

## Project Delivery Method:

- Design-build (D-B)
- Integrated Project Delivery (IPD)
- Construction management at risk (CM) with guaranteed maximum price (GMP)
- Design-bid-build (D-B-B)

## Owner Team:

- University president
- Climate transition consultant
- Project manager of capital projects
- Facility manager

## Project Delivery Team:

- Design-build (D-B) project manager
- Integrated project delivery (IPD) project manager
- Construction management (CM) project manager
- HVAC consulting engineer
- Electrical consultant engineer
- Architect, plumbing, structural, fire protection and security consultants

## HVAC Project Team:

- HVAC consultant engineer project manager
- Automatic temperature control (ATC) technician (in-house staff)
- Electrical consultant engineer project manager
- Third-party commissioning consultant (CxC)
- Testing, adjusting and balancing (TAB) technician

## HVAC Application 2023 ASHRAE Handbook

- Retail Facilities Chapter 2
- Commercial & Public Buildings Chapter 3
- Places of Assembly Chapter 5
- Education Facilities, Chapter 8

## Systems & Equipment 2020 ASHRAE Handbook

- HVAC System Analysis and Selection Chapter 1
- In-Room Terminal Systems Chapter 5
- Radiant Heating and Cooling Chapter 6
- Hydronic Heating and Cooling Chapter 13

## Project Type:

- New construction
- Addition
- Renovation
- Campus-wide decarbonization and electrification

## References:

- 2021 ASHRAE Handbook – Fundamentals
- 2020 ASHRAE Handbook – Refrigeration
- 2019 ASHRAE Handbook – HVAC Applications
- [U.S. Department of Energy Industrial Decarbonization Roadmap](#)

## Other References:

- Refer to “Codes & Standards” (back of each ASHRAE Handbook for additional reference)
- ASHRAE GreenGuide: Design, Construction, & Operation of Sustainable Buildings
- ASHRAE Indoor-Air Quality Guide: Best Practice for Design, Construction, & Commissioning
- ASHRAE Standard 55 (RE: Thermal Environmental Conditions for Human Occupancy)
- ASHRAE Standard 202 (RE: Commissioning Process for Buildings & Systems)

## DESIGN INTENT DOCUMENT (DID)

### HVAC Design Intent:

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 include the following:

- Owner Project Requirements (OPR): building program goals and additional goals
- Incorporate the university's deferred maintenance 10-year plan with the university's new decarbonization and electrification master plan
- Expand the university's building automatic system (BAS) to include new system automatic controls to monitor utility electrical and fossil fuel consumption to benchmark data in the transition process to manage the utility costs, decarbonization, and electrification process monthly
- Populating new environmental data in the existing computerized maintenance management software (CMMS) system to replace fossil fuel equipment and systems

### Program and Project Goals:

- Functional Goals: Refer to chapter 6, 2020 Handbook
- Budget Goals: Life cycle cost and electrical operating cost and electrical demand
- Timeline Goals: Phased in decarbonization and electrification each year, spanning 10-years
- Management Goals: Measure decarbonization through software and phase out deferred maintenance equipment powered by fossil fuel sources

### Utility Availabilities:

- Gas (propane), electrical power, emergency power, low pressure steam and building automation system (BAS)
- Electricity, BAS system, three fuel oil systems, and natural gas distribution system
- HVAC and electrical systems

### Existing Conditions:

- Central air systems: supply air and/or return air cubic feet per minute (cfm) general exhaust, and toilet exhaust
- Heating Systems
- Decentralized HVAC systems and fossil fuel support systems
- Decentralized plumbing systems and associated fossil fuel support systems

## BASIS OF DESIGN (BofD) DOCUMENT

- The HVAC design criteria shall be in sync with the project delivery method and owner' project requirements noted above
- The HVAC design criteria, as well as the campus-wide systems design criteria and associated processes, e.g., shall be transitions to electrical systems in the next 10-years, phasing out fossil fuel generated systems campus-wide in sync with the project delivery method and owner' project requirements noted above
- Become electrically self-sufficient through the introduction of solar panels, windmills, and battery storage
- The design criteria shall be based on ASHRAE 90.1 and state energy code compliance for outdoor air temperature compliance
- Reuse existing utilities and central heating and chilled water systems
- The new automatic controls shall interfaced decarbonization and electrification software and [DOE software tools](#) with the existing BAS system
- The existing central fossil fuel plant shall be phased out
- With each new replaced mechanical systems, replacing fossil fuel powered systems, shall include IPD conceptual/schematic phase general ( Climate transition consultant and consulting engineers shall provide system flow diagrams with these three documents (OPR, DID, and BOD), along with sequences of phasing, operation, and maintenance.