



CampusEnergy2021

BRIDGE TO THE FUTURE

Feb. 16-18 | CONNECTING VIRTUALLY

WORKSHOPS | Thermal Distribution: March 2 | Microgrid: March 16



IOWA



University of Iowa Boiler Replacement

Presented by:

Edward Scherrer | University of Iowa

Russ Price | PRVN Consultants

Jacob Price | PRVN Consultants



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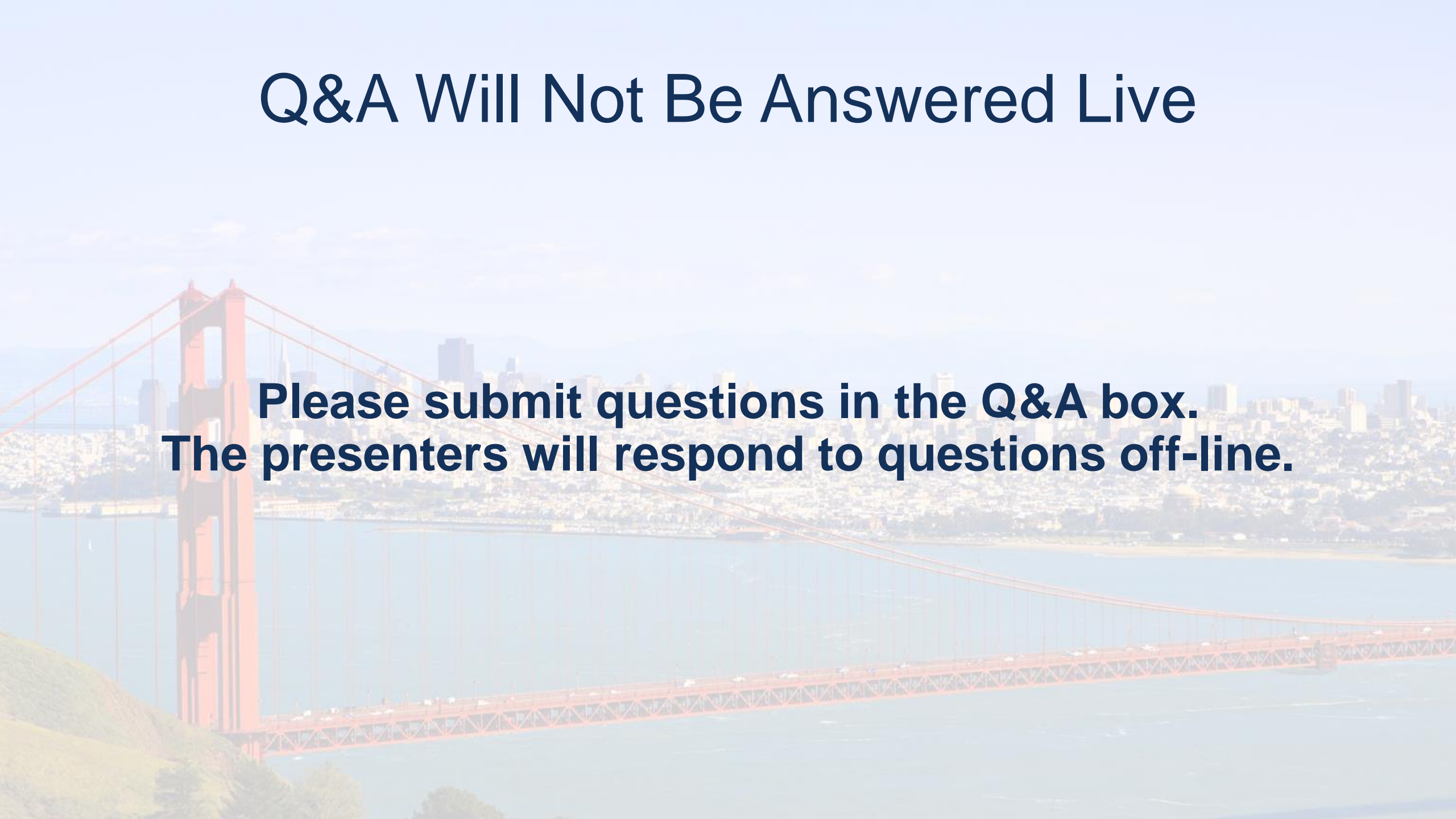
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Q&A Will Not Be Answered Live

**Please submit questions in the Q&A box.
The presenters will respond to questions off-line.**



Agenda



- Project Background
- Boiler Location Study
- Contracting Methodology
- Project Details
- Best Practices and Key Takeaways
- Questions

Existing Boiler Capacity



Pre-project Plant Capacity

Total Plant Output Capacity	Steam (klb/hr)
Current Boiler Capacity In-plant Use	605
Current Boiler Capacity with No Co-gen	675
Max Single Boiler Capacity	170
Existing Firm Capacity (N+1, No WCB)	350

