Timber Pile Cap Repairs

Travis Kinney

Overview

- Timber Cap Repair Options
  - Encapsulation
  - Full Replacement
- Shoring Options
  - Mudsills (@ Abutments)
  - Pile Clamps at Interior bents or over water.
- Interior Cap Replacement with Pile Clamps (Case Study)

Timber Cap Repairs:

Timber Cap Repair Options:

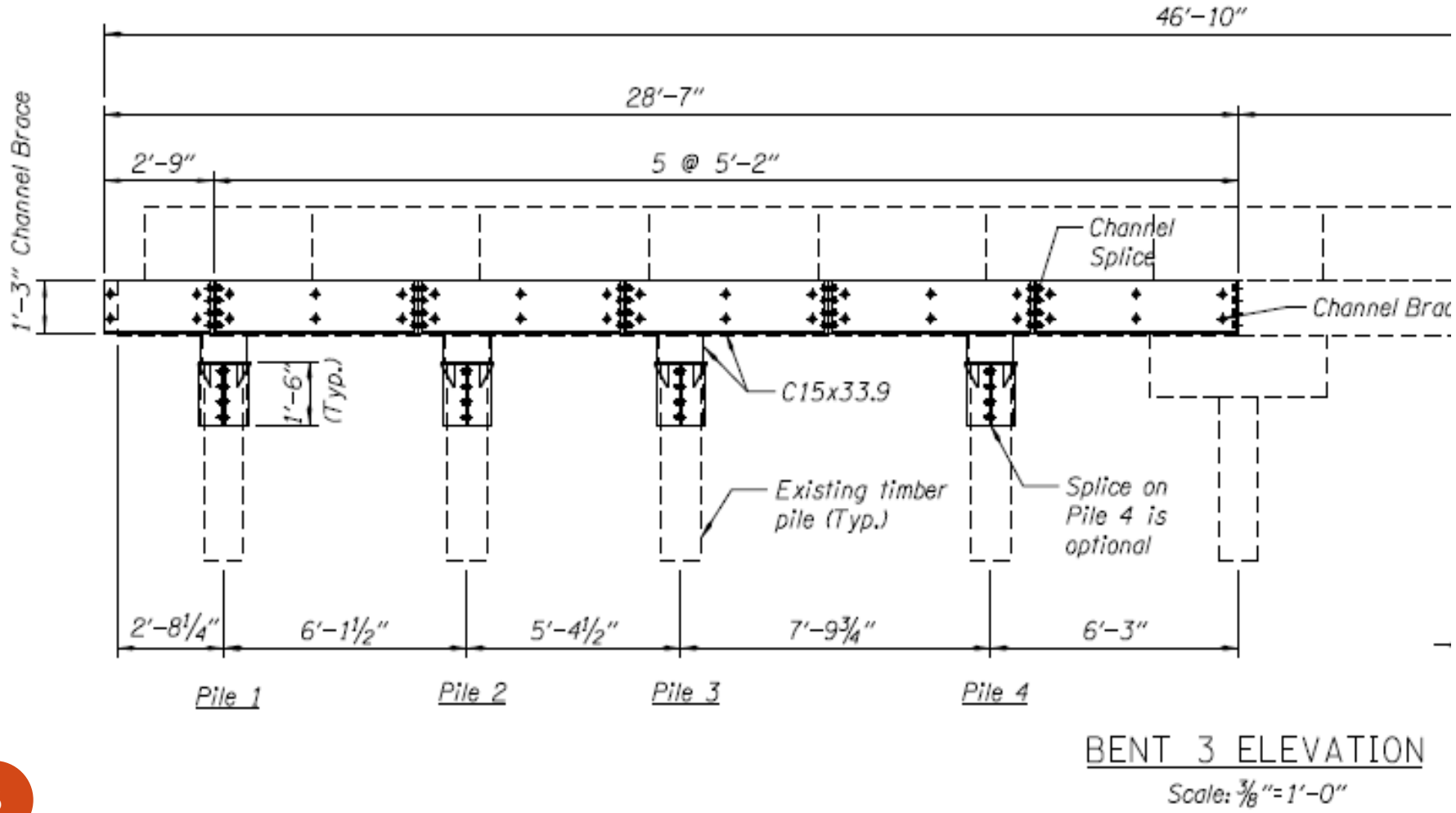
- Encapsulate with steel.

- Remove and Replace

- Epoxy Injection?

