



## BALTIMORE CONVENTION CENTER CP1

10,000 TONS IN A 5,000 TON PLANT

VEOLIA ENERGY  
NORTH AMERICA

MARCH 8, 2018

# BALTIMORE CONVENTION CENTER

## ▶ VEOLIA NORTH AMERICA'S CHILLED WATER PLANT #1

## ▶ STAKEHOLDERS

- Veolia Energy North America
- Baltimore Convention Center
- City of Baltimore
- MSA



# BALTIMORE CONVENTION CENTER

## ► VEOLIA NORTH AMERICA – BALTIMORE

- 4 CHILLED WATER PLANTS
- 10 MILES OF DISTRIBUTION PIPING
- 50 CUSTOMERS
- 12 MILLION SQUARE FEET
- 33,000 TONS OF CHILLED WATER CAPACITY



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## ► BASICS OF NEW PLANT

- PLANT **CHILLED WATER** CAPACITY: **5,400 TONS**
  - CHILLED WATER = 35°F / 52°F → (17° DT)
- PLANT **ICE BUILDING** CAPACITY: **3,660 TONS**
  - CHILLED WATER = 20°F / 32°F → (17° DT)
  - ICE BUILDING > 48,000 TON HRS IN 14 HRS
- ICE MELT MODE GENERATES AN ADDITIONAL 4,600 TONS AND TOTALS **10,000 TONS**
- 25% ETHELENE GLYCOL
- (3) 1,800 TON CHILLERS (CHW MODE)
- (9) COOLING TOWERS
- (4) 3,700 GPM CONDENSER WATER PUMPS





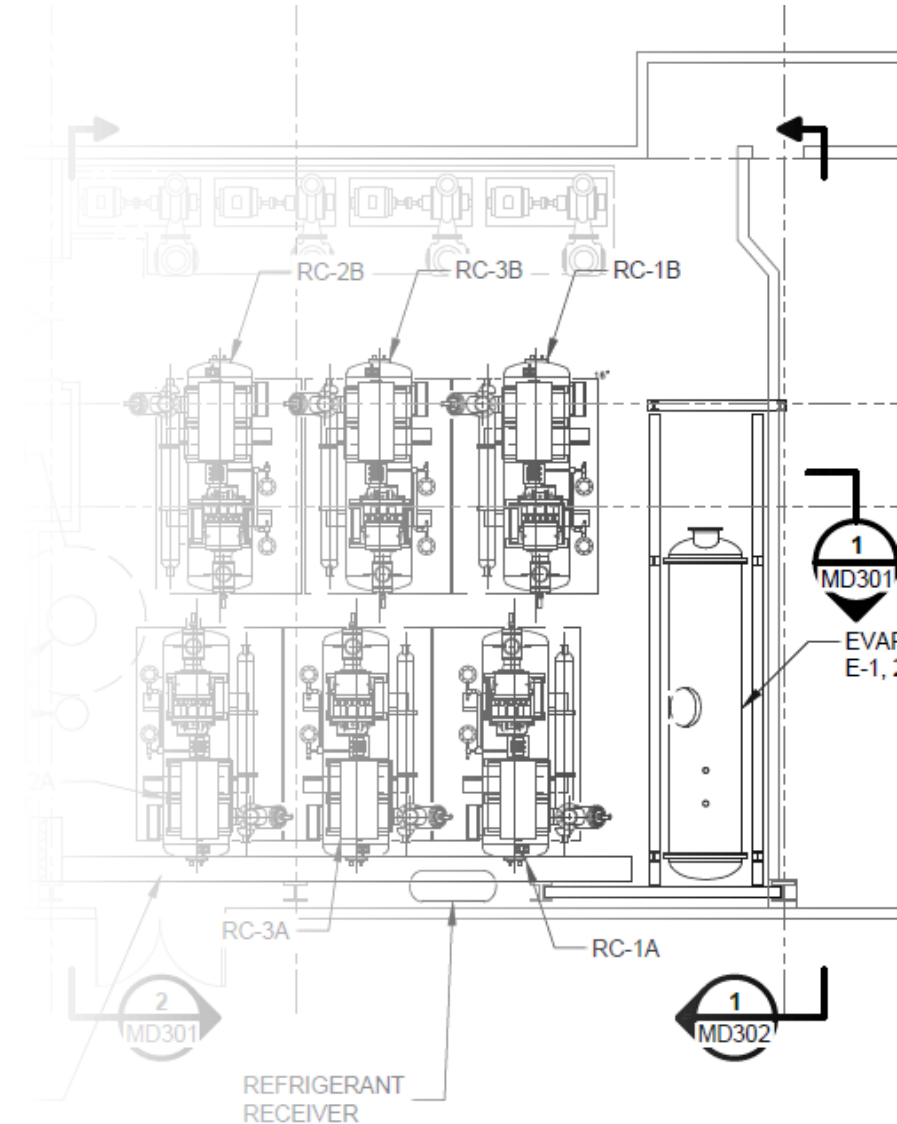
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## ► EXISTING PLANT

