University of Chicago
System Expansion and Renewal

Presented by:
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AGENDA

- Introduction
- South Steam Plant Modifications
- Condensate Polisher Project
- Q&A

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GOALS OF SOUTH STEAM PLANT PROJECT

- Meet federal, state, and local regulations for emissions
- Increase overall efficiency of plant
- Maximize available incentives from the utility companies
- Have minimal impact on turnover from old to new system

SOUTH STEAM PLANT OVERVIEW

- Four (4) natural gas boilers: 600,000 lb/hr
  - Installed in 1970
  - Replacement for coal-fired boilers
  - All boilers have been retubed within the last 15 years

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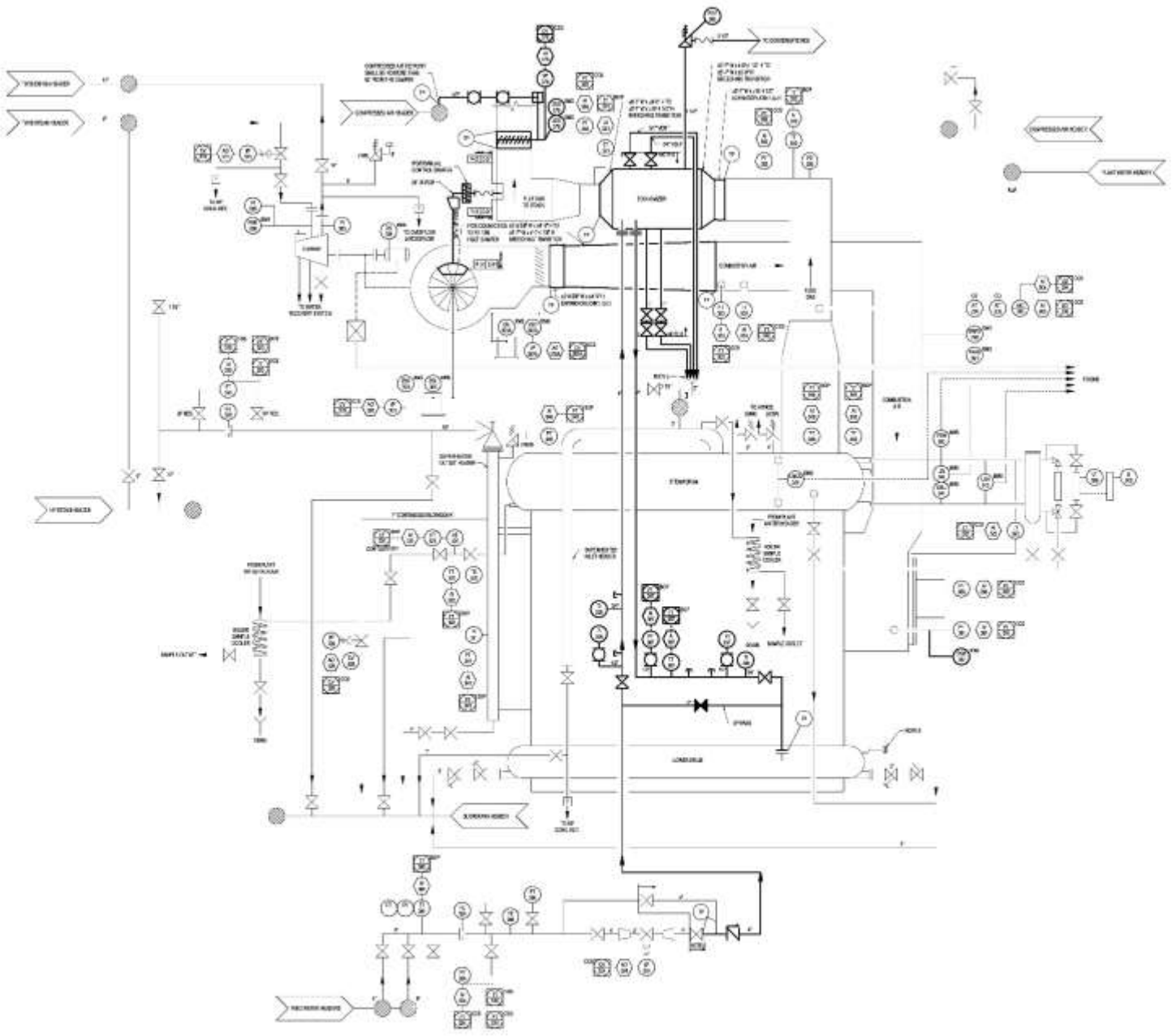

