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ARCADIS

SOUTHERLY CEPT: DESIGNING FOR INTERMITTENT USE

Columbus, Ohio
One Water Conference

August 29, 2018

THE CITY OF
COLUMBUS
ANDREW J. GINTHER, MAYOR

DEPARTMENT OF
PUBLIC UTILITIES

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Agenda

What is CEPT?

Challenges of Infrequent Use

Chemical Feed Strategy

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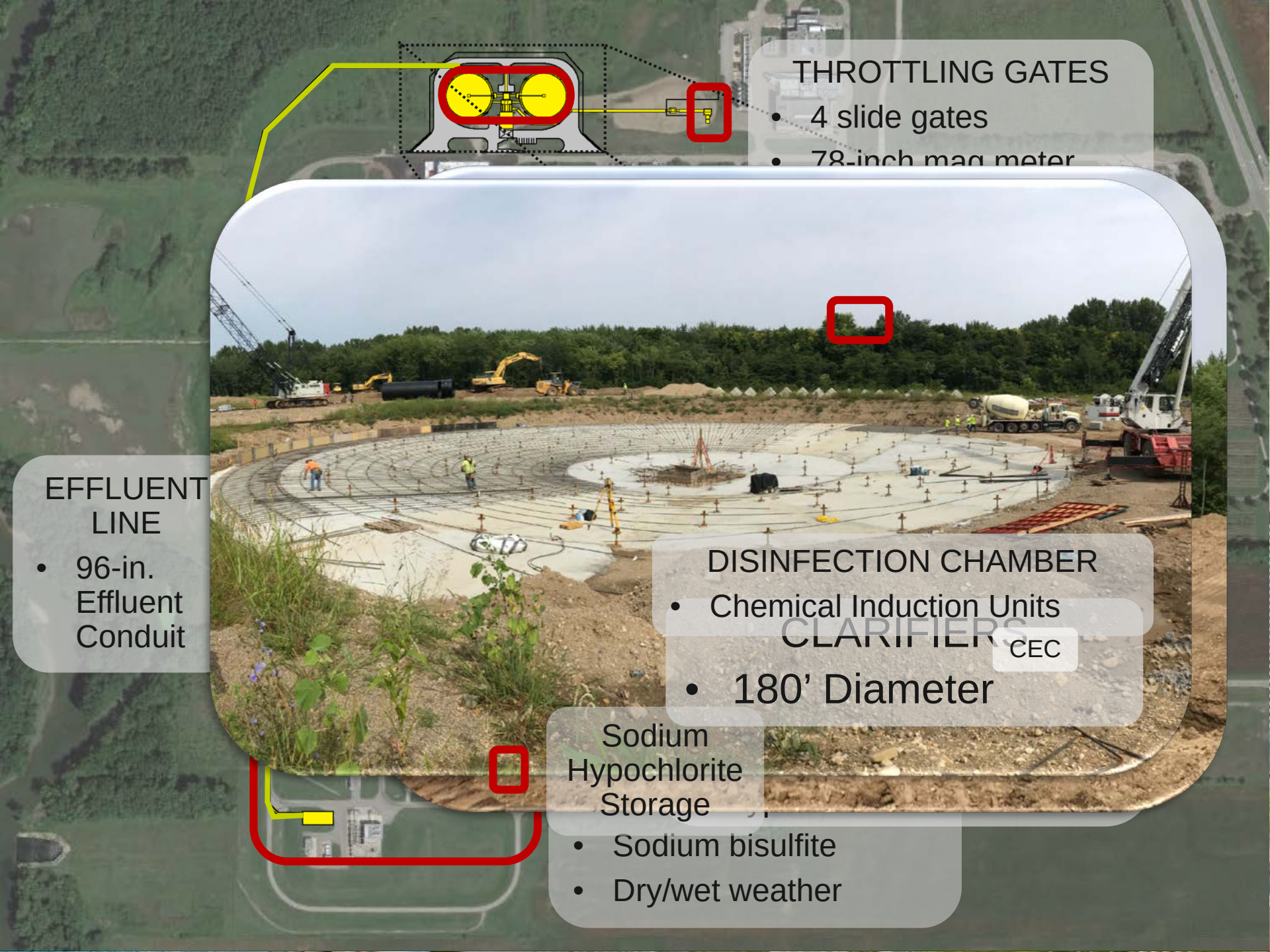
What is CEPT?

- 110 MGD wet weather treatment train
- Partial treatment: removes TSS, BOD and disinfects
- Blended with WWTP effluent near outfall to meet NPDES permit
- Goal: Reduce CSOs & Eliminate SSOs

Designed for an average of 2 activations per year!


THROTTLING GATES
• 4 slide gates
• 78-inch mag meter
EFFLUENT LINE
• 96-in. Effluent Conduit
DISINFECTION CHAMBER
• Chemical Induction Units
CLARIFIERS
CEC
• 180’ Diameter
Sodium Hypochlorite Storage
• Sodium bisulfite
• Dry/wet weather

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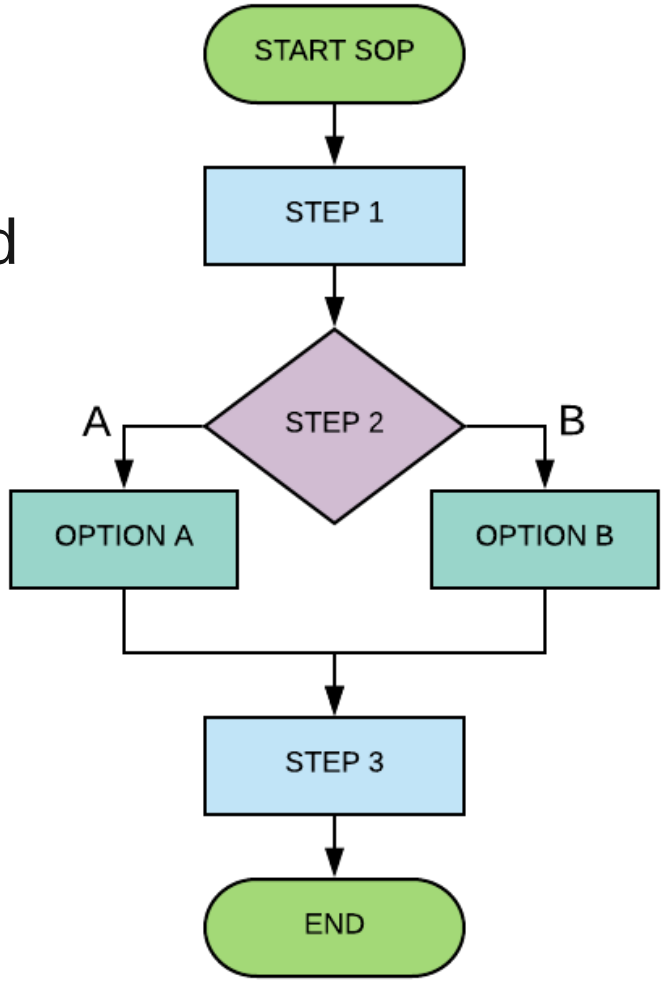
Challenges of Infrequent Use

- Operational familiarity
- Complicated startup
- Shut down for long-term dormancy
- Maintaining mechanical readiness

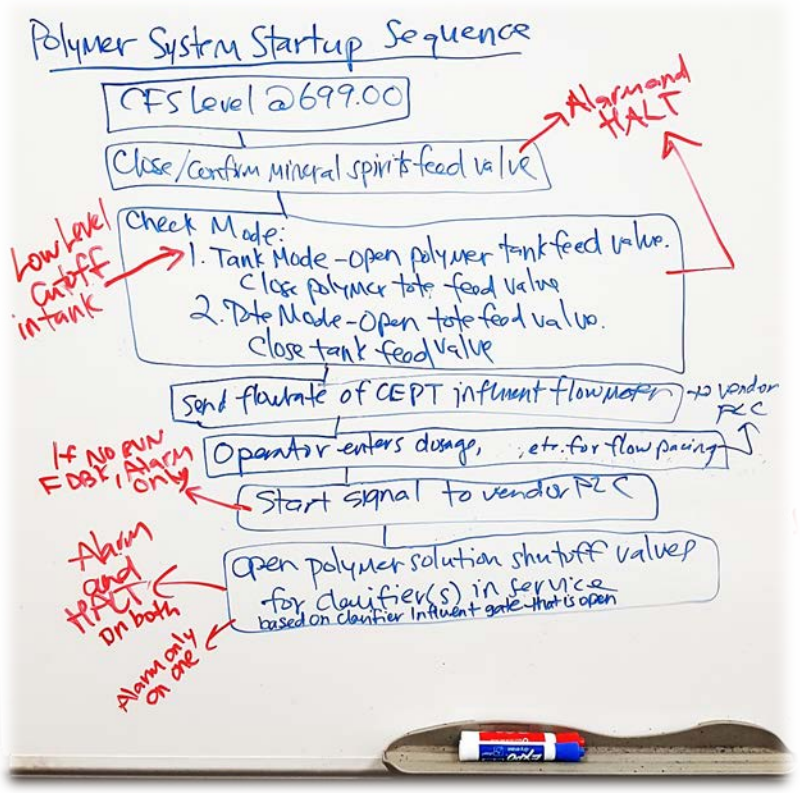
Operational Familiarity

- Simplified SOPs workflows
- High level of automation requested
- Pre-programmed sequences to automate and guide through:
  - Startup
  - Shutdown
  - Flushing & draining
  - Equipment cycling
  - & others



