CONSTRUCTION REQUIREMENTS

Note: The buildings on the UCCS campus are divided into two categories: General Fund and Auxiliaries. General Fund Buildings include academic and administrative functions. Auxiliary buildings include residence halls, athletic, and dining facilities. In some cases, construction standards differ depending on the building category. Confirm building category with Facilities Services Project Manager.

- General Requirements
- Heating, Ventilating, and Air Conditioning (HVAC)
- HVAC Piping and Pumps
- Vibration Isolation
- HVAC Air Distribution and Schematic Details
- HVAC Air Cleaning Devices
- Equipment Hail Guards
- Access Panels
- Coordination With Third Party Vendors
- Sub Metering Utilities
- Lighting Control System – Refer to Division 26
- Building Automation System (BAS) – Refer to separate Division 23 Document

DIVISION TWENTY-THREE: HEATING, VENTILATION AND AIR CONDITIONING (HVAC)

A. General Requirements

1. Consideration should be given to flexibility and adaptive reuse in the building and space design.
2. If appropriate, the design should provide for building additions with appropriate architecture and infrastructure considerations.
3. Study the possibility of future needs (expansion, new equipment) at the time the conceptual design is being formulated. If appropriate, at least one layout shall be made showing expansion possibilities.
4. Innovative designs should be considered but unproven systems and materials are not acceptable. Consider using proven components in creative ways.
5. Exterior mechanical installations must not only be designed for proper functions, but also must be considered in the aesthetics of building design. Large and unsightly installations shall be located so as to be hidden from public view or shall be appropriately enclosed.
6. The Architect shall provide sufficient room for an orderly arrangement of equipment, piping, conduit, etc. Special consideration shall be given to heights of floor to ceiling spaces to allow for maintenance and concealment of systems.
7. Special attention shall be given early in the design process to provide for sufficient and safe access space for maintenance of mechanical systems. Sufficient space implies the capability to replace major components with minor impact to the Building. Equipment shall be designed to be accessible and maintainable from floor level whenever possible. When not possible, permanent structures will be designed to minimize the necessity of such tools as ladders, hoists and portable lighting (i.e.: platforms and permanent ladders for overhead work, rail systems for removal of pumps in pits, adequate permanent lighting, etc.). The University shall not accept designs unless the

drawings clearly indicate locations of ceiling and wall access panels and other necessary access space. Specifications shall clearly identify contractor requirements to maintain these clearances and access points.

8. When equipment, wiring, piping, etc. are disconnected or "abandoned," they must be physically removed and disposed of as part of the project.
9. Where fire rated assemblies exist, fire caulk all penetrations.
10. All other assemblies – provide acoustic sealant at all penetrations.

B. Heating Ventilating, and Air Conditioning (HVAC)

1. System Design Requirements
    a. System selection shall consider the environmental requirements for thermal control, indoor air quality, and energy use.
    b. Design temperatures for heating and air conditioning systems shall be as follows:

        Normal
        Summer Setpoint - 77 +/- 2 degrees F
        Winter Setpoint - 71 +/- 2 degrees F

        Warm
        Summer Setpoint - 75 +/- 3 degrees F
        Winter Setpoint - 75 +/- 3 degrees F

        High Activity Setup
        Summer Setpoint - 75 +/- 2 degrees F
        Winter Setpoint - 71 +/- 2 degrees F

        Public Area Non-Adjustable
        Summer Setpoint - 75 degrees F
        Winter Setpoint - 71 degrees F

        MEP Rooms (excluding IDF, MDF)
        Summer/Winter - 60 degrees F minimum / 80 degrees F maximum

    c. Setpoints, other than listed above, shall not be used without prior consultation with UCCS project manager.
    d. The University utilizes central Direct Digital Control Systems (DDC) for central control of certain HVAC functions and terminal DDC for space control. UCCS has standardized on Direct Digital Controls (DDC) by:
        i. Setpoint Systems, Delta Controls, of Littleton, Colorado.
        ii. Integrated Control Systems, Inc. (ICSI) of Denver, Colorado.
        iii. Refer to Division 23 – Building Automation System (BAS) Construction Standards
    e. Occupied-unoccupied programming of systems should be initiated to shut-off ventilation air, exhaust air, fan system, pumps, etc., wherever possible. Where shut-down of systems cannot be accomplished during unoccupied hours, energy recovery systems should be considered. Each application should be examined independently to determine any special

sources for obtaining recovery of usable energy. Life cycle cost analysis by the Consulting Engineer will be required to determine the feasibility of energy recovery systems.