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NOTES:

LEGEND:

ISSUED FOR BID

THE UNIVERSITY OF CHICAGO - CHICAGO, IL
STEAM PLANT
PHASE 2 AIR PERMIT UPGRADES
BOILERS 3 AND 4 - CONTRACT C-01
GENERAL CONSTRUCTION CONTRACT

PIPING AND INSTRUMENTATION DIAGRAM
BOILER 3 OVERVIEW

PI01

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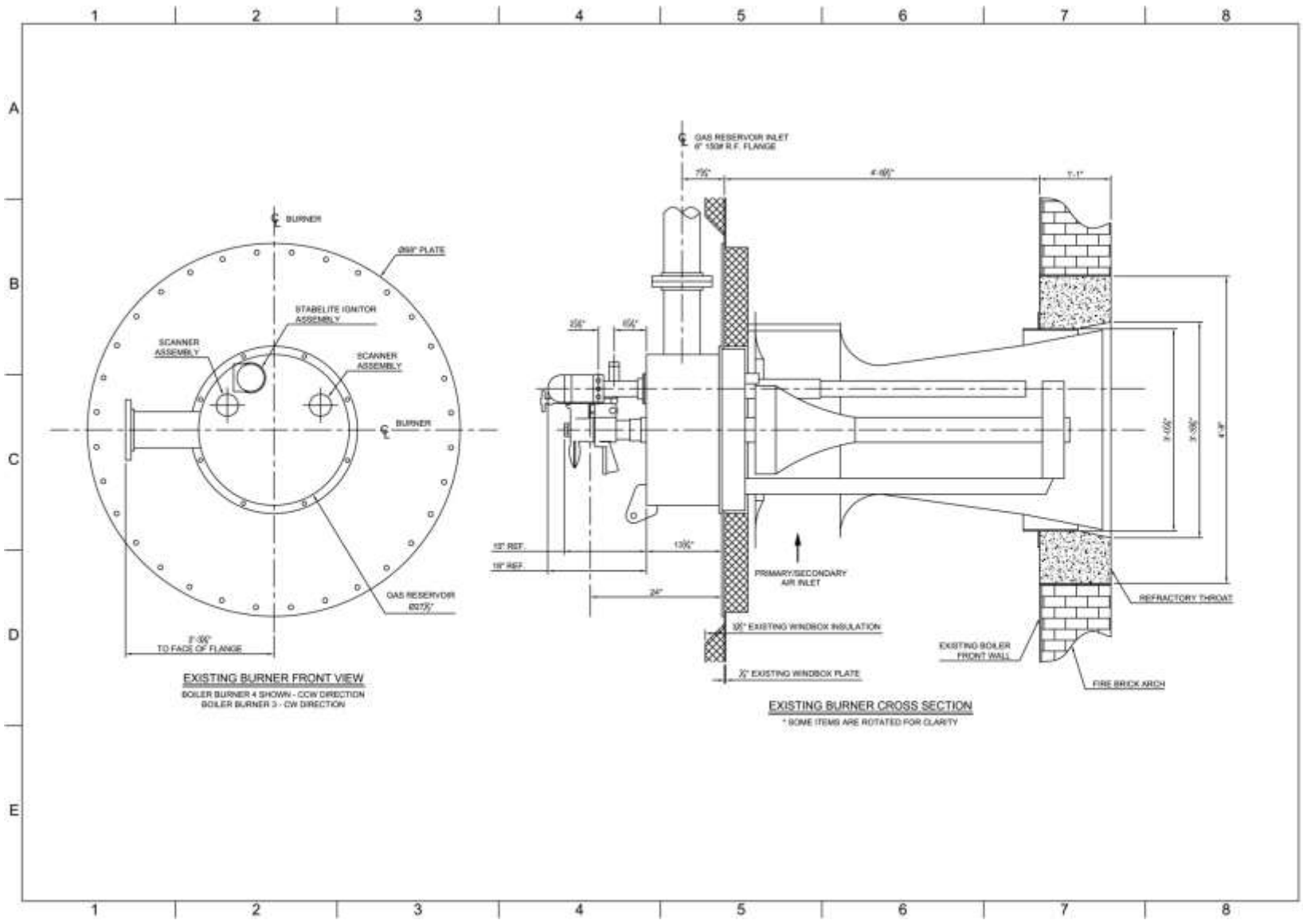
EMISSIONS