Equipment Systems to Start Up

- Flow splitting slide gates
- Ferric chloride feed pumps
- Polymer blend units
- Clarifier sludge collector drives
- Primary sludge pumps
- Sodium Hypochlorite feed pumps & induction units
- Sodium Bisulfite feed pumps & induction units
- 3rd effluent flow meter
- Process monitoring instruments (pH and Turb)



General Startup Considerations

- Fill inf. conduit prior to throttling flow to CEPT: flood flow meter
- Chemical injection dose lead/lag times: proximity to storage and pumping
- Sequentially adjust throttling gates prior to increasing influent pumping
- Filling tanks and pump piping: evacuate trapped air

Startup Procedure

- Ready reserve influent pumping capacity
  - Bring an additional pump online
  - Maintain main plant < 330 MGD
  - Pumps prepared to ramp up when called upon
- Initiate *Arm CEPT* sequences
  - Carrier water for chemicals opens automatically
  - Drain valves close

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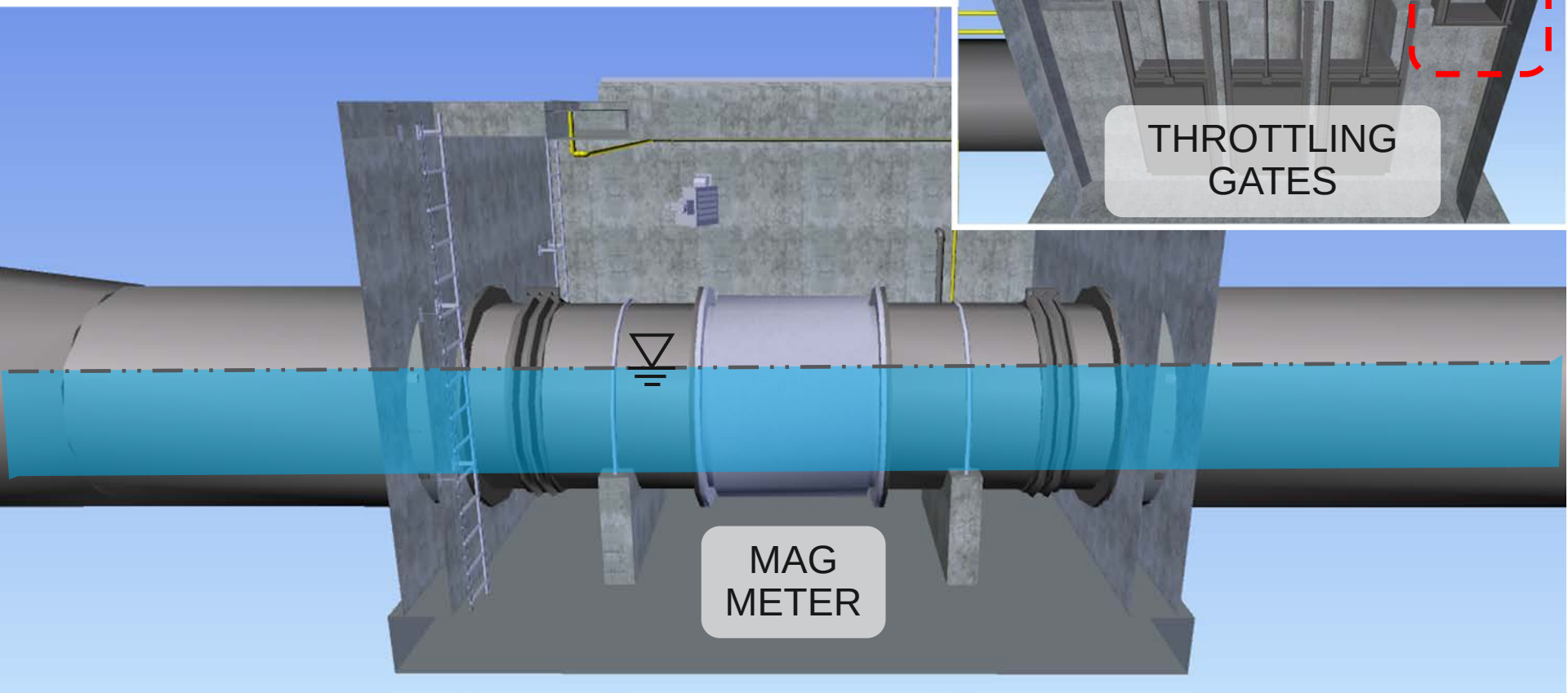
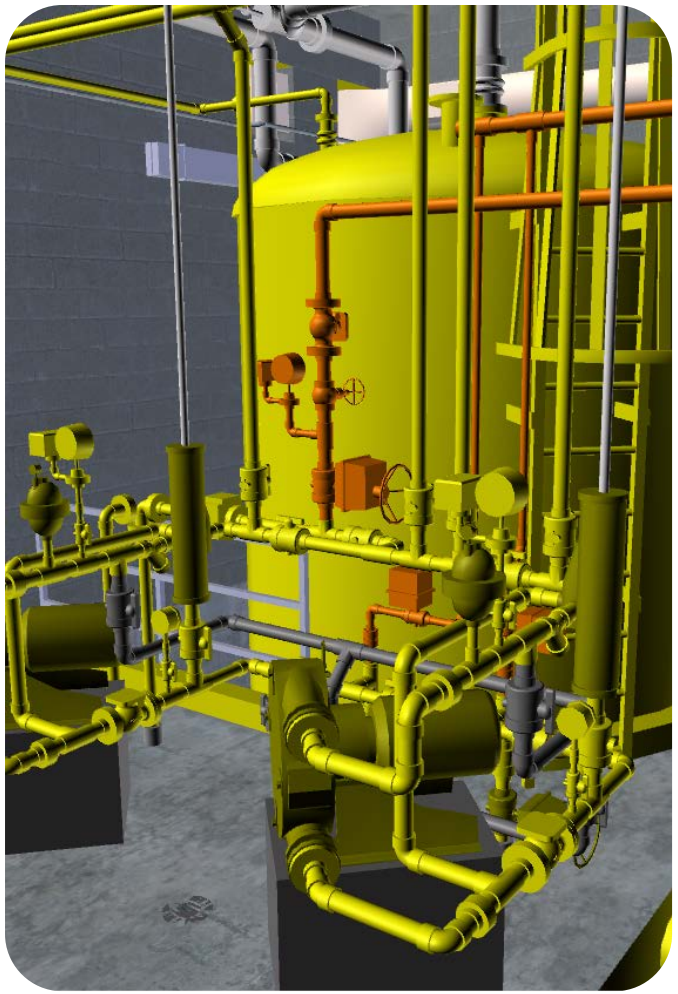
CEPT Start: Flow Splitting

- Conduit fill gate floods influent line at 30 MGD to bring mag meter throttling gates online



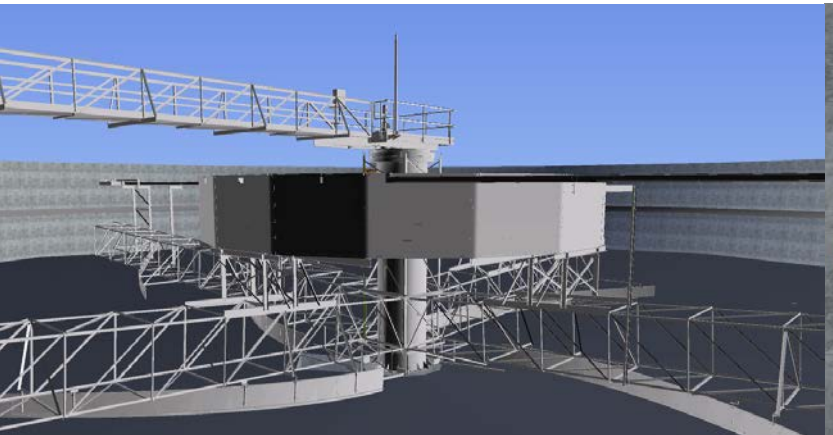
CEPT Start: Chemical Feed

- Sequences initiate automatically:
  - Polymer
  - Ferric Chloride
  - Sodium Hypochlorite
  - Sodium Bisulfite
- Based on level, flow signals



