

**Project Delivery Method:**

- Design-Build (D-B)
- **Integrated Project Delivery (IPD)**
- Design-Bid-Build (D-B-B)

**Owner Team:**

- **Local School Department**
- Building Program Committee
- **Internal Owner Representative**
- Owner Representative (consultant)
- Project Manager of Capital Projects
- **Facility Manager (in-house staff)**

**Project Delivery Team:**

- **IPD Project Manager**
- **Mechanical-Electrical Coordinator**
- **Equipment Manufacturer Technician**
- Utility Company Representative
- Architect, Acoustical, Plumbing, Electrical, Structural, Fire Protection, and Security Consultants
- **HVAC Supervisor (in-house staff)**
- **HVAC Supervisor (contractor)**
- **ATC Technician (contractor)**
- Building automation system (BAS) Technician (in-house staff)
- **Operations and maintenance (O&M) Technician (in-house staff)**
- Third-Party Commissioning Consultant (Cx/C)
- Testing, Adjusting, and Balancing (TAB) Technician

**Application 2019 ASHRAE Handbook**

- Places of Assembly, Chapter 5
- Indoor Swimming Pools, Chapter 6
- Hotel, Motel, & Dormitories, Chapter 7
- **Educational Facilities, Chapter 8**

**Systems and Equipment 2020 ASHRAE Handbook**

- Air-Handling and Distribution, Chapter 4
- In-Room Terminal Systems, Chapter 5
- Condenser Water Systems, Chapter 14

**Project Type:**

- **Existing Conditions**
- **Heating System Failure**
- New Construction
- Renovation
- Infrastructure (central heating, cooling, and/or cogeneration)

**References:**

- 2017 ASHRAE Handbook – Fundamentals
- 2018 ASHRAE Handbook – Refrigeration
- 2019 ASHRAE Handbook – HVAC Applications
- **2020 ASHRAE Handbook – HVAC Systems and Equipment**
- **Internet Browser Search Engine**

**Other References:**

- ASHRAE Standard 55 (Thermal Environmental Conditions for Human Occupancy)
- ASHRAE Standard 62.1 (IAQ)
- ASHRAE Standard 90.1 (Minimum Energy Standards)
- **OSHA 1926.54 on Temporary Heating devices**
- **OSHA Safety Manual, Temporary Heat Safety**

**DESIGN INTENT DOCUMENT**

- An unexpected heating system failure on the south side of a K-8, one-story series of classrooms resulting in no HVAC to the perimeter
- The IPD team followed the ASHRAE Handbook 2020, Chapter 1, "HVAC System Analysis and Selection" process as it pertains to space and occupational comfort as well as IAQ
- **Owner environmental health and safety (EH&S) program goals and additional goals**
- D-B process/system constraints
- **School safety and security program requirements**
- **OSHA guidelines specifically drafted for temporary heating devices and safety**
- Annual school operating budget and project timeline schedule

**Existing Conditions:**

- **Central air system supply and return air cfm to remain in operation serving the entire first floor of the building**
- **Individual perimeter classroom unit ventilators with hot water heating coils and room thermostats**
- Failed perimeter 2-pipe heating and cooling water zone pump serving six classroom unit ventilators

**Utility Availabilities:**

- Hot water heating system temporary distribution
- **Electricity for permanent and emergency temporary power**
- **Provide temporary heat and additional ventilation to the classrooms for one week while a hot water heating system zone pump is purchased, delivered, and installed in place of the existing in-line circulator.**

**DESIGN CRITERIA DOCUMENT**

- **The HVAC design criteria shall be in sync with the project delivery method and owner's building program requirements**
- **The design criteria shall be based on ASHRAE 60.2 and federal energy code compliance for outdoor air temperature compliance**
- **The existing HVAC systems serving the renovated offices and conference rooms shall be removed in their entirety, and a new VRF heating and air conditioning system shall be installed**
- Utilities shall be 480/3/60 electrical power to serve two DOAS units, 75-ton units each sized with the new automatic controls shall be interfaced with the existing BAS system
- **The air filters shall be pre-filter MERV-7 and final filter MERV-15, serving the new DOAS unit and MERV-14 fan coil unit (FCU) filters.**
- **The new automatic controls shall be interfaced with the existing BAS system.**
- The low-velocity sheet metal distribution shall be reused
- **Each office and conference room shall have its own programmable thermostat set at 68°F heating and 76° cooling in the occupied cycle and 60° heating and 76° unoccupied set points.**