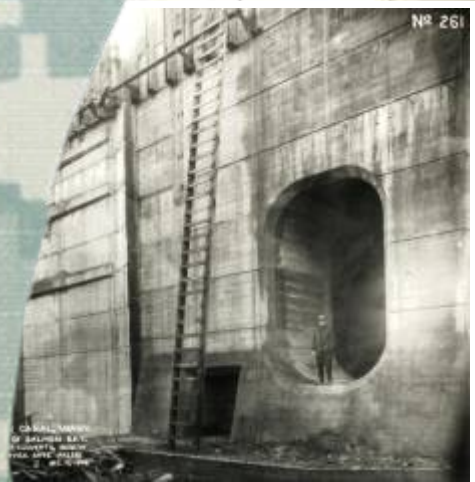
Stoney Gate Valves
Are Their Days Numbered?

-Hiram M. Chittenden Locks



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Mechanical Engineer

Seattle District

Draft January 12, 2013

US Army Corps of Engineers

BUILDING STRONG®

Agenda

- Brief project history
- Stoney Gate Valves – description
- Current condition of the valves
- Desired future for the valves
- Design status
- Discussion

Hiram M. Chittenden Locks – Quick Facts

- Connects the fresh water of Seattle's Lake Washington, Lake Union, and Salmon Bay to the salty tidal waters of Puget Sound.
- Consists of two sets of locks, a spillway, and a fish ladder.
- Serves the purposes of:

-Maintaining lake water levels at 20-22 ft.

-Allowing for boat traffic to and from Seattle's lakes to the Puget Sound.

-Preventing salt water penetration of the fresh water bodies of Seattle.

Hiram M. Chittenden Locks – Quick Facts

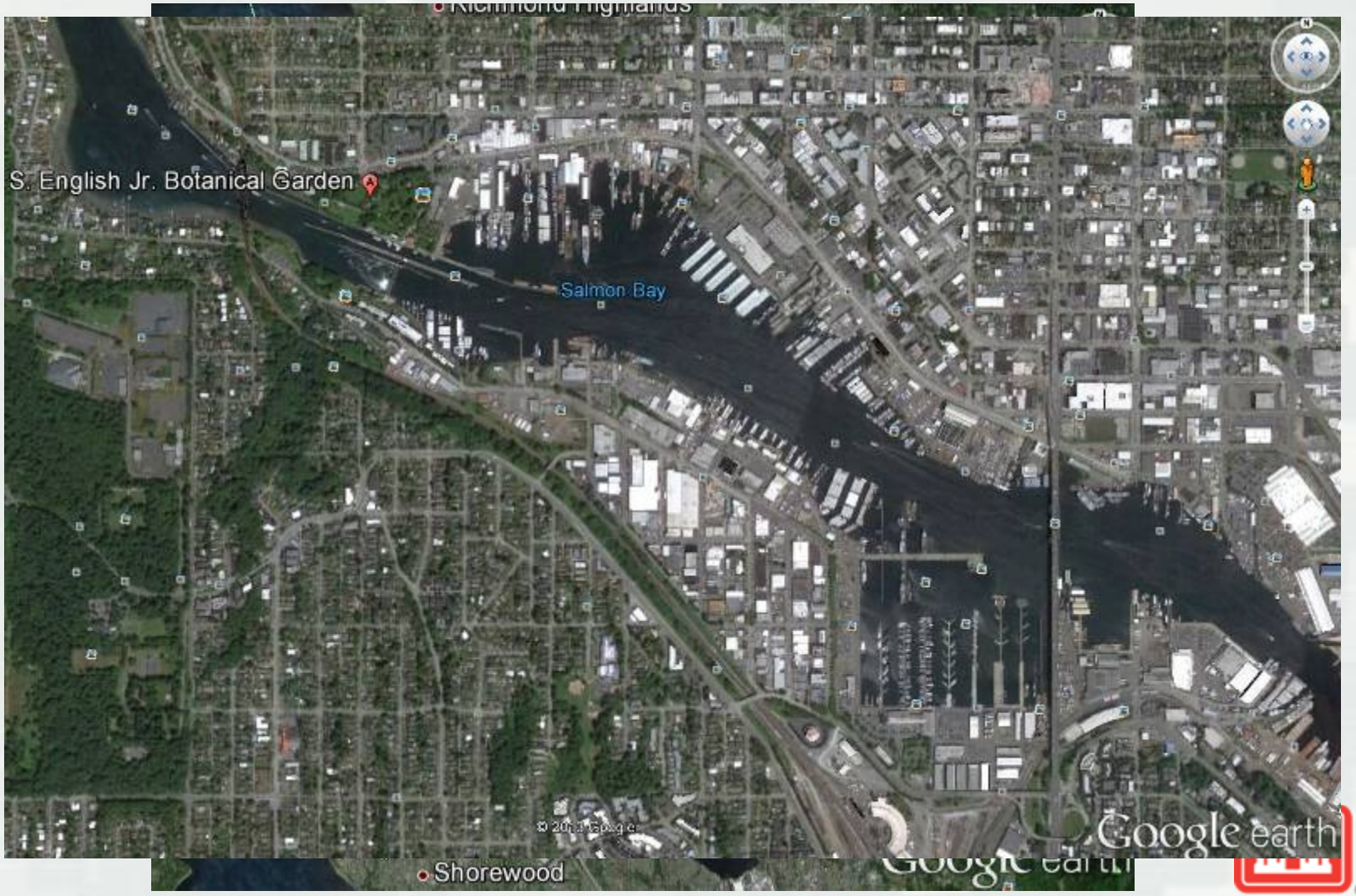
- Built in 1911
- 1.3 million visitors annually
- 50,000 vessels passed annually
- 1 million tons of commercial goods annually

