L&D 52 Wicket Sill Dewatering Box & Wicket Sill Replacement

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Outline

- Lock History
- Wicket Sill Issues
- Research and Solutions
- Fabrication of Wicket Dewatering Box
- Wicket Sill Repairs

Lock & Dam 52 History and Facts

•The original 600’ chamber was completed in 1929.

•The 1200’ “Temporary” chamber was completed in 1969.

• The two locks operate an average of 40 percent per year due to river elevations overtopping the lock walls.

•The most tonnage in the nation passes through L&D 52.

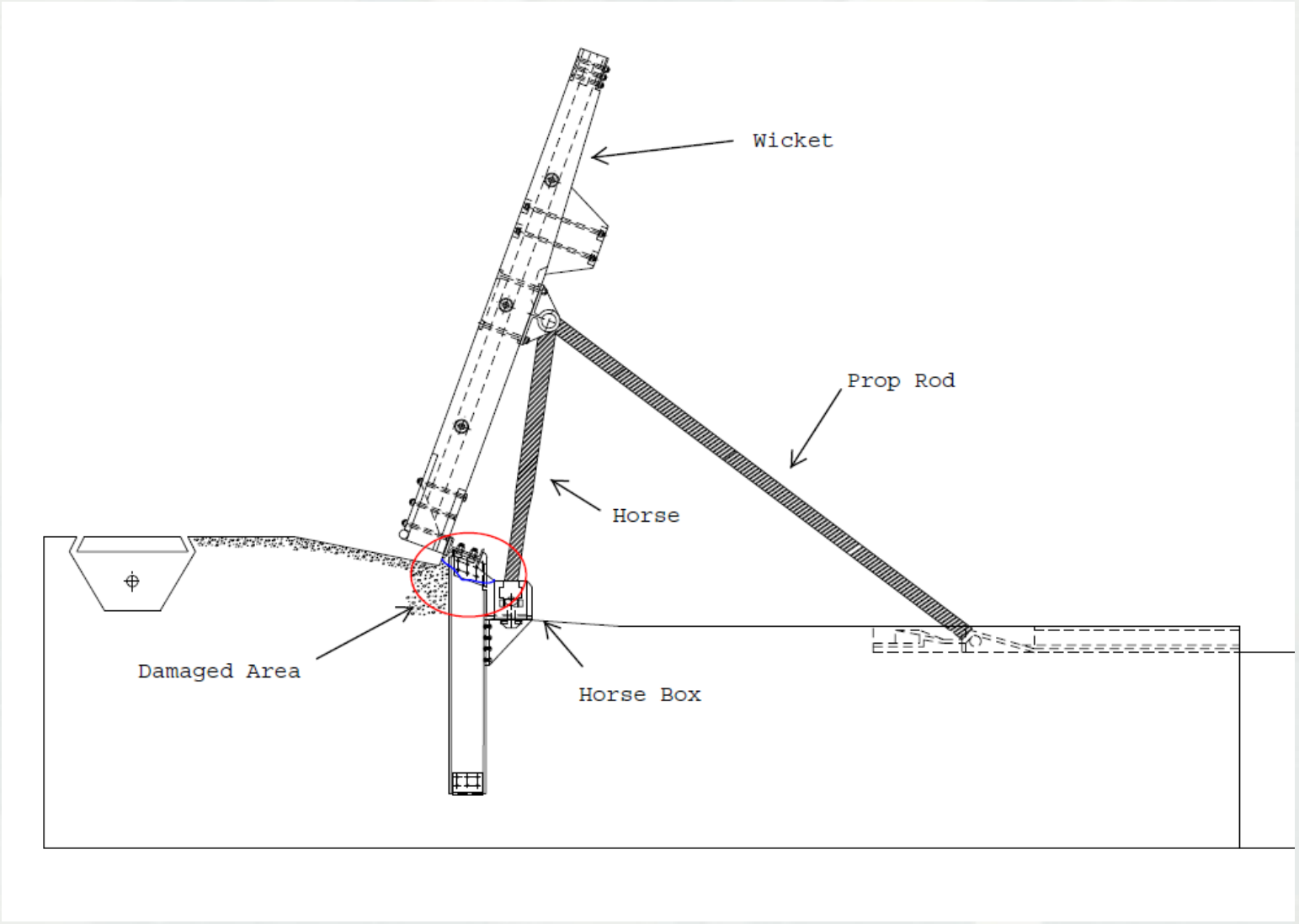
•The dam is constructed of navigable pass wickets, chanoine weir wickets, bebout weir wickets, 3 bear traps, and a fixed weir.