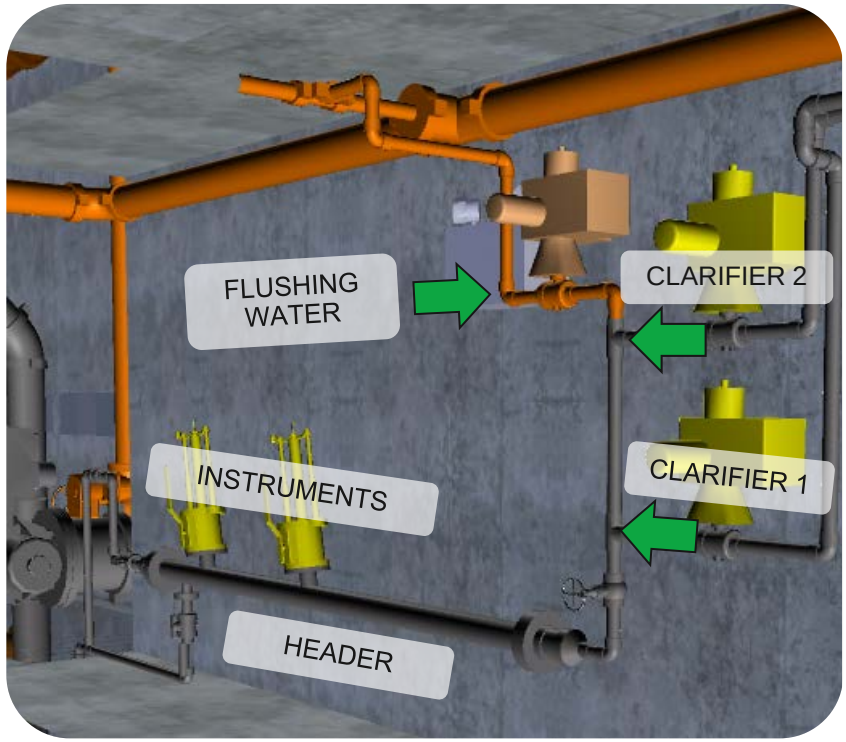
CEPT Start: Clarifiers

- Operator prompted to start sludge collector drives when tanks are half full
- Sludge pumping sequence initiated manually
  - Pump allocation: (2X duty with standby)
  - Draw off rate(s)
  - Sludge destination
  - Grinders start automatically with pumps



Hibernation (Shutdown) Strategy

- Clear pumps and valves of process medias
- Flush sludge and chemical lines and leave full of water
- Drain clarifiers and conduits and leave drains open so rainwater does not collect.
- Reduce odors by clarifier washdown
- Keep stored polymer from stratifying
- Keep process monitoring instruments calibrated



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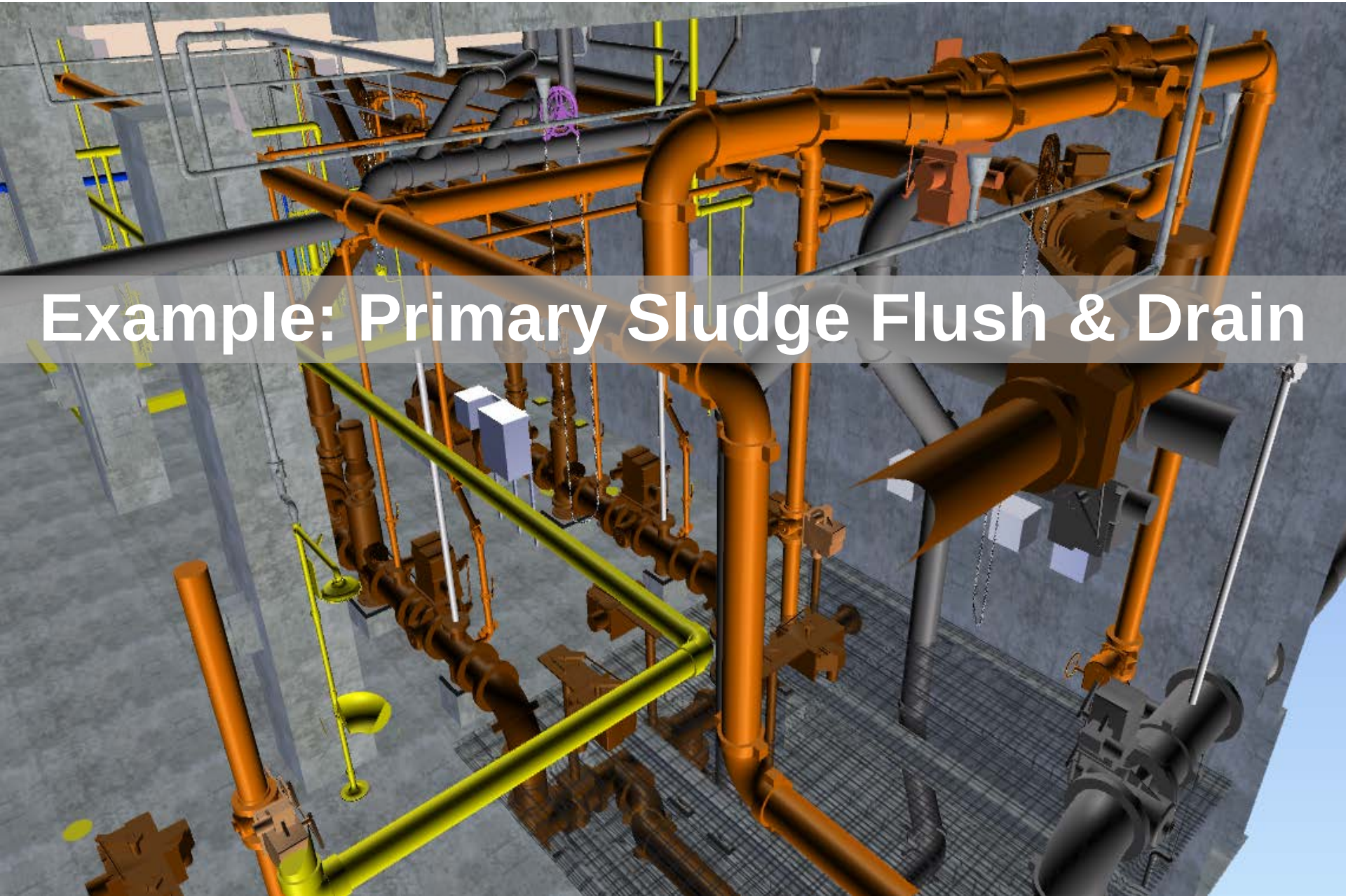
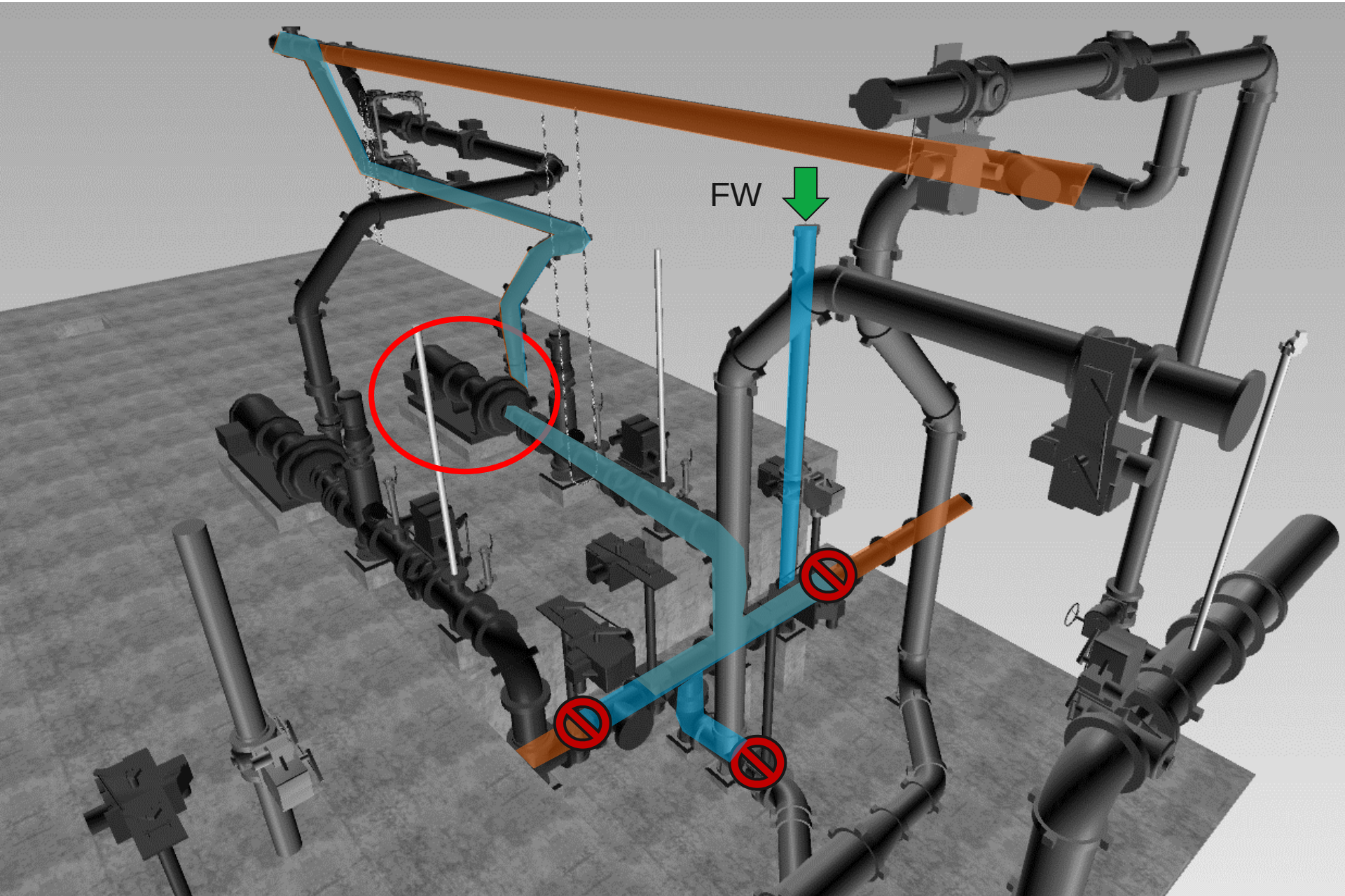