Hiram M. Chittenden Locks – Quick Facts

Also……

- The Carl S English Jr. Botanical Gardens
- Home to the NWS Commander

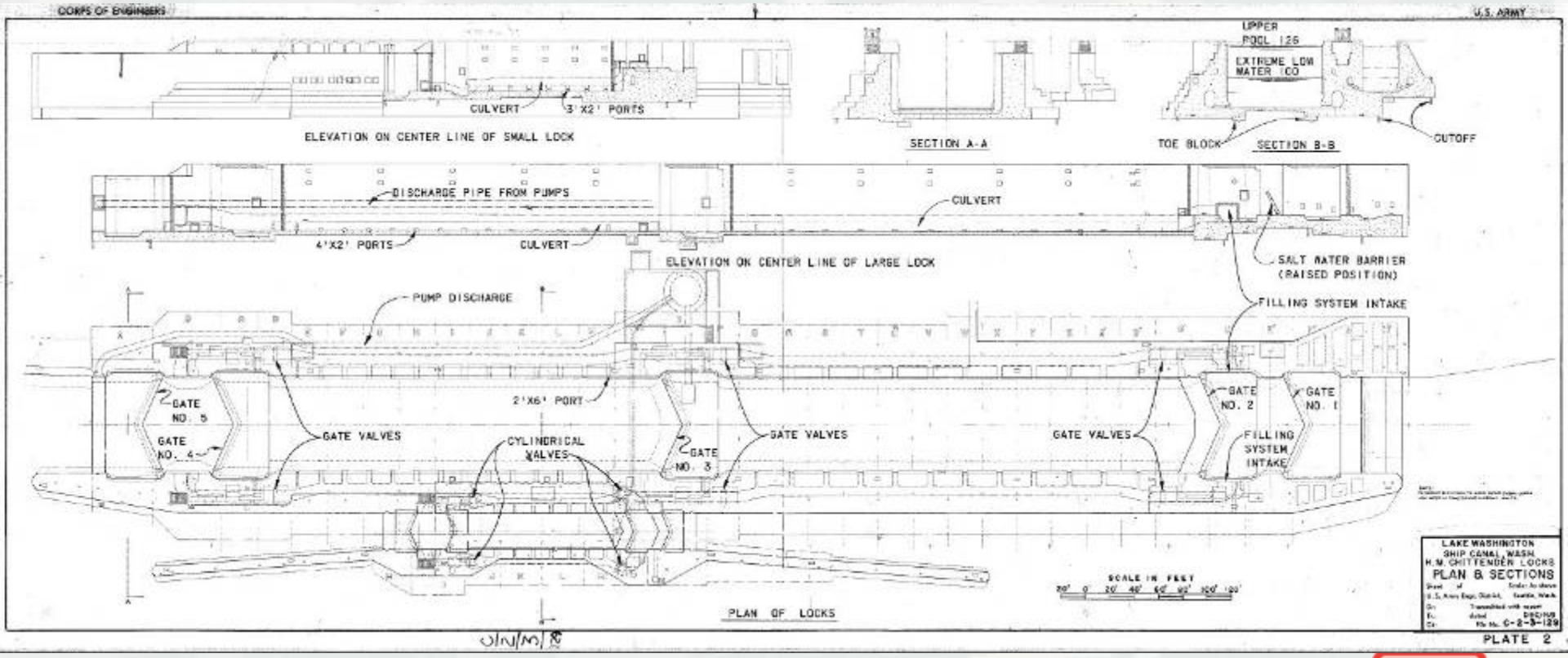
Seattle


S. English Jr. Botanical Garden
Salmon Bay
Shorewood
Google earth

Hiram M. Chittenden Locks

Large Locks

Large Locks
- 2 filling culverts
- 3 sets of Stoney Gate Valves



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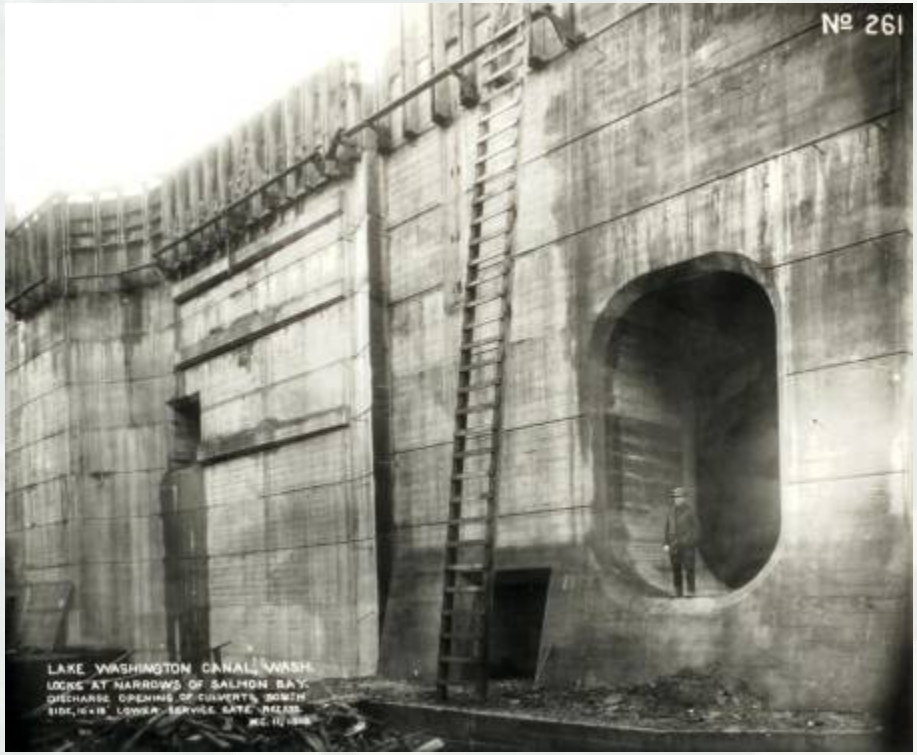
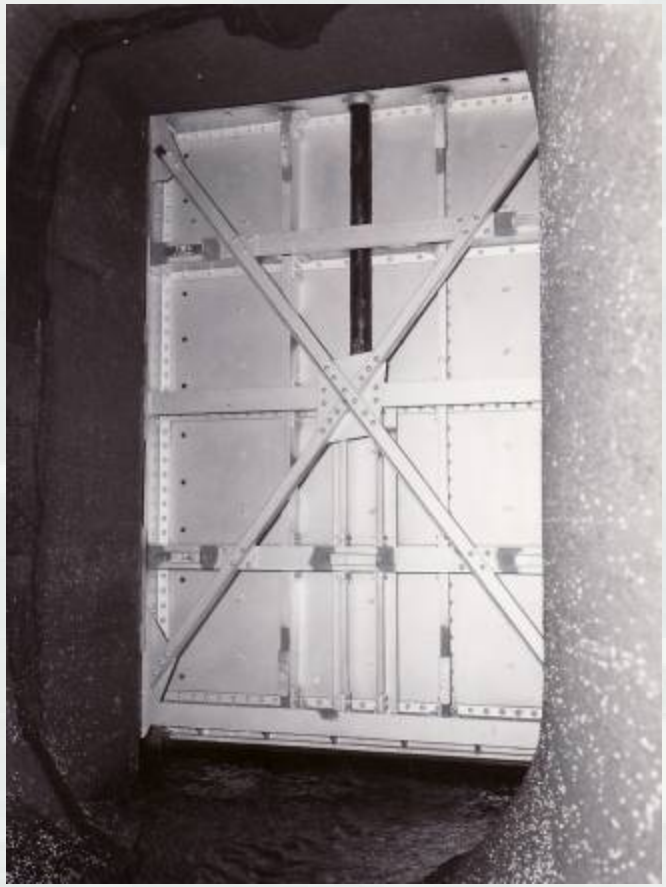
Filling Culverts

