

Project Delivery Method

Design-Build (D-B)
Integrated Project Delivery (IPD)
Construction Management @ Risk (CM) with Guaranteed Maximum Price (GMP)
Design-Bid-Build (D-B-B)

Owner Team

Data Center Owner
Owner Internal Owner Representative
Owner Representative (consultant)
Project Manager of Capital Projects
Facility Manager (outsource staff)

Project Delivery Team

CM Project Manager
D-B-B Project Manager
Mechanical-Electrical Coordinator
HVAC, Plumbing, Electrical, Structural, and Security Consultants

HVAC Project Team

HVAC Project Manager
Automatic Temperature Control (ATC) Technician (in-house staff)
Third-Party Commissioning Consultant (CxC)
Third-Party Testing, Adjusting, and Balancing (TAB) Technician

HVAC Application 2023 ASHRAE Handbook

Retail Facilities, Chapter 2
Commercial and Public Buildings, Chapter 3
Data Centers and Telecommunication Facilities, Chapter 20
Power Plants, Chapter 28

HVAC Fundamentals 2021 ASHRAE Handbook

Thermal Comfort, Chapter 9
Ventilation and Infiltration, Chapter 16
Space Air Diffusion, Chapter 20
Duct Design, Chapter 21

HVAC Systems and Equipment 2020 ASHRAE Handbook

HVAC System Analysis and Selection, Chapter 1
Air Handling and Distribution, Chapter 4
Air-to-Air Energy Recovery Equipment, Chapter 26
Liquid-Chilling Systems, Chapter 43

Project Type

New Construction
Addition
Construction Renovation
Infrastructure (central heating)

References:

ASHRAE Underfloor Air Distribution (UFAD) Guide and UFAD Operation and Maintenance (O&M) Guide
2020 ASHRAE Handbook – HVAC Systems and Equipment
ASHRAE Green Guide: Design, Construction, and Operation of Sustainable Buildings
ASHRAE Standard 202 (Commissioning Process for Buildings and Systems)
Construction Management Association of America (CMAA)

DESIGN INTENT DOCUMENT (DID)

The HVAC system selection and design intent is based on the processed outlined in ASHRAE Handbook 2020, Chapter 1, HVAC System Analysis and Selection, and includes the following:

- Owner's project requirements (OPRs), building program goals, and additional goals
- System constraints and constructability constraints
- The finalized system selection shall be a new central air-handling unit (AHU) with return air-exhaust air economizer to provide HVAC comfort to a previous data center raised-floor computer space adjacent to an existing raised floor computer room
- Specialized systems shall include general exhaust, data center exhaust, and chiller plant ventilation
- Automatic controls shall include new system automatic controls interfaced with the existing BAS controls, equipment furnished controls, BACnet interface, internet interface, and populating new equipment data into the existing computerized maintenance management software (CMMS) system from in-house O&M staff

Program & Project Goals:

- Functional Goals: (refer to Chapter 1, 2020 Handbook)
- Budget Goals: first cost and operating cost
- Timeline Goal(s): Occupancy due date and pre-purchased equipment date
- Other Goals: environmental and net-zero energy

Available Utilities:

- Existing electrical service, central chilled water supply and return (CHWS and CHWR) and hot water supply and return (HWS and HWR), and the BAS
- New propane gas to serve new UFAD AHU
- Chilled Water and Hot Water Pipe Distribution: schedule 40 black iron steel with fiberglass insulation per the state energy code

BASIS OF DESIGN (BofD) DOCUMENT

- The HVAC design criteria shall be in sync with the project delivery method and the aforementioned OPRs.
- The design criteria shall be based on ASHRAE 90.1 and state energy code compliance for outdoor air temperature compliance
- Standby Mode of Operation: The data center's office space standby chilled water cooled 25-ton computer room air conditioning (CRAC)
- Existing CHWS, CHWR, HWS, and HWR: connected to new single-zone UFAD unit. The chiller and boiler already exist. In-line circulators with associated standby pumps shall serve UFAD unit heating and cooling coils with new variable speed drives (VSDs) in lieu of ATC valves at coils that also interface with the building security system and electrical power distribution
- Air distribution from the UFAD shall be directed into a 15-inch underfloor air plenum. At each office cubicle, a floor supply air register shall be located to provide spot heating, cooling, and ventilation. Return air ductwork, evenly distributed over the 16 work cubicles, shall draw back 80% of the supply air leaving the office space under a positive pressure
- Airside Economizer: The return air/exhaust fan shall operate based on enthalpy controls discharging the air back to the UFAD unit or discharging the return air to outdoors
- A new UFAD unit shall be furnished with MERV-14 filters upstream of the heating and cooling coils and fan section
- Sheet Metal: Shall be sealed on the supply air distribution. The UFAD plenum shall be sealed (pipe, electrical, and cable penetrations in and out of the raised floor) and pressure tested for 1 inch positive pressure
- UFAD system (air and water) shall be tested, adjusted, and balanced by a TAB technician and commissioned by the commissioning agent