f. Air damper selection – opposed blade dampers to be used only in fully open or fully closed applications. Parallel dampers are to be used only in modulating applications.
g. Fan coil units or split systems may be required in specific areas to facilitate shut-down of major fan units. Where necessary, the control of these units shall be coordinated with the controls of the air handling units.
h. All air conditioning systems shall have air-economizer cycles where feasible.
i. All air conditioning, heating, ventilating and exhaust systems shall be matched to the maximum required performance. If appropriate, the use of variable volume supply and exhaust air systems is encouraged to compensate for diversities in loads and to reduce equipment sizes. VAV boxes and supply diffusers and grilles shall be designed to ensure proper space ventilation effectiveness.
j. Interior spaces requiring cooling year round should be handled independently from perimeter areas requiring heating during the winter and cooling during summer. All occupied spaces shall have their own temperature control. Corridors and other public spaces shall have independent control from offices or other adjacent spaces.
k. Interior areas with a variable volume cooling system should utilize an air economizer cycle. The perimeter systems should utilize economizer cycles when cooling is required and minimum ventilation rates when heating is required. VAV terminal units are to provide full shut-off.
l. Provide for two-stage filtration to meet LEED requirements. Heat-recovery coils shall meet LEED requirements.
m. All coils, including VAV terminal boxes, shall have clear access for cleaning.
n. Where applicable, Elevator shaft venting: In order to minimize drafts, heat loss and elevator door "whistling", it is necessary to install a motorized damper for elevator shaft venting, interlocked to the fire-alarm and BAS control system. The damper shall be operated as indicated in "Control Sequence of Operation" of the control section.
o. Outside air ventilation shall be per latest approved version of ASHRAE and state code, during the time the spaces are occupied. Where appropriate the use of CO2 sensors should be determined in conjunction with UCCS.
p. Pressure gauges are required across all AHU filter banks and other locations required by Engineer or Code.
q. Criteria for Selection of Equipment
    i. Indirect-direct evaporative cooling should be used only with the approval of the Owner. If used, provide at least two stages of pumping.
    ii. Stainless steel sumps, hardware and housings are required for the direct-evaporation sections.
    iii. Indirect evaporative cooling with a "mechanical air-chilling coil" to complement the indirect evaporative cooling coil should be considered.

iv. Fans selected for operation above 6" total static pressure must be approved by the UCCS.
v. Refer to ASHRAE for minimum Energy Efficiency Ratios (EER) allowable for all compressors under 100ton.
vi. Water-type cooling towers are preferred to conserve energy on systems 80 tons and larger. Water-cooled or evaporative condensers are acceptable depending upon project requirements.
vii. Screw type chillers are not acceptable.
viii. On units below 80 tons, an economic evaluation shall be made to determine if the condensing unit will be air cooled or water cooled. Reduced condenser water temperatures should be utilized when possible to reduce the chiller electrical consumption.
ix. Small water-cooled DX Units or research equipment which utilize tap water for condensing, after which the water is disposed of in the drain, will not be permitted.
x. Variable Frequency Drives are to be used for variable flow control. Electrical by-pass switches are required on critical equipment.

r. Size all equipment for 6,400 feet above sea level.

C. HVAC Piping and Pumps

1. Piping
   a. Install piping at right angles or parallel to building walls. Diagonal runs are not permitted, unless directed by the Engineer.
   b. Conceal all pipe installations in walls, pipe chases, utility spaces, above ceilings, below grade or floors, unless indicated to be exposed to public view.
   c. Dielectric unions are not allowed; Dielectric nipples are OK.
   d. Reverse return piping layout will be used wherever practical.
   e. Flex hoses are NOT ALLOWED at VAV boxes; Swing joints are acceptable
   f. All takeoffs shall come off the top of piping.
   g. Refer to Division 22 – Plumbing