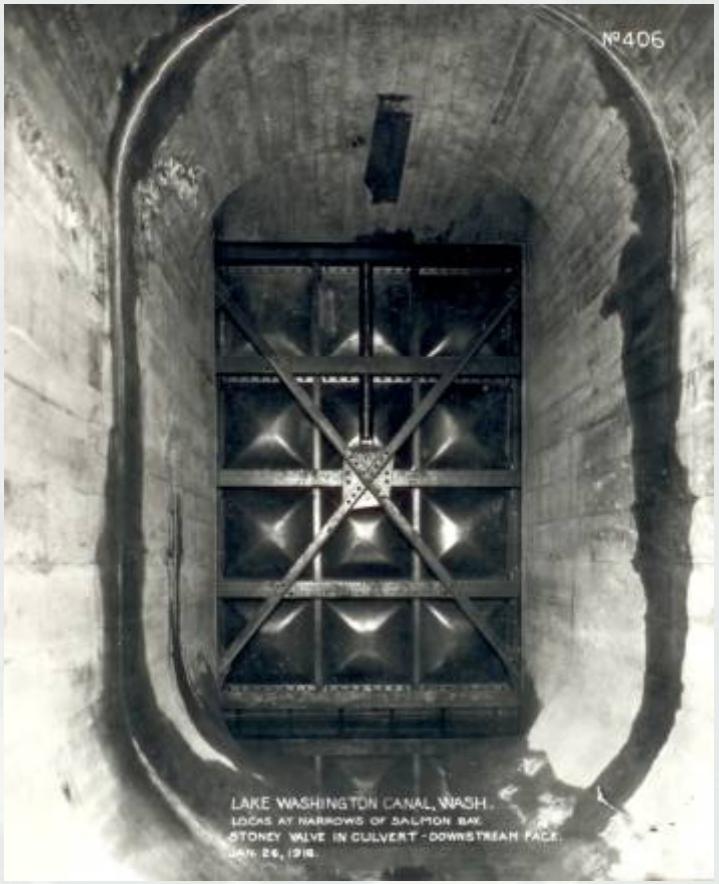
Dimensions:
8’ 5” x 14’

Flow:
Avg. 1500 CFS
Max: 2034 CFS
(per culvert)



Stoney Gate Valves





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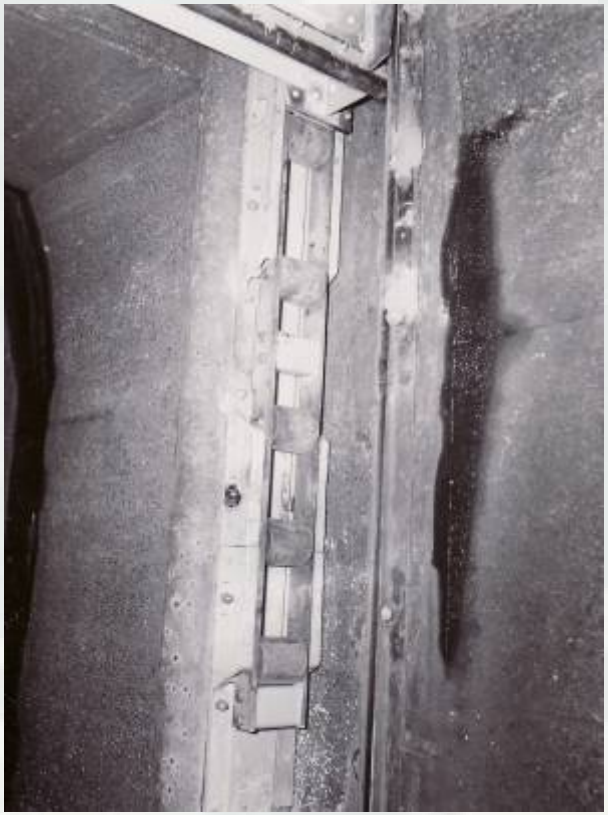
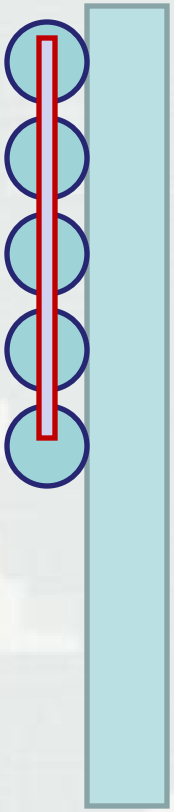
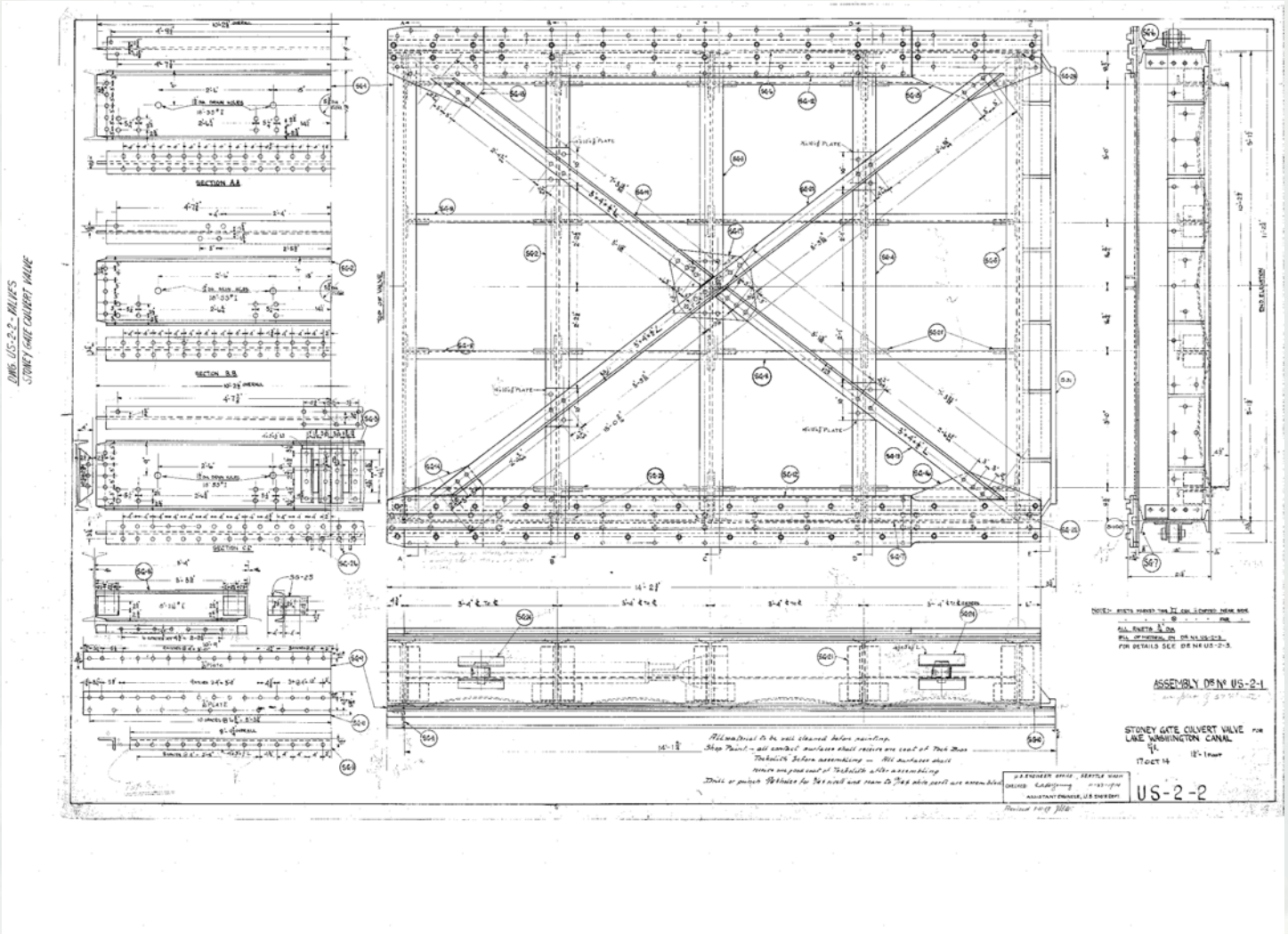
8’ 5” x 14’

