
DIVISION 1 - GENERAL REQUIREMENTS

Section III. BUILDING SAFETY, SECURITY, MAINTENANCE AND GENERAL DESIGN GUIDELINES

Paragraph B: Add the following sentence:

15. Contractors are responsible for removing all equipment and cabling that is no longer required due to remodel or retrofit projects, unless otherwise approved by the District.

DIVISION 2 - SITEWORK GENERAL

Delete entire Division and replace with the attached revised Division 2 document, “*DIVISION 2 (Addendum 1).doc*”

DIVISION 3 - CONCRETE

Section IV. CONCRETE

Add the following Paragraph:

- L. Slab on grade – all SOG will require a membrane underlayment that will work as a passive radon membrane as well as a moisture barrier. Approved products include Visqueen Radon Membrane or equivalent.

DIVISION 4 - MASONRY

DIVISION 5 - METALS

DIVISION 6 - CARPENTRY

DIVISION 7 – MOISTURE PROTECTION

Section III. ROOFING

Paragraph H, replace with the following:

- H. Provide walkways in accordance with roofing manufacturer’s recommendations for all roof areas likely to receive foot traffic to rooftop mechanical units, etc. Walkways shall consist of continuous pavers to accommodate two-wheeled carts.

DIVISION 8 - DOORS, WINDOWS AND GLASS

Section X. FINISH HARDWARE

Paragraph F. Locks: Delete Part 2 and replace with the following:

- L. Provide hardware that allows classroom doors to be locked from both sides using a key.

DIVISION 9 - FINISHES

DIVISION 10 - SPECIALTIES

Add the following Section:

XI. SITE WASTE CONTAINERS

16. Provide high volume in-ground trash containers at exterior cafeteria patios, at athletic facilities, and other grounds areas that experience high volumes of people. Consult the facilities department for design considerations and for approved manufacturers.

DIVISION 11 - EQUIPMENT

DIVISION 12 - FURNISHINGS

DIVISION 13 - SPECIAL CONSTRUCTION

DIVISION 14 - CONVEYING SYSTEMS

DIVISION 15 - MECHANICAL SYSTEMS

Section I. GENERAL

Paragraph C: add the following item:

12. Colorado Revised Statutes

Section II. VIBRATION ISOLATION

Add the following paragraph:

- E. In cases where mechanical equipment is located above ground floor slab, provide stable support to eliminate vibration.

Section VII. HEATING, VENTILATING, AND AIR CONDITIONING – GENERAL

Paragraph C: delete item 2 and replace with the following:

2. The District requires design consideration for resource efficient equipment – GSHP, Condensing Boilers, Chillers, Cooling Towers, Thermal Storage, VAVs, High Efficiency Motors, VFDs, Heat Exchangers, the highest available SEER equipment, etc. Any equipment not meeting the highest efficiency standards must have District approval.

Paragraph C: delete item 6 and replace with the following:

6. All 10-HP and larger motors shall be Power Factor corrected to maintain unity PF for energy conservation and utility penalty avoidance.

Falcon School District 49
Technical Guide for New Construction Including Additions and Remodeling
ADDENDUM 1

Paragraph C: add the following item:

12. Hot water heating systems should be designed to realize the maximum efficiency of a condensing boiler plant (i.e. sizing coils to produce large delta Ts and to utilize low water temperatures). Coil sizing, loop design, and control strategies all need to be specific for condensing boiler systems. Traditional design strategies for non-condensing boilers are not acceptable. Calculations and design intent must be submitted for District review.

Paragraph C: add the following item:

13. Boiler rooms shall have electric unit heaters to protect the boiler plant in the event of a boiler failure. Electric heaters are not allowed in other areas without District approval.

