

**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:**

- Developer 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
- Architect, HVAC, Plumbing, Electrical, Structural, Fire Protection, and Security Consultants

**HVAC Project Team:**

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

**Application 2019 ASHRAE Handbook**

- Retail Facilities, Chapter 2
- Commercial and Public Buildings, Chapter 3
- Places of Assembly, Chapter 5
- Power Plants, Chapter 28

**Systems and Equipment 2020 ASHRAE Handbook**

- Central Cooling and Heating Plants, Chapter 3
- Air-to-Air Energy Recovery Equipment, Chapter 26
- Boilers, Chapter 32

- Cooling Towers, Chapter 40
- Hydronic Heating and Cooling, Chapter 13

**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 Indoor-Air Quality Guide: Best Practice for Design, Construction, and Commissioning
- 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 process outlined in ASHRAE Handbook 2020, Chapter 1, "HVAC System Analysis and Selection," and includes the following:
  - Owner Building Program Goals and Additional Goals
  - System Constraints and Constructability Constraints
  - The Finalized System Selection Shall Be Central Plant Heating Versus Decentralized Heating Plants
  - Specialized Systems Shall Include General Exhaust, Kitchen Exhaust, and Boiler Plant Ventilation
  - Automatic Controls Shall Include a New



BAS, Temperature Controls, Furnished Equipment Controls, a BACnet Interface, an Internet Interface, and a New Computerized Maintenance Management Software (CMMS) System from an Outsourced Operation and Maintenance Firm

#### **Program and Project Goals:**

- Functional Goals: (Refer to Chapter 1, 2020 ASHRAE 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 Include New Natural Gas Service, Electrical Service, Emergency Power, Central Plant Hot Water Heating, and a BAS
- Heating System Includes Gas-Fired Boilers (Fire-Tube), Two Lead-Lag Boilers, and One Summer Boiler
- Includes a 100% Outside Air with VAV Control to Maintain 0.1-Inch Positive Building

#### **DESIGN CRITERIA DOCUMENT**

- The HVAC Design Criteria Shall Be in Sync with the Project Delivery Method and Owner's Project Requirements.
- The Design Criteria Shall Be Based on ASHRAE 90.1 and State Energy Code Compliance for Outdoor Air Temperature Compliance.
- The Utility Shall Be Natural Gas to Serve the New Central Boiler Plant that Shall Include Two Firetube Hot Water Boilers and One Condensing Boiler.
- Heating Season Boilers Shall Be Lead-Lag Control at 800 Boiler Horsepower (BHP), Each Sized at 60% of Load and One Summer Boiler at 200 BHP. The Automatic Controls Furnished with Each Boiler Shall Be Interfaced with the BAS.
- The New Central Plant Hot Water System Shall Be Primary Pumps Serving the Three Boilers Furnished with VFDs.
- The Pipe Distribution Shall Be Installed Underground to the New Commercial Office Buildings and Connect to New Individual Pump and Stand-By Pump, Each with VFDs.
- Filters Shall Be MERV-4 pre-filter and MERV-10 Final Filter. The Air-Handling Unit's Heating Coil Shall Be an Integral, Vertical Face, and Bypass Preheat Hot Water Coil.