Stoney Gate Valves





Stoney Gate Valves



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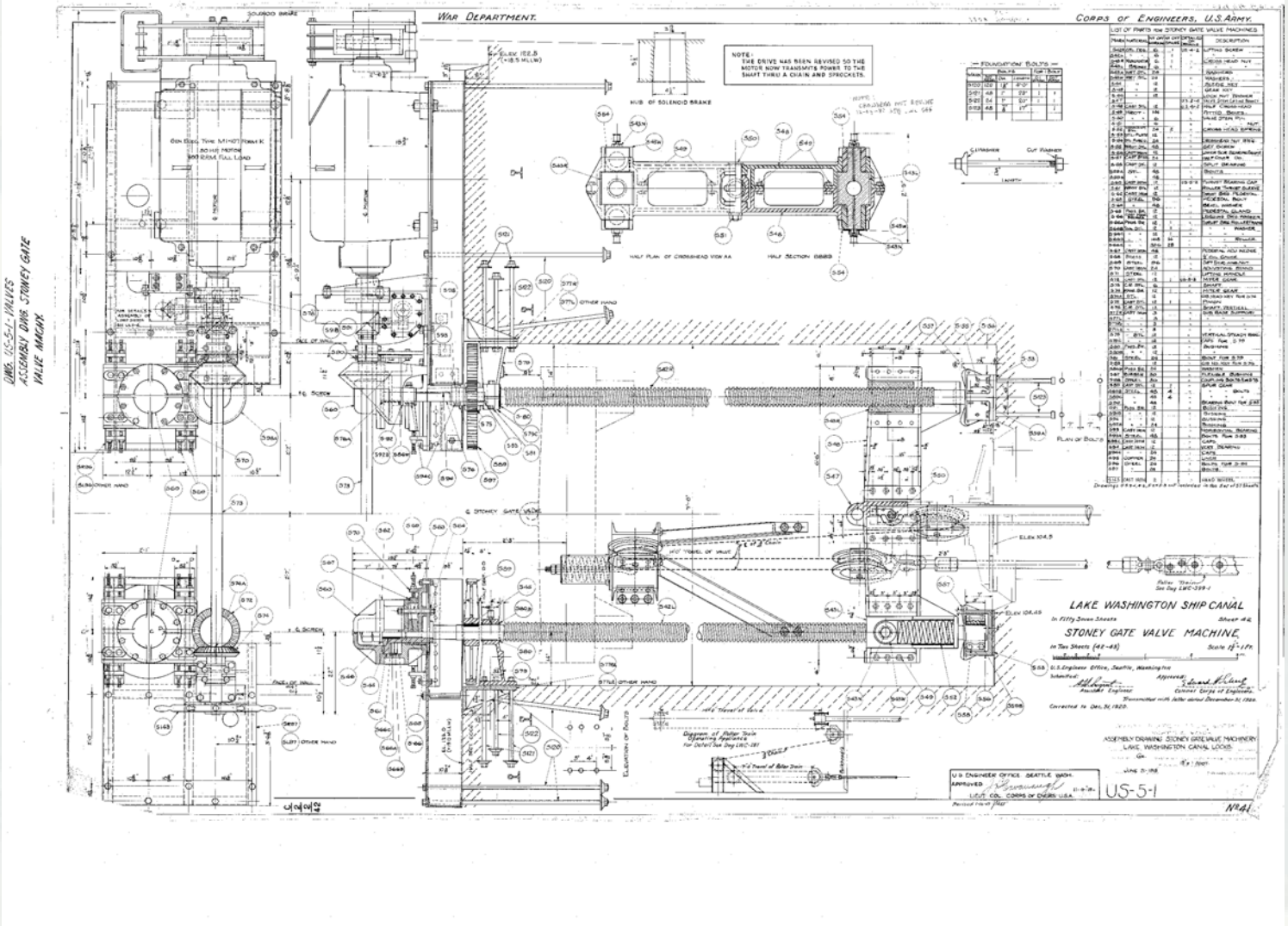