- REPLACE EXISTING AGING CHILLED WATER GENERATING EQUIPMENT
- EXISTING COMPONENT SYSTEM:
  - (6) 900 TON REFRIGERANT (**R22**) COMPRESSORS
  - (3) 1800 TON EVAPORATORS (STACKED)
  - 5400 TONS OF REFRIGERANT CONDENSERS

## ► EFFICIENCIES (ICE BUILDING)

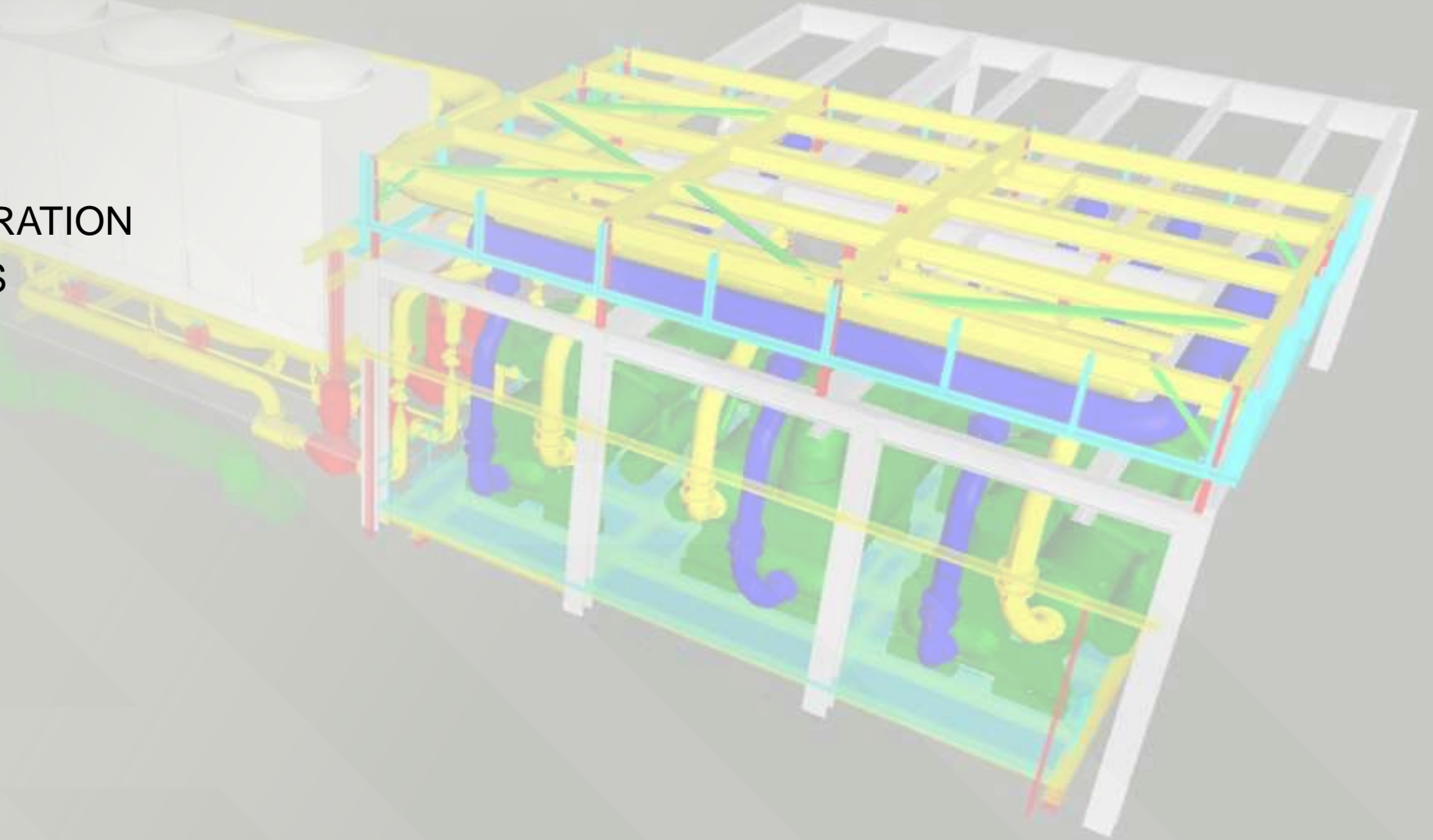
- OLD PLANT: 1.4 KW/TON
- NEW PLANT: 0.85 KW/TON