•Olmsted Lock & Dam will replace Lock & Dam 52 & 53, the last low lift locks on the Ohio River

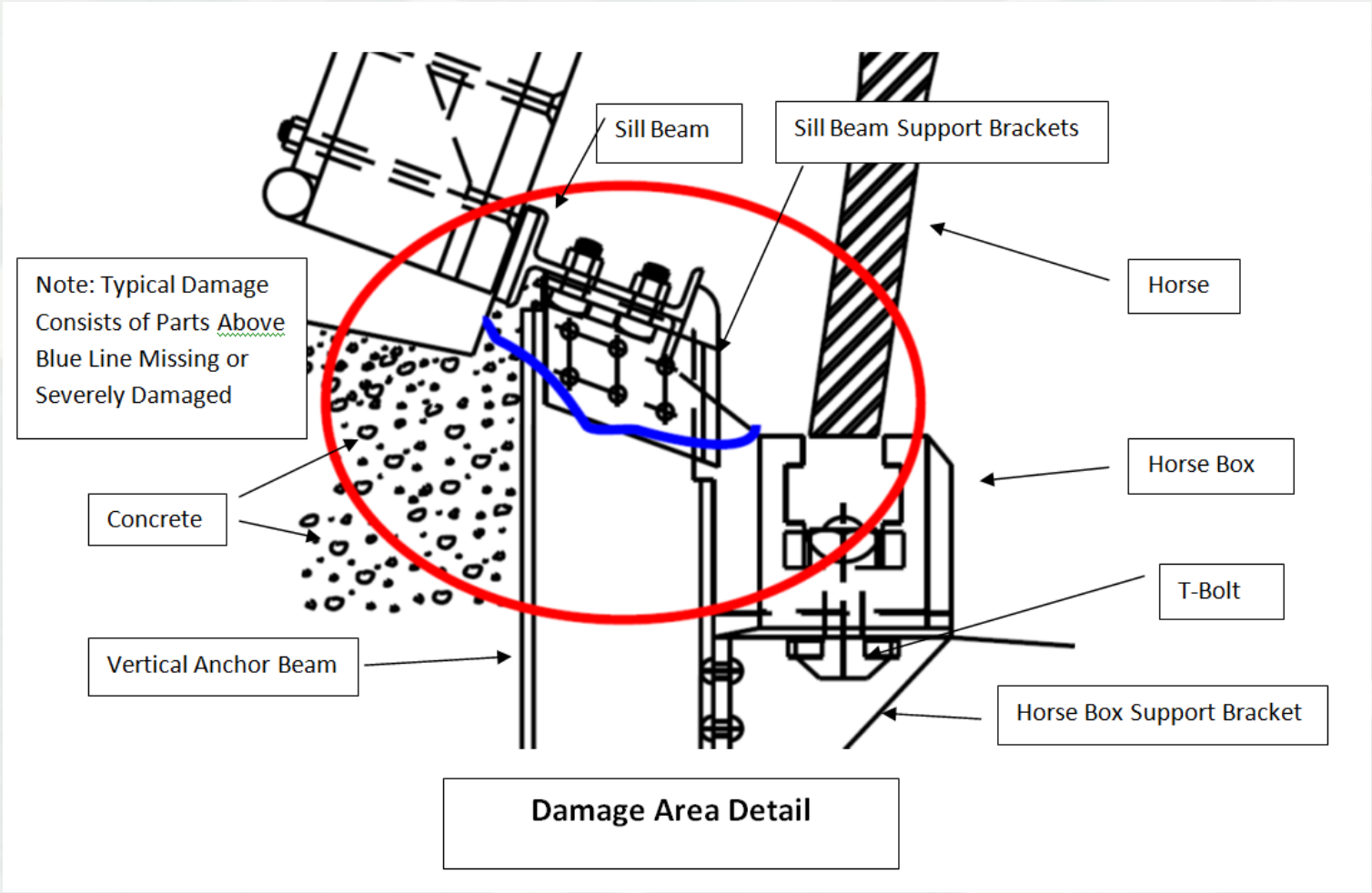
Locks & Dam 52


LOCKS AND DAM 52
NAVIGABLE PASS
BEBOUT WEIR
FIXED WEIR
MAIN CHAMBER
AUXILIARY CHAMBER
CHANOINE WEIR
BEAR TRAPS

Locks & Dam 52 Wicket Sill Damage

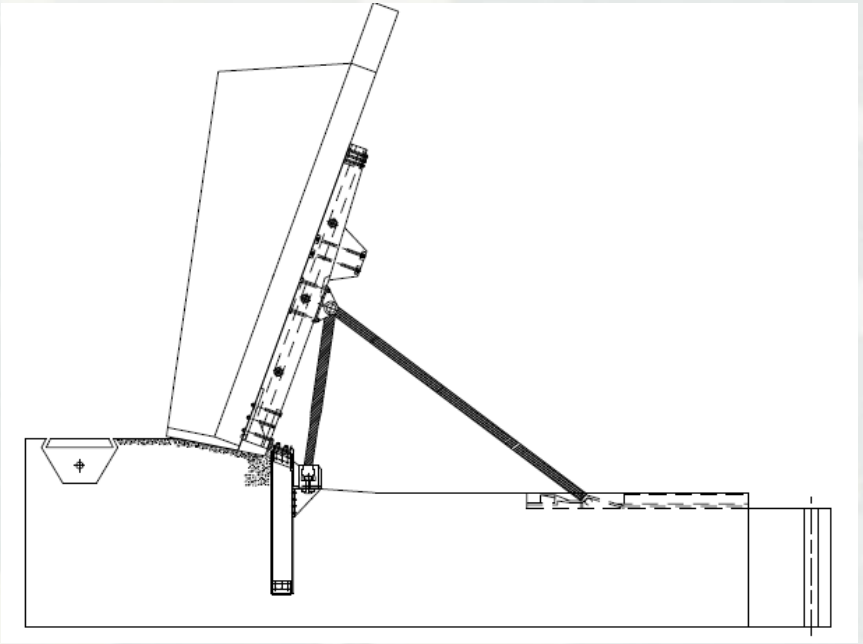


Locks & Dam 52 Wicket Sill Damage



In some locations on the chanoine weir the wicket travels past the sill and rests on the horse. The t-bolts were not designed for that shear load.

Deflector Box



Repairs were usually performed with the deflector box which spans two wickets. The two wickets can then be removed and replaced along with other wicket components by divers on the downstream side.

