

**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 & Balancing (TAB) Technician

**Application 2019 ASHRAE Handbook**

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

**Systems and Equipment 2020 ASHRAE Handbook**

- HVAC System Analysis and Selection, Chapter 1
- Central Cooling and Heating Plants, Chapter 3
- Air-to-Air Energy Recovery Equipment, Chapter 26
- Liquid-Chilling Systems, Chapter 43
- Cooling Towers, Chapter 40

**Project Type:**

- New Construction
- Addition
- Infrastructure (central heating)

**References:**

- 2017 ASHRAE Handbook – Fundamentals
- 2019 ASHRAE Handbook – HVAC Applications
- 2020 ASHRAE Handbook – HVAC Systems and Equipment
- ASHRAE GreenGuide: Design, Construction, and Operation of Sustainable Buildings
- ASHRAE Standard 202 (Commissioning Process for Buildings and Systems)
- CMAA (Construction Management Association of America)

## 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 (OPR), building program goals, and additional goals
- System constraints and constructability constraints
- The finalized system selection shall be a remote outdoor central chiller plant and electrical generator to provide standby cooling and power to serve an existing data center
- 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 operation and maintenance (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, pre-purchased equipment date, and phased construction date
- Other goals: environmental and net-zero energy
- Utility Availabilities: Existing natural gas service, electrical service, central chilled water plant, and BAS system
- Chilled water pipe distribution: Schedule 40 black iron steel with 1-inch fiberglass insulation with a vapor barrier and additional outdoor weather protecting canvas covering of pipe, valves, and fittings

## BASIS OF DESIGN (BoFD) DOCUMENT

The HVAC Design Criteria shall be in sync with the project delivery method and the owner’s project requirements.

- 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 four chilled water-cooled, 25-ton computer room air conditioning (CRAC) units and their central chiller plant shall be backed up by a new standby chiller and emergency electrical power installation to provide emergency cooling, should the existing, single chiller and/or associated cooling tower fail or are required to be shut down for central plant maintenance.
- Standby chiller installation: Existing chilled water valve with associated two-position diverting valves shall isolate the exiting central plant and open flow to the new standby chiller for chilled water supply to the data central CRAC units. The new chiller self-contained automatic controls shall be interfaced with the existing BAS system. Existing controls shall also include an interface with the building security system and electrical power distribution.
- The pipe distribution shall be installed underground to the data center’s outdoor equipment and connect to new individual and standby pumps each with VFDs.
- Conceptual/schematic phase general notes: The HVAC design engineer shall include an electrical data sheet to coordinate with the electrical design engineer, a plumbing data sheet to coordinate with the plumbing design engineer, and equipment and distribution weights to coordinate with the structural design engineer and security consultant.