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## ► CHALLENGES

- SPACE
- SOUND / VIBRATION
- SITE ACCESS



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A 3D cutaway rendering of a mechanical room. The room is filled with a complex network of yellow pipes and blue ducts. Green equipment, likely chillers or towers, is visible in the background. The room is enclosed by a grey wall and a grey ceiling. The rendering is shown from an isometric perspective, highlighting the tight quarters and the dense arrangement of the mechanical systems.

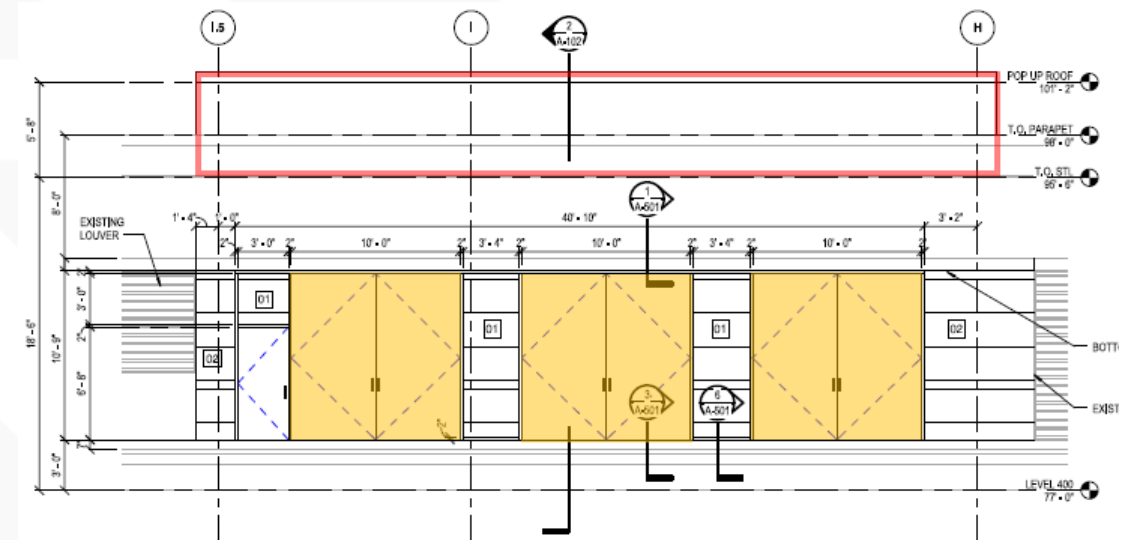
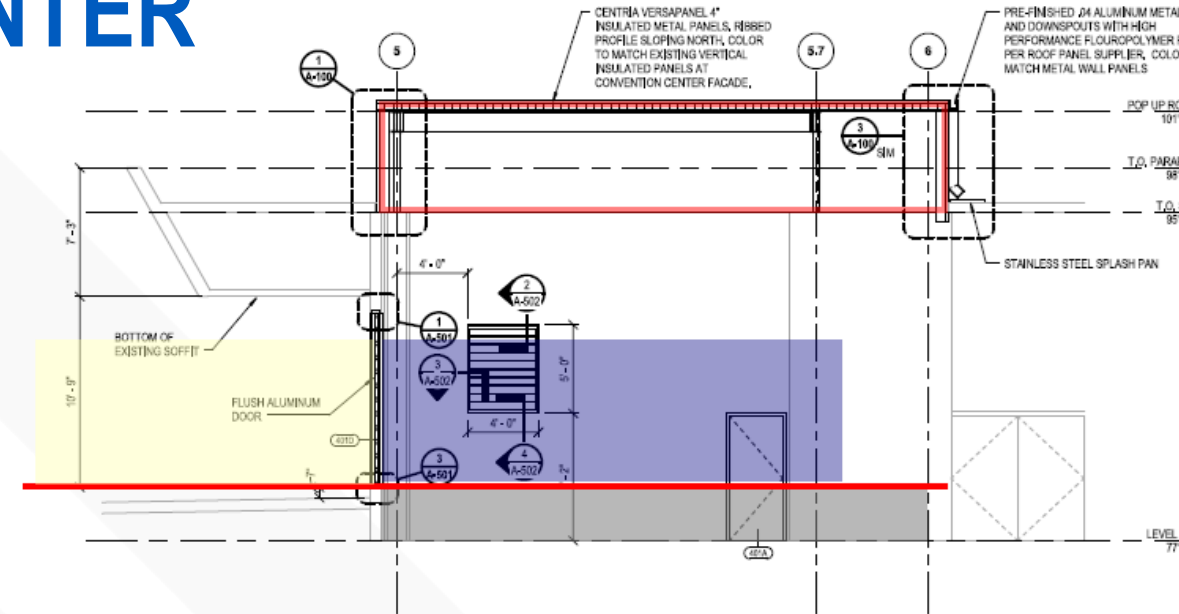
▶ LIMITED SPACE FOR EQUIPMENT  
MAINTENANCE / CLEARANCE / EGRESS

- CHILLERS
- TOWERS
- PUMPS

# BALTIMORE CONVENTION CENTER

▶ CHILLERS - LIMITED SPACE FOR  
EGRESS / MAINTENANCE / CLEARANCE

- ELEVATED PLATFORM AND WALL OPENINGS TO FACILITATE TUBE PULL
- ADDITIONAL HEIGHT REQUIRED A ROOF POP UP ABOVE CHILLERS FOR PIPING AND MAINTENANCE





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- ▶ CHILLERS - LIMITED SPACE FOR EGRESS / MAINTENANCE / CLEARANCE
  - REMOTE MOUNTED COMPRESSOR STARTERS
  - ALTERNATING ORIENTATION FOR SHARED NEC CLEARANCE
  - INDUSTRIAL EQUIPMENT ACCESS



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The background image shows a large industrial mechanical room. In the foreground, there are large white cylindrical chillers with yellow safety railings. A person in a blue shirt and white hard hat is walking on a metal walkway in the distance. The room is filled with complex piping and machinery.