Example: Primary Sludge Flush & Drain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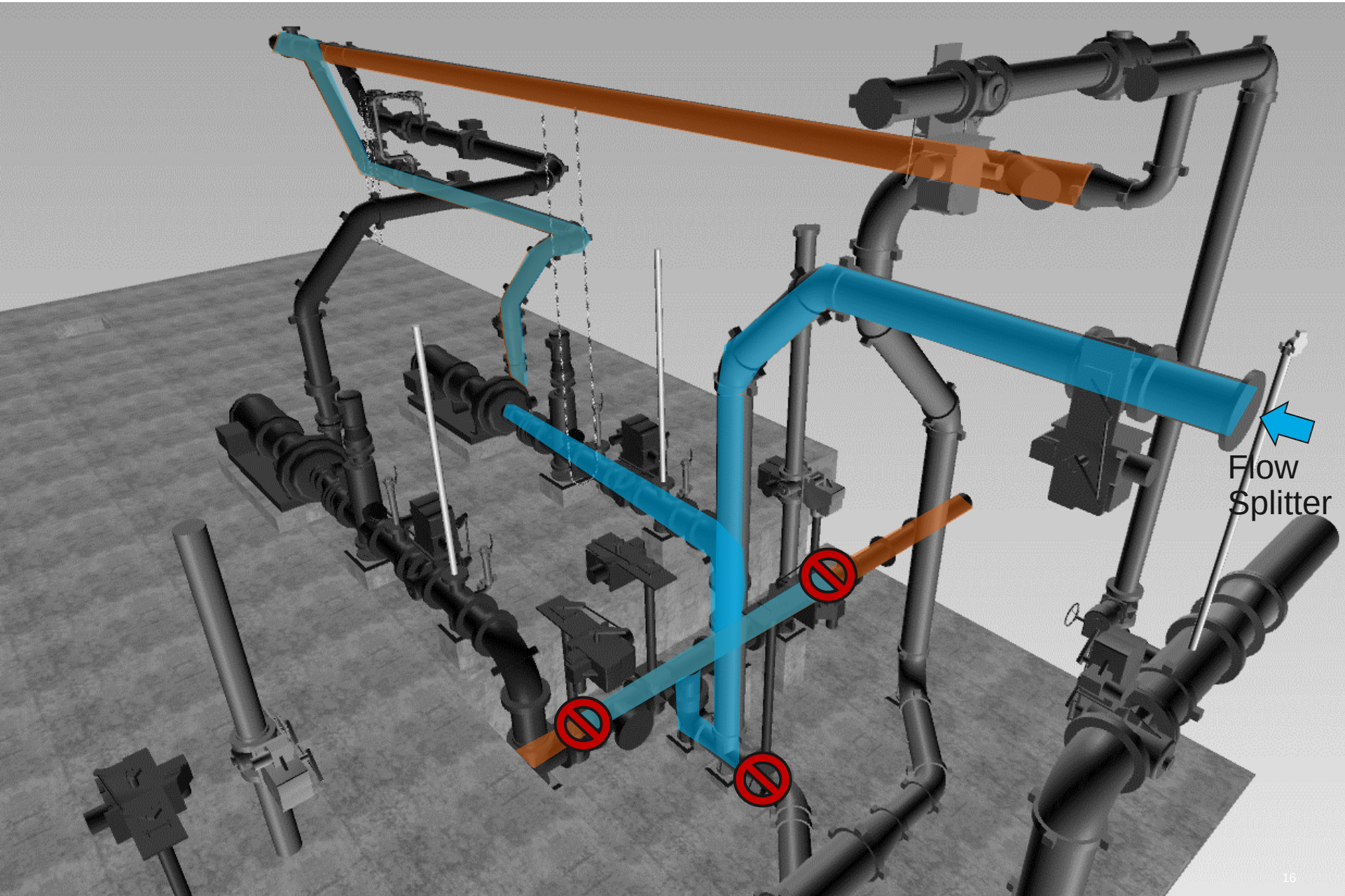
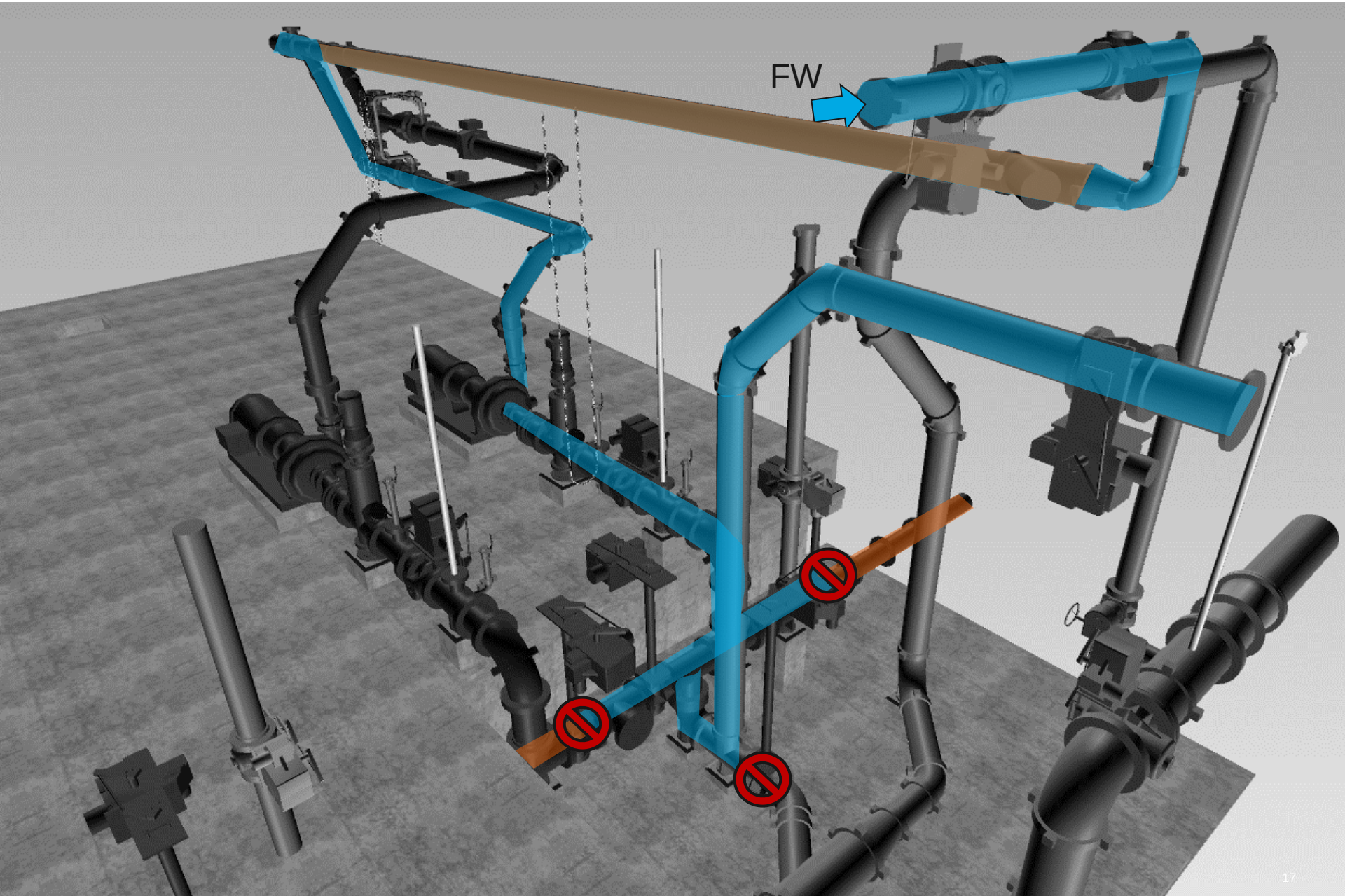