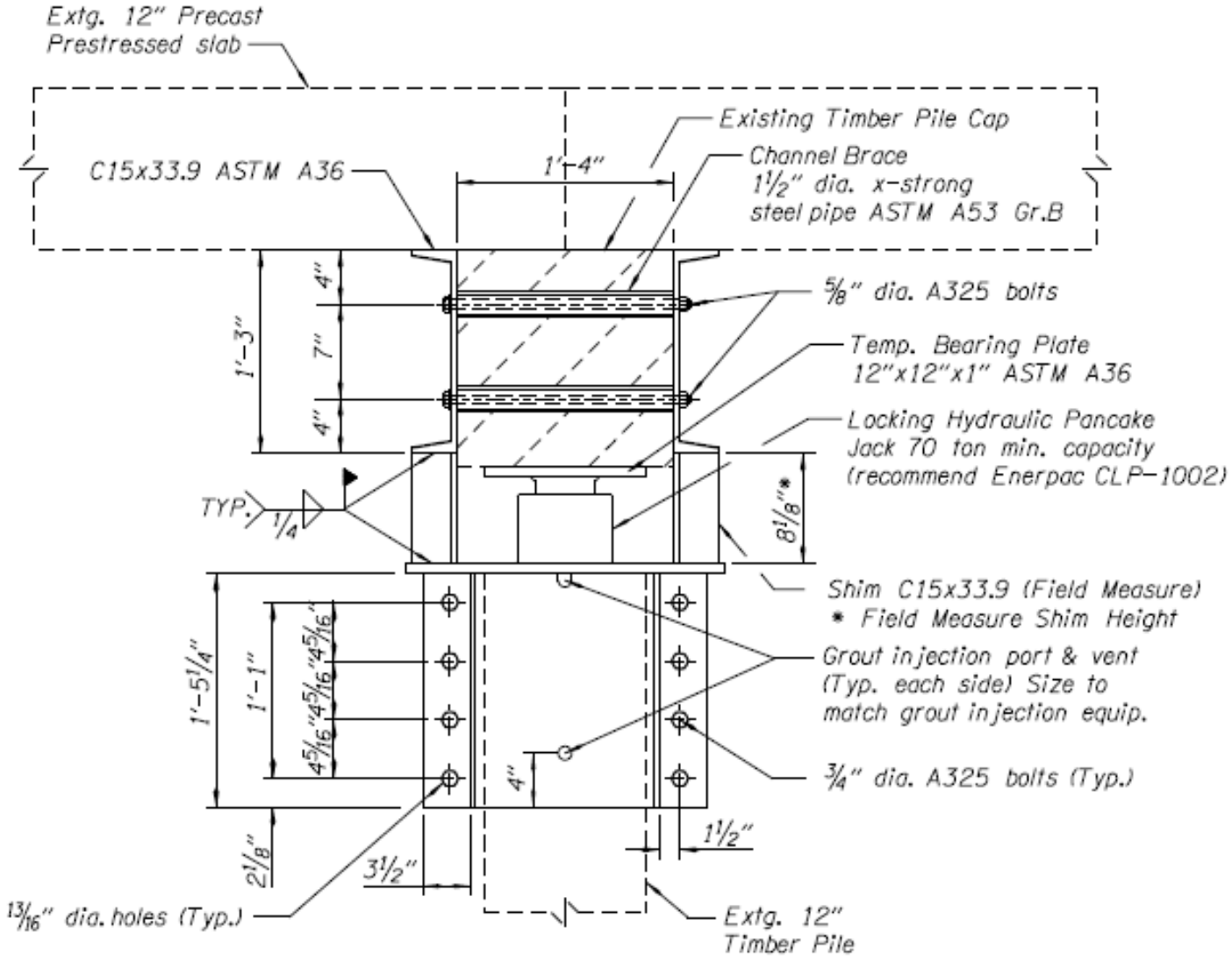
In-place timber cap repair

- Repairing timber pile cap in place using channels.




08/05/2015

Cross-section of cap



- Installing channel shims to connect steel cap to pile splice.

Temporary Cap Repair: Fayetteville

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- Bolting bolts to timber piles to support new beams

Temporary Cap Repair: Fayetteville

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Timber Cap Replacements

- Timber member usually replaced with Steel H Beam of similar size.
- Requires shoring the structure while old cap is removed and new cap is installed.

Pile Clamps

- Use to jack and shore the superstructure during pile cap repairs.
- They have been in heavy use by ODOT bridge crews and Local Agency bridge crews.
- Crews had clamps fabricated to fit on square piles also.
- Bridge is typically left open to all traffic throughout the project.
- First used in 1980's?
- Video of replacement available on YouTube.