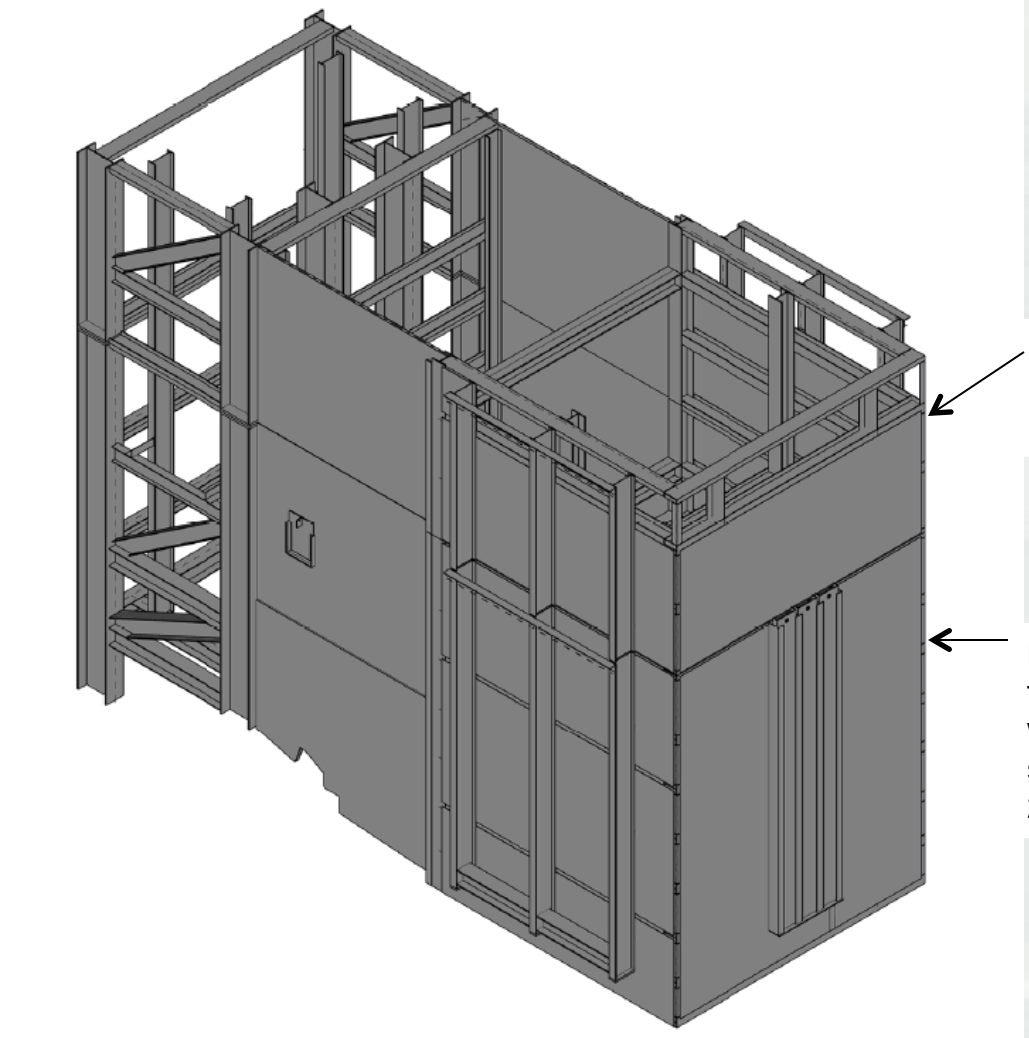
Rock Island District

LRL Operations & Engineering made a site visit to Rock Island District to observe their wicket dewatering box & repairs.

