorbeams, 2”x6” Nail Laminated Deck and 3” thick Runner Boards
- Floorbeams are Southern Pine and Decking is Eastern Spruce
- Nail Laminated Deck Adequate for H20
- Floorbeams Adequate for H15
- Replace Runner Boards with full width Runners (PT 2)
- No Floorbeam/Deck Replacement or Repair Required



# REHABILITATION ALTERNATIVES: H3 EAST TRUSS



Lattice Replacement 12%

Chord Replacement 12%

Legend:

**Red** – Replace due to Condition (PTN 2)

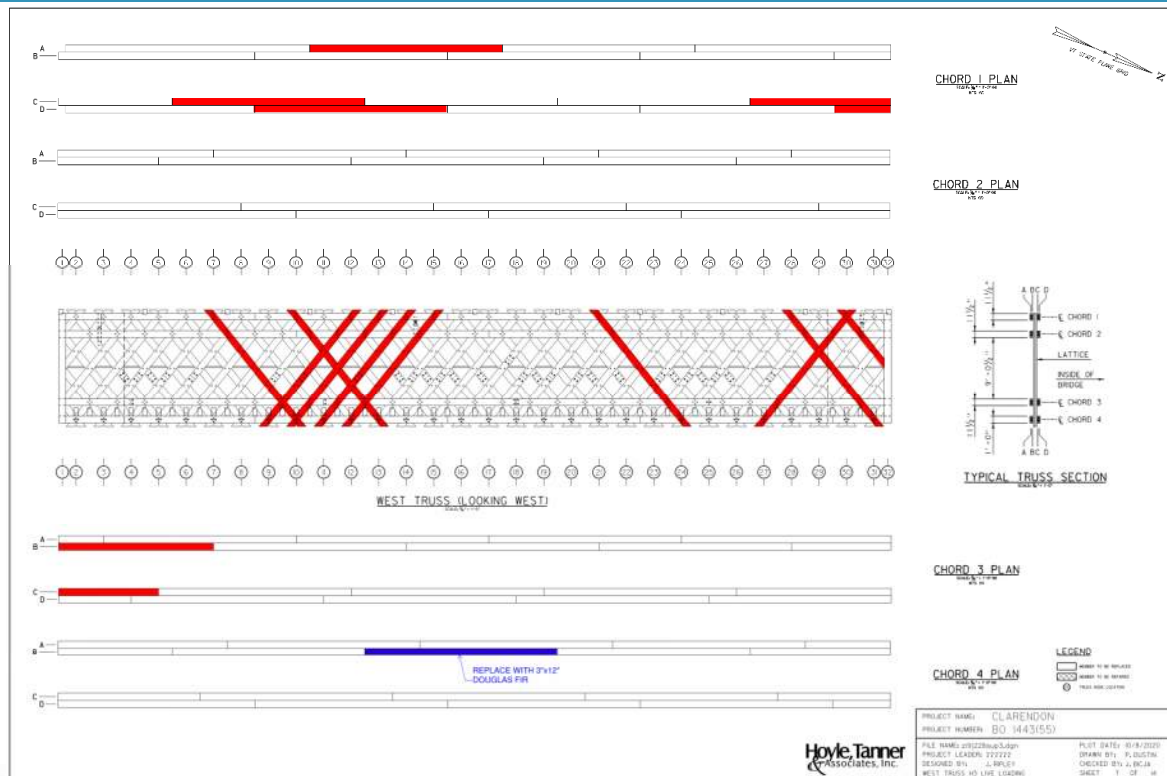
**Blue** – Replace due to Strength (PTN 2)



Vermont Agency of Transportation  
Clarendon BO 1443(55)



# REHABILITATION ALTERNATIVES: H3 WEST TRUSS



Lattice Replacement 16%

Chord Replacement 10%

Legend:

**Red** – Replace due to Condition (PTN 2)

**Blue** – Replace due to Strength (PTN 2)

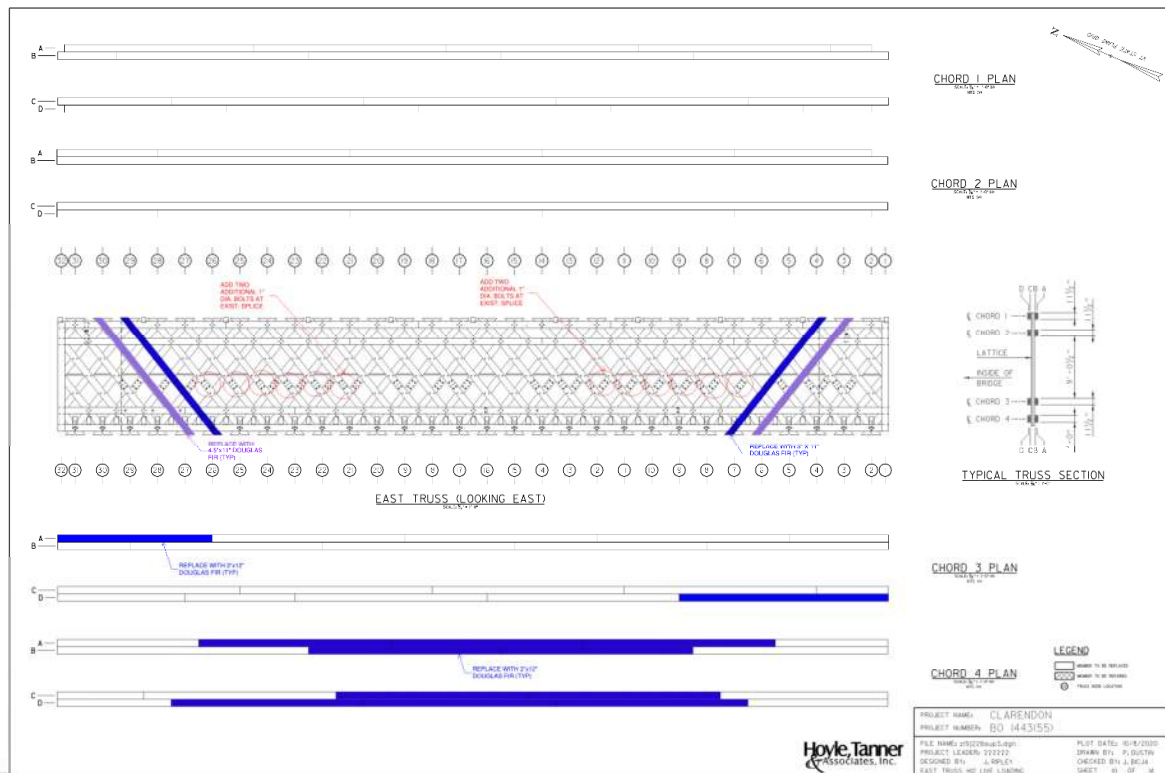


Vermont Agency of Transportation  
Clarendon BO 1443(55)





# REHABILITATION ALTERNATIVES: H12 EAST TRUSS



Lattice Replacement +7%

Chord Replacement +18%

Legend:

Blue – Replace due to Strength (PTN 2)

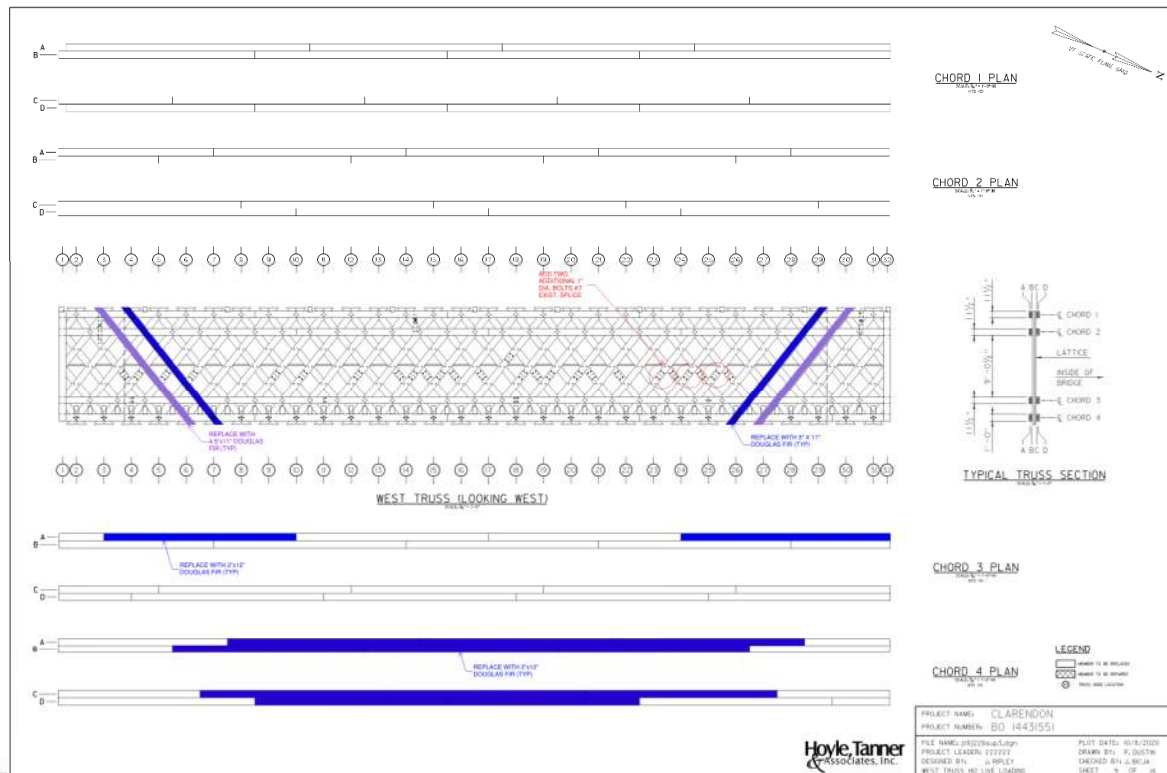
Purple – Replace due to Strength w/Larger Size (PTN 5)