Flow
Splitter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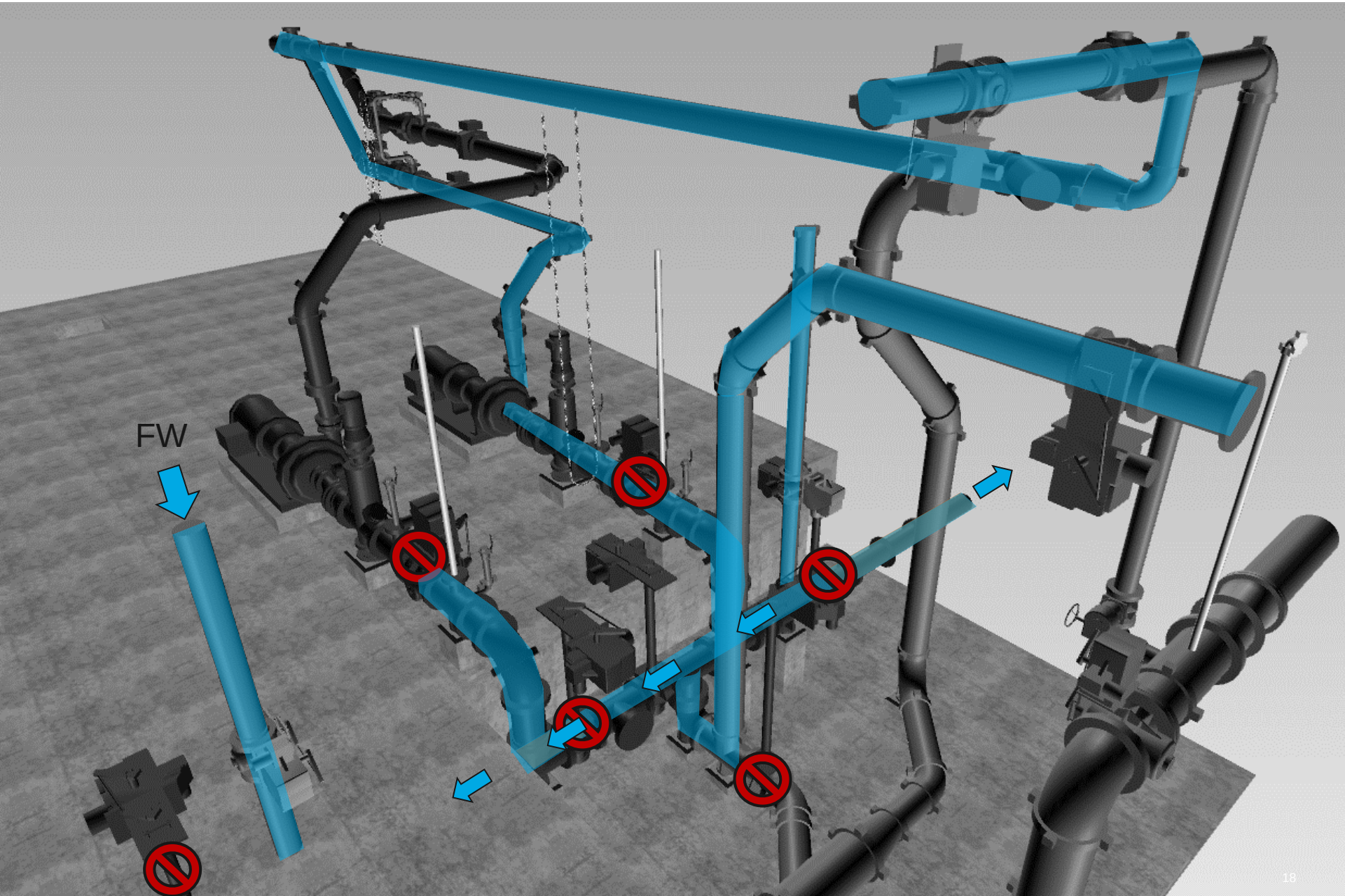
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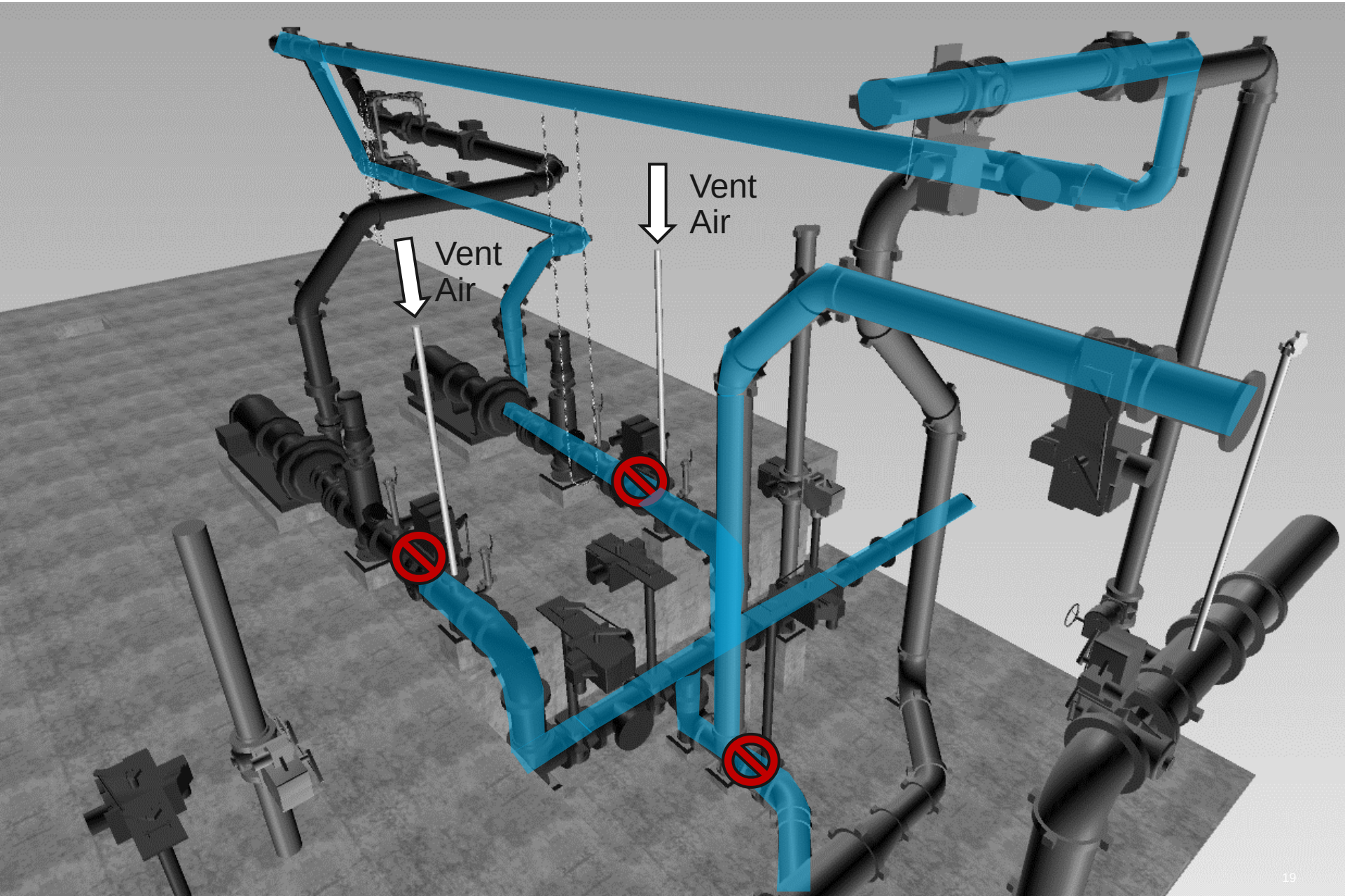
Vent
Air
Vent
Air