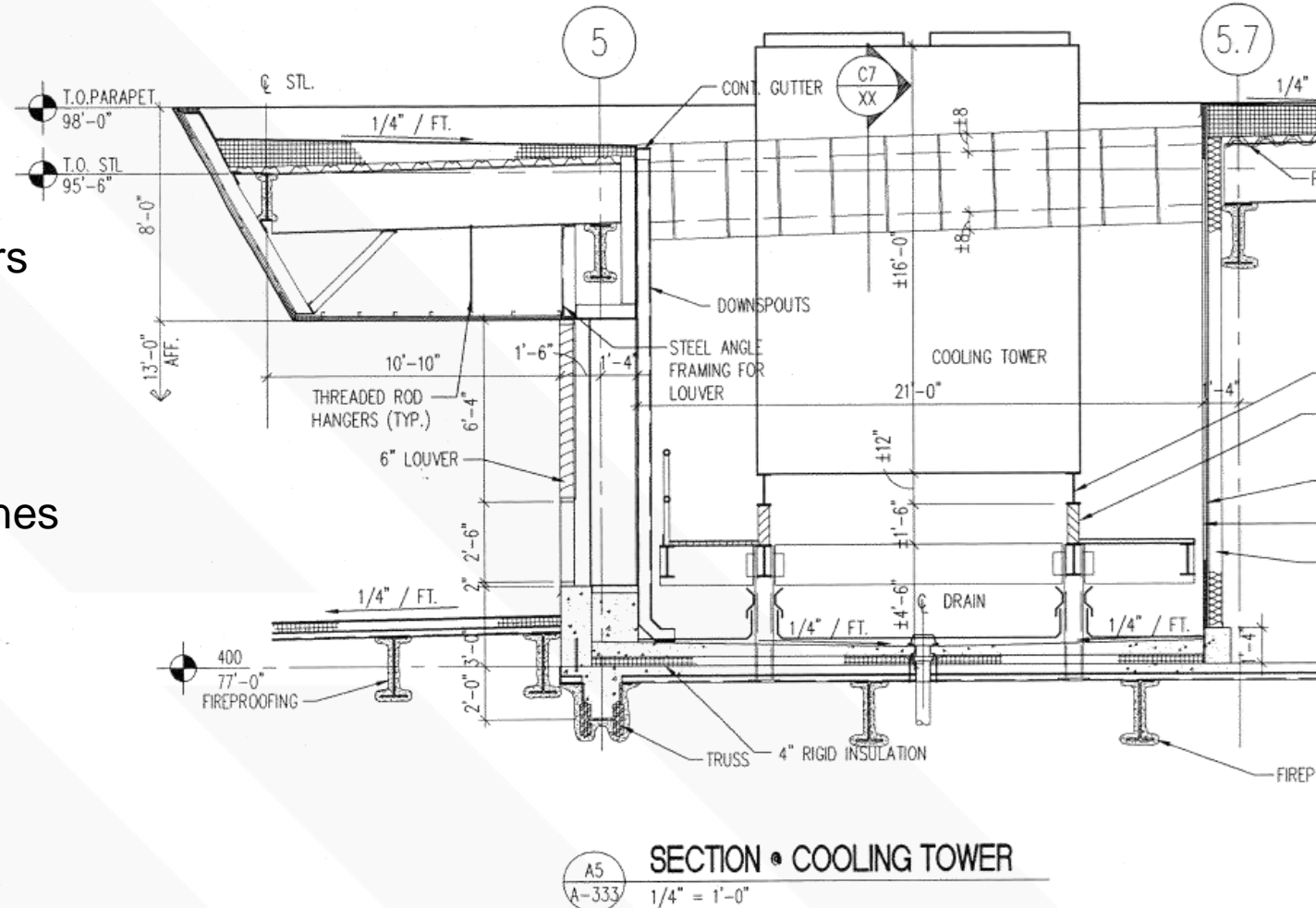
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# BALTIMORE CONVENTION CENTER