Rock Island District

Dewatering box working conditions

LRL Wicket Dewatering Box

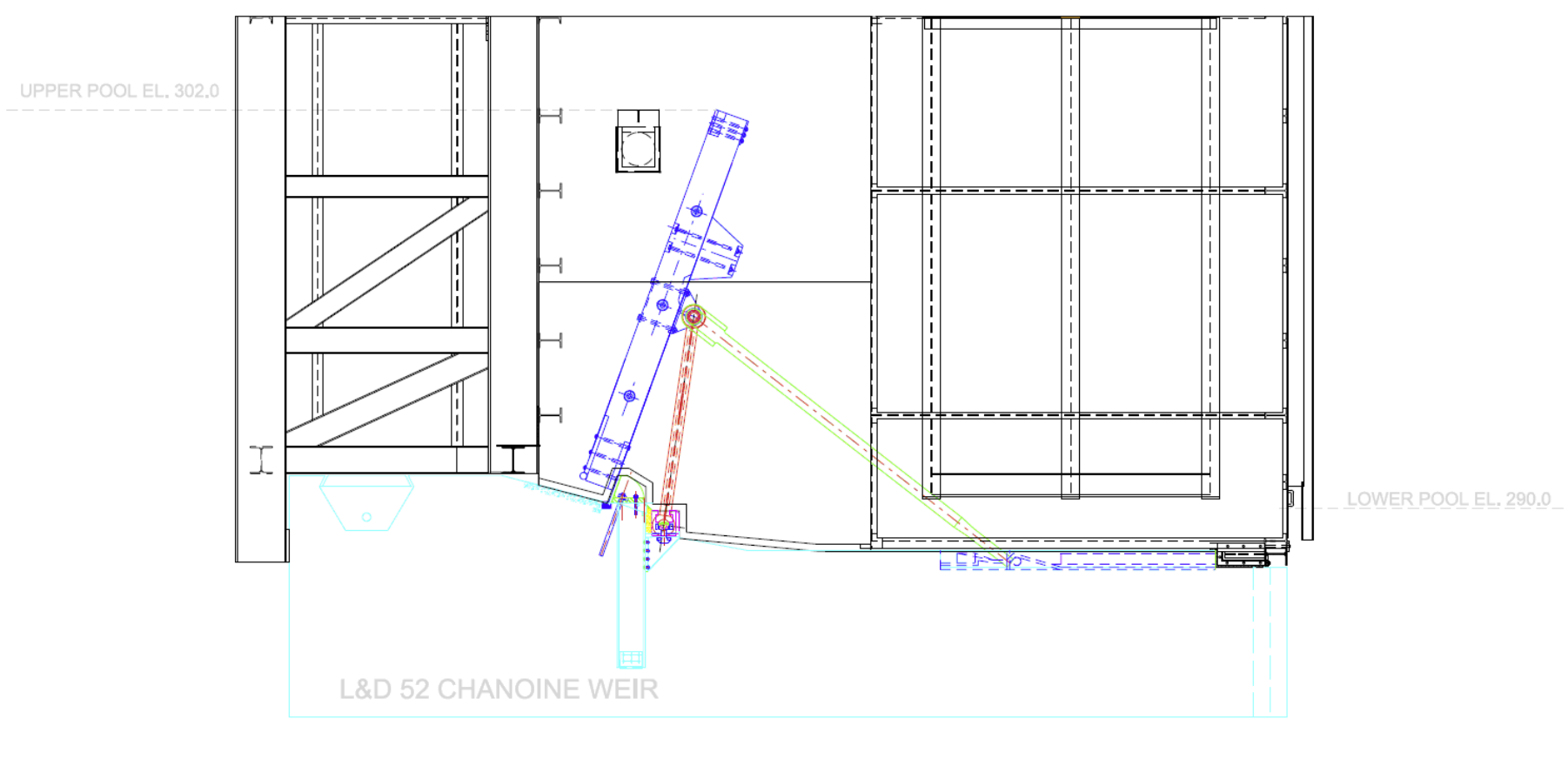


Top section is added for the navigable pass wickets

Bottom section is used for the chanoine weir wickets. Only the bottom section was fabricated in 2013.

ED based the wicket dewater box design from Rock Island's wicket dewatering box, but modified it to fit L&D 52 and 53's sill profile.

L&D 52 Chanoine Weir Profile



Fabrication

The box was fabricated in house by LRS. Photo of downstream section of the wicket dewatering box. The individual walls were fabricated inside the shop and then moved outside for assembly.

Fabrication

The skin sheets were seal welded inside and out, which cause heat shrinkage issues and warping on the W-beams. The beams had to be heated and cooled to get them plumb.