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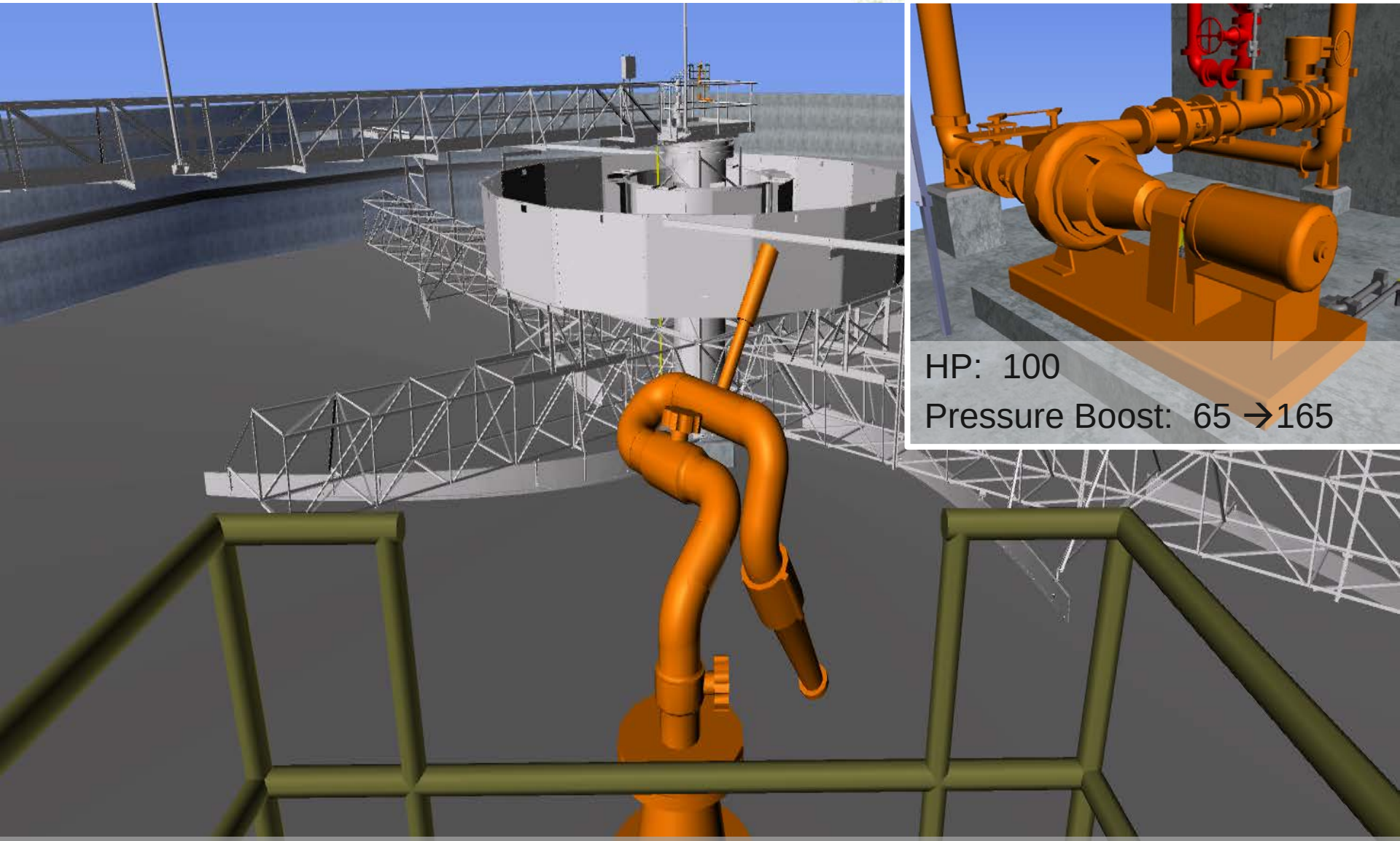

HP: 100

Pressure Boost: 65 →165

Washdown: High Pressure Plant Effluent

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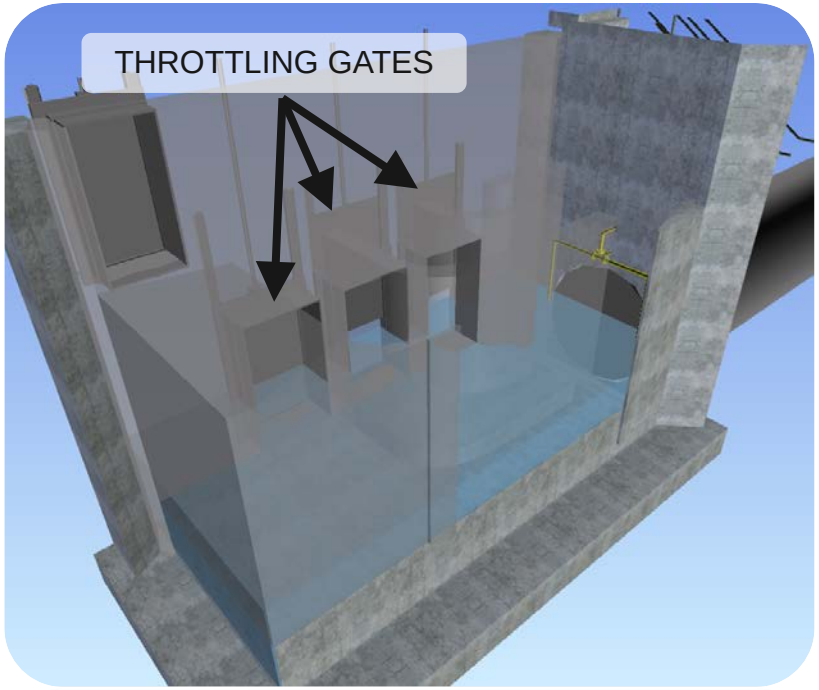
Maintaining Mechanical Readiness

- **Strategy: Exercise pumps, valves, gates, collectors periodically using pre-programmed sequences**
- Design allows for side stream cycling of clarification equipment during dry weather
  - Clarifiers are not filled
  - No discharge occurs
- Initiate *CEPT Influent Cycling* sequence followed by performing full shutdown SOP, including:
  - Flush, drain, and washdown sequences



ALL* moving equipment is exercised!

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Chemical Feed Strategy

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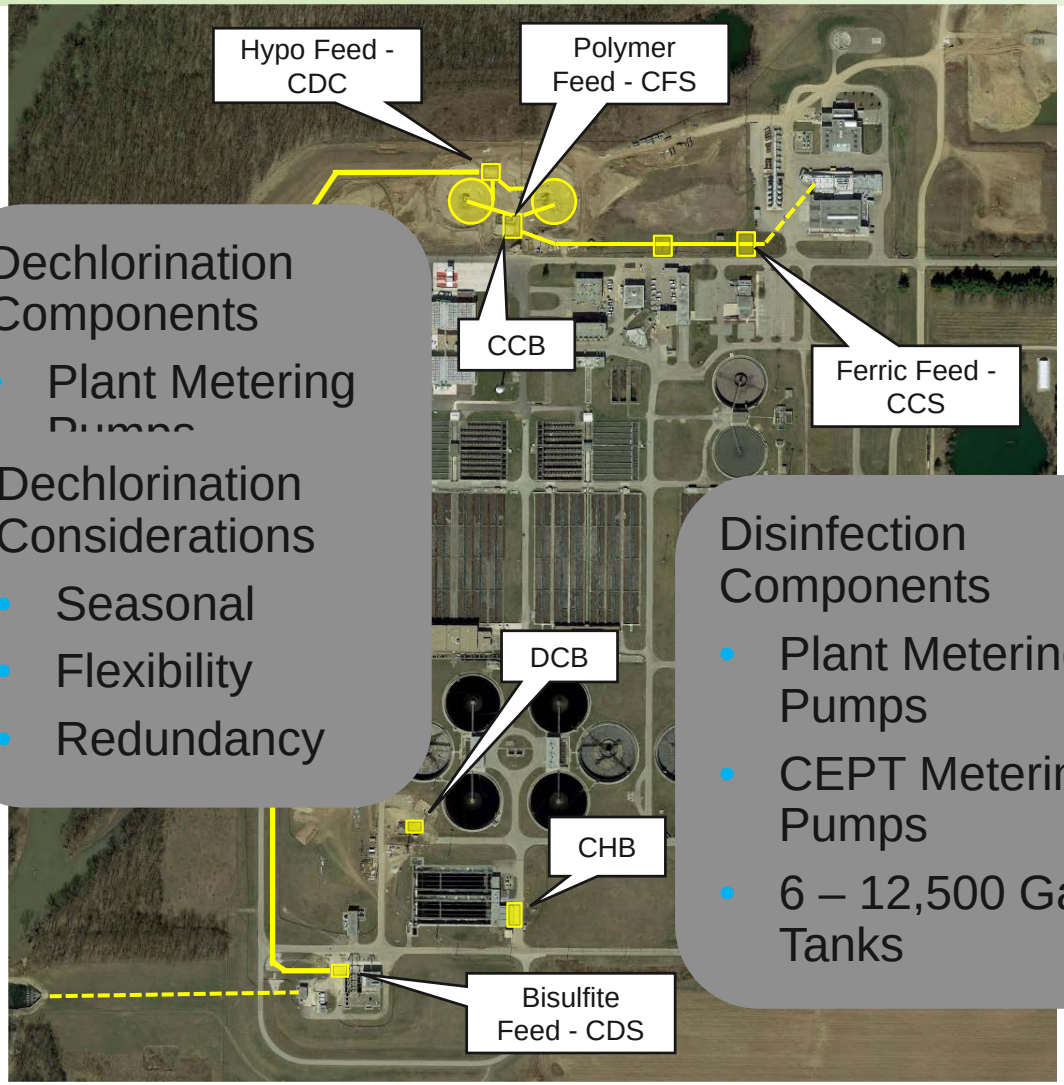
Timing and Controls

- Disinfection Design Considerations
- Disinfection System Startup

CEPT Chemical Facilities



Dechlorination Components

- Plant Metering Pumps

Dechlorination Considerations

- Seasonal
- Flexibility
- Redundancy

Disinfection Components

- Plant Metering Pumps
- CEPT Metering Pumps
- 6 – 12,500 Gal Tanks

- CEPT Control Building
  - Ferric
  - Polymer
- Chlorine Control Building
  - Sodium Hypochlorite