Vermont Agency of Transportation  
Clarendon BO 1443(55)



# REHABILITATION ALTERNATIVES: HI2 WEST TRUSS



Lattice Replacement +7%

Chord Replacement +20%

Legend:

**Blue** – Replace due to Strength (PTN 2)

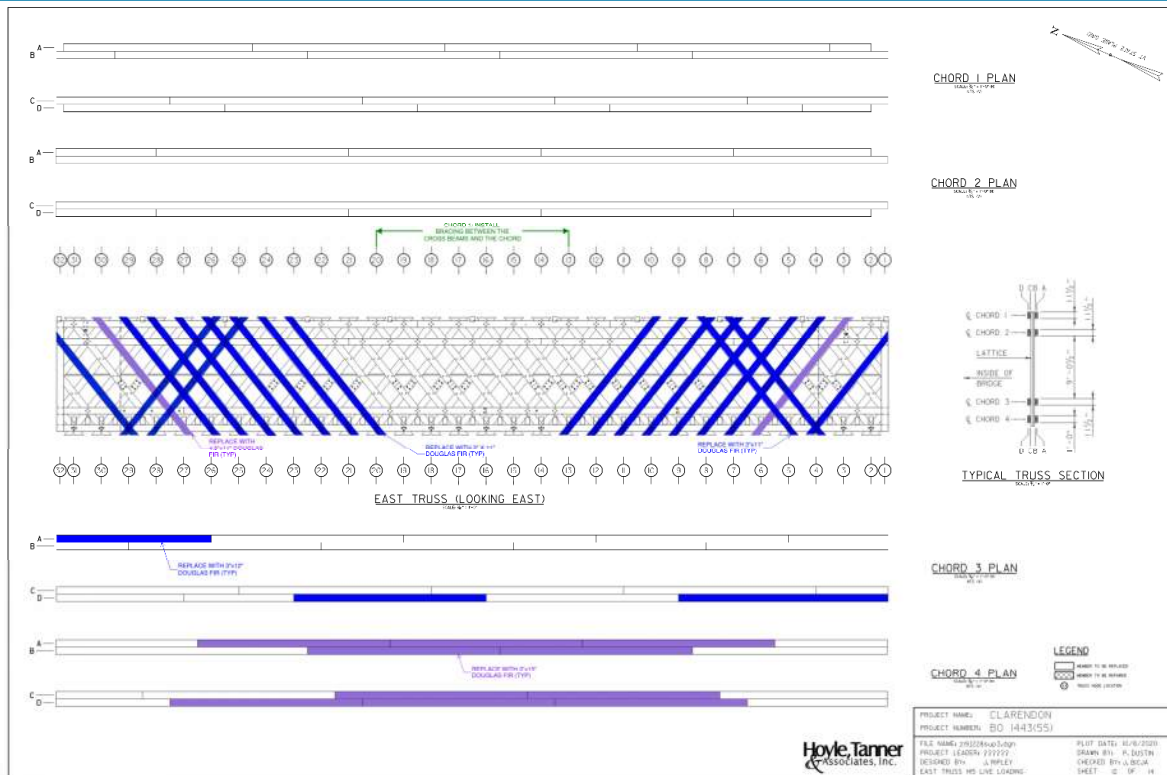
**Purple** – Replace due to Strength w/Larger Size (PTN 5)



Vermont Agency of Transportation  
Clarendon BO 1443(55)