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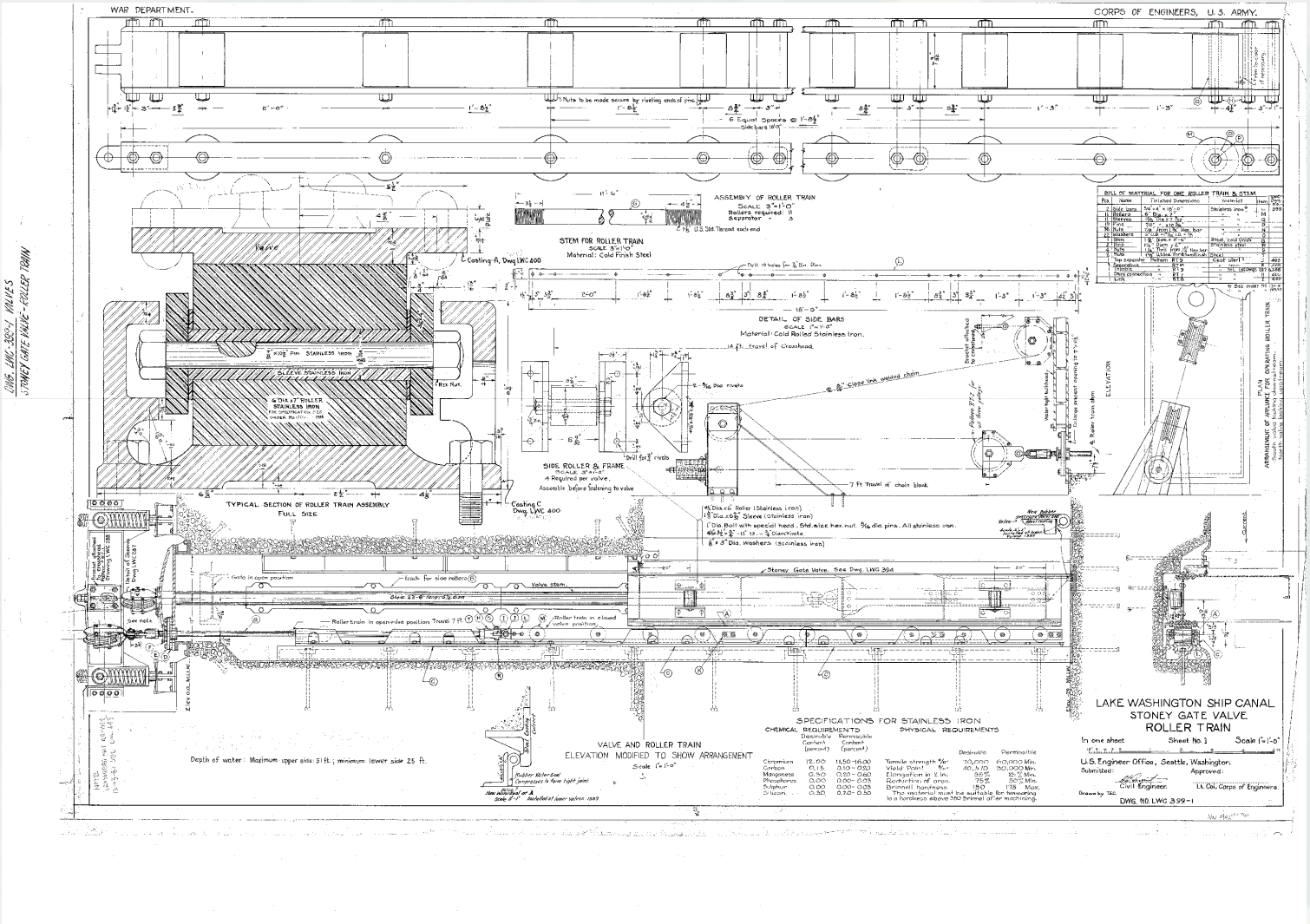
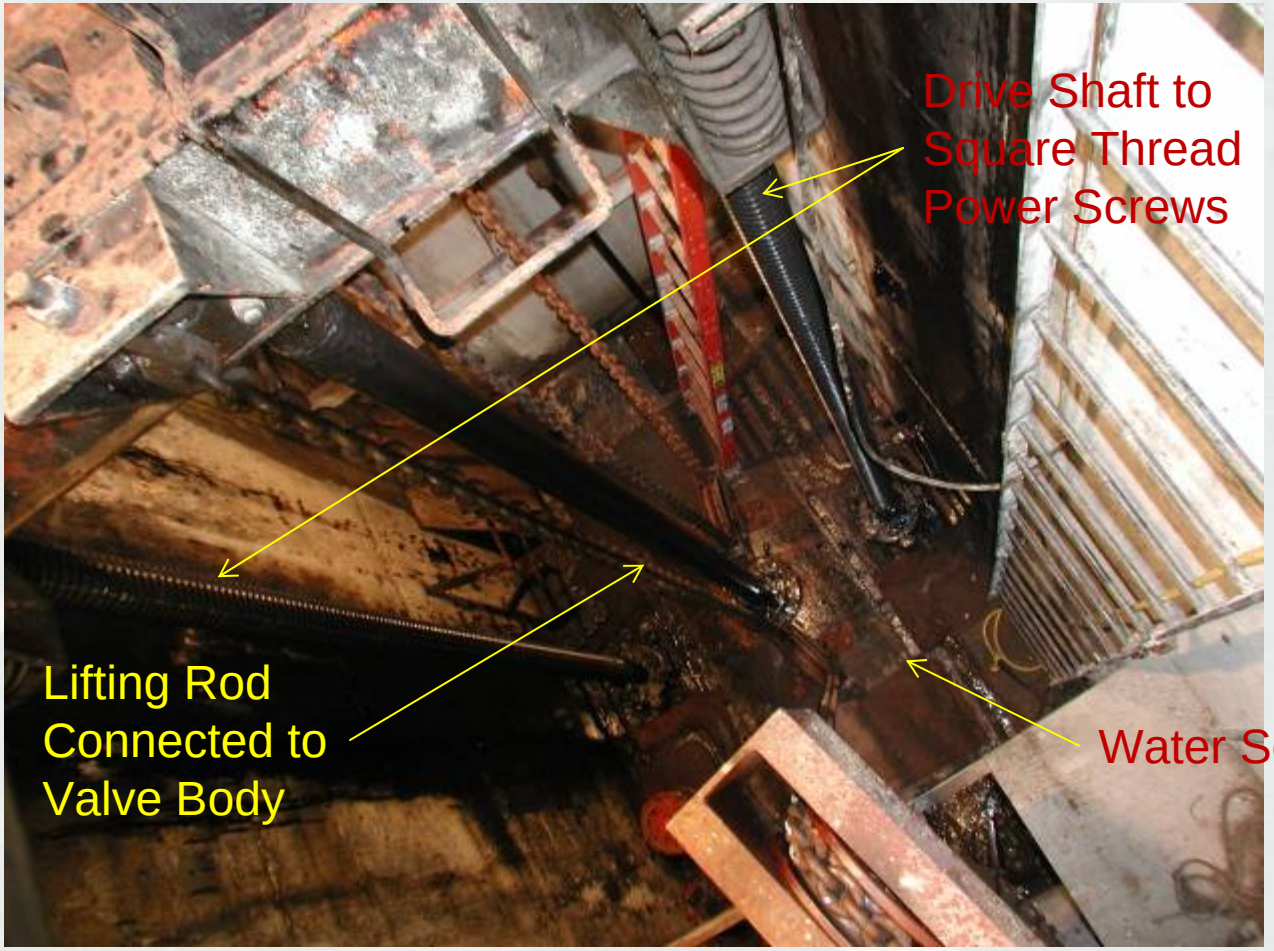
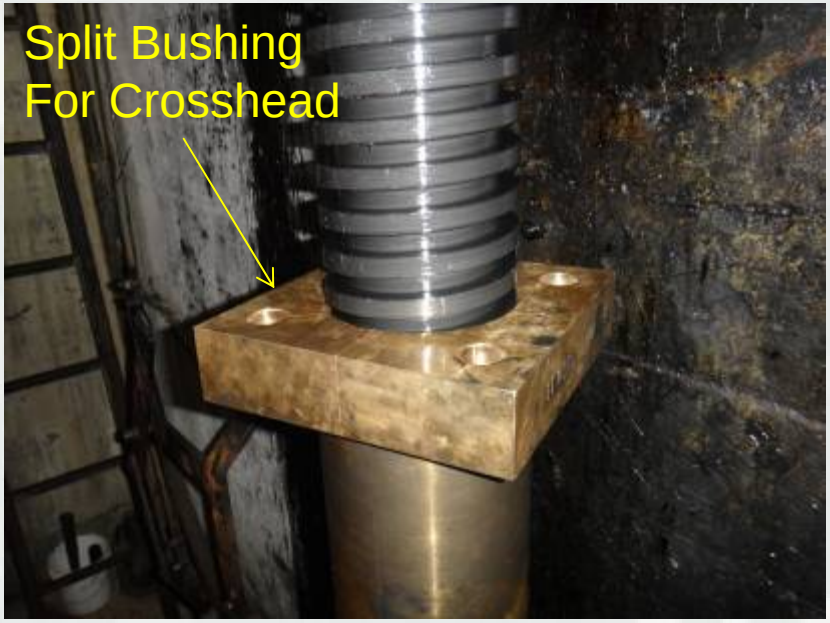