Replacing cap with pile clamps

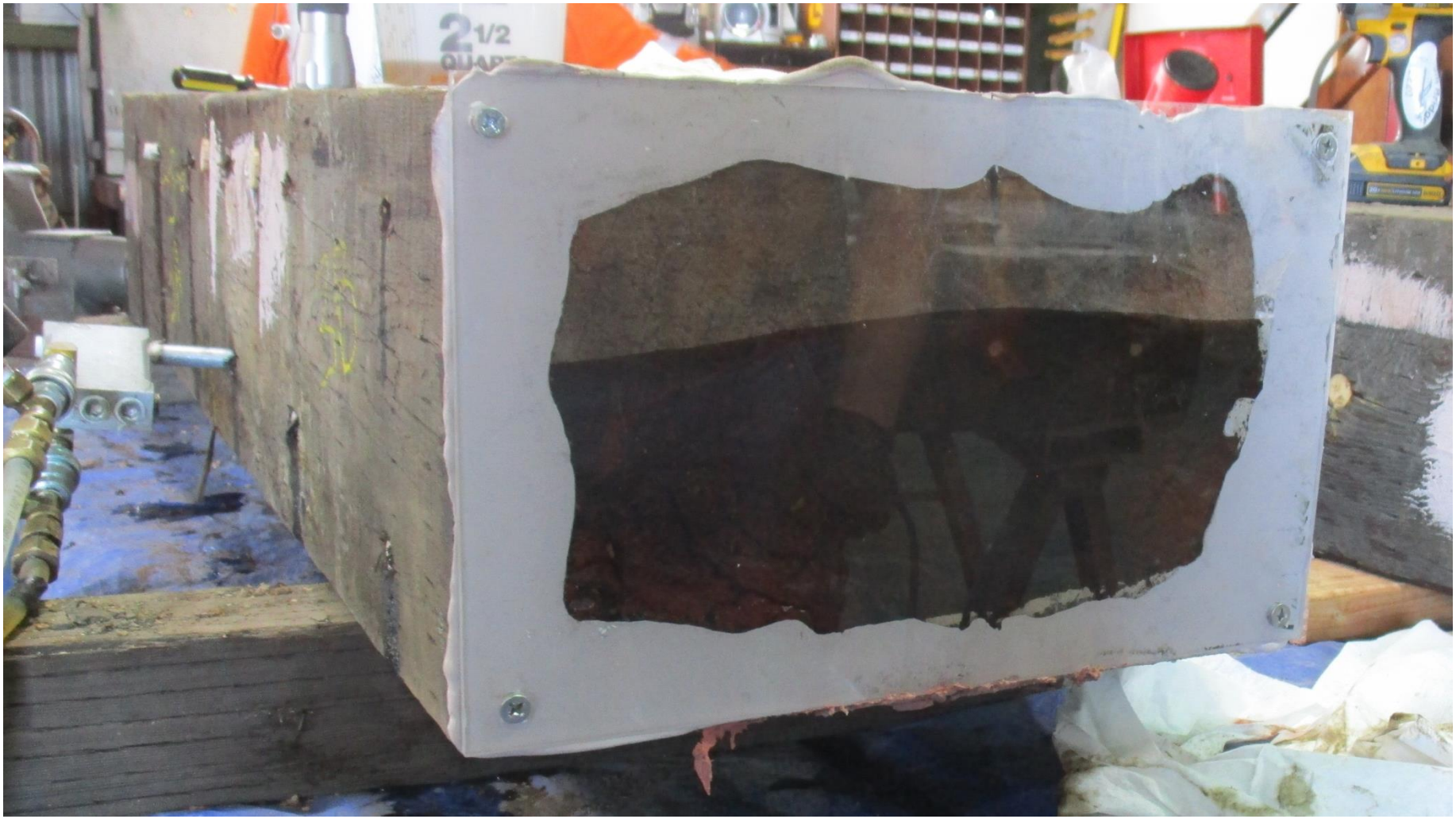
Jacking from the Ground


POWER TEAM

Epoxy Injection?

- Repair in place.
- Some caps don't function like beams but instead were used for construction and now act as a spacer between pile and girder.

Lets try it...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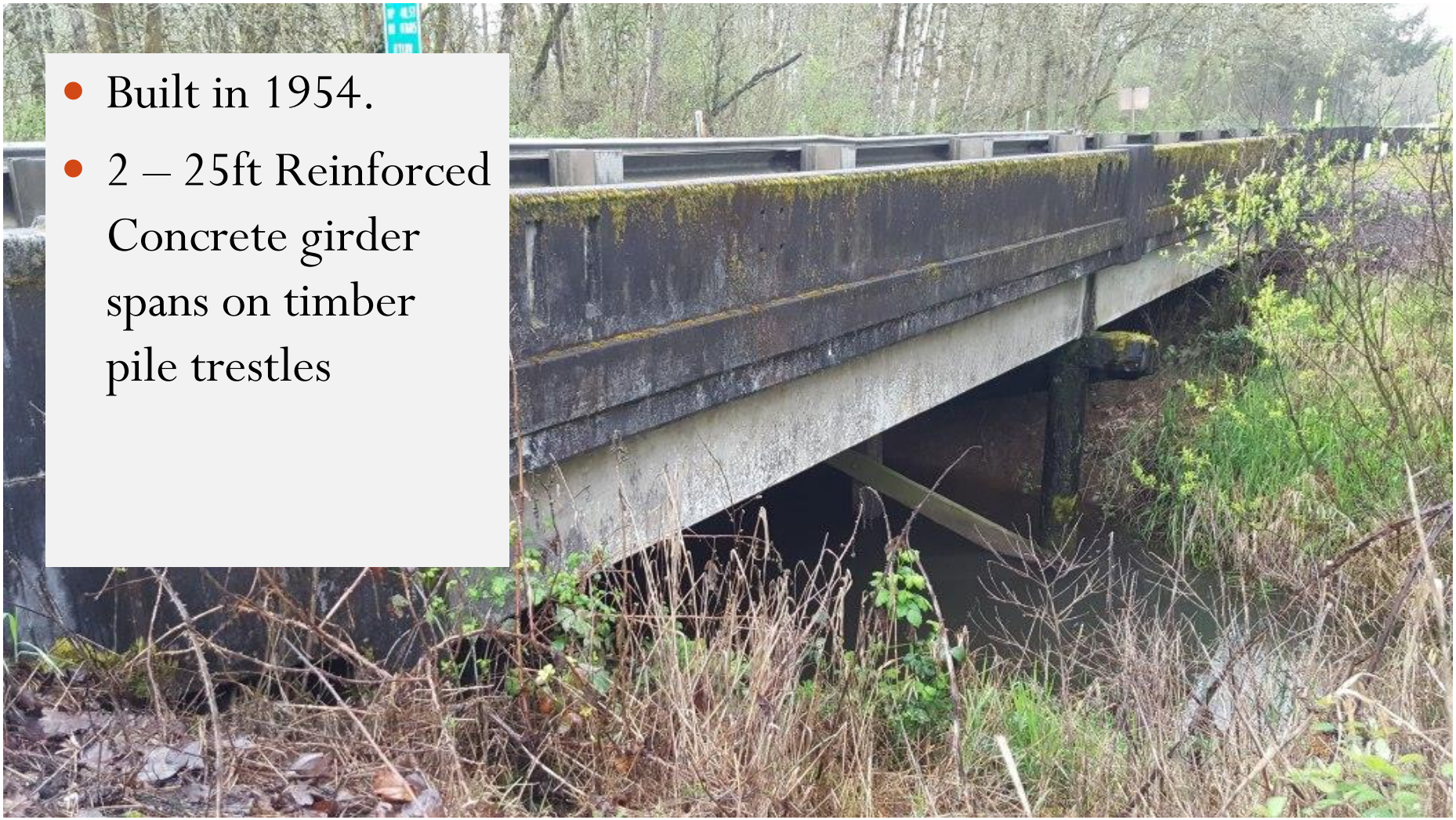
09/25/2017

Epoxy Injection Destructive Test

Cap Repair Summary:

- Encapsulation:
  - Useful when utilities or shoring constraints make full removal problematic.
  - $50,000 - $80,000.
  - Connection to piles can be difficult. (w/o is temporary)
  - Not feasible on abutments.
- Cap Replacement:
  - $25,000 - $65,000
  - Shoring dominates design constraints and overall cost.
- Epoxy Injection:
  - Not recommended at this time as a viable cap repair.