- Pre-project emissions:
  - NOx: 0.20 lb/MMBtu
  - CO: 200 ppm
- Emissions requirement:
  - NOx: .08 lb/MMBtu
  - CO: 50 ppm

BURNER UPGRADE

- Modified burner throat
- New gas pokers and swirlers



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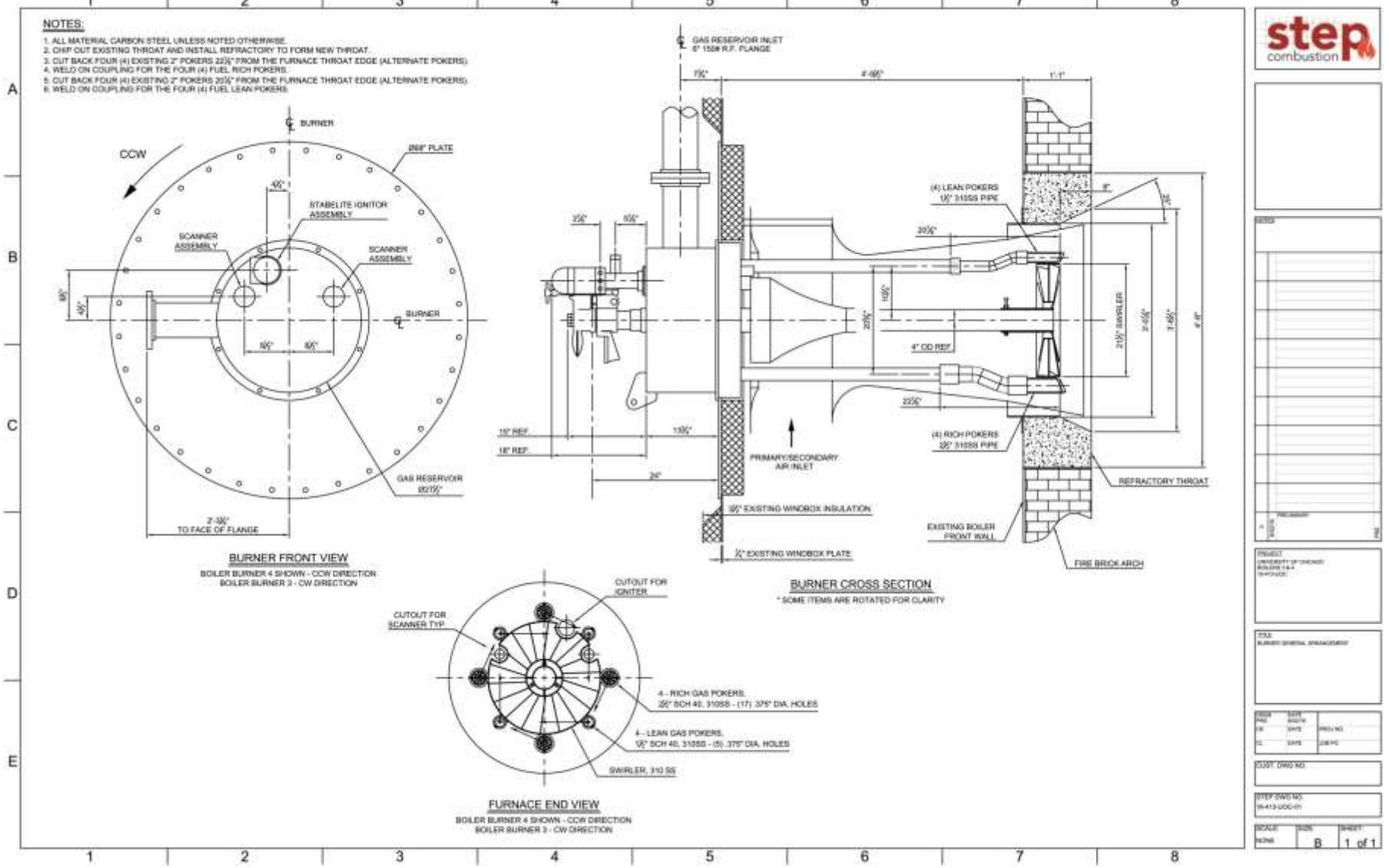