Stoney Gate Valve Equipment

Stoney Gate Valve Equipment

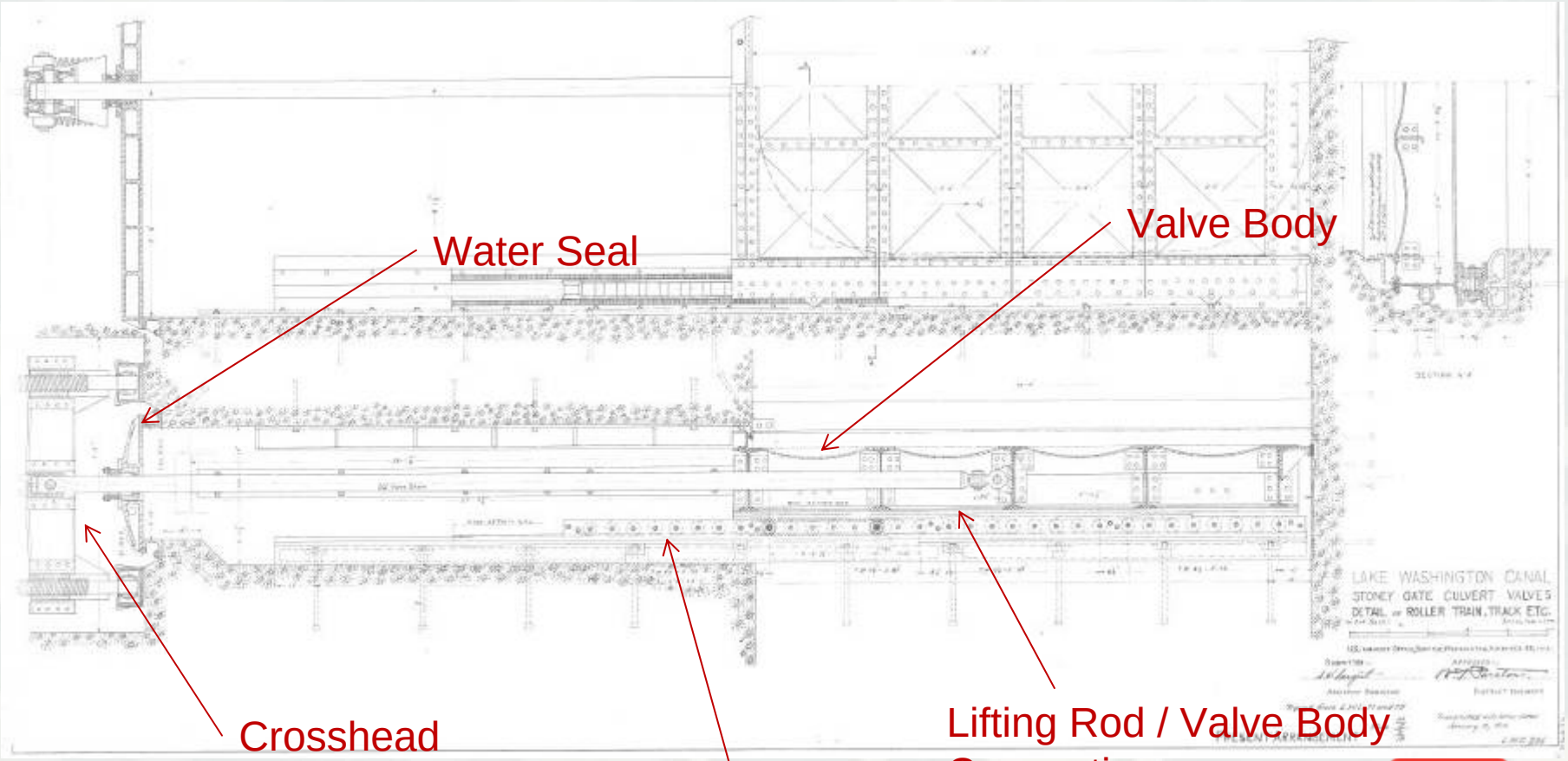


Stoney Gate Valve Equipment



Controls?

Elevation View



Current Condition

Quick glance shows robust valve bodies to be in decent shape.

Current Condition

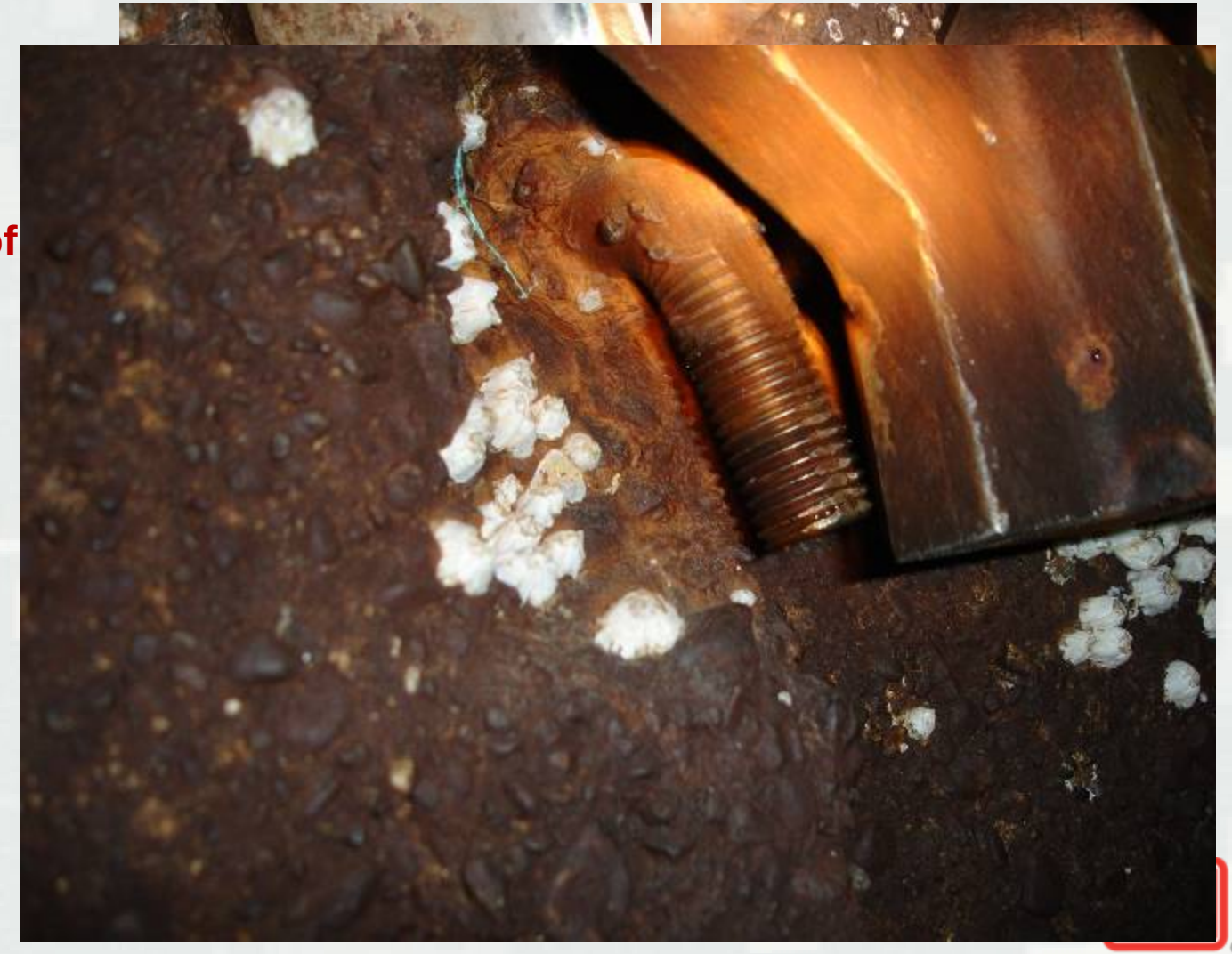
Close inspection reveals fractures, loose/missing nuts, and multiple modes of corrosion.