# REHABILITATION ALTERNATIVES: HI 5 EAST TRUSS



Lattice Replacement +37%

Chord Replacement +19%

Legend:

Blue – Replace due to Strength (PTN 2)

Purple – Replace due to Strength w/Larger Size (PTN 5)

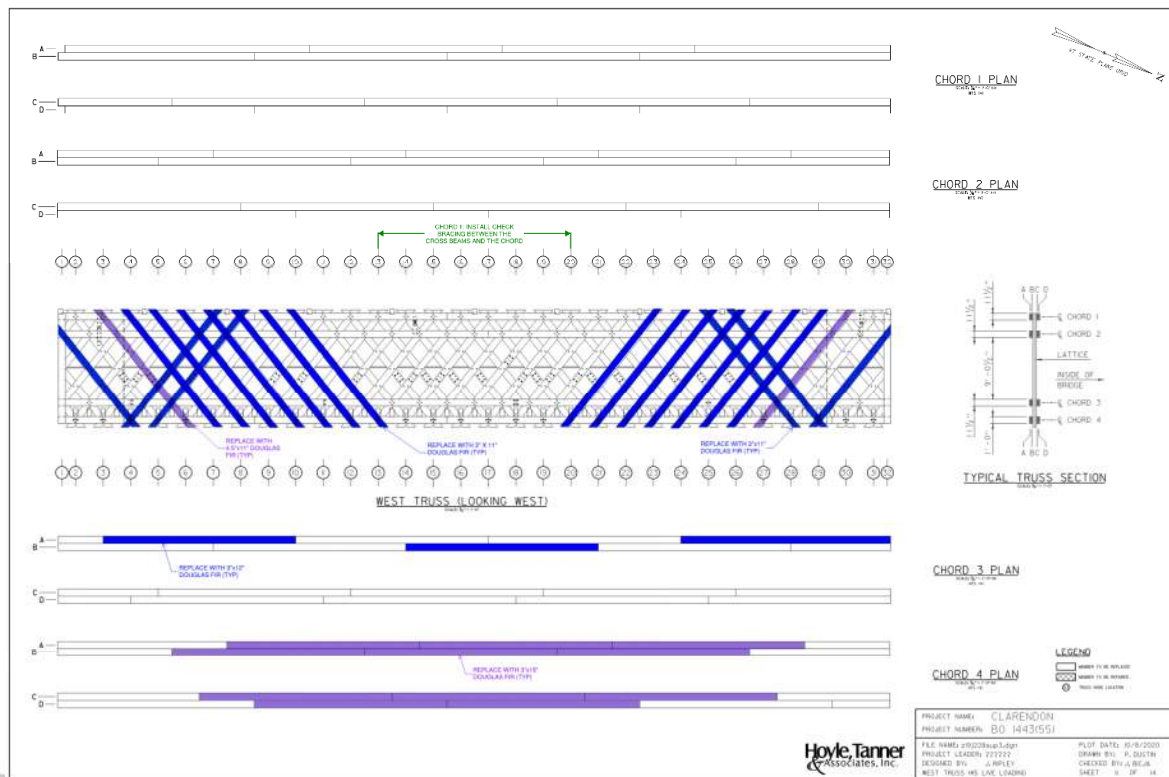


Vermont Agency of Transportation  
Clarendon BO 1443(55)

Hoyle, Tanner  
& Associates, Inc.



# REHABILITATION ALTERNATIVES: HI5 WEST TRUSS



Lattice Replacement +37%

Chord Replacement +21%

Legend:

Blue – Replace due to Strength (PTN 2)

Purple – Replace due to Strength w/Larger Size (PTN 5)