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INDUCED FLUE GAS RECIRCULATION

- Recirculate flue gas:
  - Reduces peak flame temperature
  - Lowers average oxygen content of the combustion air

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NEW ECONOMIZERS

- Replaces air preheaters
  - Smaller size
  - Lowers NOx emissions

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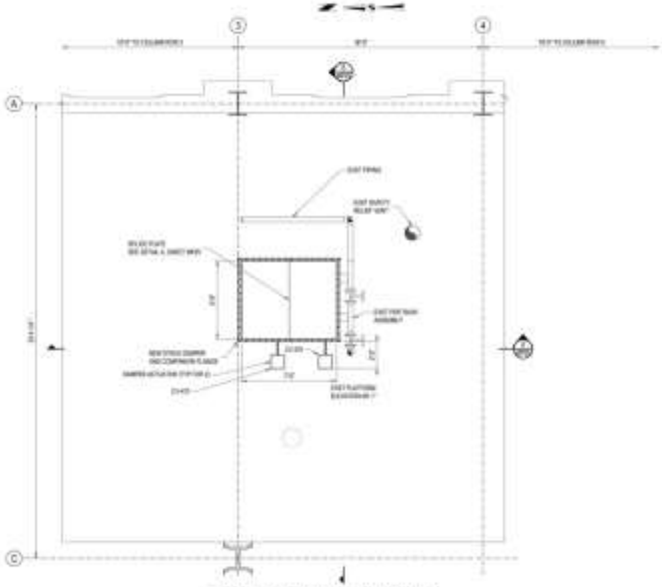
BREECHING

- Modified breeching transition in location of demolished air preheater

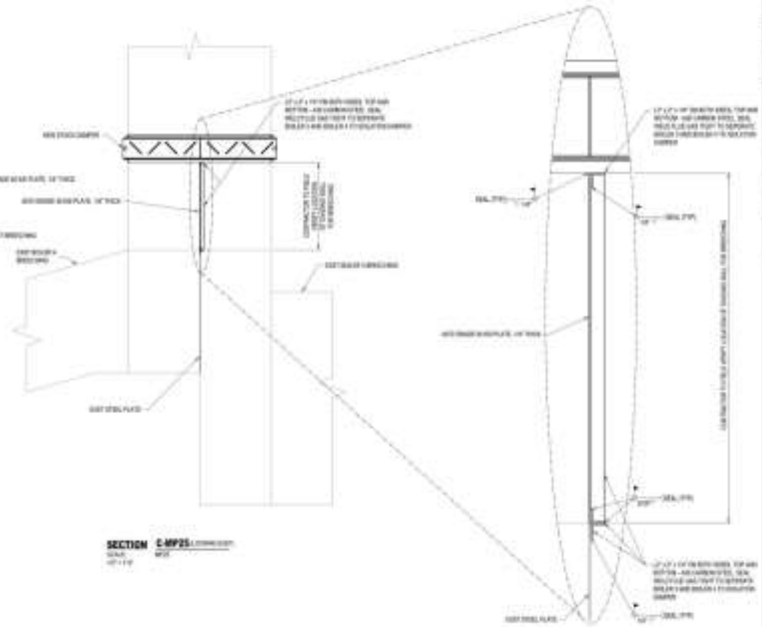
STACK DAMPER

- Modified Boiler 3 and 4 breeching to common stack to include divider plate and stack dampers