Current Condition

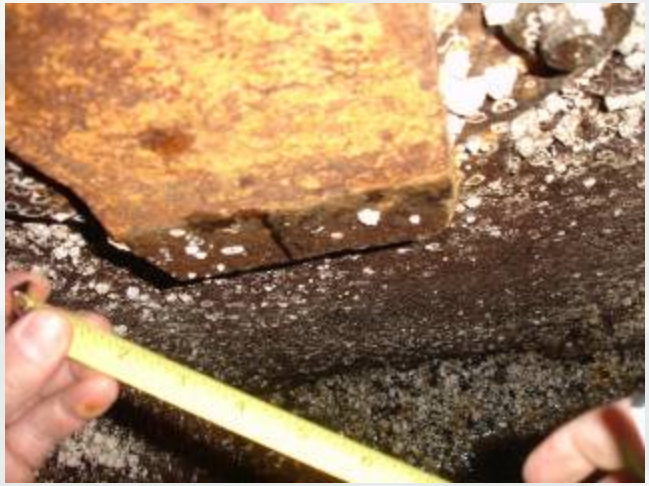
Current Condition

Castings are experiencing multiple modes of corrosion.

Many bolts are missing.

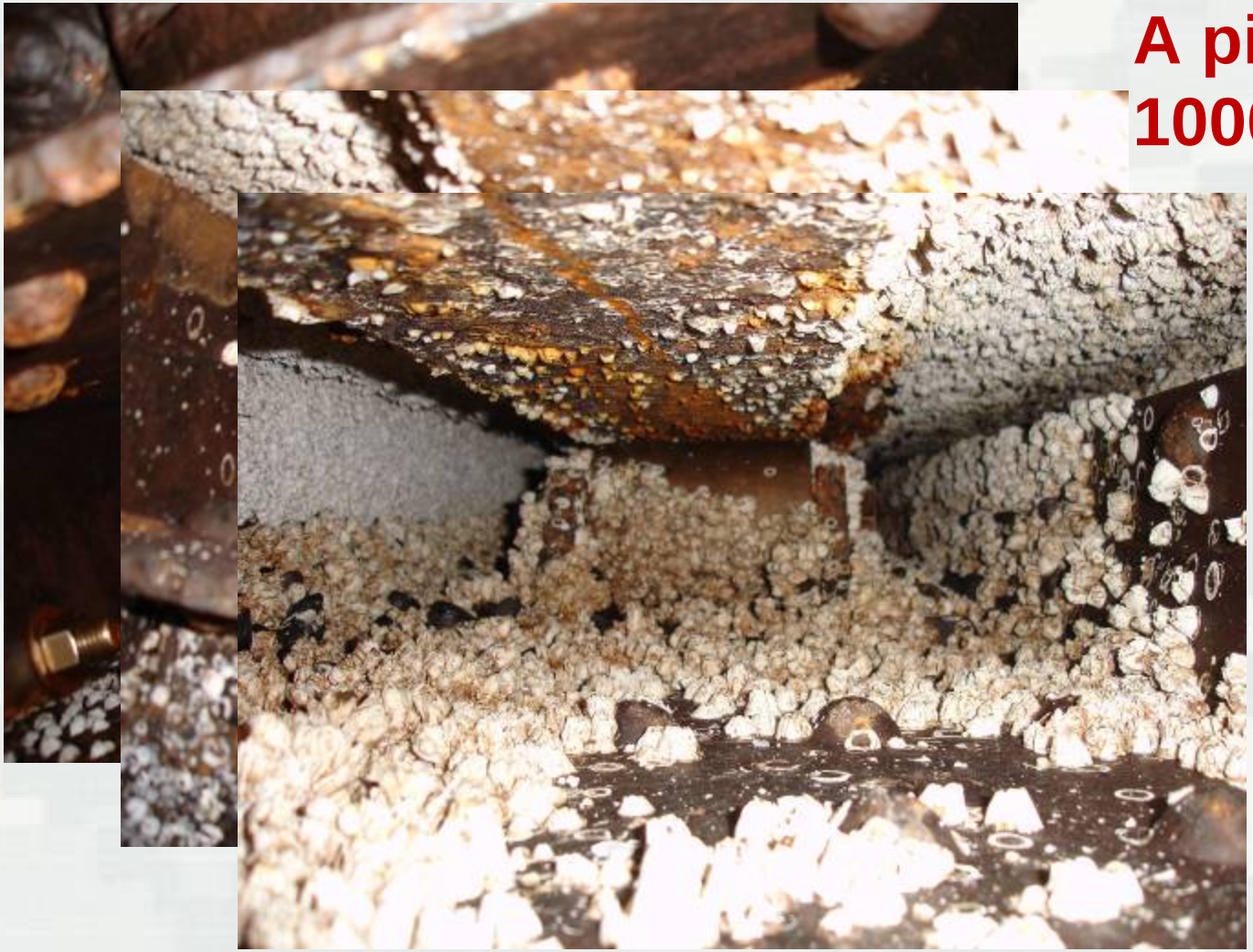


Current Condition



Excessive and uneven wear on roller pads.

Current Condition - Rollers



A picture is worth 1000 words

Roller Train Problems

- Broken roller discovered during 2012 pumpout and inspection.

Roller Train Problems

- Turns out roller issues are not a new problem.

ing in fixed nuts in a crosshead attached to the valve stem. Considerable trouble has been experienced with maintenance of the roller trains, partly due to corrosion of the steel and partly to excessive wear on the tracks and rollers, allowing the roller train to slip out of place and jam the valve. This has occurred at both upper valves, making it necessary to

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1939

when the valve is entirely removed. This type has been installed at the two upper valves, and it is expected that two more valves will be so equipped this year, followed by the two remaining valves next year.

The smaller lock is equipped with valves of the cylindrical type.

Gate machinery. The gates were originally opened and closed by wire-cables attached near the outer edge of each leaf, but because of excessive interruptions to the lock service necessitated by replacement of cables, sheaves, housings and anchors, the entire gate-operating machinery of both

-11-

What can be done?

- We do have replacement parts for one set of gates…but then what?
- We can salvage parts from the #2 set of gates…but then what?