## ► Cooling Towers

- Replace existing evaporative condensers
- New COUNTER FLOW Cooling Towers
  - Allow more GPM / SQ FT
  - Still Vertically Limited due to sight lines
  - Free area required around towers
- Egress / Access
  - Platforms
  - 30" condenser water piping



# BALTIMORE CONVENTION CENTER

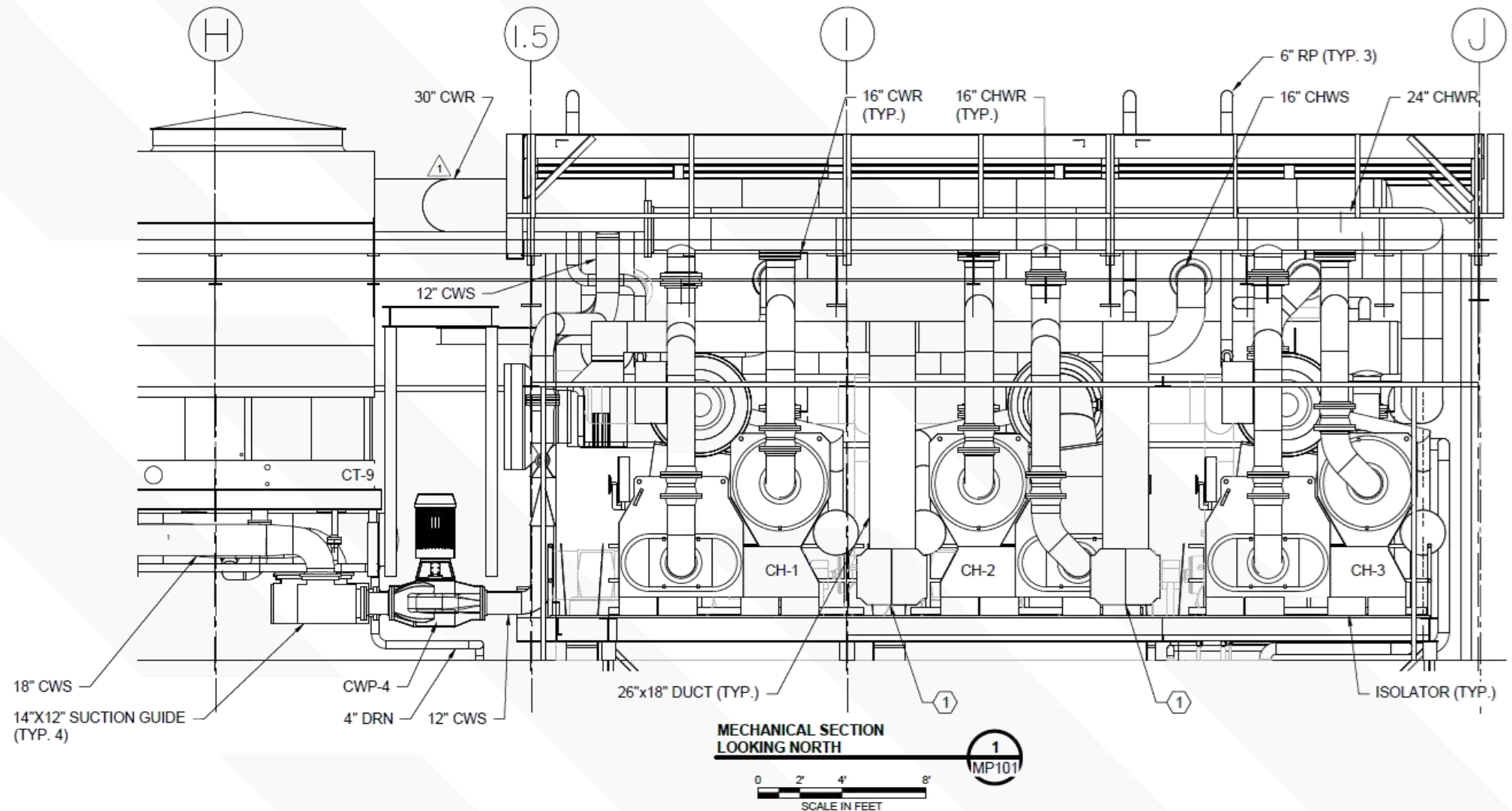
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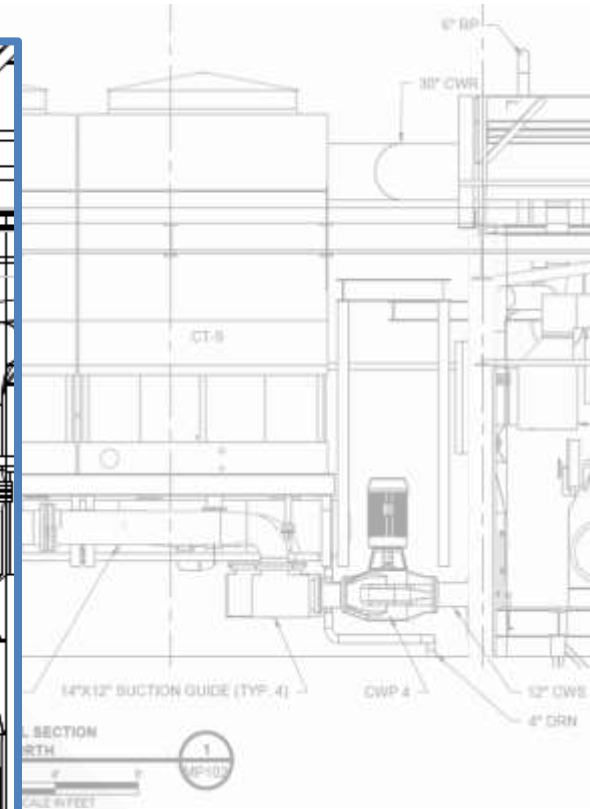
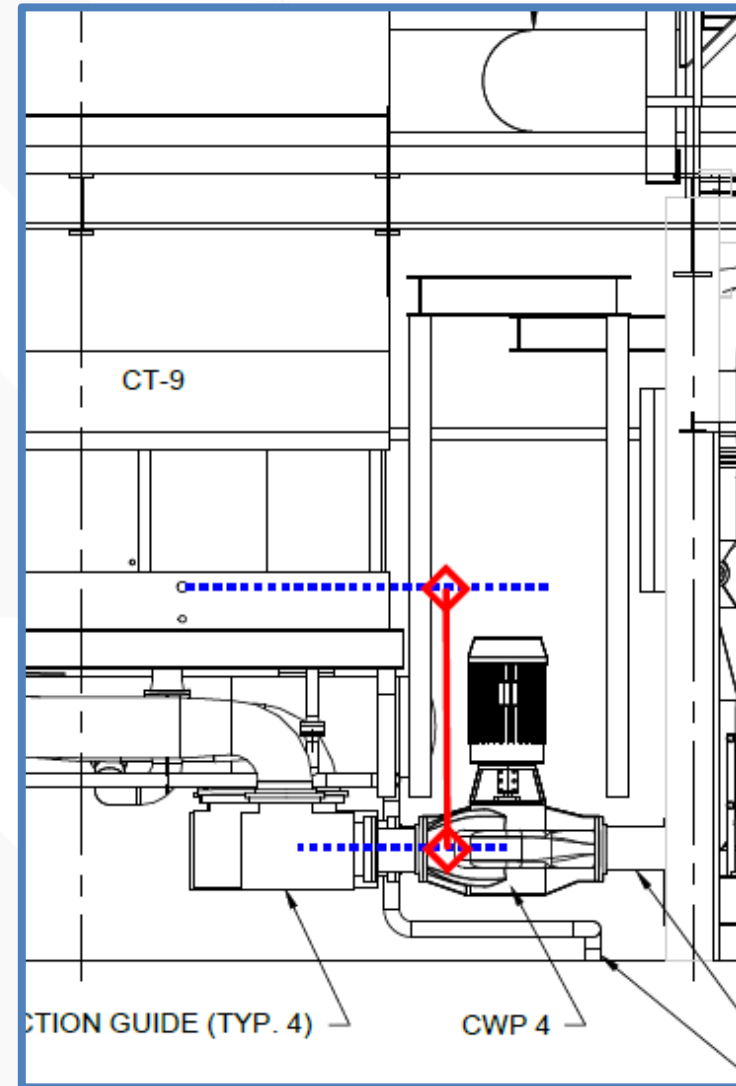