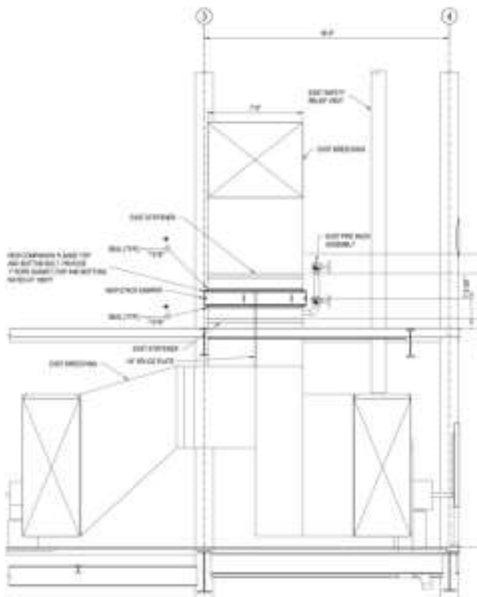


ENLARGED MECHANICAL PLAN - ELEVATION 65'-1"

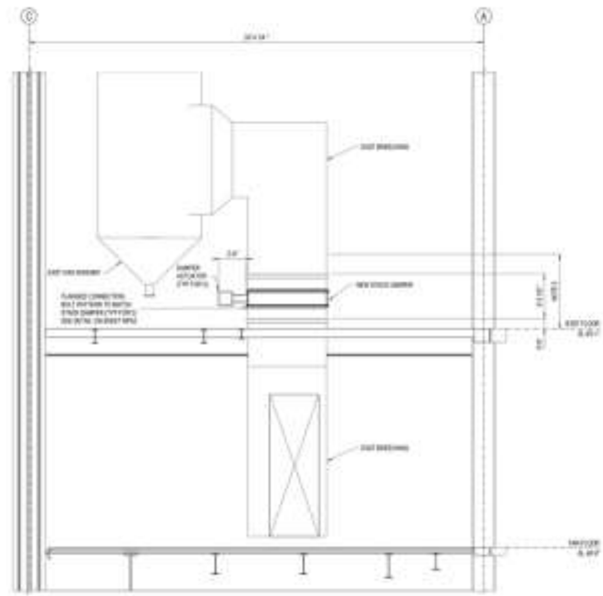
DETAIL A-MP25



SECTION C-MP25



SECTION A-MP25



SECTION B-MP25

INSTALLATION OF STACK DAMPER NOTES:

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STEAM PLANT
PHASE 2 AIR PERMIT UPGRADES
BOILERS 3 AND 4 - CONTRACT C-01,
GENERAL CONSTRUCTION CONTRACT

MECHANICAL PLAN AND SECTIONS
PLATFORM 65'-1"

MP25

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CONTROLS SYSTEM UPGRADE

- New predictive emissions monitoring system:
  - Compliance to regulations
  - Will work during loss of power and loss of communications
- New combustion control system
  - Controls boilers to obtain optimum combustion to limit emissions

GOALS OF CONDENSATE POLISHER PROJECT

- Install duplex condensate polishers in West Campus Combined Utility Plant and South Steam Plant
- Modify condensate piping system to address localized bottlenecks
- Replace South Steam Plant reservoir pumps
- Install new condensate bypass in South Steam Plant

Design Conditions

- Flow rate
  - Design: 600 GPM
  - Peak: 900 GPM
- Pressure Drop
  - Design: 5 PSI
  - Peak: 10 PSI
- Operating Temperature Range: 40 – 200°F
- Operating Pressure Range: 30 – 100 PSI
- Daily Water Usage: 865,000 GPD
- Effluent Water Quality: < 0.3PPM total hardness as $CaCO_3$