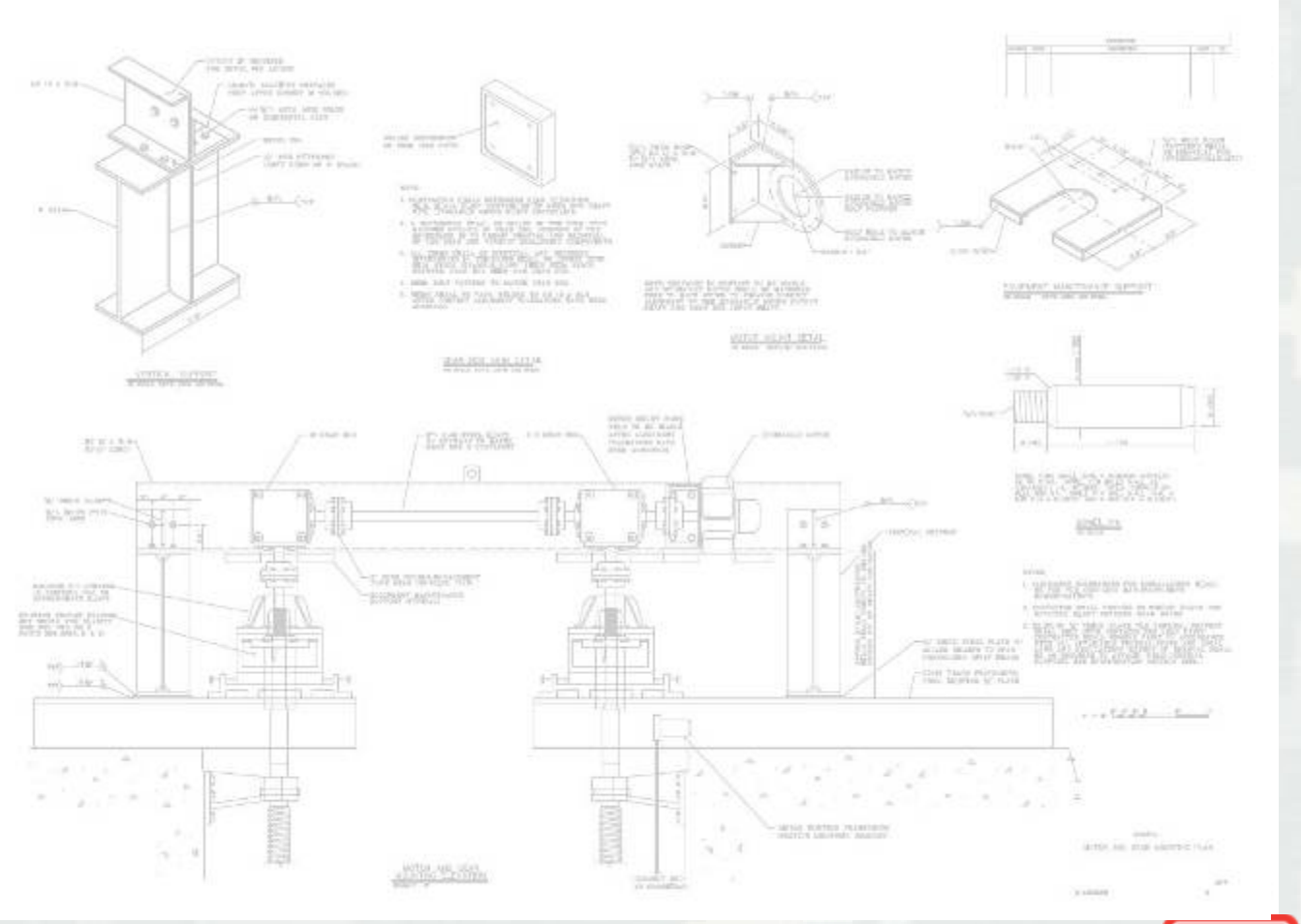
What are the ramifications of this fix?

- Valves cannot form a proper seal.
- Valves cannot be integrated into the control systems safety interlocks as intended.

What should be done?

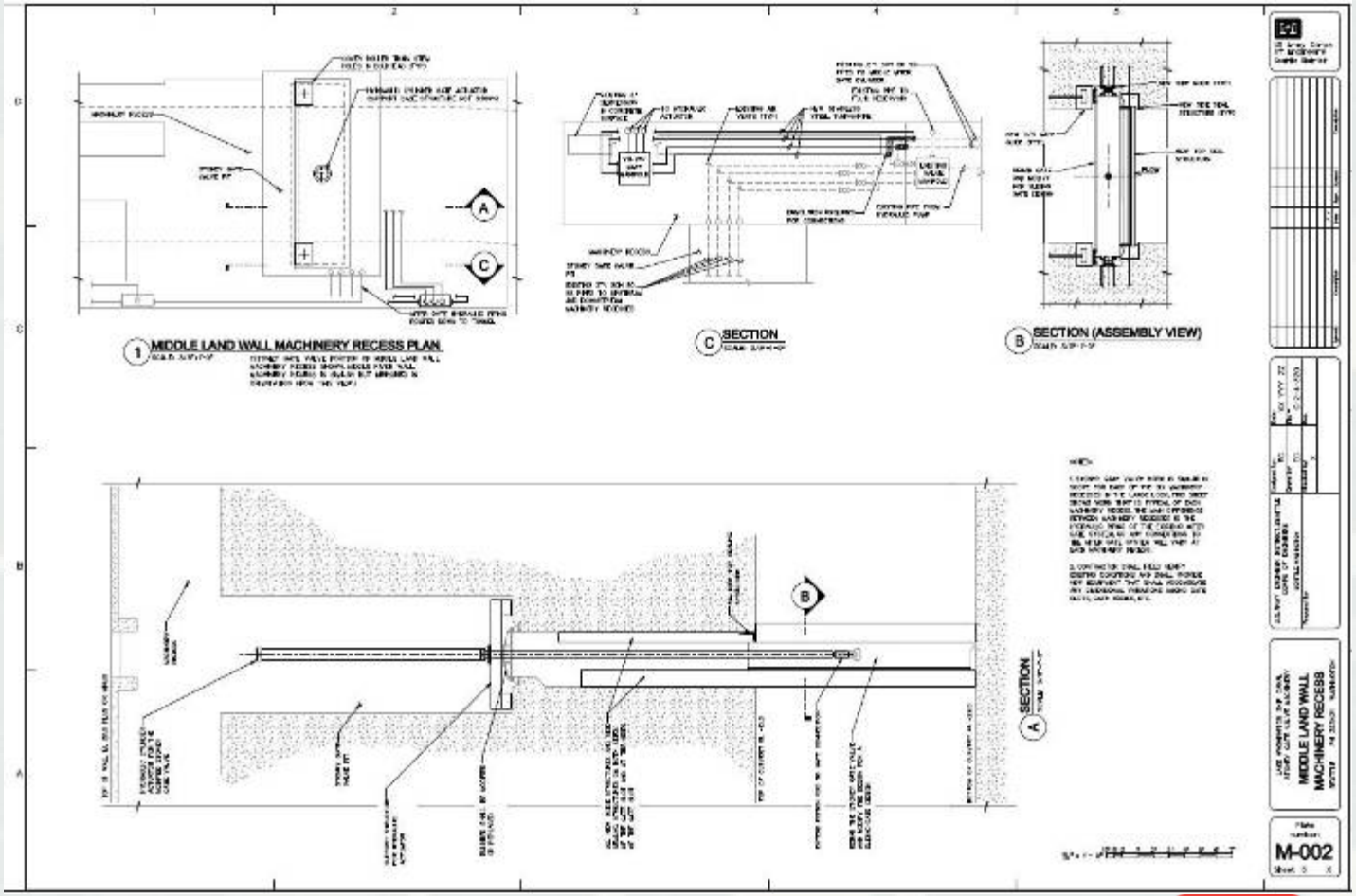
Plans on the Shelf

- Plan 1



Plans on the Shelf

- Plan 2



Concluding Questions

1. What type of hydraulic system should we implement?
2. Does anyone have experience swapping UHMW wear pads for the rollers?
3. Should the valve body be rehabbed and reused or should it be redesigned entirely?
4. What type of tolerances should we design the valve slot to have?
5. What can be done to deter barnacle growth?