Fabrication

Upstream Side Wall

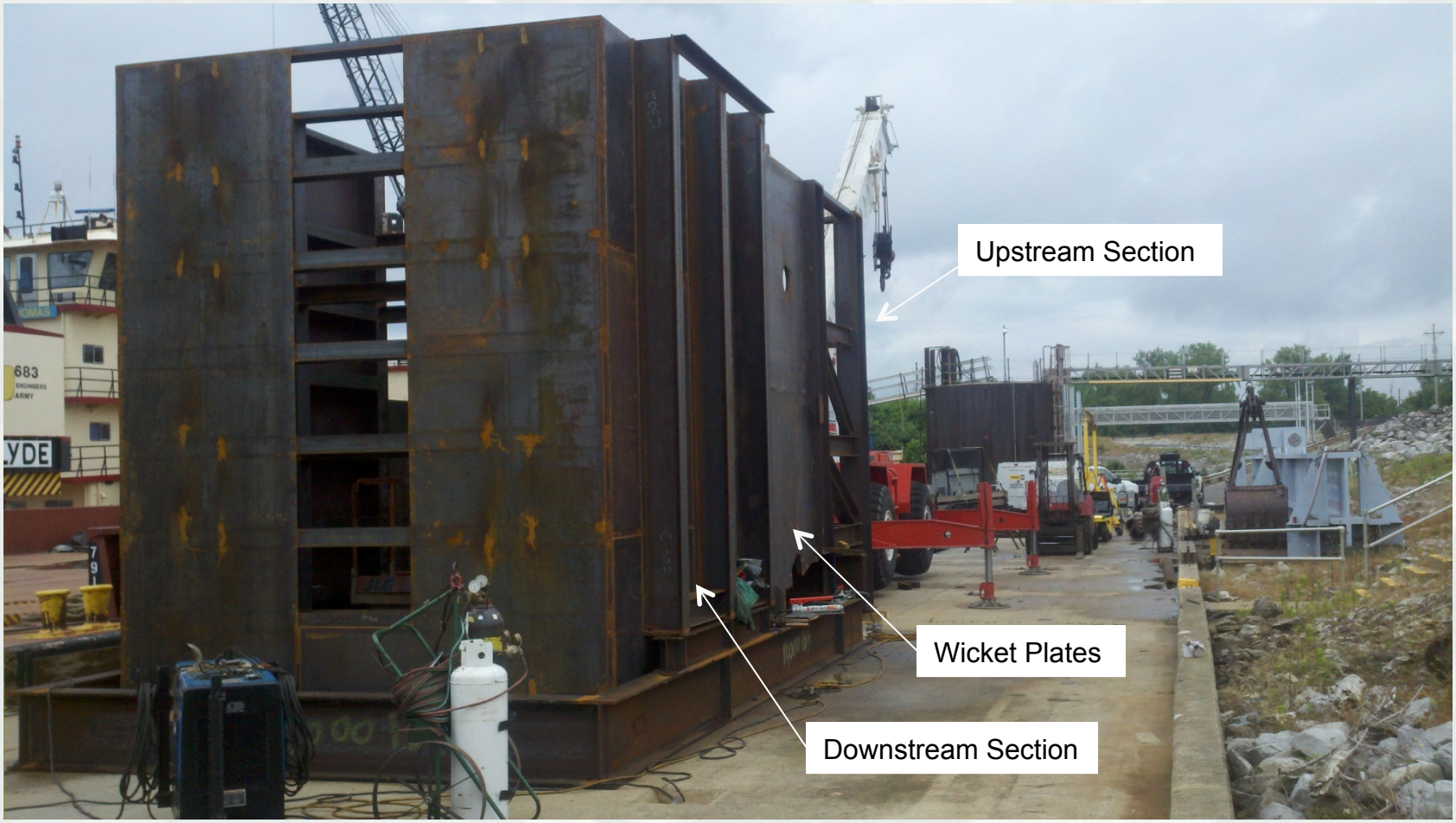
Fabrication

A dewatering box stand was fabricated for ease of box assembly and the changing of rubber seals. The box is able to be picked with be stand attached on bottom.

Fabrication

The box was moved down the hill on the esplanade in two sections, the upstream and downstream sections.

Fabrication



The upstream and downstream sections were aligned on the stand. The large wicket plates were dropped in from the top and welded to connect the upstream and downstream sections of the box.

Fabrication

The dewatering box main structure was fabricated in 2 months with a foreman, work leader, and 5 welders. All steel was cut to length, coped, beveled, and drilled by an outside steel supplier prior to delivery.