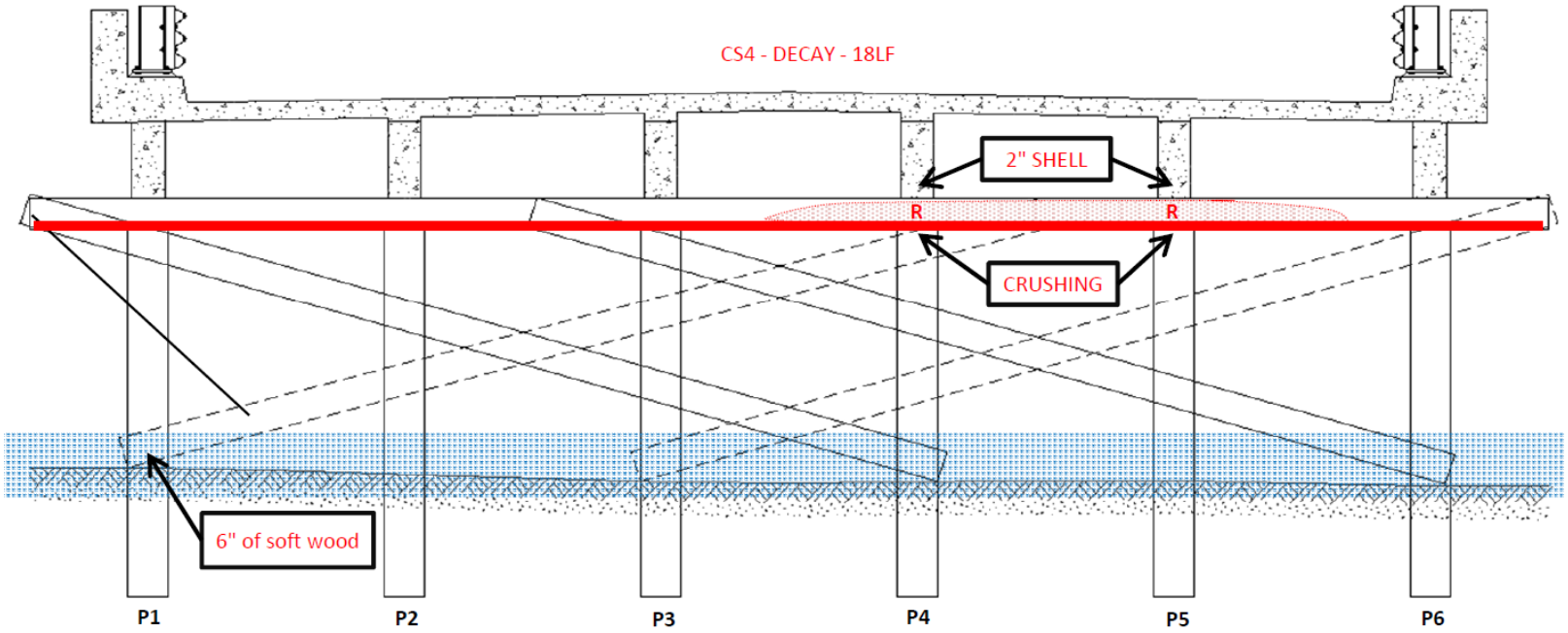
Dairy Creek Over Flow Bridge Case Study



- Built in 1954.
- 2 – 25ft Reinforced Concrete girder spans on timber pile trestles

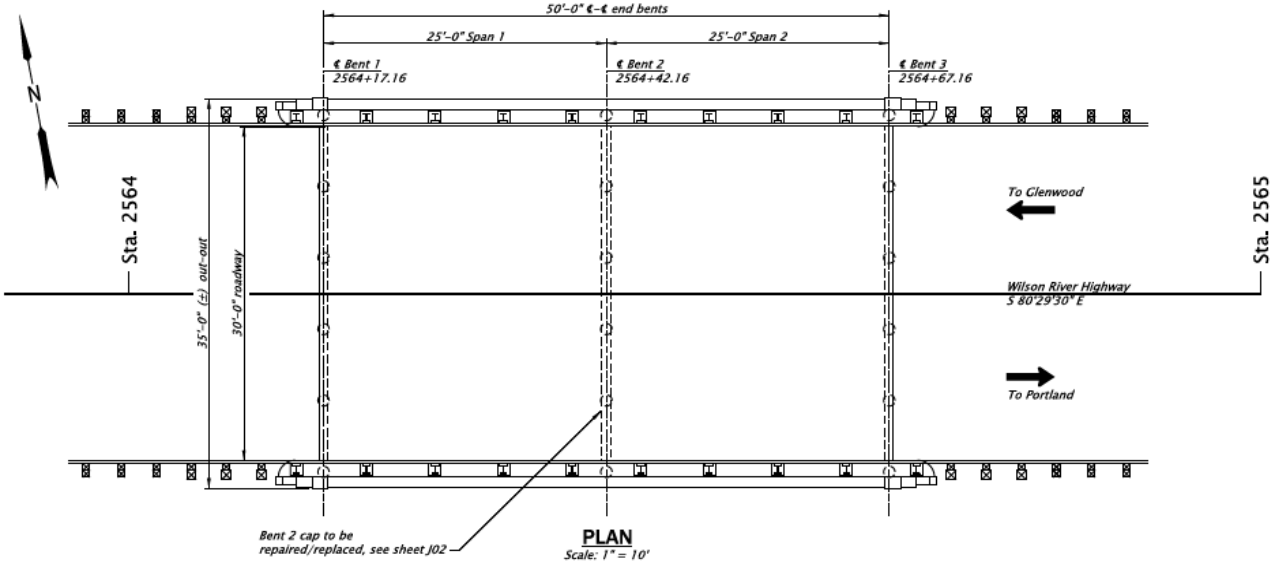
Timber Boring Report

- Inspected in April of 2018.
- Identified Significant rot and crushing above two interior piles.
- Substructure condition rating reduced to NBI 4.
- Load Posting Letter Drafted

