# NEW BOILER PLANT FOR RESEARCH PARK COMPLEX
## *USING DESIGN-BID-BUILD PROJECT DELIVERY*

**Project Delivery Method:** Design-Bid-Build (DBB)
**Owner Team:** Complex ownership company, private sector, and community research building.
- Building Program Committee:
  - Owner;
  - Owner representative (consultant);
  - Project manager of capital projects; and
  - Facility manager (in-house staff).

**Project Delivery Team:**
- Architect - Prime consultants (AIA owner-architect contract); and
- HVAC, plumbing, electrical, structural, fire protection, and security consultants.

### OWNER'S BUILDING PROGRAM
**Application – ASHRAE 2019 Handbook:** Commercial and public buildings, Chapter 3.
**Project Type:** New construction.
**References:**
- 2016 ASHRAE Handbook – HVAC Systems and Equipment;
- Refer to "Codes & Standards" (back of each ASHRAE Handbook for additional reference);
- ASHRAE Practical Guide to Seismic Restraints;
- ASHRAE Standard Practice for Inspection & Maintenance of Commercial Building HVAC Systems;
- ASHRAE Standards 15 & 34 (Refrigeration);
- ASHRAE Standard 90.1 (Minimum Energy Standards);
- ASHRAE Standard 202 (Commissioning Process for Buildings and Systems);
- ASHRAE Guideline 0 (Commissioning Process); and
- International District Energy Association (IDEA) and applicable IDEA documents.

### DESIGN INTENT DOCUMENT
**HVAC Design Intent:**
- The HVAC system selection and design intent is based on the processed outlined in ASHRAE Handbook 2016, Chapter 1, HVAC System Analysis and Selection, and includes the following:
  - Owner building program goals and additional goals;
  - System constraints and constructability constraints;
  - Finalized system selection shall be central plant; and
  - Automatic controls shall include temperature controls, equipment furnished controls, BACnet interface, internet interface, existing building automation system (BAS) interface, and existing computerized maintenance management software (CMMS) system interface.
- Program and project goals:
  - Functional goals: (*refer to Chapter 1, 2016 Handbook*);
  - Budget goals: first cost, operating cost, and/or life cycle cost;
  - Timeline goals: pre-purchased equipment date and boilers online by August 2021; and
  - Management goals: property management, out-source mechanical and electrical services, service contracts, and capital projects management.
- Utility availabilities: natural gas, emergency power, hot water heating, and a BAS system;
- New construction: a 15,000-square-foot boiler plant with 7,500 square feet mezzanine plus 2,500 square feet for employee lockers, an eating area, toilets, showers, a BAS office, and a boiler plant manager's office; and
- Central air systems: a single-zone supply air system, an air-side economizer with barometric relief, and employee area exhaust.

### DESIGN CRITERIA DOCUMENT
- The HVAC design criteria shall be in sync with the project delivery method and the owner' building program requirements as noted above.
- 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 serve three firetube hot water boilers. The 2-800 boiler horsepower (BHP) units shall be sized at two-thirds capacity each with 1-200 BHP intended to be a standby for these two boilers plus to operate during the air conditioning season. The new automatic controls shall be interfaced with the existing BAS.
- The new central plant hot water system shall include primary pumps per boiler and secondary pumps with variable frequency drives (VFDs). The pipe distribution shall be piped overhead to the existing research facility and connect to existing tertiary pumps with VFDs within each building.
- A central air system within the boiler plant shall provide heating in the winter to maintain 65°F and in the air conditioning season at 78° via a single duct-single zone, constant volume system to provide ventilation air and combustion air as well as to maintain a positive building pressure of 0.05 inch gage.
- Filters shall be MERV 7 prefilter and MERV 13 final filter. The air-handling unit's heating coil shall be an integral, vertical face and bypass preheat hot water coil. The chilled water shall be from a stand-alone, 50-ton, air-cooled chiller with screw compressor to serve the air-handling unit's chilled water coil. Chilled water shall have propylene glycol for minus 20° outdoor temperature to avoid winter drain-down. The end suction pump shall be constant flow with a three-way valve at the air-handling unit chilled water coil to maintain 55° constant flow through the chiller and to eliminate pump head pressure control.
- Conceptual/schematic phase general notes:
  - The HVAC design engineer shall provide system flow diagrams with these three documents along with automatic temperature control (ATC) sequences of operation; and
  - The HVAC design engineer shall include an electrical data sheet to coordinate with the electrical design engineer, plumbing data sheet to coordinate with the plumbing design engineer, and equipment and distribution weights to coordinate with the structural design engineer. **ES**


**Application:**
☐ Retail Facilities, Chapter 2
☐ Commercial and Public Buildings, Chapter 3
☐ Educational Facilities, Chapter 8
☐ Industrial Air Conditioning, Chapter 15
☐ Laboratories, Chapter 17
☐ Power Plants, Chapter 28

**Project Type:**
☐ New Construction
☐ Renovation
☐ Infrastructure (central heating, cooling, and/or cogeneration)
☐ Facility Audit and Capital Project Master Planning

**References:**
☐ 2016 ASHRAE Handbook – HVAC Systems and Equipment
☐ 2017 ASHRAE Handbook – Fundamentals
☐ 2018 ASHRAE Handbook – Refrigeration
☐ 2019 ASHRAE Handbook – HVAC Applications

**Other References:**
☐ Cooling Technology Institute (cooling towers)
☐ ACGIH - Industrial Ventilation: A Manual of Recommended Practice for Design, 28th Edition
☐ ASHRAE Standard 202 (Commissioning Process for Buildings and Systems)
☐ ASHRAE Guideline 0 (Commissioning Process)
☐ International District Energy Association (IDEA) and applicable IDEA documents

## DESIGN INTENT DOCUMENT

**HVAC Design Intent:** The HVAC system selection and design intent is based on the process outlined in ASHRAE Handbook 2016, Chapter 1, HVAC System Analysis and Selection, and includes the following:
☐ Owner building program goals and additional goals
☐ Finalized system selection shall be decentralized HVAC systems and terminal
☐ Specialized systems shall include general exhaust, kitchen exhaust, and smoke exhaust
☐ Budget goals: first cost, operating cost, and/or life cycle cost
☐ Timeline goals: occupancy due date and pre-purchased equipment date
☐ Utility availabilities: natural gas, emergency power, hot water heating, and a BAS system.

## DESIGN CRITERIA DOCUMENT

☐ The HVAC design criteria shall be in sync with the project delivery method and owner' building program requirements as noted above.
☐ The design criteria shall be based on ASHRAE 60.2 and federal energy code compliance for outdoor air temperature compliance.
☐ The utility shall be natural gas to serve the new central boiler plant that shall serve three firetube hot water boilers. The size shall be 2-800 boiler horsepower (BHP) units, each sized at two-thirds capacity and 1-200 BHP intended to be a standby for these two boilers plus to operate during the air conditioning season.
☐ The new automatic controls shall be interfaced with the existing BAS system.
☐ The new central plant hot water system shall be primary pump-secondary pumps serving the boilers and heat exchangers.
☐ The pipe distribution shall be standard underground distribution to new tertiary pumps with VFDs within each building.
☐ A central air system, within the boiler plant shall provide heating in the winter to maintain 65°F and 75° in the air conditioning season.
☐ The HVAC design engineer shall provide system flow diagrams at the design development phase.
☐ 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 at the conceptual/schematic phase.