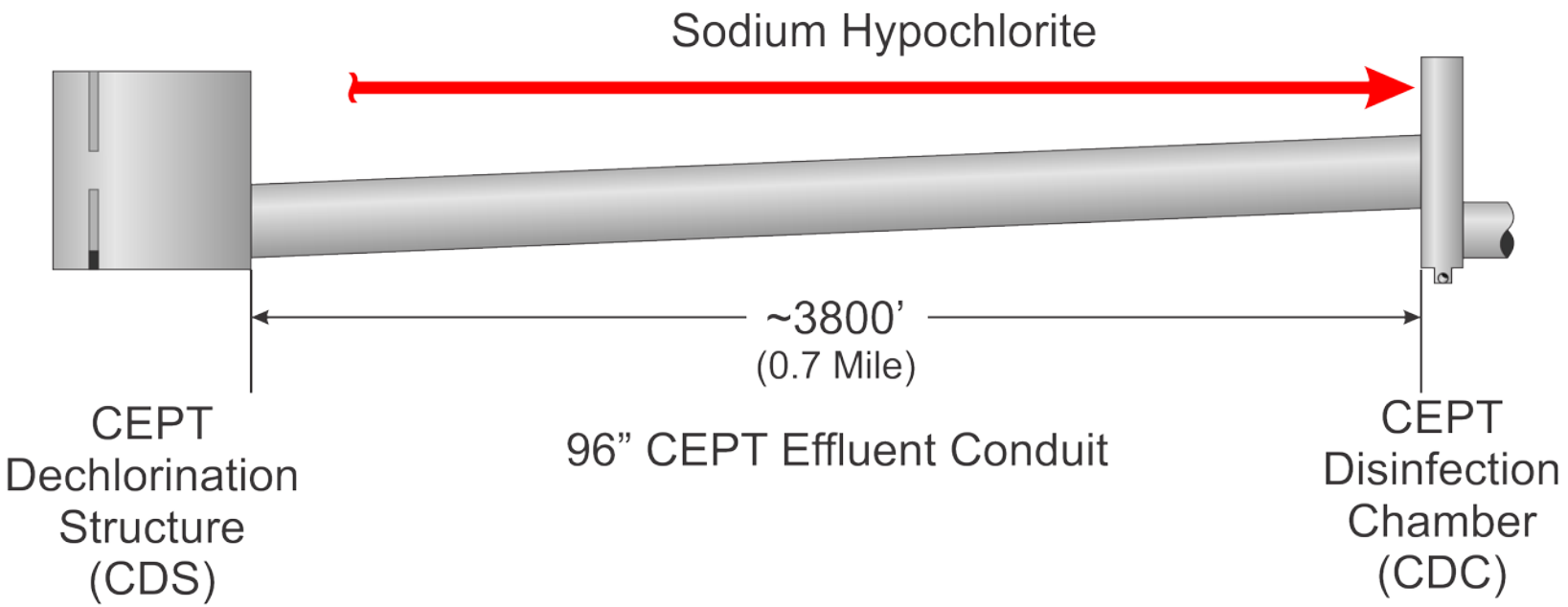
Dechlorination Control Building

- Sodium Bisulfite

Chemical Systems Start Up

- Inputs
  - Flows
  - Levels at structures
  - Gate/valve positions
  - Process equipment readiness
  - Monitoring/Sampling equipment readiness
  - Systems interlock/permissive
- Chemical Feed Piping Lengths
  - Ferric
  - Polymer
  - Bisulfite
  - Hypochlorite

Disinfection



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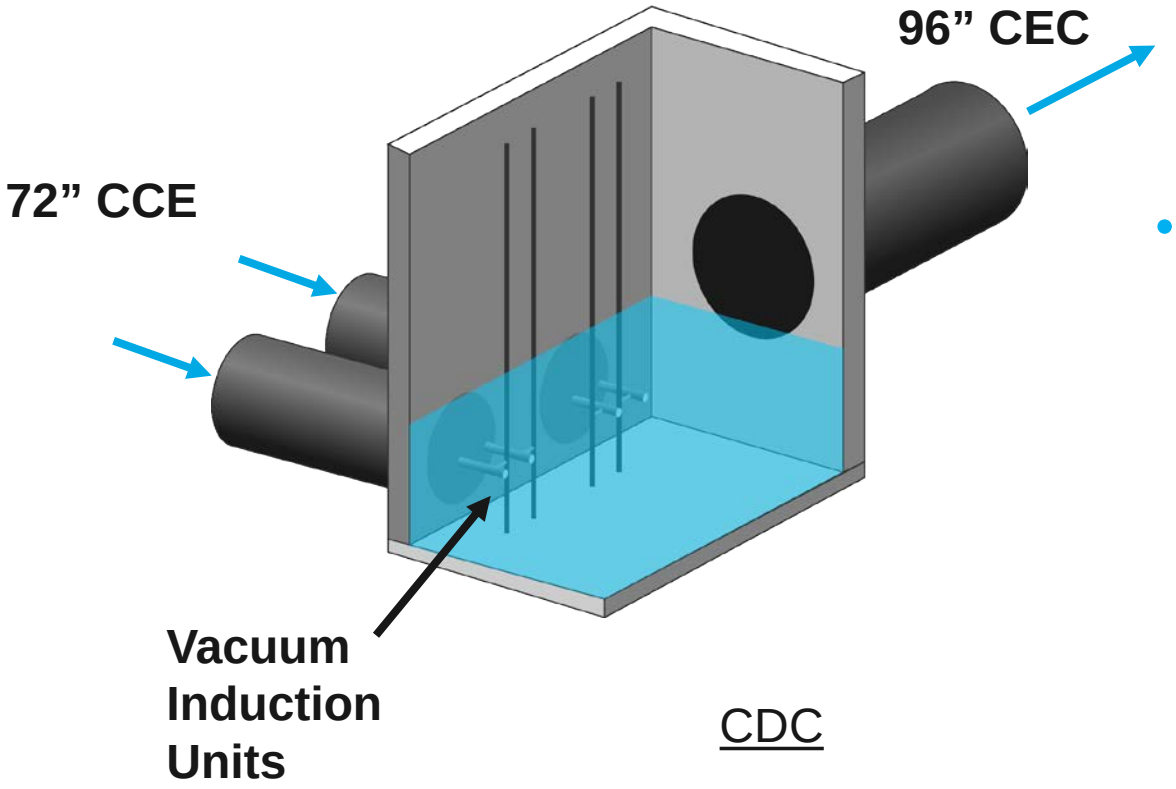
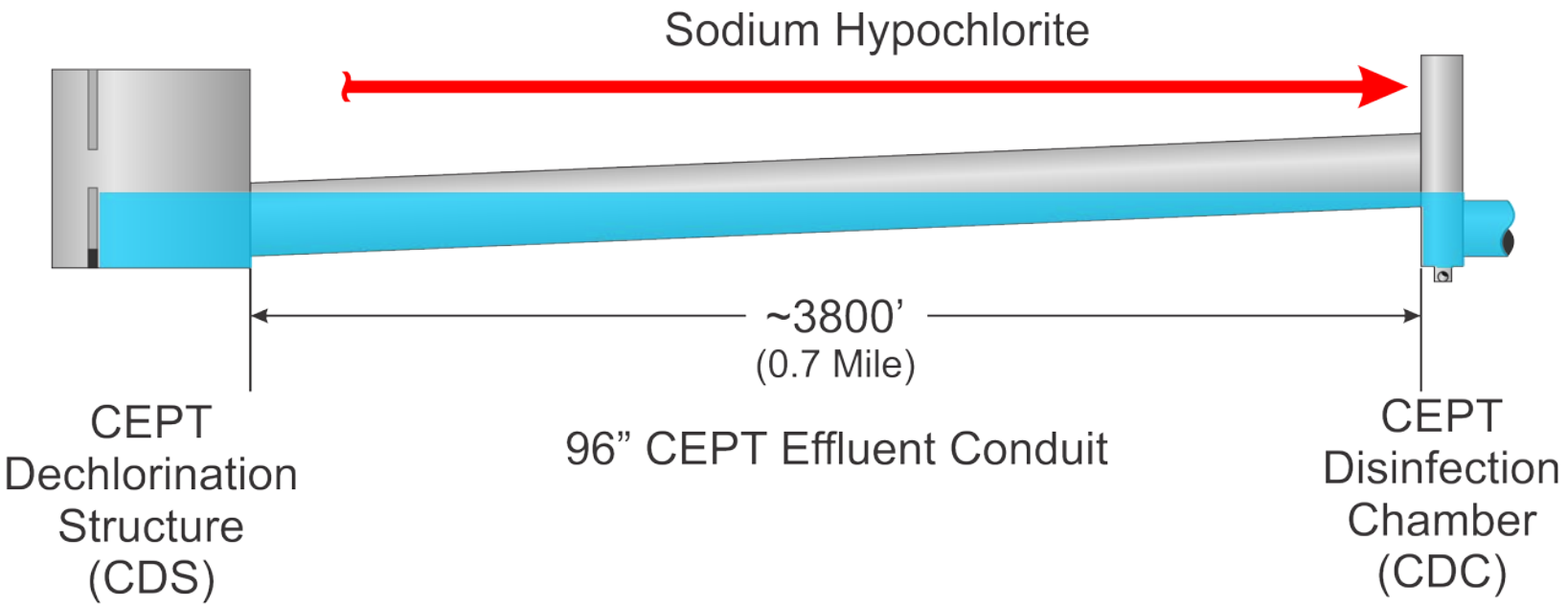
CEPT Disinfection Chamber