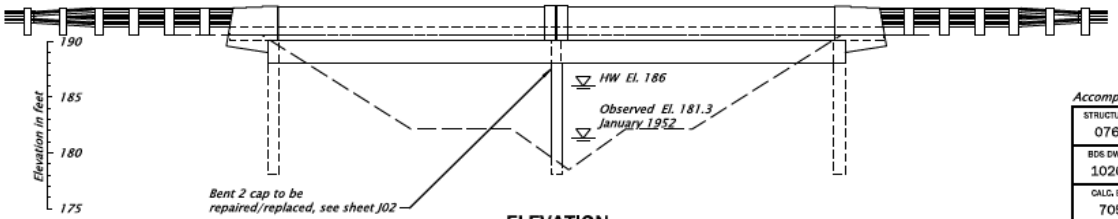



09/12/2018

Plans Delivered in August 2018

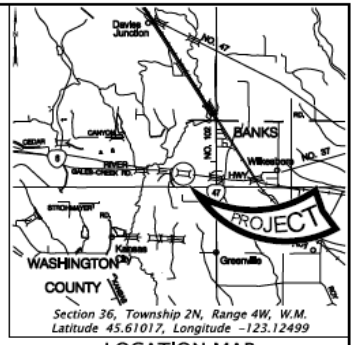


PLAN
Scale: 1" = 10'



ELEVATION
Scale: 1" = 10'

NOTE:
Elevations shown are based on National Geodetic Vertical Datum 1929 (NGVD29).



LOCATION MAP
No Scale

GENERAL NOTES:
Limit traffic speed to 20 MPH during jacking.

Provide all materials and perform all work according to the Oregon Standard Specification for Construction 2015.

Repair is designed in accordance with 2014 AASHTO LRFD Bridge Design Specifications, seventh edition, for the following live loads:

Strength II Limit State:
OR-STP-4D
OR-STP-4E
OR-STP-5BW

Provide structural steel according to ASTM specifications shown in the contract plans.

Produce welds according to the latest edition of AWS D1.5.

Provide Douglas Fir (non-laminated) timber conforming to Select Structural Grade according to WCLIB rules.

Incise and treat sawn members with pentachlorophenol type A to a minimum retention level of 0.50 pcf in accordance with AWPA Specification U1.

Accompanied by sheets J02 — J0x.

SCALE WARNING
IF THIS SCALE LINE DOES NOT MEASURE ONE INCH, THEN DRAWING IS NOT TO SCALE

STRUCTURE NO.	07685
BDS DWG NO.	102082
CALC. BOOK	7053
HWY: 037 M.P.: 48.57	
COUNTY	YAMHILL
DATE	August 2018

REGISTERED PROFESSIONAL ENGINEER
58,420
Digitally Signed
OREGON
JULY 21, 1998
SEAN WHITE
RENEWS: 06-30-2020

OREGON DEPARTMENT OF TRANSPORTATION

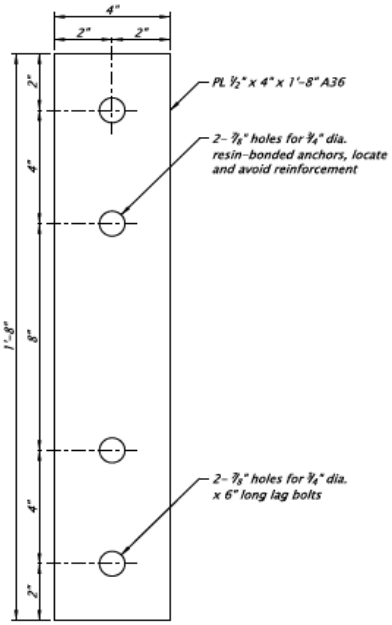
Dairy Creek Overflow_Hwy37_MP 48.57

MAJOR BRIDGE MAINTENANCE
WILSON RIVER HWY, MP 48.57
WASHINGTON COUNTY

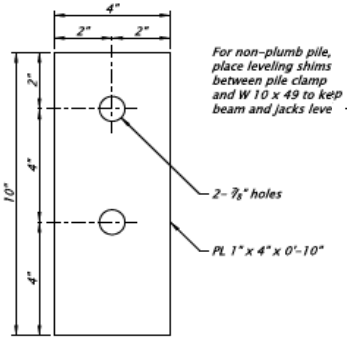
Designer: Sean J. White, PE — Reviewer: Matthew A. Stucker, PE
Drafter: Joe Tilman — Checker: Travis J. Kinney, PE

