

## Project Delivery:

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

## Owner Team:

- College Campus Management
- Building Program Committee
- Owner Representative (consultant)
- Facility Manager
- Third-party Commissioning Consultant (CxC)

## Project Delivery Team:

- D-B Project Manager
- IPD Project Manager
- D-B-B Project Manager
- Federal Grant Representative
- Architect, Acoustical, Plumbing, Electrical, Structural, Fire Protection, & Security Consultants

## HVAC Project Team:

- HVAC D-B Engineer
- ATC D-B Technician
- BAS Technician (in-house staff)
- Testing, Adjusting, & Balancing (TAB) Technician
- Energy Engineering Consultant (EEC)

## Application:

- Places of Assembly, Chapter 5
- Hotel, Motel, and Dormitories, Chapter 7
- Energy Use and Management, Chapter 37
- Owning and Operating Costs, Chapter 38
- Building Energy Monitoring, Chapter 42

## Project Type:

- New Construction
- Addition
- Campus Dashboard with Individual Chilled Water Metering
- Energy Audit & Retrofit

## References:

- 2020 ASHRAE Handbook – HVAC Systems and Equipment
- 2021 ASHRAE Handbook – Fundamentals
- 2022 ASHRAE Handbook – Refrigeration
- 2023 ASHRAE Handbook – HVAC Applications

## Other References:

- ASHRAE GreenGuide: Design, Construction, & Operation of Sustainable Buildings
- ASHRAE Procedures for Commercial Building Energy Audits
- SHRAE Fundamentals of Design & Control of Central Chilled-Water Plants
- ASHRAE Standard for Commercial Building Energy Audits
- ASHRAE Standard 90.1 (Minimum Energy Standards)
- ASHRAE Standard 202 (Commissioning Process for Buildings & Systems)
- Design-Build Institute of America (DBIA)
- International District Energy Association (IDEA)

## DESIGN INTENT DOCUMENT (DID)

### HVAC Design Intent:

- The HVAC system selection and design intent are based on the process outlined in ASHRAE Handbook 2020 Chapter 1 HVAC System Analysis and Selection. It includes the owner building program goals and additional goals, system constraints and constructability constraints, Reference is made to ASHRAE Handbook 2020, Chapter 3, Central Cooling and Heating Plants
- Complete an energy audit of primary-secondary chilled water system from central chiller plant to individual campus buildings that make up the 20 buildings.
- Automatic controls shall include new chilled water system flow monitoring and Btuh energy metering at central plant and at individual buildings. Energy data will be compared on Btuh per square foot per year will be compared to global warming, decarbonization, and operating cost compared to historical data.
- Interface of new with existing temperature transmitters, pressure differential transmitters, Gallons per minute (GPM) flow metering transmitters, temperature differential, pump controls, and BACnet Interface and Internet Interface with new building automation system (BAS).
- Program and project goals; refer to Functional Goals, Chapter 1, 2020 AHSRAE Handbook. Collect environmental data compared to global data to share with student activists and environmentalists. Budget goals are utility operating costs, as well as energy consumption reduction and life cycle cost.
- Faculty goals include student awareness, community awareness, and board of directors.
- Available utilities include electrical power, central plant chilled water, and BAS.
- Existing conditions include two water-cooled, variable-speed compressor chillers, two draw-through cooling tower and two plate-and-frame waterside economizer heat exchangers. Existing pumps are a combination of split-case horizontal and vertically mounted pumps with variable frequency drive (VFD).

## DESIGN CRITERIA DOCUMENT

- The HVAC design criteria shall be in sync with the project delivery method and owner's project requirements noted above.
- The design criteria shall be based on an energy audit of the central chilled water system distribution followed by financial reimbursement analysis as well as a federal utility conservation analysis of existing air conditioning conditions, associated operation, and proactive maintenance management, resulting in an information flat-screen monitor at strategic locations for quick reference by those on campus.
- Based on the proposed retrofit project, a building-by-building continuous monitoring energy and utility cost analysis inventorying the chilled water flow meters and Btuh energy metering to determine decarbonization results.
- The addition of a new BAS computer system with remote flat-screen monitoring and management shall be overlaid to the existing cooling system to capture operating cost as well as enhance operation and maintenance of this primary-secondary system.
- The existing utilities shall include electrical power and central chilled water distribution with flow meters and Btuh energy metering as the cooling media leaves and returns from each lab and from each primary piece of cooling equipment, and each chilled water pump. This energy retrofit project shall follow ASHRAE Guideline 22, Instrumentation for Monitoring Central Chilled Water Plant Efficiency.
- The D-B HVAC design engineer shall provide system flow diagrams with associated automatic energy management control and sequence of operation.
- The D-B project manager shall include estimates for all costs associated with design, build, and warranty project.