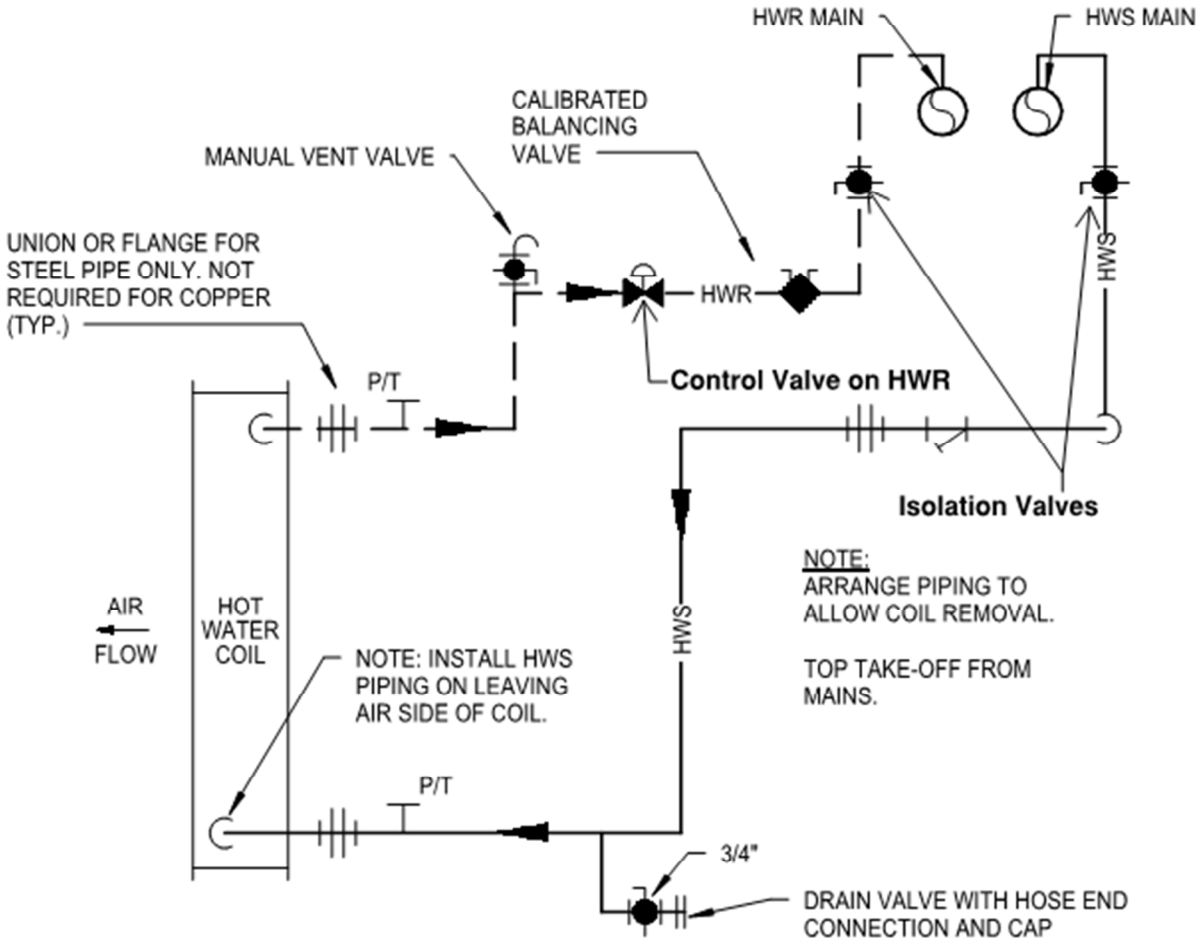
D. Vibration Isolation

1. Provide vibration isolation devices for limiting transmittance of vibration from vibration-producing equipment to the structure on which it is supported or attached. The type of vibration isolation device is a function of building uses, size of mechanical equipment, and the frequency at which the equipment operates. The mechanical engineer or a vibration consultant shall consider these factors when designing the vibration isolation system.
2. Provide the types of vibration isolation devices as recommended by the respective mechanical equipment manufacturers or vibration consultant, to isolate vibrations for each particular piece of equipment. Include a schedule of equipment (i.e. pumps and fans) to be isolated.
3. For facilities where vibration isolation is critical, a consultant specializing in vibration isolation shall be used.

E. HVAC Air Distribution and Schematic Details

1. Provide minimum 30” clear access in front of VAV controls panel and filter access. FPVAV needs clear access on bottom of unit. Consider ceiling heights when placing VAV boxes so that they are accessible by ladder.

