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
- 3rd Party Commissioning Consultant (CxC)

-Project Delivery Team:
- Design-Build (D-B) Project Manager
- Integrated Project Delivery (IPD) Project Manager
- Design-Bid-Build (D-B-B) Project Manager
- Federal Grant Representative
- Architect, Acoustical, Plumbing, Electrical, Structural, Fire Protection, & Security Consultants

-HVAC Project Team:
- HVAC (heating, ventilating, & air conditioning) D-B Engineer
- ATC (automatic temperature control) D-B Technician
- BAS (building automation system) Technician (in-house staff)
- Testing, Adjusting, & Balancing (TAB) Technician
- Energy Engineering Consultant (EEC)

-Application:
- Places of Assembly Chapter 5
- Hotel, Motel, & 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
- ASHRAE Fundamentals of Design & Control of Central Chilled-Water Plants
- ASHRAE Standard for Commercial Building Energy Audits
- ASHRAE Standard 90.1 (RE: Minimum Energy Standards)
- ASHRAE Standard 202 (RE: Commissioning Process for Buildings & Systems)
- DBIA (Design-Build Institute of America)
- IDEA (International District Energy Association)

DESIGN INTENT DOCUMENT (DID)

-HVAC Design Intent:
- The HVAC system selection and design intent are based on the processed 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 energy audit of primary-secondary-tertiary chilled water system from central chiller plant to individual buildings that make up the Laboratory 24-room complex.
- 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 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 & Project Goals" refer to Functional Goals: *(refer to chapter 3, 2020 Handbook).* Budget Goals are energy consumption reduction and life cycle cost.
- Faculty Goals include student awareness, community awareness, and Board of Directors.
- Existing Conditions include 4-water-cooled, variable speed compressor, chillers) and 1-steam absorption chiller, 6-draw-thru cooling tower and 2-plate & frame waterside economizer heat exchangers. Existing pumps are a combination of split case horizontal and vertical based-mounted and with variable frequency drive (VFD).

DESIGN CRITERIA DOCUMENT

- The Design Criteria shall be based on an energy audit of the central chilled water system distribution followed by financial reimbursement analysis and also 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 and enhance operation and maintenance of this primary-secondary system.
- The existing utilities included electrical power and central chilled water distribution with flow meters and BTUH energy metering as the cooling media leaves and returns from the multiple campus buildings. This energy retrofit project shall follow ASHRAE Guideline 62
- D-B HVAC Design Engineer shall provide system flow diagrams with associated automatic energy management control and sequence of operation.
- D-B project manager shall include estimates for all costs associated with design, build, and warranty the project.