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## ► PUMPS

- $NPSH_A / NPSH_R$
- 1800 RPM => 23 Ft  $NPSH_R$
- 1200 RPM => 4 Ft  $NPSH_R$

$$NPSH_A = H_A \pm H_Z - H_F + H_V - H_{VP}$$



# BALTIMORE CONVENTION CENTER

## ► CHALLENGES WHEN DESIGNING A CENTRAL PLANT WITHIN A SENSITIVE MEETING SPACE.

- NOISE / VIBRATION
  - Establish a baseline with testing
- VIBRATION ISOLATION
- STRUCTURAL ANALYSIS
- LOW NOISE FANS



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## SCHEDULE

- ▶ PREPURCHASE LONG LEAD ITEMS
  - CHILLER
  - COOLING TOWER
- ▶ CHILLED WATER PLANT #1 IS REQUIRED FOR PEAKING
  - PLANT COULD ONLY BE SHUT DOWN AFTER SEPTEMBER AND HAD TO BE UP AND RUNNING BY APRIL OF THE FOLLOWING YEAR.
- ▶ EQUIPMENT DELIVERIES MUST BE PERMITTED / COORDINATED WITH THE CITY
  - SITE ACCESS
    - TIMING
    - WEEKENDS ONLY
  - MULTIPLE LIFTS



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## ► LIFTS



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FRONT BUMPER OF CRANE  
IN-LINE WITH EDGE OF FENCE

CENTER-PIN OF OUTRIGGER 10' FROM CURB ON THIS SIDE

CENTER-PIN OF OUTRIGGERS ON THIS SIDE 4' INTO GRASS

JIB LAY-DOWN AND  
ASSEMBLY AREA



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## ► RECAP

- Need to be creative when dealing with tight spaces
- Understanding the maintenance limitations
- Tower Optimization for footprint
- Noise and Vibration
- Restricted site access



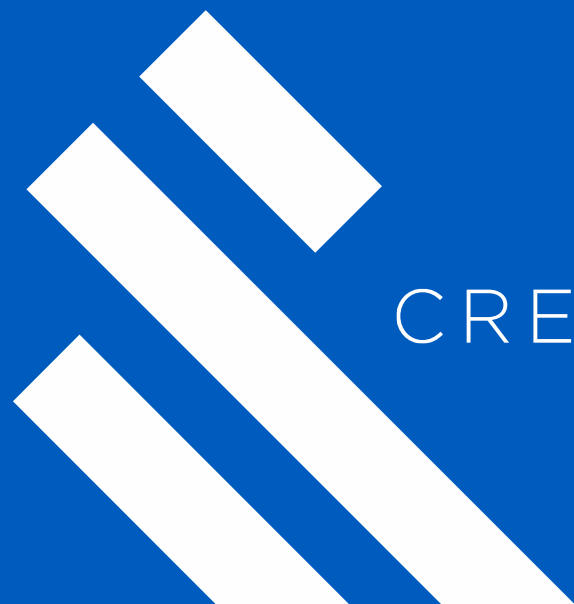
# QUESTIONS?

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**Images Courtesy of Veolia North America**



CREATE AMAZING.