CDC

- Coordinated Effort
  - CEPT Clarifier Effluent
  - Vacuum Induction Units
  - CEPT Effluent Conduit

Disinfection



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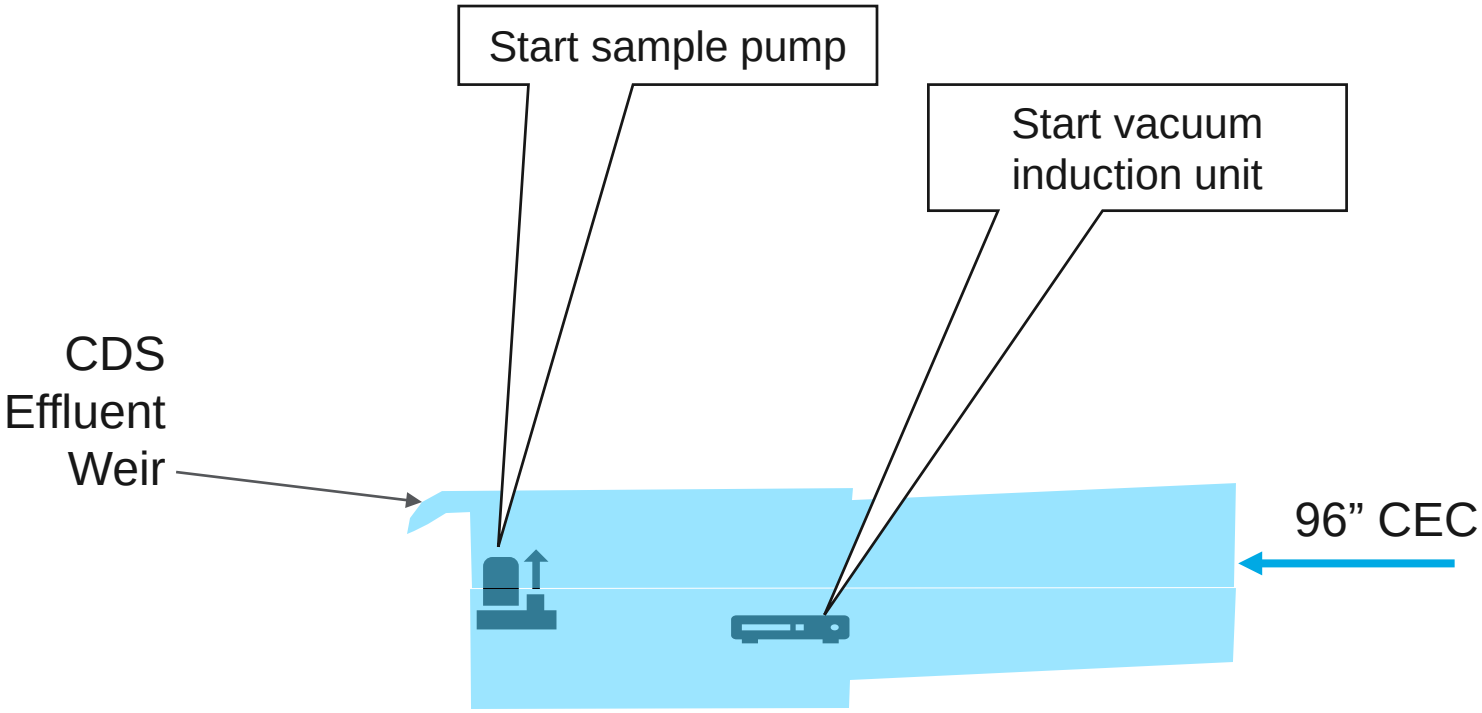
CEPT Dechlorination Structure



CDS

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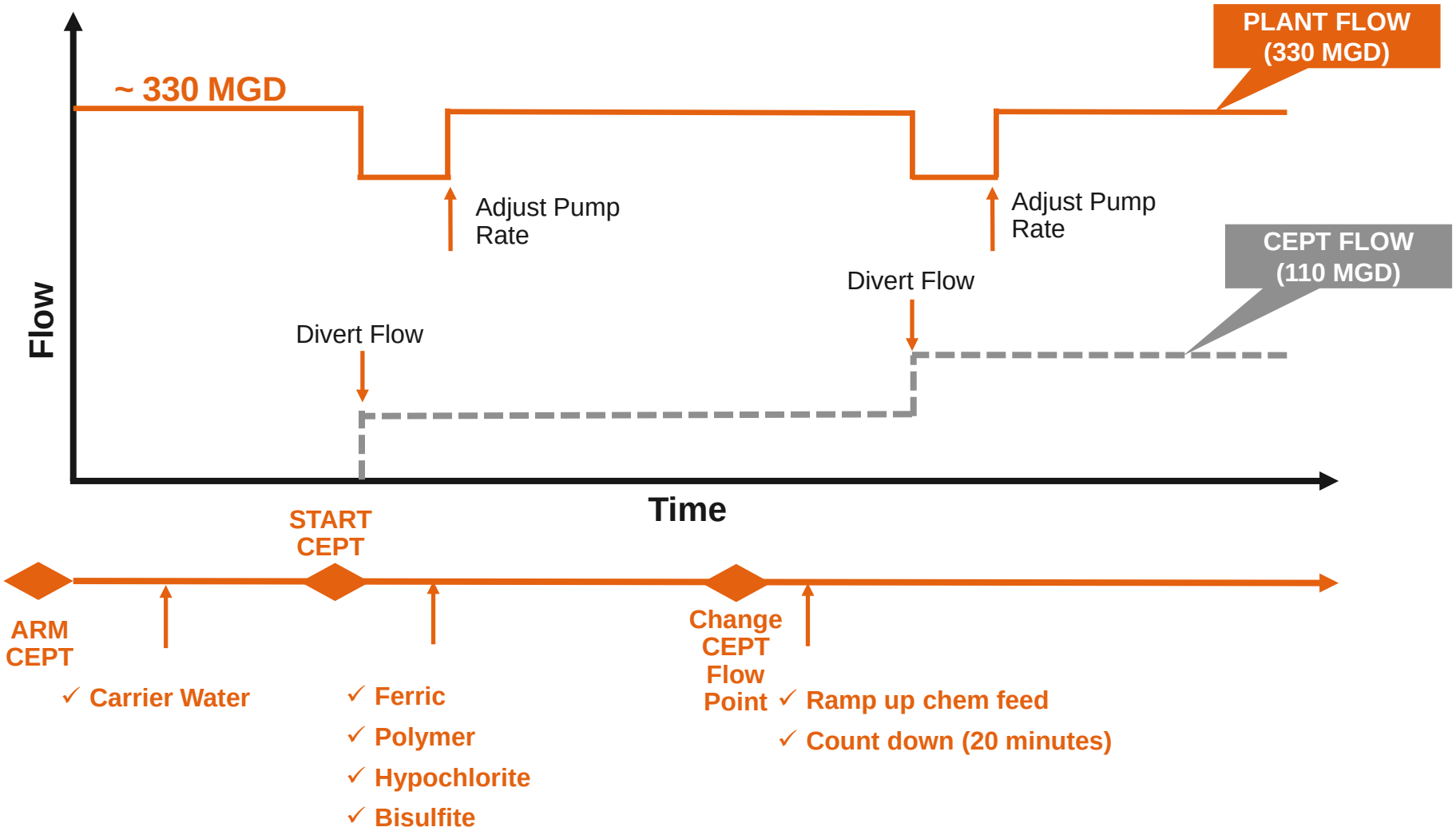
Flow and Chemical Adjustments



S88 and S89 ‘Fun’ Facts:

Project documents:

- 623 total number of drawings
- 96 Instrumentation drawings
- 349 pages of functional requirements

Number of firms:

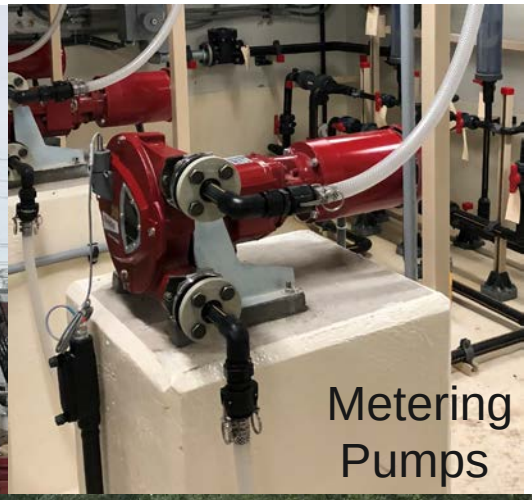
- Team of 14 Consulting Firms

Schedule:

- Preliminary Design 2014 - 2015
- Design from 2015 - 2017
- Construction started June 2017

Under Construction


CEPT Control Building


Metering Pumps

What's next ?

- **Operational Demonstration October 2019**
  - Initiate plant flow of 220 MGD or higher
  - Weather Dependent
  - Over a 6-month period
  - Four successful demonstration events
- **Simulated Flow Operational Demonstration ~ August 2019**
  - Test field instruments
  - Programming
  - Personnel 'walk through'
  - Confirm SOP
- **Construction Closeout June 2020**

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Today's Speakers

SETH GRIMES
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