Fabrication

LRS continued fabricating small items, sandblasting, and painting the box during the Winfield Tainter Gate Cylinder Replacement

Sill Repairs at L&D 52

Water conditions did not allow LRS to set the box at the failed sill locations. Other sill problem areas were identified prior to the repair for higher river flow conditions.

Sill Repairs at L&D 52

Sill Repairs at L&D 52

The box was set and proceeded to dewater.

Sill Repairs at L&D 52

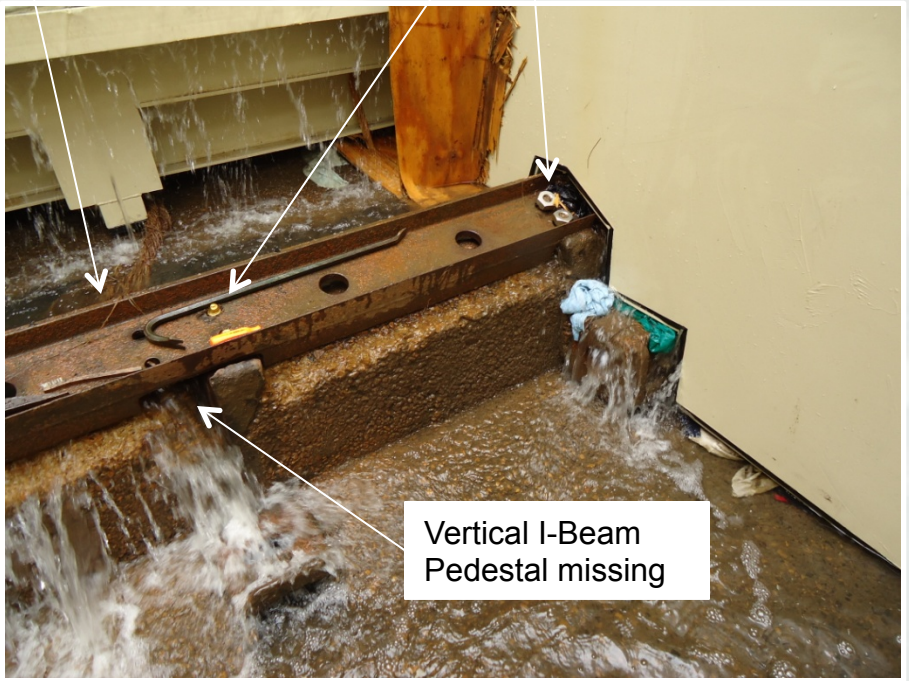
The box is 12 ft. wide, but only the middle 8 ft. of sill can be replaced per setting.

Sill Beam Condition

Typical Sill Beam Condition

The Horizontal Sill Beam had been replaced by divers

Missing and loose sill nuts.