Projected Campus Demand

Building	Expected Date	Low-End Projection – Energy Mgmt Model (PPH)	High-End Projection – Building Designers (PPH)
0035301 – John and Mary Pappajohn Biomedical Discover Building	05/17/2014	3,833	15,000
0390201 – Stew and Lenore Hansen Football Performance Center	11/01/2014	3,750	4,160
0297701 – Mary Louise Petersen Residence Hall	07/01/2015	3,688	3,000
0194401 – Art Building Replacement – Construct New Facility	05/16/2016	3,813	10,000
0257001 – Hancher Auditorium Replacement Facility	07/01/2016	2,491	10,000
0275901 – Voxman Music Building	07/01/2016	4,730	8,000
0404309 – Hospital Parking Ramp No. 2 Replacement	07/01/2016	1,036.3	1,500
0418001 – John and Mary Pappajohn Biomedical Discovery Building-Fit-Out Central Vivarium Space	12/30/2016	12,500	13,000
0111007 – University of Iowa Children’s Hospital – Bid Package	07/01/2017	11,070	10,000
0452001 – Seamans Center for the Engineering Arts and Sciences – South Annex Addition	09/29/2017	3,125	4,500
0415801 – Madison Street Residence Hall	07/01/2018	4,375	4,167
0303801 – Psychology Building	07/01/2018	1,875	2,100
0500301 – Museum of Art – New Facility	07/01/2018	2,500	4,000
0329501 – Pharmacy Building – Construct New Facility	01/01/2020	1,250	2,000
Total		60,035	91,427

Post-Project Boiler Capacity



Post-Project Plant Capacity

Total Plant Output Capacity	Steam (klb/hr)
Existing Firm Capacity (N+1, No WCB)	350
Boiler 12 Capacity	175
Post Project Plant Capacity (N+1, No WCB)	525

Capacity Expansion Program Objectives:

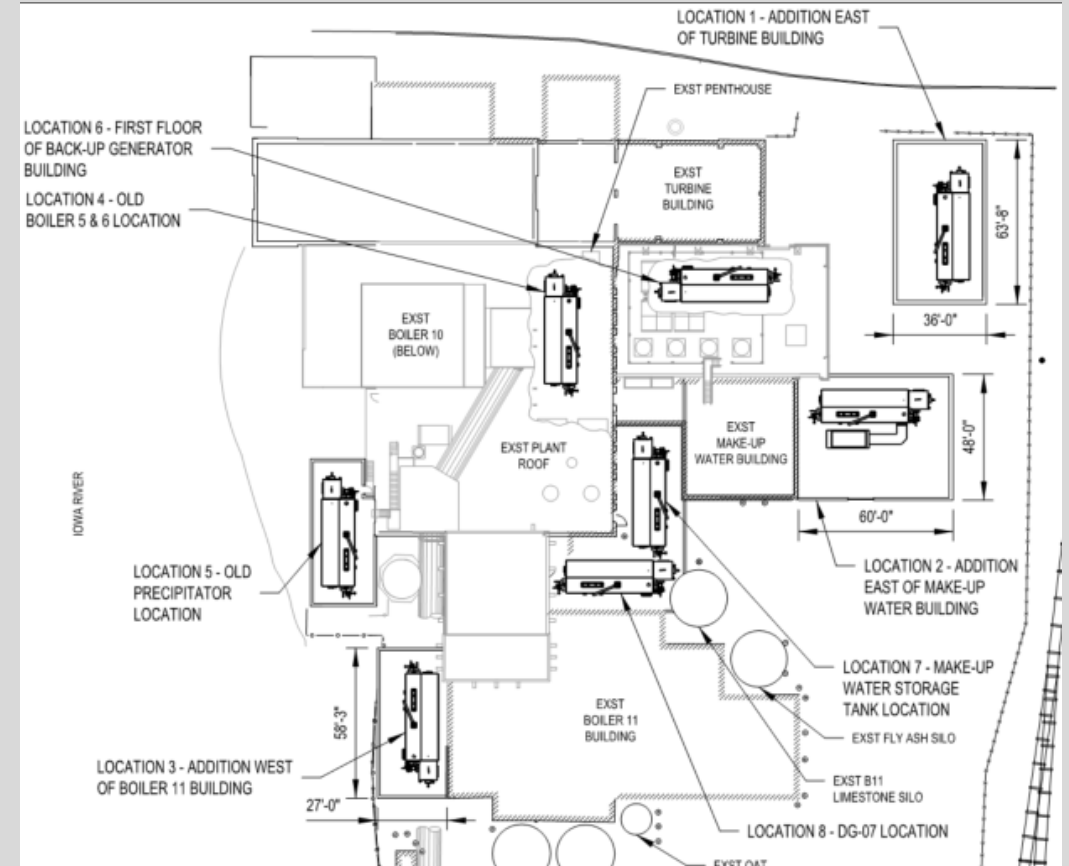
- New, reliable boiler capacity
- Two new steam turbine generators to replace TG#1 (installed in 1947) and TG#5 (installed in 1952)
- New Maintenance Shop
- New Electrical Room



Boiler Study

Three things were studied regarding the new boiler:

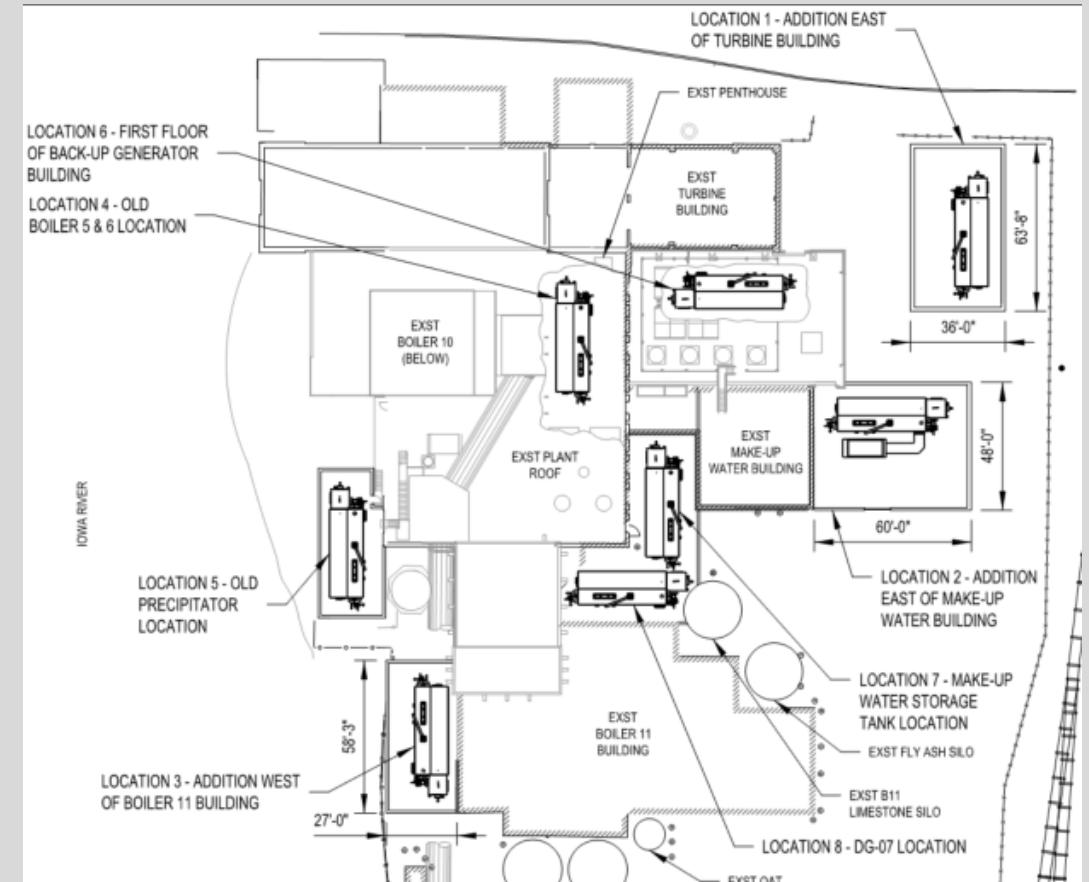
- Location
- Pressure: 500 psig vs 800 psig
- Field-erected versus packaged boiler

