CHAPTER/REGIONAL TECHNOLOGY AWARD - SHORT FORM

1. Category - Check one and indicate New, Existing, or Existing Building Commissioning (EBCx)

☒ Commercial Buildings	☒ New	☐ Existing or	☐ EBCx
Institutional Buildings:				
☐ Educational Facilities	☐ New	☐ Existing or	☐ EBCx
☐ Other Institutional	☐ New	☐ Existing or	☐ EBCx
☐ Health Care Facilities	☐ New	☐ Existing or	☐ EBCx
☐ Industrial Facilities or Processes	☐ New	☐ Existing or	☐ EBCx
☐ Public Assembly	☐ New	☐ Existing or	☐ EBCx
☐ Residential (Single and Multi-Family)			

2. Name of building or project: 110 N Wacker Drive Bank of America Tower

City/State: Chicago, IL

3. Project Description: 54-story core and shell office building

Project Study/Design Period: 07/2016 (Begin date (mm/yyyy)) to 09/2018 (End date (mm/yyyy))

Percent Occupancy at time of submission: 81%

4. Entrant (ASHRAE member with significant role in project):

a. Name: Jensen Tyler James (Last First Middle)

Membership Number: 8150712

Chapter: Illinois

Region: VI

b. Address (including country): 233 S Wacker Dr Suite 5300

Chicago (City) IL (State) 60606 (Zip) US (Country)

c. Telephone: (O) 312.476.6747 d. Email: tjensen@esdglobal.com

e. Member's Role in Project: Project Manager

f. Member's Signature: Tyler Jensen

5. Engineer of Record: FE Moran

By affixing my signature above, I certify that the information contained in this application is accurate to the best of my knowledge. In addition, I certify that I have discussed this entry with the owner and have received permission from the owner to submit this project to the ASHRAE Technology Awards Competition.

Introduction

Developed by Riverside and Howard Hughes, 110 N Wacker Drive is a Class A+ office tower with more than 1.5 million square feet of leasable space over 55 occupied floors. Completed and occupied in summer 2020, it is the tallest all-commercial building built in Chicago in the last 30 years. Bank of America occupies floors 4-20 and 26 as the anchor tenant and the building's namesake.

The building includes floor plates ranging from 26,000 to 30,000 rentable square feet, all with floor to ceiling glass and a stepped west elevation along the Chicago River that provides striking unobstructed views. Base building amenities include a dramatic 40' tall entrance lobby, conference center, and fitness center.

Mechanical System Overview

The building uses district chilled water as the primary cooling source, with built-up central air handling systems and medium pressure duct distribution to deliver low temperature air to each tenant floor. Mid-rise fan systems at Level 23 deliver approximately 680,000 CFM supply air to low and mid-rise office floors. High-rise fan systems at Level 56 deliver approximately 400,000 CFM to high rise office floors. Tenant fit-outs use series flow fan powered boxes with EC motors for energy efficient high quality air distribution.

Energy Efficiency

Chicago's district chilled water provider, CenTrio (formerly Enwave), uses an interconnect network of chilled water piping between multiple chiller plants in the downtown central business district. CenTrio uses ice storage to generate cooling capacity at off-peak hours and peak shave. This operation also means that district chilled water is delivered at very cold temperatures, between 34 ºF – 38 ºF. The mechanical system at 110 N Wacker takes advantage of the opportunity and utilizes low temperature chilled water and large deltaT to minimize pumping energy and to enable low temperature air distribution.

The low temperature chilled water and low temperature air coupled with ECM series flow fan powered boxes provided approximate energy cost savings of 20% for cooling, 39% for fans, and 24% for pumping relative to the IECC 2015 energy code baseline. The overall building was modeled to have approximately 10% less energy cost than code baseline and approximately 18% less energy cost than LEED v2009 baseline.

Central air handling systems include energy recovery from the toilet exhaust and electrical transformer exhaust.

Indoor Air Quality

A state-of-the-art indoor air quality program is being deployed at the building that holistically combines secondary air purification, hospital grade MERV 15 filtration, ventilation rates that significantly exceed national standards, and 24/7/365 indoor air quality and pollutant measurement and verification.

A UL certified ozone free bipolar ionization air cleaning system actively cleans pollutants and pathogens from the air and surfaces. Air quality sensors are being installed throughout public spaces with the option for tenants to extend the system into their spaces and an Intelligent Building Platform developed by cohesion connects to automation systems to monitor and display air quality components.

The combination of optimized ventilation air, superior mechanical filtration, and the bipolar ionization air purification system will provide high indoor air quality. Distributed air quality sensors measure and verify performance of eight separate air quality components including carbon monoxide, carbon dioxide, VOC's, airborne particulates, ozone, radon, formaldehyde, and outdoor fresh air supply rates. The data is connected through cohesion's Intelligent Building Platform to the Building Automation System so that the HVAC system can proactively respond and optimize ventilation rates and air quality throughout the building.

Innovation

The building was completed amid the COVID-19 pandemic and the development team recognized the importance of HVAC systems and indoor air quality as something that is front of mind for all occupants in commercial office towers. Riverside, ESD, and cohesion enhanced the HVAC system design mid-way through construction and deployed the innovative indoor air quality program, which was the first of its kind deployed in a commercial office building.

Another innovation is that the building utilizes a single chilled water pressure zone even though the building is nearly 800' tall. A single pressure zone facilitates energy efficient low temperature distribution without temperature gains that are inherent to pressure break heat exchangers used in typical buildings of this height. The single pressure zone is also space efficient because there is no mid-level heat exchanger and pumping, a feature that is critical in core and shell speculative developments where maximizing leasable square footage is paramount.

