Evaluation of Embedded Wall Quoin Rehabilitation Methods

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Common Problems

- Markland and Meldahl are projects with similar designs, similar ages, and similar levels of traffic.
- Wall quoins are embedded structural steel and flush with the surrounding second pour concrete. Non replaceable and not adjustable.
- The project design life was 50 years.
- They just hit the big five O.
- Repairs with epoxies have extended service life.

Different Approaches

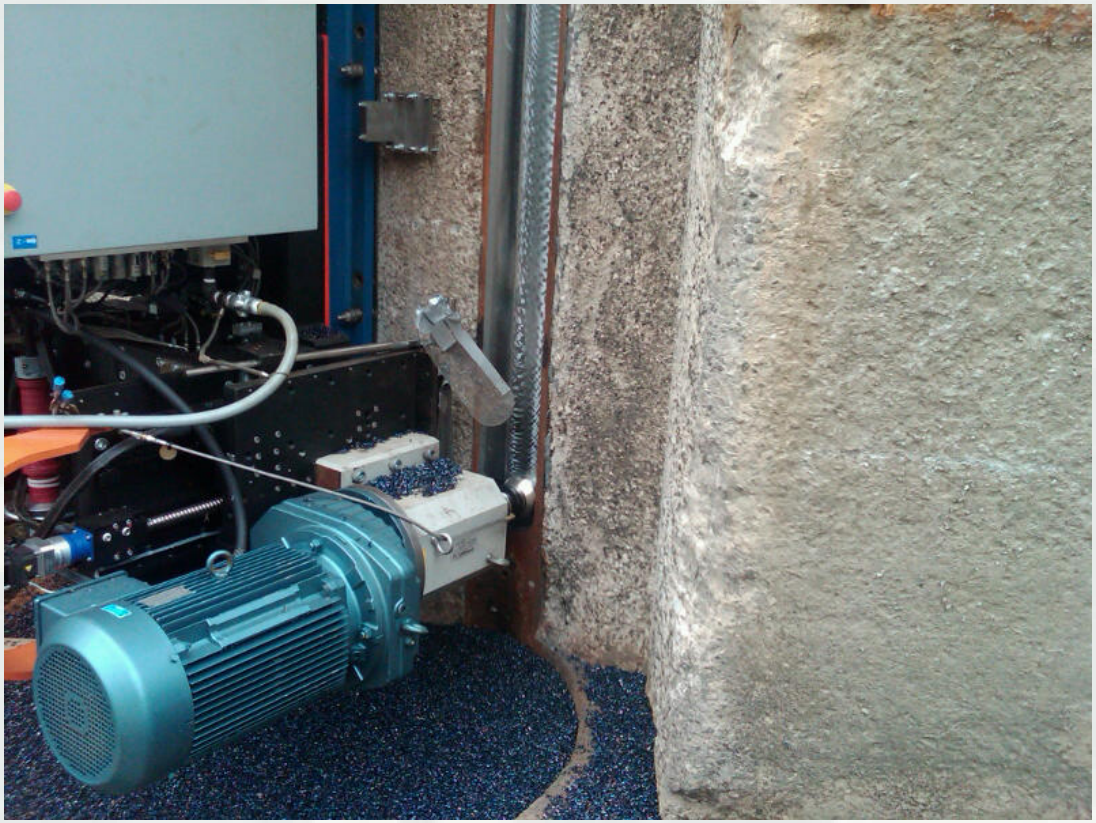
- At Markland the wall quoins were milled down for new removable replacement blocks. This required the purchase of two milling machines and replacement blocks.

- At Meldahl the second pour concrete was removed along with all the embedded steel. This required a contract for a large amount of concrete removal and the purchase of new embedded steel framing and new replaceable blocks.

End Result

- Both projects will have wall quoin blocks that are adjustable and replaceable in the future
- Markland's are stainless steel clad on the bearing surface and backed with epoxy
- Meldahl's are carbon steel and backed with zinc
- Both projects will have new miter gates
- Both projects will have new or refurbished anchorages
- Meldahl will now have horizontal seals