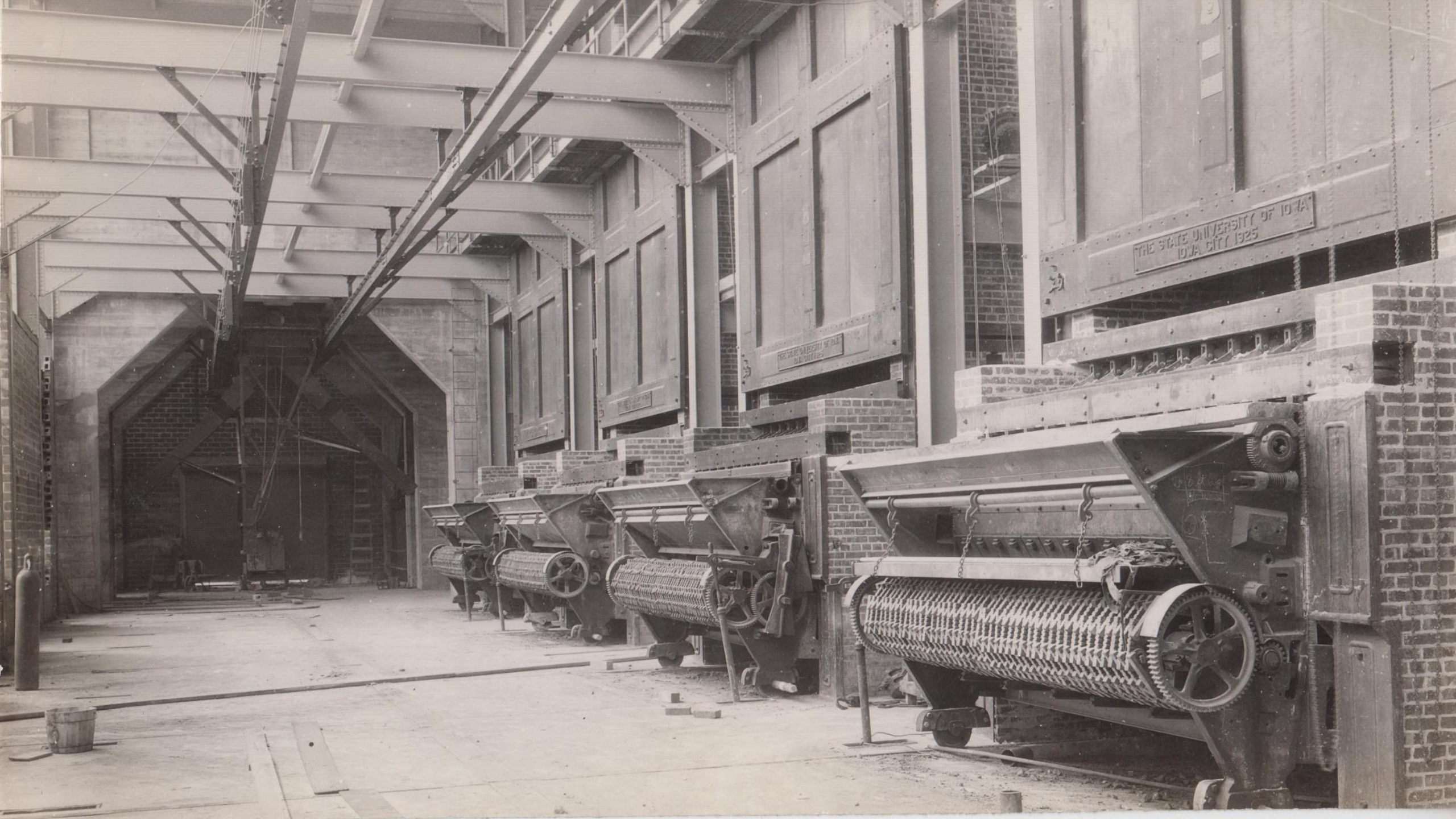


Boiler Location

Several areas in the existing plant were investigated to house the new boiler. The site for the new boiler was determined to be in the existing Main Power Plant in the old Boiler 5 and 6 location. The determining factors for locating the boiler in this location include:

- No plant addition
- All operating boilers would be in the same building
- Better crane access to existing plant equipment
- Tie-points are shorter
- This site does not intrude on an addition for a future boiler, parking, and truck unloading at the Main Power Plant





Boiler Pressure

Two boiler pressures were investigated: 500 psig and 800 psig, as well as adding a topping cycle. 500 psig was recommended for the following reasons:

- Existing redundancy in the plant auxiliaries
- Redundancy in boilers and turbines
- No new boiler feed pumps
- No 800 psig header in the plant