PLAN AND ELEVATION — SHEET NO. J01

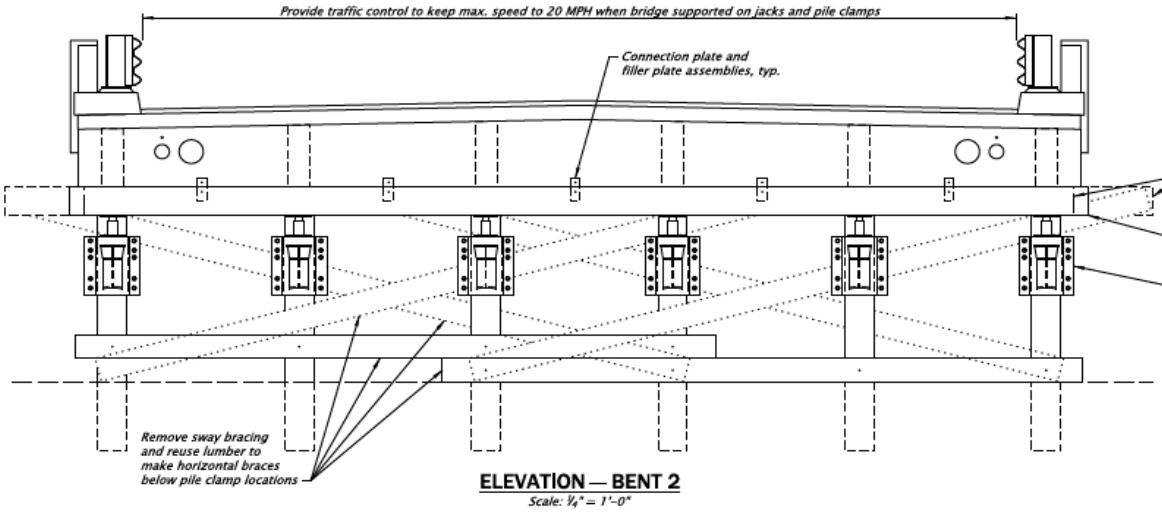
Jacking Plan



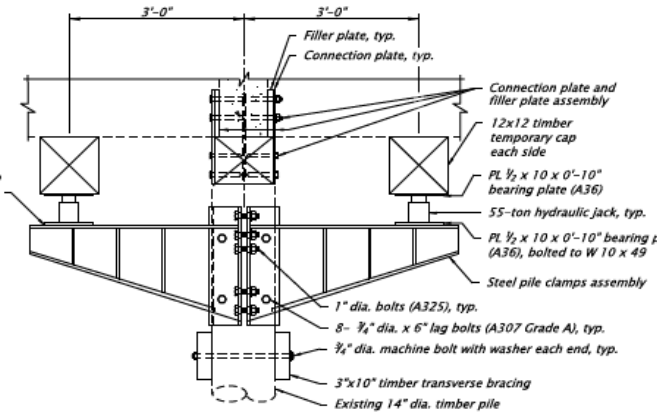
CONNECTION PLATE
Scale: 3"=1'-0"



FILLER PLATE
Scale: 3"=1'-0"



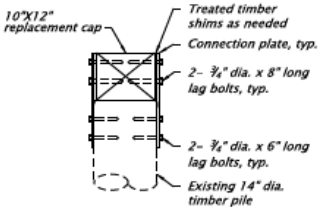
ELEVATION — BENT 2
Scale: ¼" = 1'-0"



SECTION AT TIMBER PILE
Scale: 1/2"=1'-0"

TIMBER CAP REPLACEMENT CONSTRUCTION NOTES:

1. Remove sway bracing and reinstall horizontally.
2. Install pile clamps with wood shims as needed to get uniform fit.
3. After bringing snug tight, torque 1" dia. A325 bolts to 320 ft.-lbs.
4. Install eight ¾" dia. by 6" lag bolts (A307 Grade A) per pile.
5. Restrict traffic speed.
6. Lift bent (limit to 1") and replace cap. Lift off expected at 1300 PSI (55-ton jack).
7. Lower bridge, open traffic, and install connection plates.



CONNECTION AT PILE
Scale: 1/2"=1'-0"

See sheet J01 for accompanying sheets and referenced drawings.

SCALE WARNING
IF THIS SCALE LINE DOES NOT MEASURE ONE INCH, THEN DRAWING IS NOT TO SCALE

STRUCTURE NO.	07685
BDS DWG NO.	102083
CALC. BOOK	7053
HWY: 037 MP: 48.57	
COUNTY	YAMHILL
DATE	August 2018

REGISTERED PROFESSIONAL ENGINEER
58,420
Digitally Signed Aug 23 2018 1:02 PM
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Dairy Creek Overflow_Hwy37_MP 48.57

MAJOR BRIDGE MAINTENANCE
WILSON RIVER HWY, MP 48.57
WASHINGTON COUNTY

Designer: Sean J. White, PE — Reviewer: Matthew A. Stucker, PE
Drafter: Joe Tillman — Checker: Trenda J. Kinney, PE