The chilled water pipe riser is full sized through the building and space is planned for a future chiller plant at the top of the building if required in the future. While district chilled water is currently used, the developer wants the flexibility to convert to chilled water self-generation in the future if required.

Operation and Maintenance

The building has an intelligent building platform that integrates security systems access control, destination dispatch elevators, HVAC controls, amenities booking, and tenant information, which facilitates smooth operation and maintenance for tenants, building engineering, and property management alike.

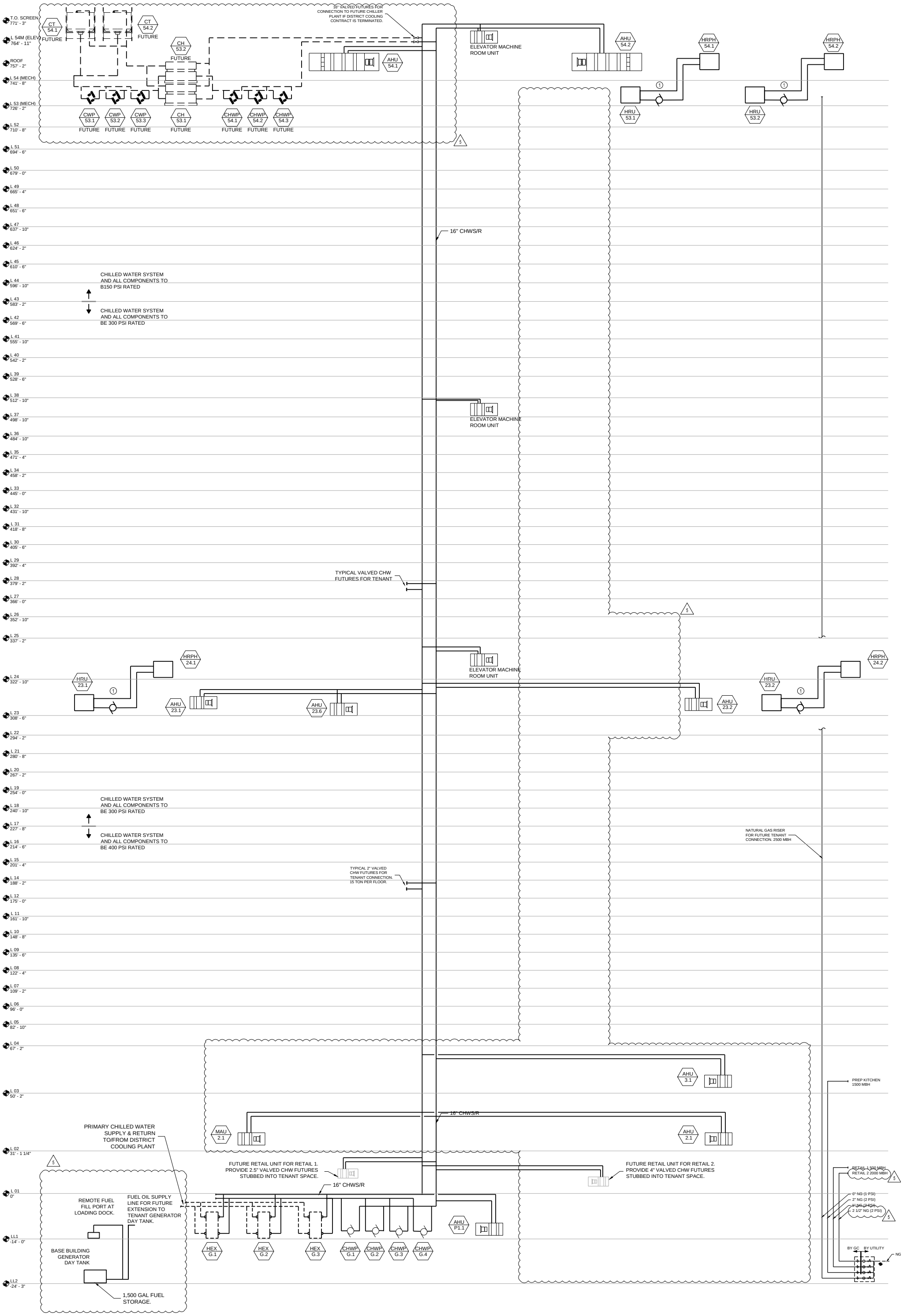
Cost Effectiveness

ESD's design scope was delivered as design-build with enhanced construction administration services including peer review, submittal review and field review services, which provided an economical delivery method while retaining the benefit of ESD support and oversight through construction. Working collaboratively with the design team, development team, and design-build subcontractors, cost effective solutions were developed that maintained the design intent and owner's project requirements.

Low temperature air distribution provided significant mechanical system cost savings as well as opportunity for increased leasable square footage. Air-side system capacities and associated duct risers were reduced by approximately 25% relative to traditional HVAC systems. The reduced shaft sizes allow approximately 50-100 sf additional leasable area per floor, which provides significant revenue generation over the 55 occupied floors.

Environmental Impact

The building is LEED Platinum certified. The overall building was modeled to have approximately 10% less energy cost than code baseline and approximately 18% less energy cost than LEED v2009 baseline. Low flow fixtures are used through the core and shell areas and provide greater than 40% reduction relative to baseline.



Chilled Water System Diagram