WEST CAMPUS COMBINED UTILITY PLANT OVERVIEW

- Two (2) natural gas boilers: 450,000 lb/hr
- Two (2) 2,000-ton chillers

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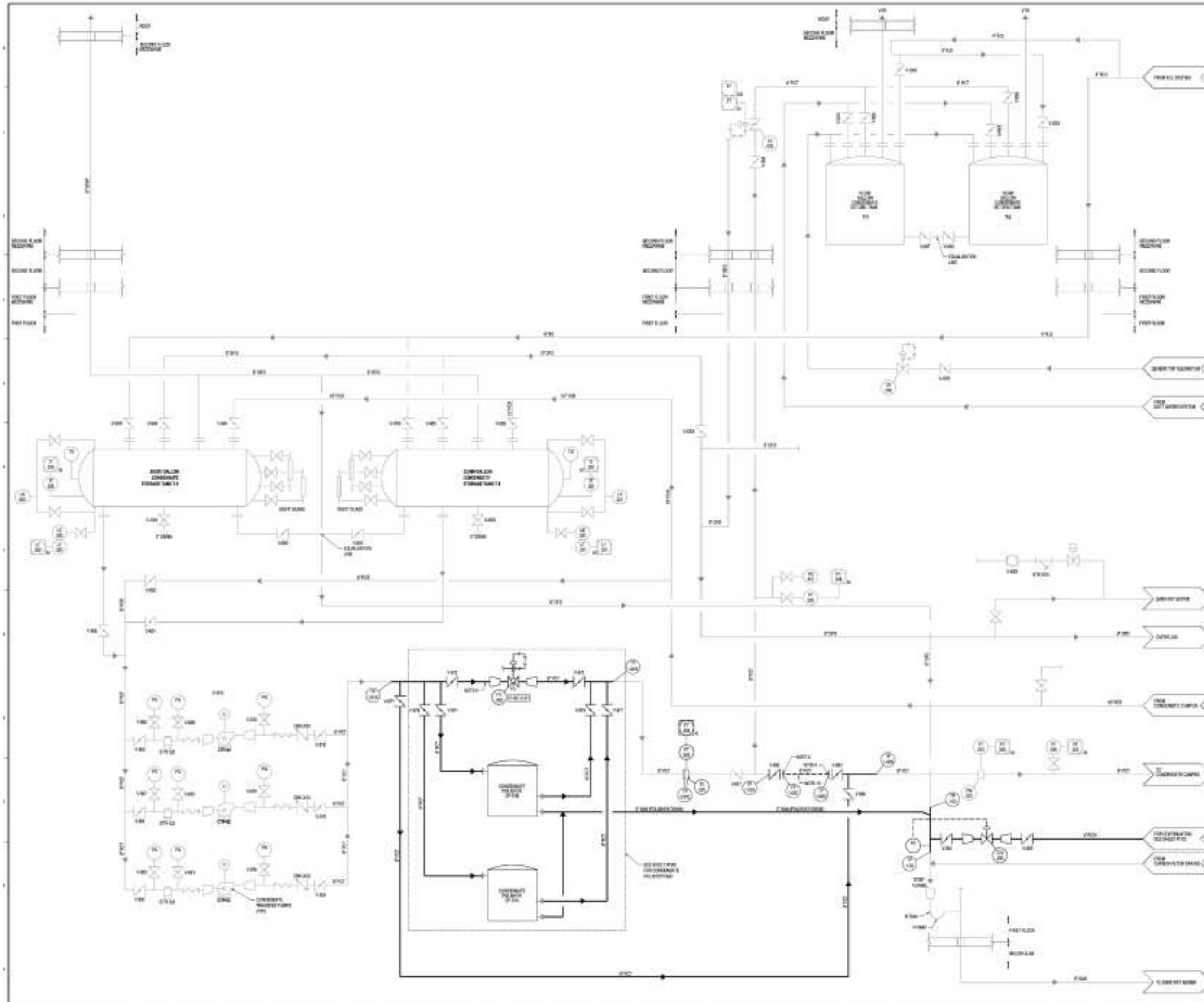

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WATER TREATMENT SYSTEM UPGRADES
CONDENSATE POLISHERS
UC PROJECT NO: 16705
C-01 WCCUP POLISHER INSTALLATION & SSF CONDENSATE PIPING REPLACEMENT