Section IX. HEAT GENERATION

Add the following paragraphs:

E. Testing and Start-Up-General.

1. Testing of mechanical systems shall be conducted by the Manufacturer and the Contractor in the presence of a representative of the Architect. The Owner's representative shall also be informed at the start of the tests.
2. Boiler plants and all associated hydronic loops shall be thoroughly flushed to ensure that all construction debris is removed from the system prior to initial operation of the boiler and pumping plant. Flushing shall first be conducted with all terminal valves in a closed position to prevent contamination of coils or other peripheral equipment; then flushed thoroughly with all valves open. Flushing shall continue until little debris is detected at the lowest flush point. Follow Manufacturers specifications for initial fill and operation of the boiler plant.
3. Fill and vent the heating system, add trisodium-chloride boiler cleaning compound and operate system at maximum design conditions (200° F. minimum) with pumps running valves open, and with heating unit fans "off" for a period of 24 hours prior to hydrostatic testing. Pump screens must be in place to divert and capture any remaining construction debris from the system.
4. Fill and vent the chilled water system with clean tap water. Operate system at maximum design conditions with pumps running and valves open for a period of 24 hours prior to hydrostatic testing. Pump screens must be in place to divert and capture any remaining construction debris from the system. Drain and fill with glycol mixture.
5. Provide for such items as thermometer wells, pressure test cocks, flow meters, access doors, etc., as required to allow tests, adjustments, and balancing to take place.
6. All heating system piping will be tested hydrostatically to 125 psi for at least six consecutive hours during which time the pressure shall remain constant without pumping. Any system components or equipment which cannot withstand test pressure shall be isolated or removed from the system. Welded piping shall be subjected to a "hammer test" and "soap suds" test while under pressure.

Falcon School District 49
Technical Guide for New Construction Including Additions and Remodeling
ADDENDUM 1

7. Test and adjust boiler burner controls.
8. Drain system completely; flush and refill, adding specified boiler water treatment.

F. Boiler System Testing.

1. Provide Factory boiler field combustion tests for minimum and maximum firing rates which include the following information:
 - a. Stack temperature
 - b. Gas pressure and gas cubic feet per hour
 - c. Percent CO₂ and CO
 - d. Presence of CO in flue gas or high stack temperature will require corrective action by the Contractor
 - e. Thermal efficiency

Section XIII. CONTROLS

Delete section and replace with the following:

XIII. CONTROLS

A. General.

1. The School District will furnish and install all work under this section of the specification. The Mechanical Contractor shall include an allowance in their bid to coordinate all work required by others for this section.
2. The System. The School District has an established District-wide Automated Logic central Control and Building Automation System. All new buildings and additions or remodeling shall continue and become a part of this system. The installed system is Native BAC-net standard. New controls systems must be compatible with existing installations. Separate software, gateway devices, drivers or routers are not acceptable.
3. The temperature control system shall be an extension of the existing DDC system. The system shall be placed into operation and adjusted under operating conditions, being carefully coordinated with related subcontractors. See section on "Testing, Adjusting and Balancing."
4. All control actuators and valves are to be Belimo. Other manufacturers must have District approval.
5. Require that the Architect or mechanical consultant review a copy of the Temperature Control submittal, including drawings of system layout, connections to central School District system, and detailed sequence of operations and give written approval prior to release of approved submittal.
6. Pneumatic systems are not allowed, except for specialized academic or programmatic needs. All controls shall be DDC.

Falcon School District 49
Technical Guide for New Construction Including Additions and Remodeling
ADDENDUM 1