Markland Milling



Wall Quoin Milling

Milling Complete

Finished Wall Quoin

Meldahl Concrete Removal

Removed Quoin Section

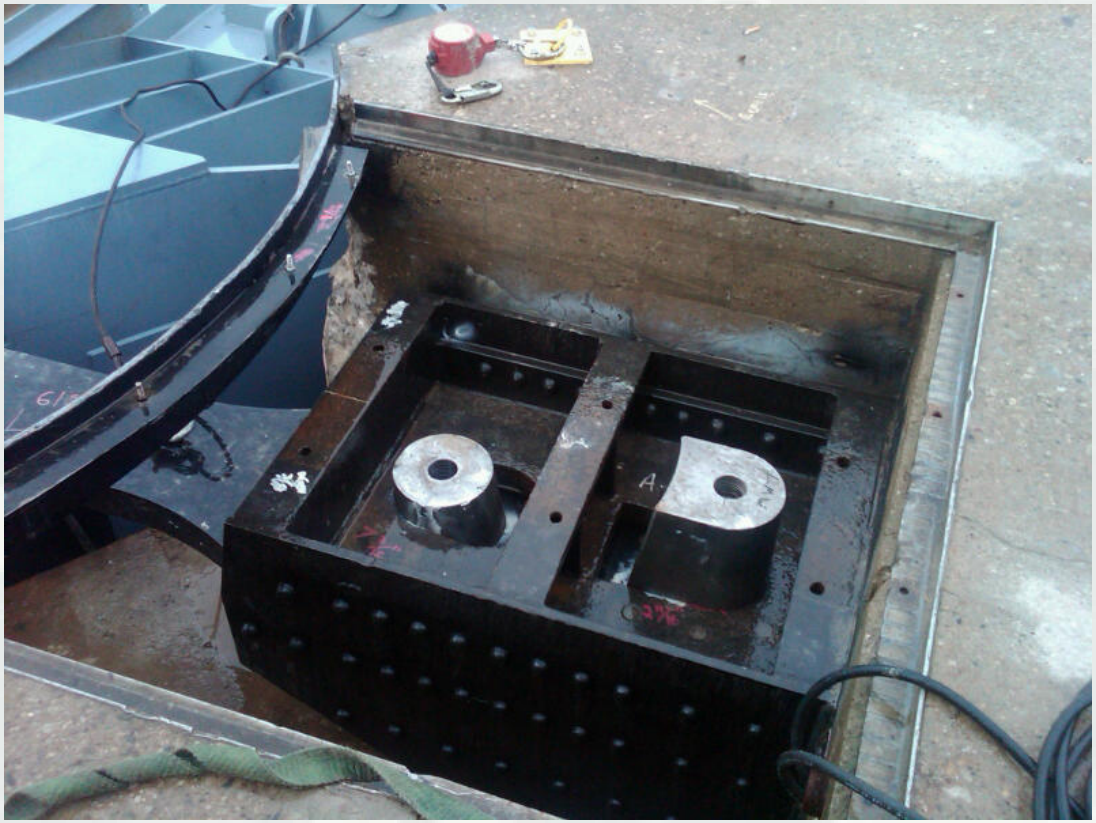
Concrete Removed

Finished Slot

Markland Anchorage Work

- Existing embedded anchorage reused
- Heavy riveted structure analyzed for fatigue by Louisville Engineering Division. No concerns or problems found.
- Anchorages were sandblasted, inspected for cracks and defects by NDT methods. Anchorages were painted and assembled using original style components but with improved material properties and inspection during fabrication.

Refurbished Markland Anchorage



Meldahl Embedded Anchorage

- The existing concrete around the anchorage was removed and the existing structure was modified to accept a new style anchorage per Huntington District Engineering Division. This was in response to the anchor arm failure at Greenup lock.

Meldahl Anchorage

Pintle Base Modifications

- Markland pintle bases were replaced to change to a fixed pintle and the existing bases were damaged when the gates fell.

- Meldahl bases were modified to make the pintles fixed.

Markland Pintle Base

New Pintle Base

Meldahl Pintle Base Modification

Similarities

- The heavy lift crane Shreve was used to remove, transport, and install miter gates.

- Both jobs were suspended due to high water and are scheduled to be finished this summer.

Markland Advantages and Disadvantages

- A - Milling is faster and retains existing embedded steel
- A - No contractor involvement or coordination
- D - Expensive and complicated machine to own/maintain and store
- D - Doesn’t fix possible embedded issues

Meldahl Advantages and Disadvantages

- A - Replaces all steel and permits extra rebar and structure
- A - Uses conventional equipment
- A - Contractor responsible for equipment
- D - Takes longer and dependant on contractor and procurement system
- D - Requires Corps support for contractor

Questions?