Vertical I-Beam Pedestal missing

The horizontal sill beams that have been replaced by divers, usually the nuts are loose or missing because the divers are unable to tighten them due to the deteriated brass bolts.

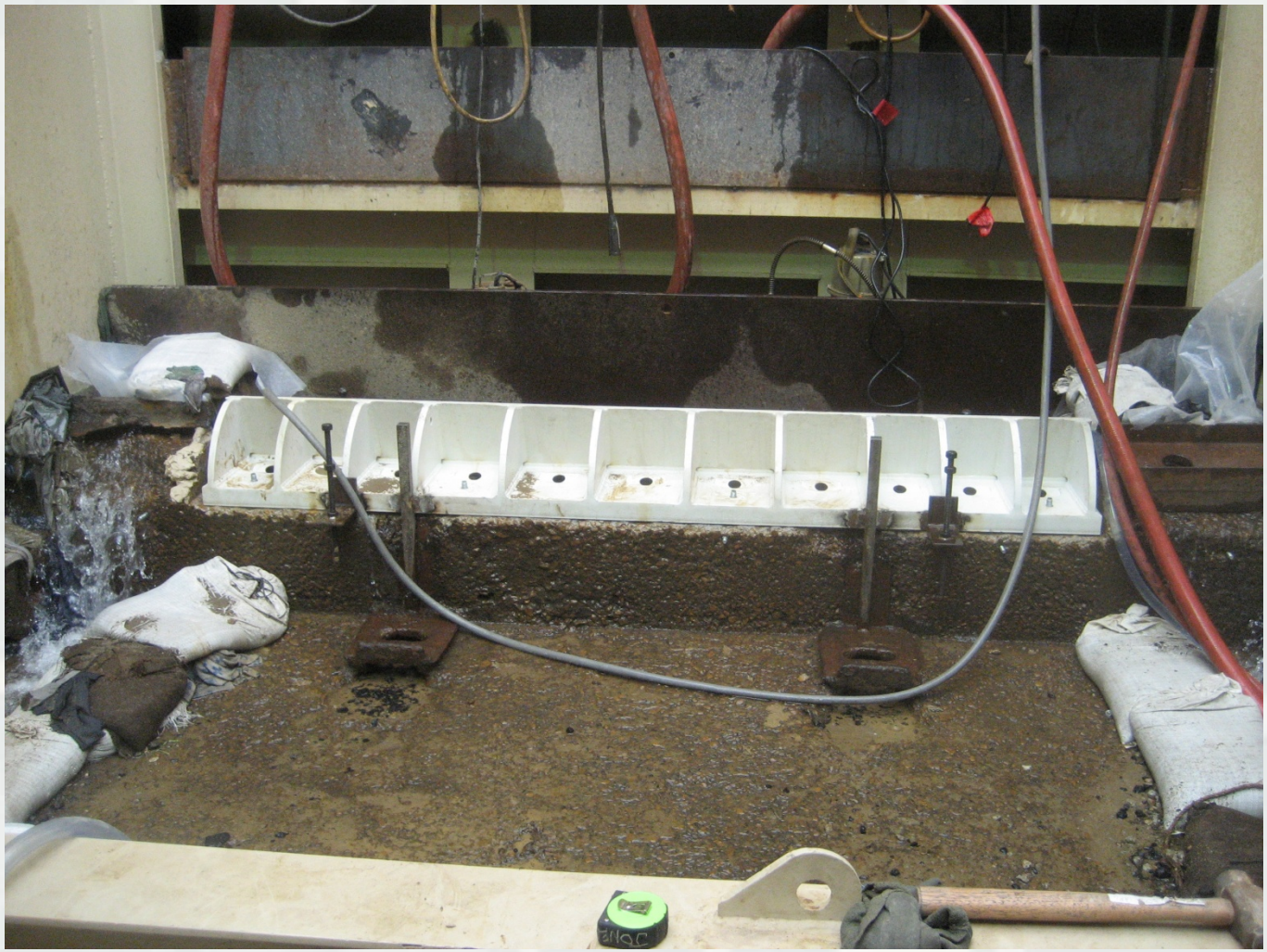
Sill Beam Condition In Second Location

The left wicket was bearing only on the concrete.

Sill Beam Repair Process

The wickets, horizontal sill beam, and the concrete is removed.

Sill Beam Repair Process



The new sill beam is positioned, bolted down with small mechanical anchors, and the large anchor holes are drilled.

Sill Beam Repair Process

The new sill beam is removed, the holes are cleaned.