7. Pump and Boiler Controls:
 - a. DDC system shall automatically control boilers and pumps. The heating pump shall restart automatically after a power failure.
 - b. High-efficiency, premium-quality motors are required. All motors over 2 HP shall be VFD controlled. VFDs shall be of a Manufacturer approved by Owner. Approved VFD Manufacturers include: ABB, Safetronix, and Siemens.
 - c. The system supply water temperature shall automatically be varied inversely to changes in outside temperature and/or by building demand. As building demand decreases the supply water temperature setpoint shall also decrease. The schedule shall be adjustable, and shall be controlled by the existing District DDC system.
 - d. Operate condensing boilers and systems to achieve maximum efficiency as dictated by the manufacturer. When multiple boilers are involved, these boilers are to be automatically sequenced or staged with the load per manufacturer's recommendations (i.e. two boilers running at 40% capacity will achieve greater efficiency than 1 boiler running at 80% capacity). Consult manufacturer's guidelines for switchover thresholds or use a staging controller designed for use with the installed boiler system.
 - e. Systems shall be provided with standby pumps that shall have pump controls and circuits arranged for automatic lead-lag selection of pumps, and alarm circuit on standby pump.
7. Unit Heaters and Cabinet Unit Heaters will utilize wild coils and the DDC system shall cycle the fan to satisfy a temperature setpoint. These units shall be programmed for night setback.
8. Heating and ventilating units will normally have cycle similar to ASHRAE II unit ventilator cycle. Check for exhaust interlocks in kitchens, shops, science rooms etc.
9. Provide all unit controls based on the specific use of the area. In general, the simplest controls that will perform the intended function are preferred.
10. Freeze protection shall be provided for all systems handling outside air. Consider the use of face and bypass control for any systems designed for 100% outdoor air (i.e.: make up air units).
11. Outside air dampers shall close any time the fans are off and during warm up of area serviced, per District DDC controls.
12. Provide for night heating by District DDC system, with OSA dampers closed at all times units are in Night-cycle mode.
13. Thermostats - Wall Mounted:
 - a. DDC sensors are used that include adjustable temperature features and override capability (one per zone, mapped for building engineer use and control).
14. Controls Zones - DDC: The building will minimally be divided into the following dedicated air handling zones for operation. No listed space is to be served by more than 1 unit.
 - a. Auditorium

Falcon School District 49
Technical Guide for New Construction Including Additions and Remodeling
ADDENDUM 1

- b. Gymnasium, Weight and Locker Rooms
 - c. Administration Area – Multiple zones
 - d. Classrooms to be divided into zones as required by building orientation.
 - e. Media Center
 - f. Music wings or other defined academic areas
 - g. Kitchen
 - h. Cafeteria
 - i. Lobbies, hallways, and common areas.
15. Exhaust Fans:
- a. Exhaust fans for group toilets shall be controlled with air handlers on District DDC system. Small exhaust fans for individual toilet rooms may be switched on with the lights.
 - b. Kitchen exhaust fans shall have local manual start with hard-wire interlock to makeup air unit.
 - c. Fire Protection: Provide fan shutdown in accordance with latest editions of IBC and NFPA. Where ionization type detectors are used, provide for connection to building fire alarm system or smoke detector in the zone.
 - d. Relief exhaust fans shall be controlled. Fans shall be OFF during night cycle when outdoor air dampers are closed.
16. Entry Heaters:
- a. Provide 24-volt control circuit
 - b. Provide for DDC control
 - c. Electric heaters are prohibited, except in boiler rooms or with written permission of Owner
- B. Required Control Points
1. Roof-Top and Air Handler Units (RTU and AHU):
- a. DX Units: multiple stages of cooling are required where applicable, and there shall be Enable/Disable control for each stage. On-board safety circuits shall override the control point.
 - b. Gas-Fired Units: Heating shall be Enabled/Disabled by the building automation system, and burners shall be of the modulating type with an associated control point.
 - c. Fans: Supply Fans and Return Fans shall have Start/Stop control and Amps input (See VFDs for VFD control requirements).
 - d. Temperatures: Mixed Air and Discharge Air Temperatures shall be provided for all units.
 - e. Heating and Cooling Coils: coil valves shall be fully modulating with an associated control point.
 - f. Coil Circulation Pumps: any pumps shall have Start/Stop control and Status input. Status shall be determined through a differential pressure switch.
 - g. Static Pressure: Duct Static Pressure (located at approximately 2/3 of the furthest distribution point) and Building Static Pressure (both in psi) shall be provided.
 - h. Dampers: all dampers shall be fully modulating and have an associated control point.
 - i. Alarms: High Pressure Limit and Smoke Detect sensors shall be hard-wired to disconnect power to the units and provide an alarm to the District DDC