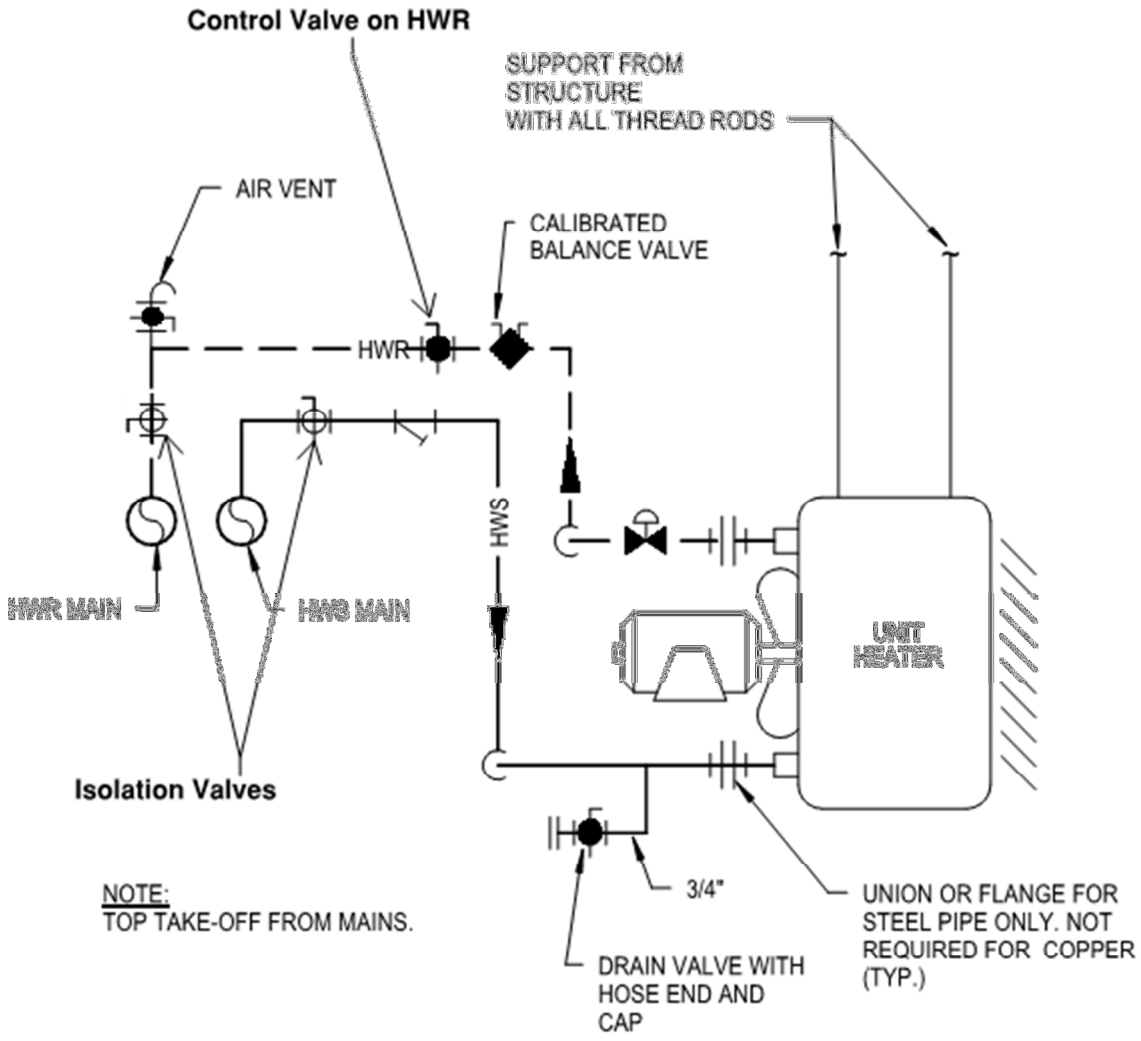
2. VAV Schematic Detail



TERMINAL BOX
COIL PIPING DETAIL

SCALE: NONE

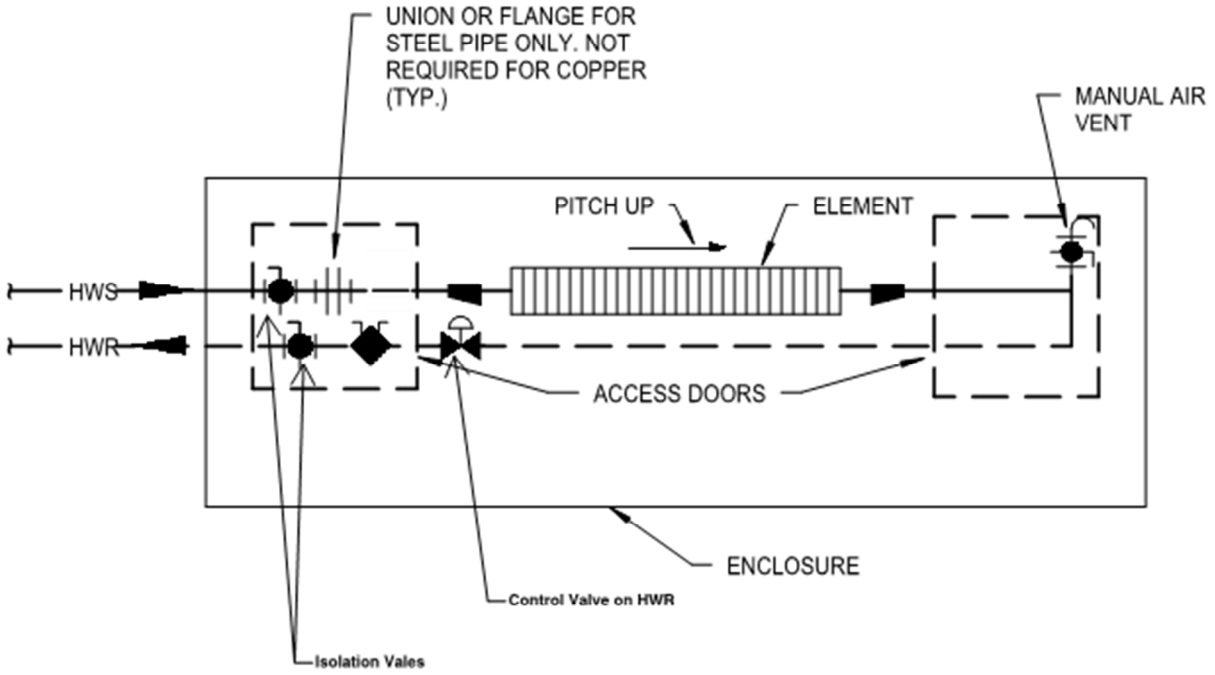
3. Unit Heater Schematic Detail



UNIT HEATER PIPING DETAIL - HORIZONTAL

SCALE: NONE

4. Baseboard Heating Schematic Detail



NOTE:
SEE PLANS FOR PIPE SIZES AND ARRANGEMENT.

BASEBOARD RADIATION PIPING DETAIL

(15850) SCALE: NONE

F. HVAC Air Cleaning Devices

1. As directed by UCCS for renovation projects, provide negative air equipment.

G. Equipment Hail Guards

1. For all exposed mechanical equipment, spec equipment with hail guard accessory to cover fins.

H. Access Panels

1. Provide locking powder coated access panels at ALL locations. All access panels are to be keyed to the same keyway across all general fund and auxiliary buildings. Coordinate with UCCS Project Manager.

I. Coordination with Third Party Vendors

1. Allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
2. Provide for ease of disconnecting the equipment with minimum interference to other installations.
3. Coordinate with other site utilities, future utilities and equipment.
4. Coordinate installation of required supporting devices and sleeves through concrete, masonry and other structural walls.
5. Coordinate chases, sleeves, and openings with general construction.
6. Schedule building shutdowns or loss of power with UCCS parties ahead of scheduled activities.
7. Coordinate electrical service connections with CSU standards.
8. Coordinate grounding requirements with CSU standards.
9. Coordinate location of access panels for mechanical items with general construction and UCCS Project Manager.

J. Sub Metering Utilities – BASE BID

1. Domestic Water – Measure overall building consumption. Controls contractor provides communication infrastructure between meter and BAS.

2. Natural Gas – Meter overall gas consumption tied back to the BAS controls system; Colorado Springs Utilities provides Pulse Indicator Board (PIB); Controls contractor provides communication infrastructure between PIB and BAS.

3. Electric – Measure overall building consumption. Controls contractor provides communication infrastructure between meter and BAS.

4. Per CSU standards, interval data at 5-minute (electric); interval data at 15-minute (natural gas, water).

Provide Add Alternate #1: Sub meter different building electrical panel loads. Controls contractor provides communication infrastructure between sub meter and BAS.

Provide Add Alternate #2: Sub meter mechanical equipment makeup water from overall building use. Controls contractor provides communication infrastructure between meter and BAS.

K. Lighting Control

1. **Refer to Division 26 Lighting Controls Construction Standards**

L. Building Automation System (BAS)

1. **Refer to Division 23 Building Automation System (BAS) Construction Standards**