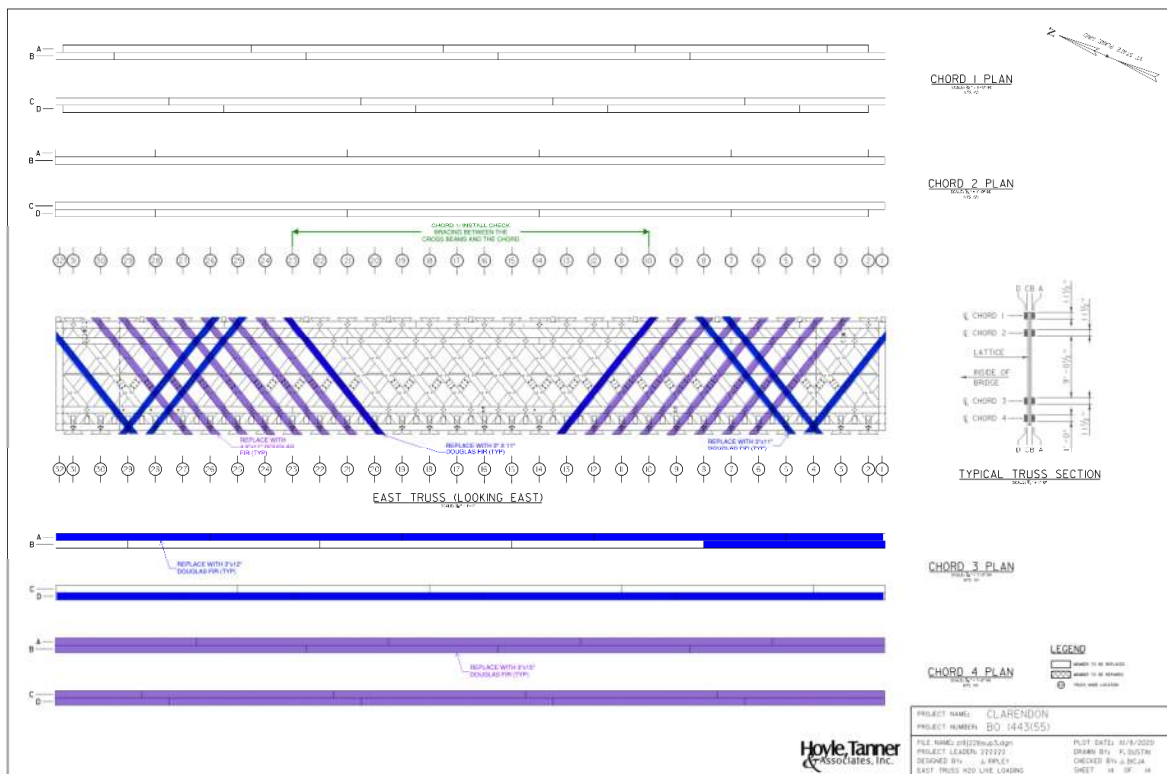


Vermont Agency of Transportation  
Clarendon BO 1443(55)





# REHABILITATION ALTERNATIVES: H20 EAST TRUSS



Lattice Replacement +37%

Chord Replacement +39%

Legend:

Blue – Replace due to Strength (PTN 2)

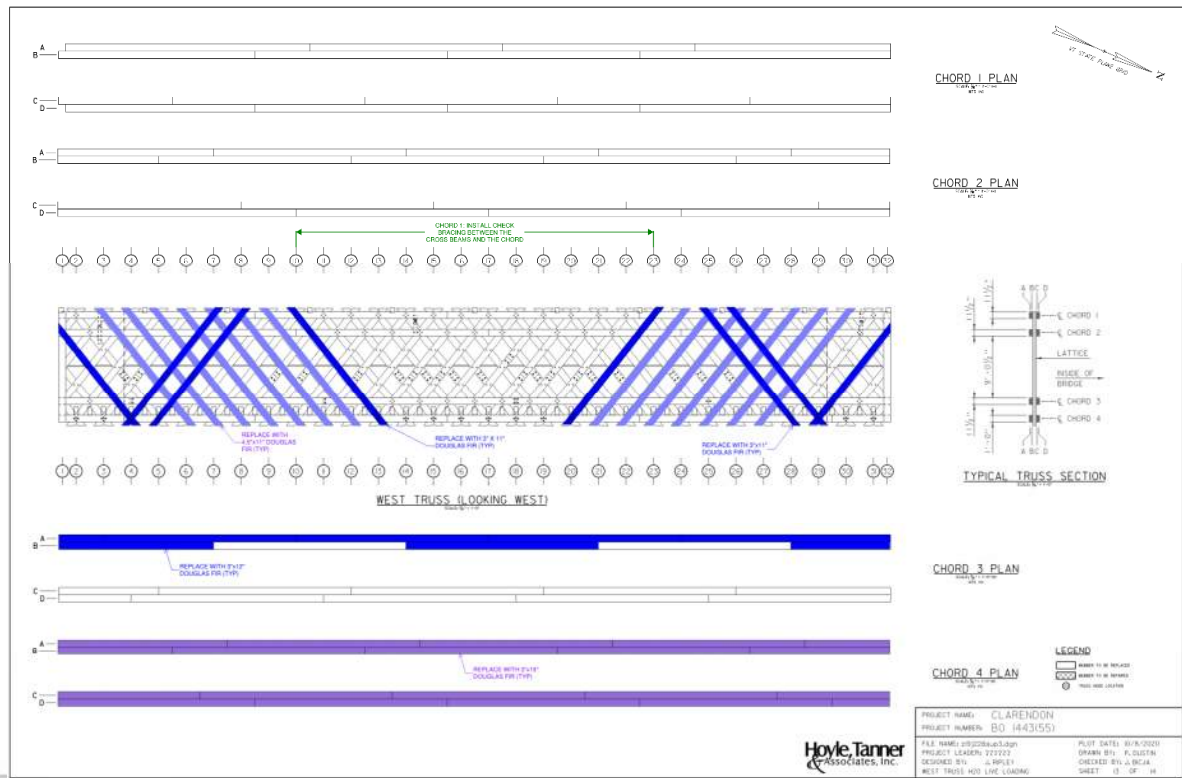
Purple – Replace due to Strength w/Larger Size (PTN 5)