- Common steam inlet pressures

Field-Erected vs Packaged Boiler

We investigated a field-erected boiler versus a packaged boiler. A field erected boiler was recommended for the following reasons:

- A 500-ton crane was required to install a packaged boiler; the lift would have been 80 feet high and 100 feet out
- The diaphragm roof would need to be removed and reinstalled
- The cost to field erect the boiler was less than the added cost to purchase and install the packaged boiler

Contracting Methodology



The CapEx program included several procurement contracts to expedite the schedule and provide shop drawings of actual equipment. Having shop drawings leads to a detailed design of the new equipment. The major equipment procurement packages include:

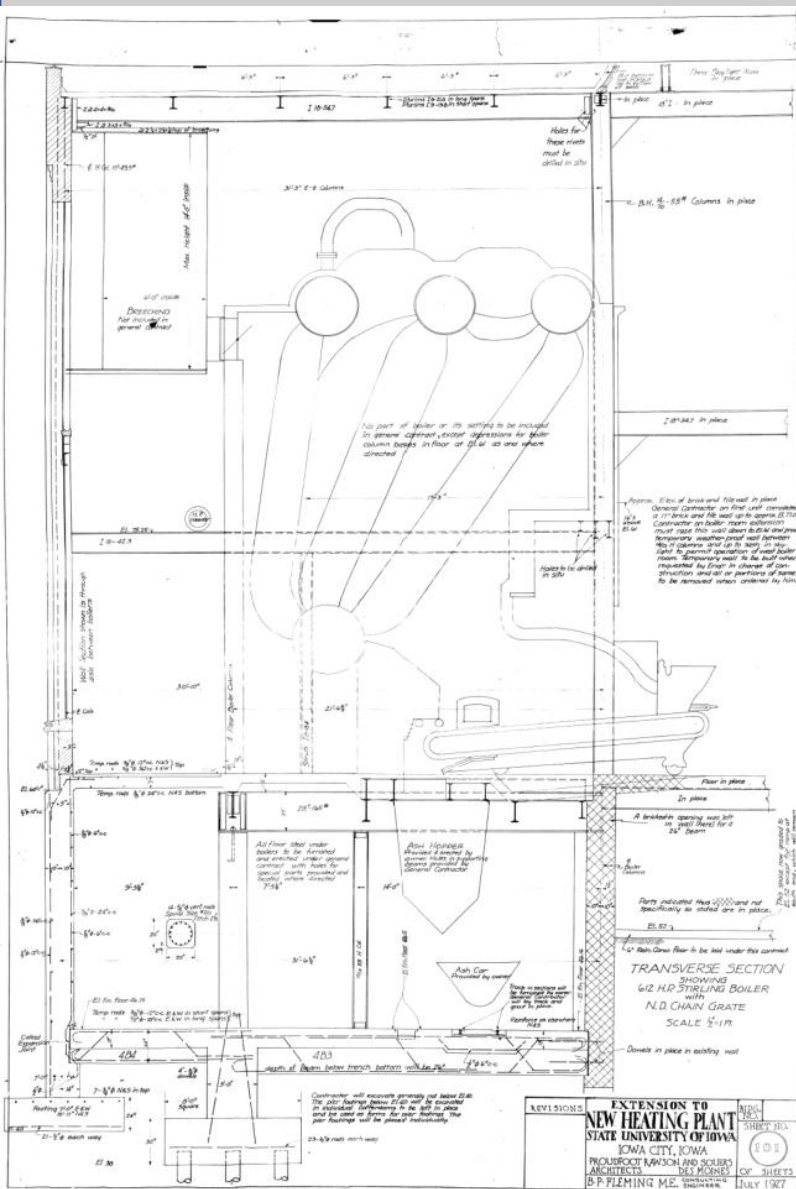
- Steam Turbine
- Steam Condenser
- Electrical Gear
- CEMS
- Control Hardware Integration