BENT ELEVATION — SHEET NO. J02

Install Timber Pile Clamps

Setup Scaffolding

Lateral Bracing

Get Pile Clamps Into Position


09/12/2018

Install Shims

Align Pile Clamps For Final Fit Check

Brings Bolts to Snug Tight

Use Torque Wrench

Install Lag Bolts

Get False Caps Under Bridge


Oregon
Department
of Transportation

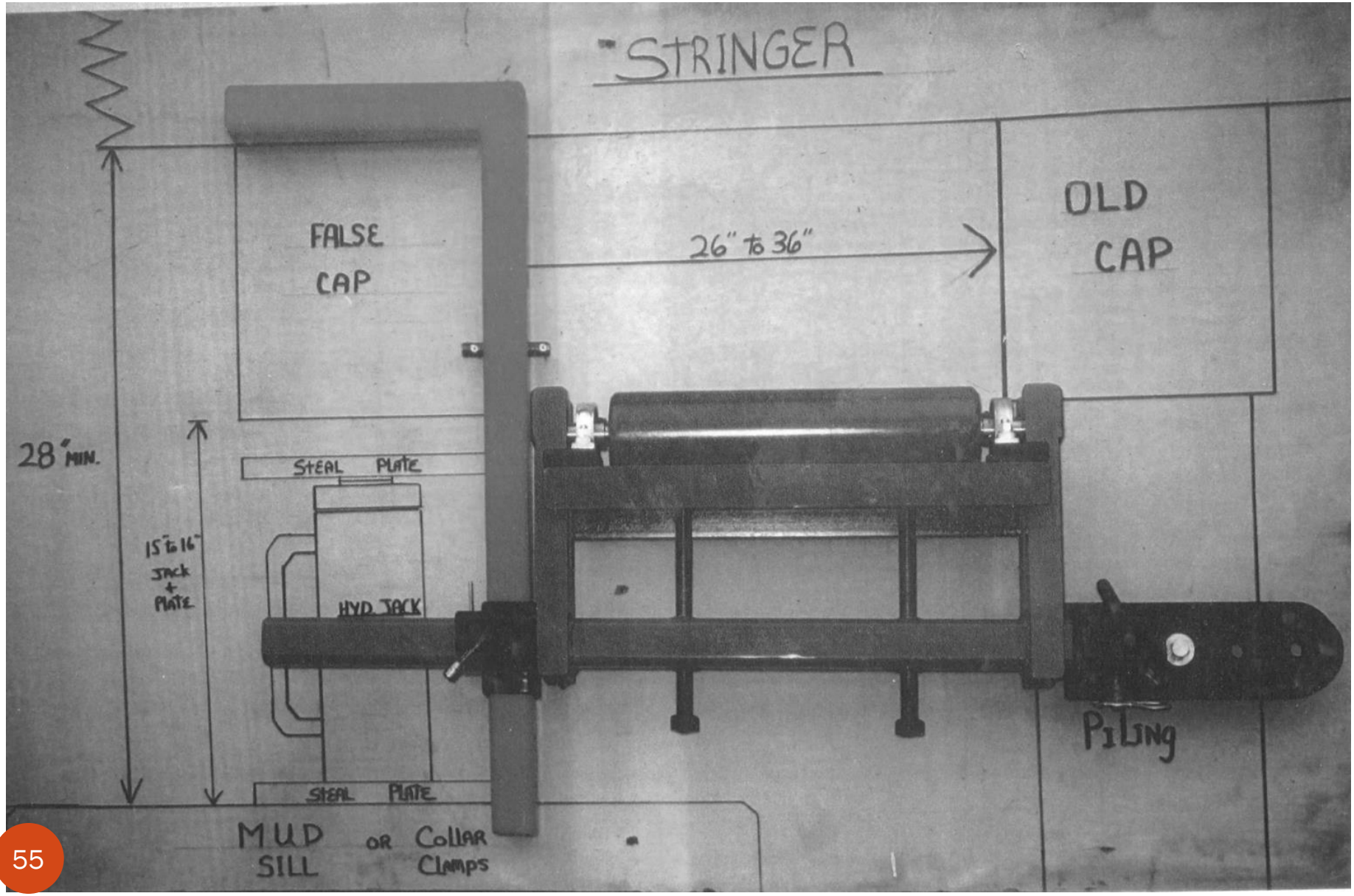
Cap on Roller Video

Rail Hangers

Secure False Caps in Place


BVA

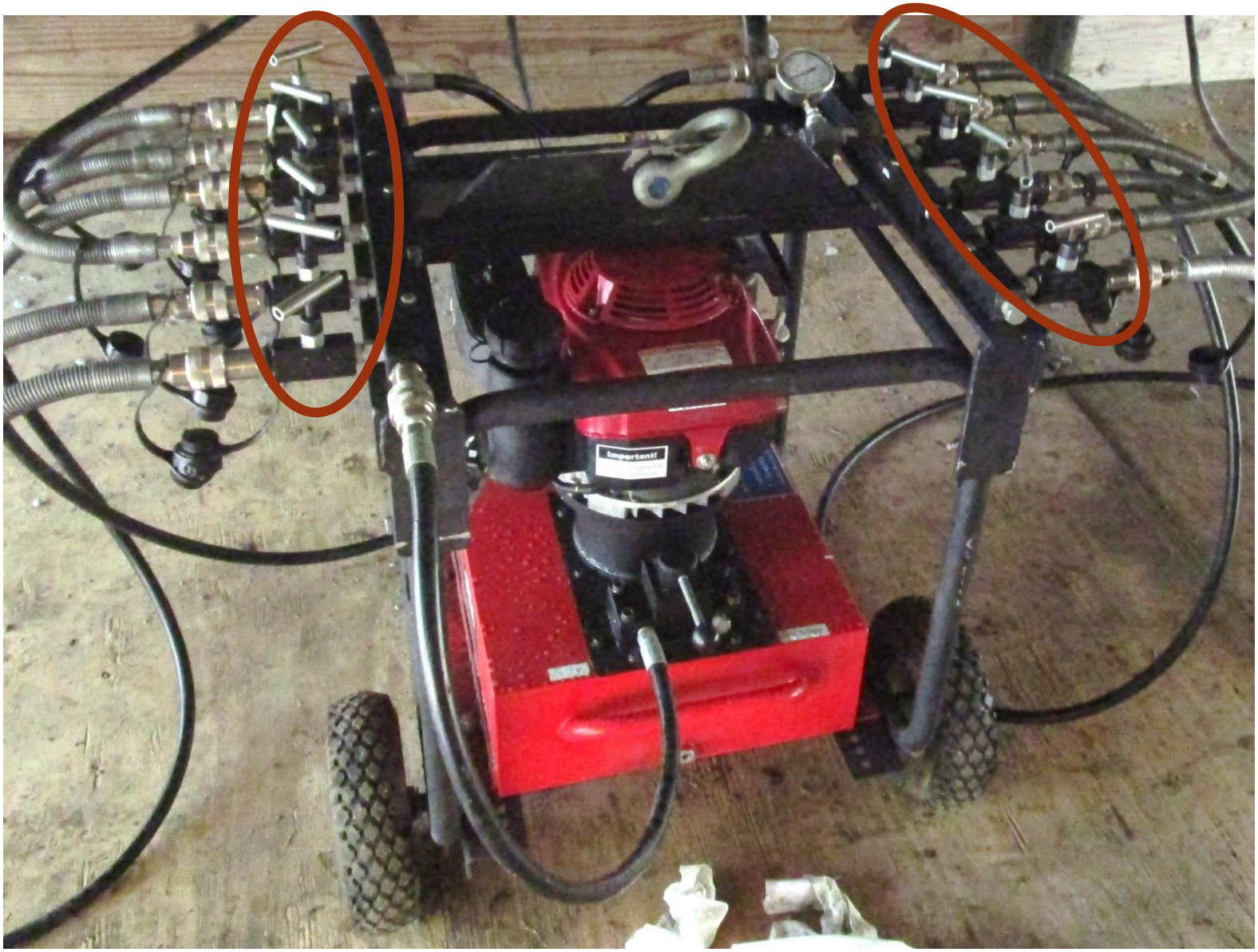