Falcon School District 49
Technical Guide for New Construction Including Additions and Remodeling
ADDENDUM 1

- system. Freeze-stats shall be wired in the same manner for units with hot or chilled water coils.
2. Make-up Air Units (MAU):
 - a. Gas-Fired Units: Heating shall be Enabled/Disabled by the building automation system, and burners shall be of the modulating type with an associated control point.
 - b. Fans: Supply Fan shall have Start/Stop control and Amps input.
 - c. Temperatures: Discharge Air Temperature shall be provided for all units.
 - d. Heating Coils: coil valves shall be fully modulating with an associated control point.
 - e. Coil Circulation Pumps: any pumps shall have Start/Stop control and Status input.
 - f. Damper: Outdoor Air Damper shall have a digital control point.
 - g. Evaporative Units: shall have digital control points for Drain Valves, Fill Valves, and Pumps
 - h. Alarms: High Pressure Limit and Smoke Detect sensors shall be hard-wired to disconnect power to the units and provide an alarm to the District DDC system. Freeze-stats shall be wired in the same manner for units with hot water coils.
 3. Variable Air Volume (VAV) or Fan Powered Boxes (FPB):
 - a. Dampers: all dampers shall be fully modulating and have an associated control point.
 - b. CFM: CFM input is required of all units.
 - c. Temperatures: Discharge Air and Space Temperature shall be provided for each unit.
 - d. Reheat: heating coil valves shall be fully modulating and have an associated control point.
 - e. Fans: all fans shall have Start/Stop control and Status input.
 - f. Occupancy: applicable units shall receive a local "Occupied" signal from a room occupancy sensor.
 - g. Baseboards: applicable units shall have an auxiliary output for baseboard control.
 - h. Thermostat – Wall mounted: shall include adjustable temperature features and override capability.
 4. Exhaust Fans:
 - a. Exhaust fans for group toilets shall have Start/Stop control and Status input. Small exhaust fans for individual toilet rooms may be switched on with the lights.
 - b. Kitchen exhaust fans shall have a local manual start Enabled/Disabled by the District DDC system, and a hard-wire interlock to the MAU.
 - c. Building relief exhaust fans shall have Start/Stop control and Status input (See VFDs for VFD control requirements).
 5. Pumps:
 - d. All pumps shall have Start/Stop control and Amps input (See VFDs for VFD control requirements).
 6. Variable Frequency Drive (VFD):
 - a. All VFDs must communicate with the District DDC system via BACnet or Modbus RS-485, 2-wire interface (Baud rate shall be determined by other Modbus equipment and fastest available rates).
 7. Boilers:

Falcon School District 49
Technical Guide for New Construction Including Additions and Remodeling
ADDENDUM 1

- a. All heating system boilers must communicate with the District DDC system via BACnet or Modbus RS-485, 2-wire interface (Baud rate shall be determined by other Modbus equipment and fastest available rates).
- 8. Lighting Panels:
 - a. All lighting control panels must communicate with the District DDC system via BACnet or Modbus RS-485, 2-wire interface (Baud rate shall be determined by other Modbus equipment and fastest available rates).
- 9. Walk-ins:
 - a. All walk-in freezers and refrigerators shall provide a temperature input to the District DDC system for alarming purposes.
- 10. Cabinet Unit Heaters (CUH):
 - a. All CUHs shall have Start/Stop control, DAT, and Space Temperature input.

Section XIV. TESTING, ADJUSTING, AND BALANCING

Delete Paragraphs A and B, and replace with the following:

- A. The TAB contractor will be contracted directly to the District. The project specifications shall still contain a section for TAB, but the Mechanical Contractor is not responsible for hiring a TAB contractor.

DIVISION 16 – ELECTRICAL SYSTEMS

Section I. GENERAL

Paragraph C, item 2.a., replace with the following:

- a. Provide Lightning Protection for building critical systems. Consult District Facilities Department for systems requiring lightning protection.

Paragraph C, item 2.c., replace with the following:

- c. Provide Power Factor Correction to maintain power factors within 5% of unity.