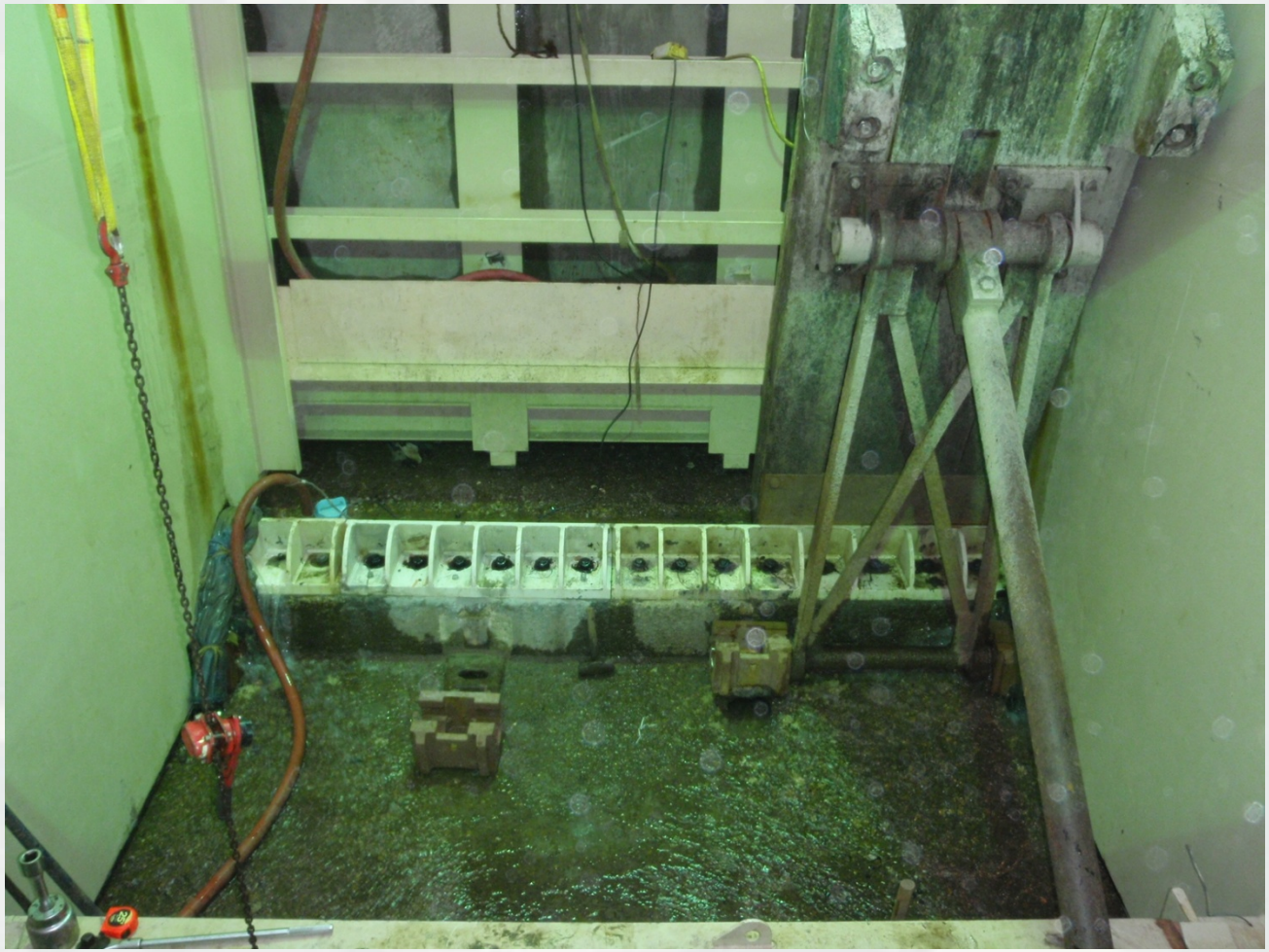
Sill Beam Repair Process

The large anchor holes were plugged. Underwater grout is applied under the sill beam and in the trench just upstream of the sill beam so water doesn't jet underneath.

Sill Beam Repair Process

The sill beam is set back in place. The large epoxy anchors are installed. The grout and the epoxy cures at the same time.

Finished Product



Sealing around the box during the dewatering and waiting for the grout and epoxy to cure are the most time consuming steps. It would be beneficial to have a rapid cure underwater grout with the correct properties.

LRS Is Currently Fabricating the Top Section of the Box for the Pass Wickets

Any Questions??