Vermont Agency of Transportation  
Clarendon BO 1443(55)



# REHABILITATION ALTERNATIVES: H20 WEST TRUSS



Lattice Replacement +37%

Chord Replacement +41%

Legend:

**Blue** – Replace due to Strength (PTN 2)

**Purple** – Replace due to Strength w/Larger Size (PTN 5)



Vermont Agency of Transportation  
Clarendon BO 1443(55)

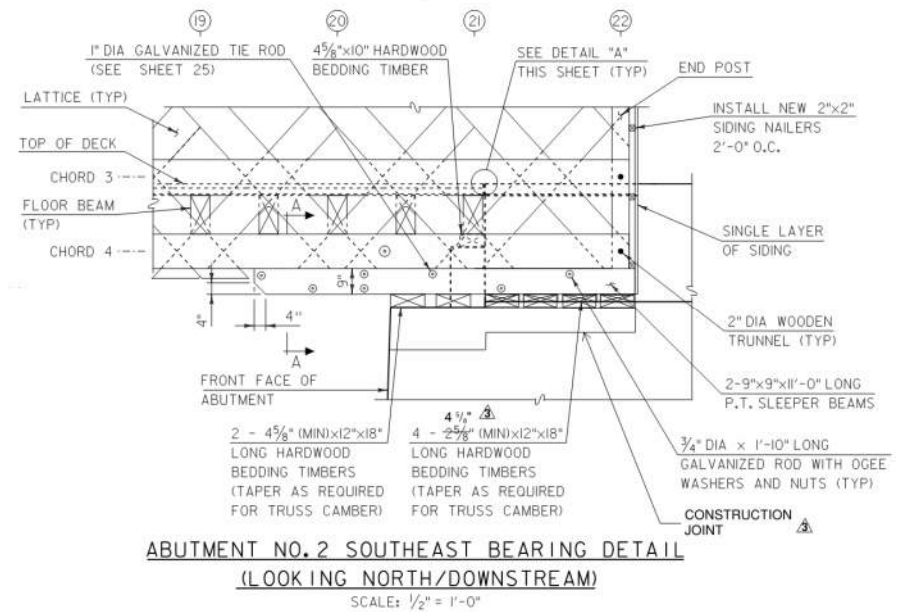
Hoyle, Tanner  
& Associates, Inc.



# REHABILITATION ALTERNATIVES: TRUSS BEARINGS



Existing Bearing Blocks



Longley Covered Bridge, Montgomery

# SUBSTRUCTURE – RECOMMENDED WORK

## Substructure

- Concrete Repair / Crack Sealing (PT I)
- Stain And Seal Concrete (PT I)





# RIGHT OF WAY, UTILITIES, AND FIRE PROTECTION

- Right of Way is 3-Rod
- Relocation of Utilities may be Required
- Insecticide/Fungicide
- Fire Protection
  - Recommend NOCHAR
  - Protectowire/Sprinkler
  - Lighting



# SUMMARY

- Superstructure Replacements/Repairs PTN I - 5
- Substructure Repairs PTN I
- Current Live Load Rating ~ H2 (2 tons)
- Approach Work
  - 250' of Roadway Reconstruction
  - New Signage
  - New Steel Backed Timber Guardrail



An aerial photograph of a river flowing through a dense forest. A wooden covered bridge spans the river in the center. To the left, a house with a white roof and a blue sky are visible. The river is surrounded by lush green trees and vegetation. A blue horizontal bar is at the top, and a larger blue horizontal bar is at the bottom containing the text.

# QUESTIONS