Section IV. SERVICE AND DISTRIBUTION

Paragraph A: add the following item:

- 4. All transformers must be Energy Star Rated.

Section IV. LIGHTING

Change to Section V. and change all subsequent sections accordingly.

Paragraph D, item 4.f., add the following sentence:

Classroom occupancy sensors must provide an auxiliary dry contact, for use by the BAS, similar to Wattstopper model DT-200.

Paragraph E: add the following item:

- 2. Luminaires utilizing lamps longer than 4 feet are not allowed.

Section VII. FIRE ALARM SYSTEM

Paragraph C. Equipment: add the following:

Falcon School District 49
Technical Guide for New Construction Including Additions and Remodeling
ADDENDUM 1

3. Power Supplies:
 - a. System power supplies must be rated for 125% of the load for all connected devices. Under test conditions, all loads are coincident and power supplies frequently burn out.

Paragraph C, Part 3. System Operation: Change subheadings to the following:

G. System Operation.

1. Fire Detection and Control:
 - a. For remodel projects actuating devices shall be grouped in zones represented by zone Light Emitting Diodes (LED's) on the control panel. For new buildings each initiation device shall have a unique address and be identified at the FACP and remote annunciator.
 - b. Actuation of a UL approved alarm initiating device shall, at both the fire alarm control panel and remote annunciator:
 - 1) Light the respective red zone alarm LED. This zone LED will remain lit until the actuating device is restored to normal and the system is reset or for addressable systems indicate the address and description of the device in alarm.
 - 2) Cause the respective red zone alarm LED to flash. This LED will continue to flash until the alarm acknowledge switch is actuated. Once acknowledged, the zone LED will be constantly illuminated until the actuating device is restored to normal and the system is reset.
 - 3) Evacuation:
 - (a) The audible alarm signals will sound continuously throughout the entire facility. When an alarm condition occurs, a fire alarm evacuation signal shall be transmitted over the horns and the visual signal shall flash until reset. This tone shall be a slow whoop sweeping from 800Hz to 1200 Hz.
 - (b) Should subsequent alarm actuation of a different zone occur, the alarm devices will sound until silenced or the main control panel is reset.
 - (c) The systems shall be capable of automatically transmitting fire information to the Owner Security Office. Dry contacts (normally closed, which open on alarm or trouble conditions) are needed for "alarm" and "trouble" conditions.
 - (d) Alarm lamps shall be provided and located as shown on the plans. These lamps shall be constantly illuminated until the system has been reset.
 - (e) There shall be an adequate quantity of zoned auxiliary outputs to provide interfacing to HVAC, smoke dampers, security, and door controls as required per plans and specifications.
 - (f) Each alarm initiating circuit, horn circuit, and battery voltage shall be supervised. Any disarrangement of system wiring such as loss of power, opens or grounds, shall activate the audible and visual trouble indicators. Actuation of the trouble acknowledge switch shall silence the audible trouble indicator, but the trouble LED will remain lit. A subsequent trouble will reactivate the audible trouble indicator. The trouble LED shall be non-cancelling, except by an actual clearing of the trouble condition.
 - (g) Power for operating DC smoke detectors and door holders will be obtained from a supervised power supply within the main fire alarm control panel.

Falcon School District 49
Technical Guide for New Construction Including Additions and Remodeling
ADDENDUM 1

- (h) The control unit shall drive its primary operating power from a 120VAC single phase 60Hz supply. There shall also be a 24V battery standby power source capable of operating the entire system for a period to 60 hours in a supervisory mode and then be capable of operating the alarm devices for a minimum of ten minutes. There shall also be a power failure monitor capable of sounding the audible trouble indicator for 48 hours in the event of AC power failure and loss of battery standby.

Paragraph D: add the following sentence:

10. Locate all fire dampers and actuating devices where they can be easily accessed for maintenance and repair.

Paragraph D, Part 2: change the last sentence to read:

All wiring shall meet national, state, and local electrical codes.

Paragraph D: change to paragraph E.

Paragraph E: change to paragraph F.