PIPING AND INSTRUMENTATION DIAGRAM
WCCUP CONDENSATE

PI101

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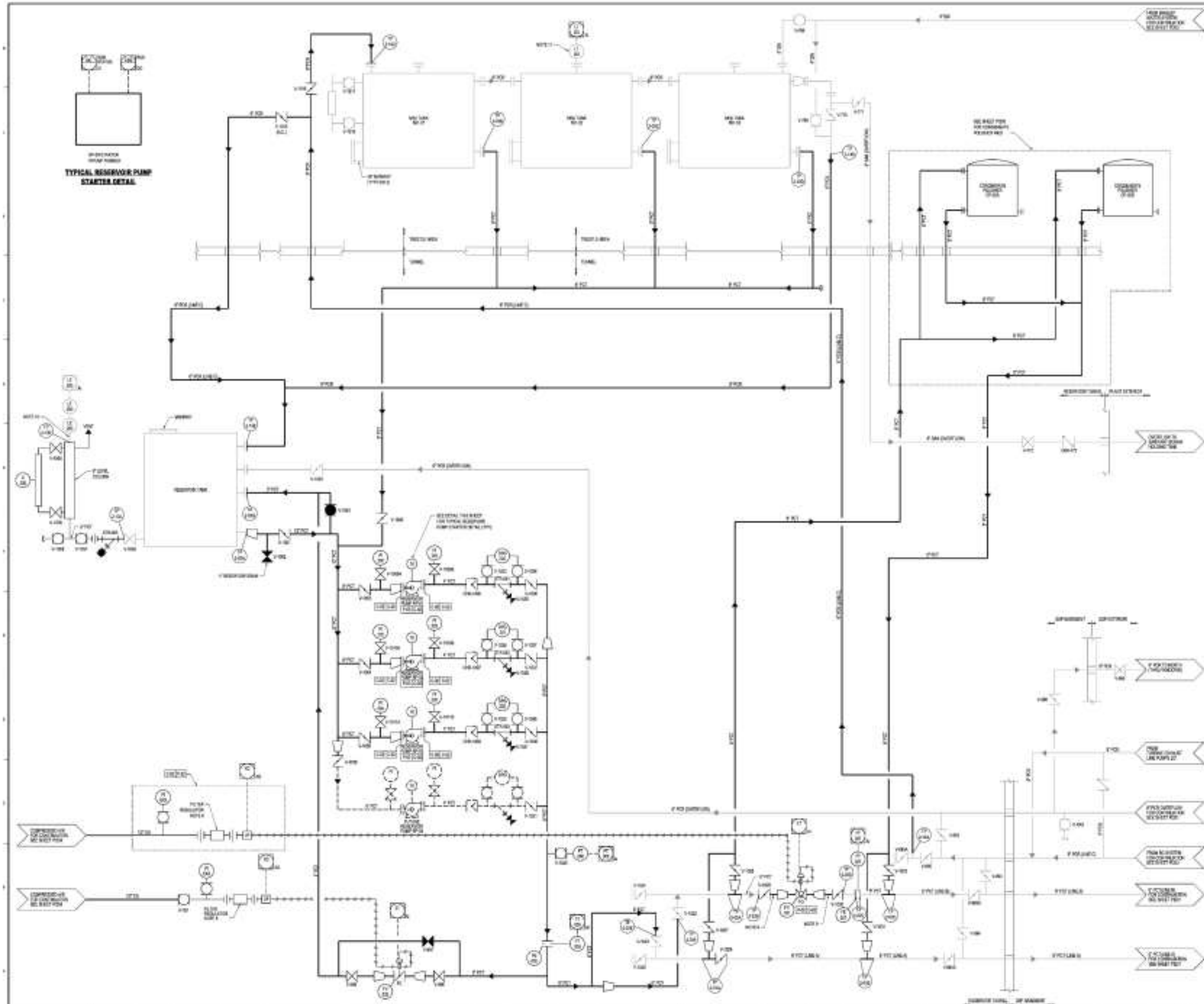

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ISSUE FOR CONSTRUCTION

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WATER TREATMENT SYSTEM UPGRADES
CONDENSATE POLISHERS
UC PROJECT NO:
C-02 SSP POLISHER INSTALLATION