Setup Rollers




09/13/2018

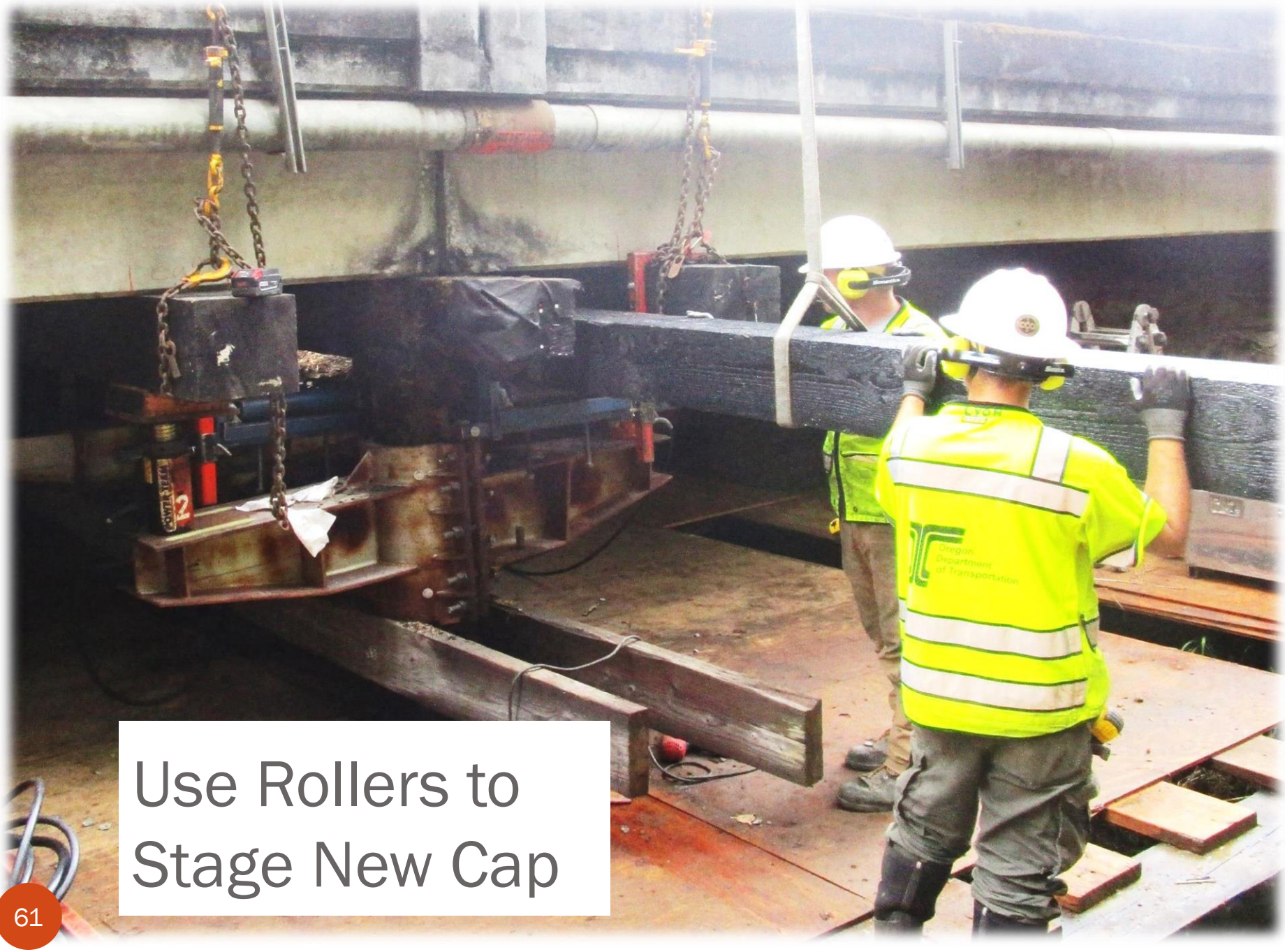
Transfer Load to False Caps

Use Shut off Valves to Lift Uniformly



Cut Drift Pins

Use Small Jack to Get Cap off Piles



Use Rollers to Stage New Cap


CABLE 1-877-445-6622
WARNING
09/13/2018

Just Pull the Cap Into Place

New Cap in Place

Contact Information:

Travis Kinney, PE

ODOT Bridge Maintenance Engineer

Email:Travis.J.Kinney@ODOT.State.OR.US

Phone: 503-986-4010

Questions