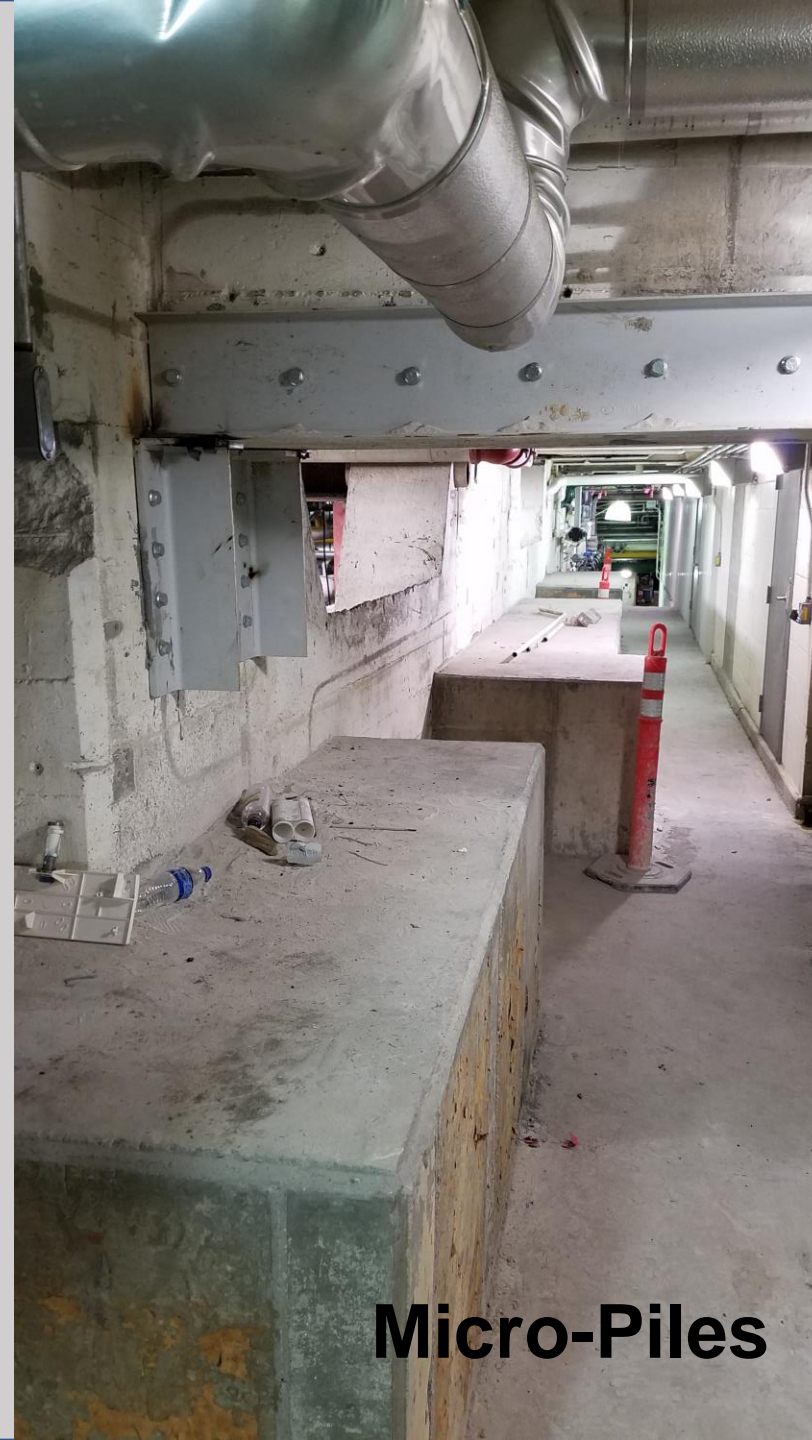
The following were major construction packages:

- Utility Outage
- Structural Foundation Contract
- Balance of Plant
- Boiler Procurement/Erection Contract
- Maintenance Shop
- Steam Turbine Construction

Foundation

The image is a composite of two parts. On the left is a detailed technical drawing titled "TRANSVERSE SECTION SHOWING 6-2 HP STIRLING BOILER WITH N.D. CHAIN GRATE SCALE 1/8\"/>





Micro-Piles

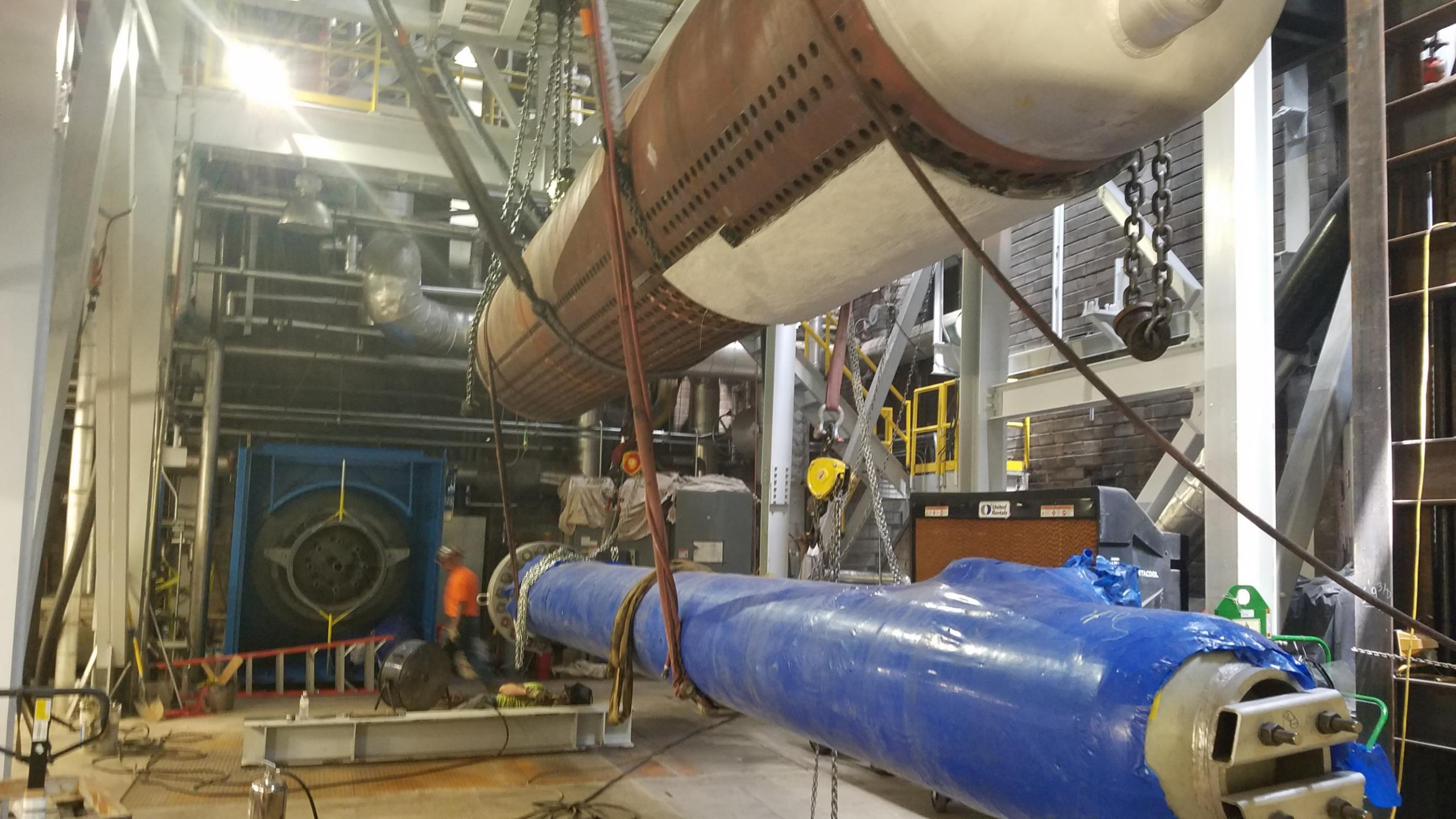


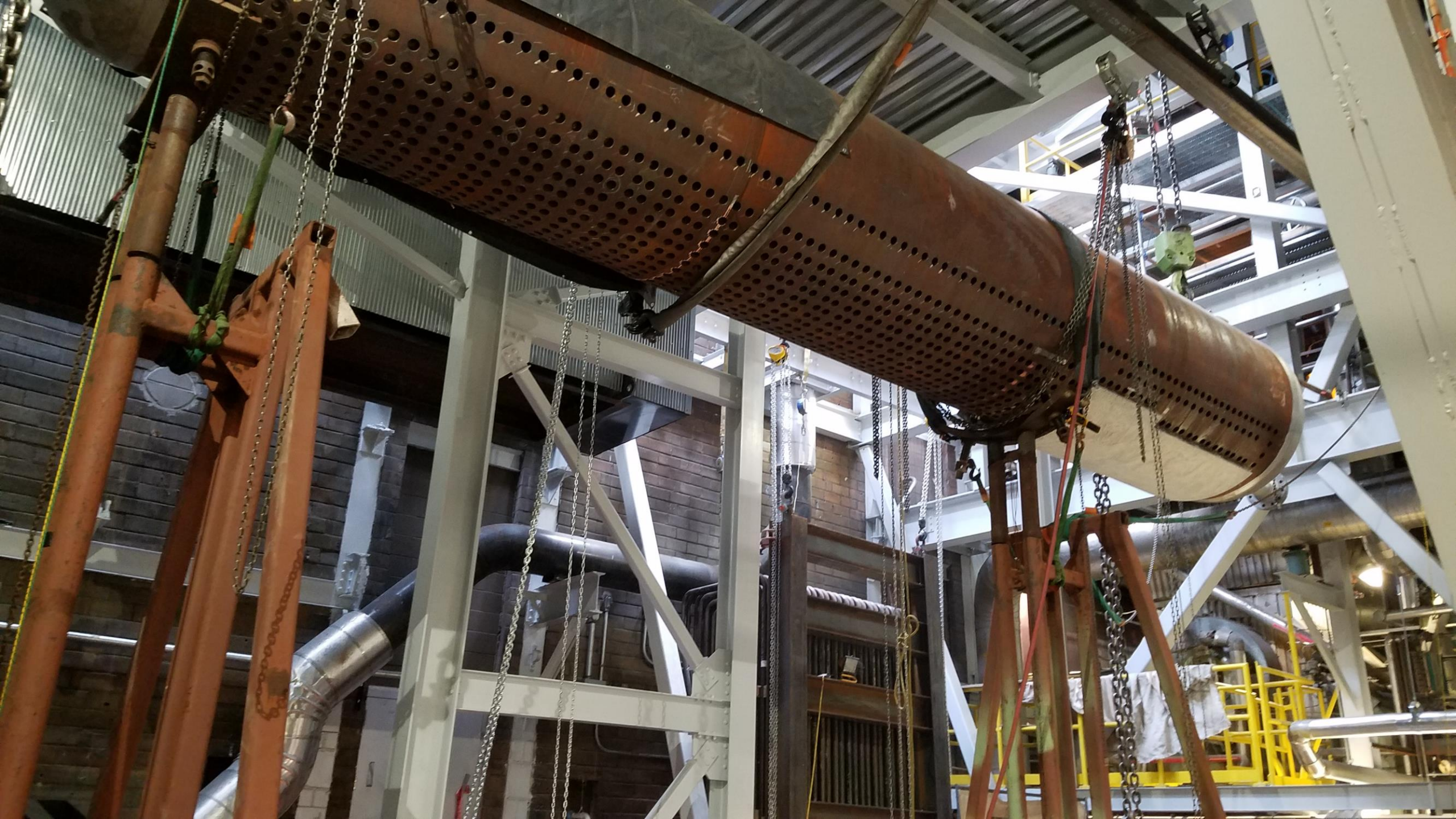
Steam Drum:

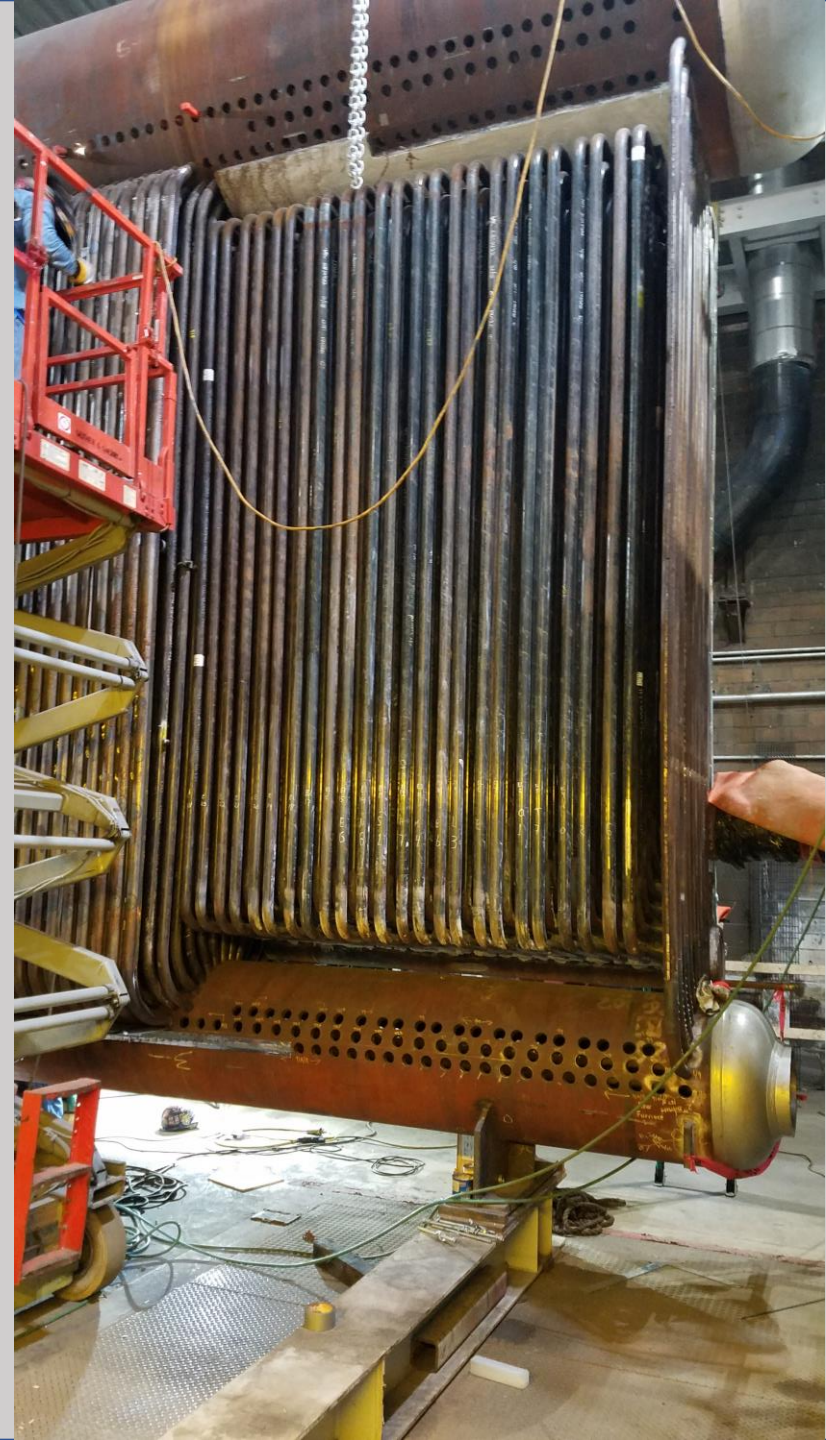
- 65,000 lbs
- The existing plant was shored
- New steam drum was rigged into the plant on air skates



Major equipment was rigged into the plant before the steam drum because there wouldn't be room for installation after the steam and mud drum were installed







Stack Installation





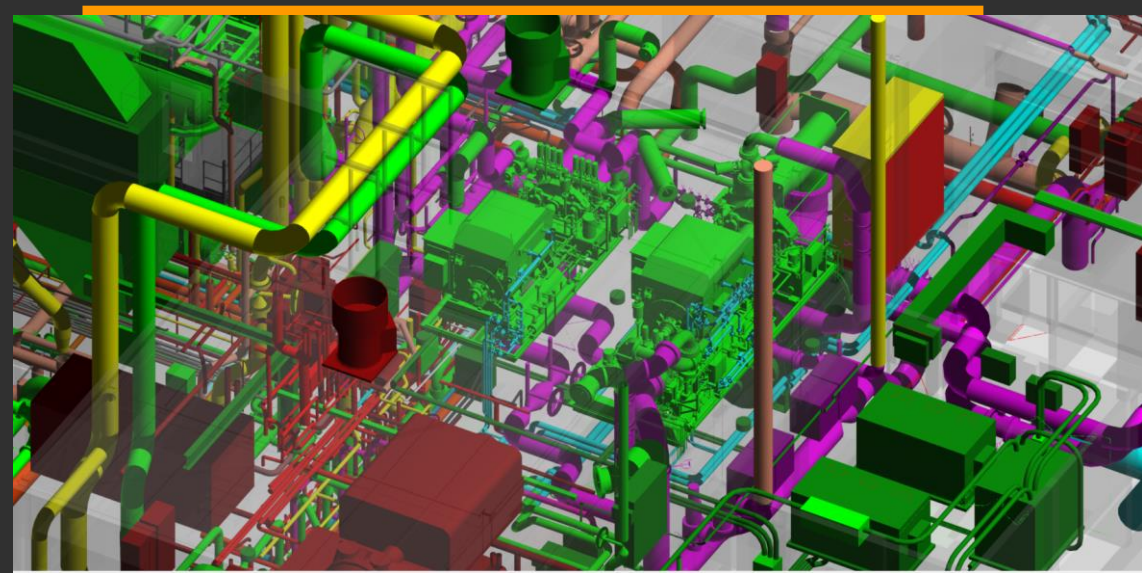
Maintenance Shop





Maintenance Shop

Best Practices & Key Take-Aways



- Weekly meetings with action items
- 3D laser scan the Plant
- 3D model the Plant
- Plant involvement
- System Readiness Checklist



Questions

Thank You!



Presented by:

- Edward Scherrer
Edward-scherrer@uiowa.edu
- Russ Price
price@PRVNinc.com
- Jacob Price
jprice@prvninc.com



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