PIPING AND INSTRUMENTATION DIAGRAM
SSP RESERVOIR TUNNEL CONDENSATE

P1202

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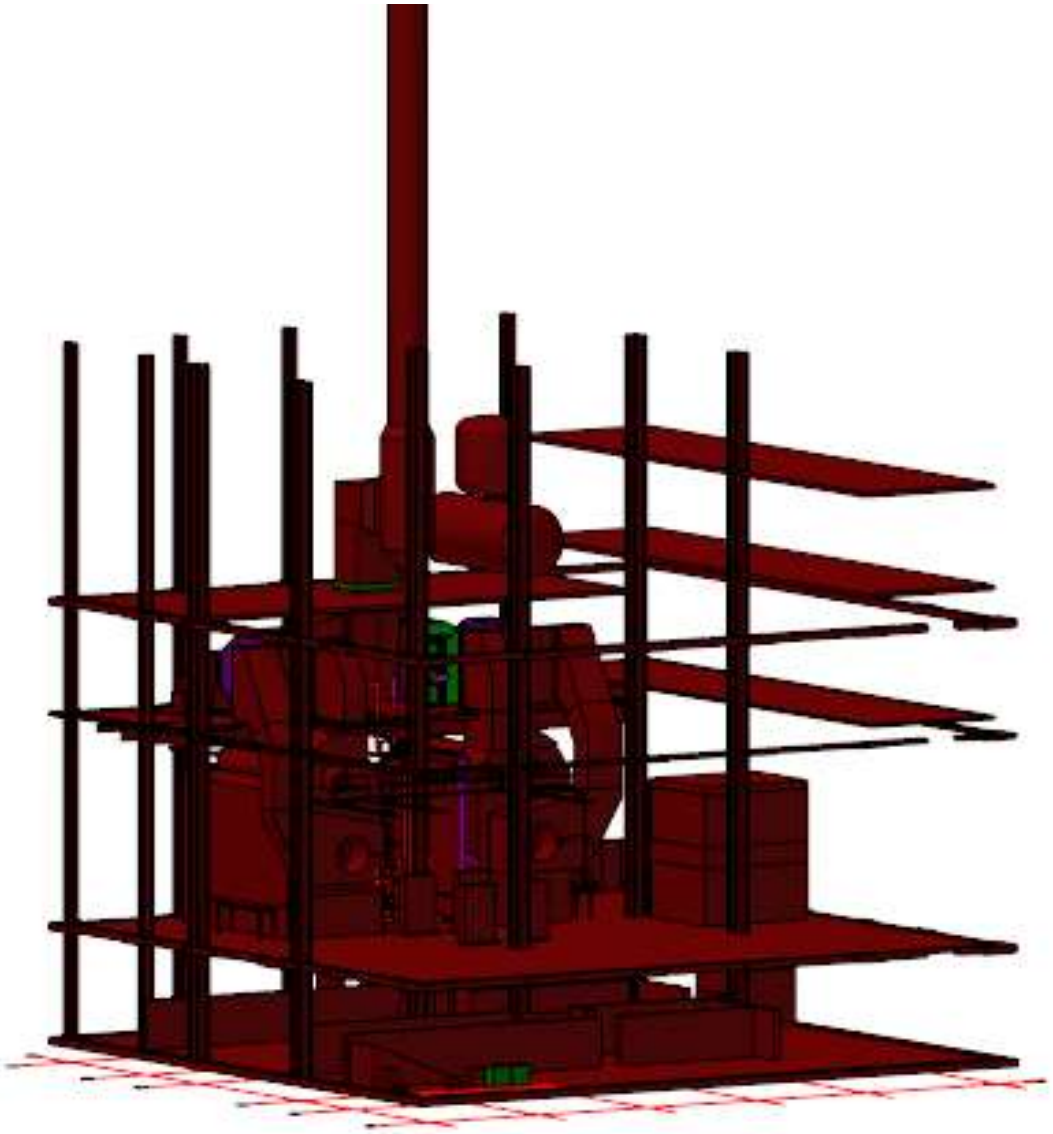

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COMMISSIONING

- Get CX Agent involved early and develop checklists early
- Project wiring diagrams
- Operating/control system description with equipment-vendor-supplied data and review
- Control system FAT with Control Service Technician and equipment vendor in attendance
- Loop checkout utilizing vendor representatives
- Set up historian (PI, etc.) prior to startup
- Startup and testing procedures prior to startup efforts

Best Practices & Lessons Learned

- Boiler tuning is critical when two boilers utilize a common stack
- Scheduling
- Coordinate plant outages
- Care when operating equipment until plant is fully commissioned

Questions