

WHEN TO USE THIS BASIS OF DESIGN SECTION

This BOD section should be used for new construction projects to guide Architects, Engineers, and Development staff toward heating + cooling solutions that are energy efficient and easy to maintain.

REQUIREMENTS:

A. MINIMIZE HEATING + COOLING LOAD THROUGH BUILDING ENCLOSURE + VENTILATION SYSTEM DESIGN:

A first step in providing effective and efficient heating and cooling of buildings is to provide a building enclosure and ventilation system that minimizes heating, cooling and dehumidification loads. See the Building Enclosure and Ventilation sections of the Basis of Design for more information.

B. USE HEAT PUMP TECHNOLOGY:

Use Central System with Heat Recovery (VRF-HR) (3 Pipe): Central systems afford more efficient sizing of equipment, and mitigate the tendency to oversize equipment, which is common in individual, or "1-to-1" systems. Central VRF-HR systems can deliver both heating and cooling at the same time. Heat recovery can occur year-round by setting a range of acceptable temperatures for all units. For example, if one space begins to overheat in the winter due to solar gain, the excess heat can be moved to another space that is calling for heat. These systems can be used for the whole building, or parts of building, and require one or more outdoor compressors located on the exterior.



C. DISTRIBUTION:

I. DUCTED FAN-COIL DISTRIBUTION FOR APARTMENTS: Provide a ducted air handler (fan-coil) for distribution of heating and cooling within residential apartments. Ducted distribution allows efficient use of space within the apartment (e.g., furniture can be placed against the exterior wall without compromising distribution) and contributes to air mixing within apartments. Horizontal fan coils can be installed in ceiling plenums, or vertical fan coils can be installed in closets. Ductwork distributes the heating/cooling to the different rooms of the apartment. All duct work must be sealed. Ductwork openings must be protected during construction to prevent contaminants getting in the ductwork.



II. EITHER DUCTED OR NON-DUCTED DISTRIBUTION FOR COMMON AREAS:

Distribution of heating and cooling for common areas and non-residential areas must be appropriate to the use of the space. An internal conference room, for example, may be best served by a ceiling cassette that allows the loads of the conference room to be managed independently of perimeter office spaces. A large community room may benefit from ducted distribution to provide uniform conditions within the space. All duct work must be sealed. Ductwork openings must be protected during construction to prevent contaminants getting in the ductwork.

D. SIZE ALL EQUIPMENT USING ACCA MANUAL J+S OR ANSI/ASHRAE/ACCA STANDARD 183:

Heating and cooling systems shall be sized to meet calculated loads for the specific building or space served. Rule-of-thumb sizing is not acceptable. For buildings 3 stories or less in height use ACCA Manual J to calculate building loads and ACCA Manual S to size equipment. For buildings over 3 stories in height calculate heating and cooling loads according to ANSI/ASHRAE/ACCA Standard 183 and size equipment not greater than these loads.

1. When calculating heat and cooling loads use the following interior conditions:
 - a) Maximum of 74F for heating (this satisfies HUD's requirement of 68F)
 - b) Minimum of 72F for cooling

E. PREDICTIVE MODELING FOR ENERGY CONSUMPTION + COST: POAH desires to have an estimate of energy consumption and cost for operation of the new building. Engineers shall provide estimates of energy use and cost for each of the following, broken out by common-meter energy use vs. resident-meter energy use:

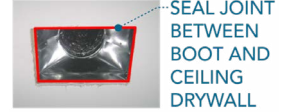
1. Heating energy use (including electric and gas/oil as applicable)
2. Cooling energy use
3. DHW energy use (including electric and gas/oil as applicable)
4. Ventilation energy use (including electric and gas/oil as applicable)
5. Lighting energy use
6. Plug load energy use

F. COMPRESSOR PLACEMENT: Compressors should be placed away from windows and outdoor patios, and should be easily accessed by maintenance. Compressors should be installed on stands a minimum of 18 inches off the ground or roof. Any/all refrigerant lines should be covered/protected. Landscape plans should include a visual barrier of compressors without interfering with operation or access by maintenance.



G. DUCTWORK:

1. Duct Tightness: Duct leakage shall not exceed 4 CFM25 per 100 sq. ft. of conditioned floor area.
2. Duct System Static Pressure: The ductwork shall allow the air handler to operate within its recommended static pressure range.
3. Duct Boots: Duct boots must be sealed to the interior finish.
4. Installation: All duct work openings must be protected during construction to prevent contaminants getting into, and settling in, the ductwork.



H. CONTROLS:

Central VRF Systems must include:

1. Master Controller: control to all VRF units from a central location within the building. Allow the monitoring of issues, maintenance schedules, over-ride setpoints. Provide system with BACnet option to integrate other third-party HVAC equipment control. System to provide data trending. Control system to allow remote login access.
2. Provide onsite computer/laptop to operate the control system and trending, if specified by the manufacturer.
3. Watt Meters, or other manufacturer recommended BTU Meters, on outdoor units. Incorporate energy allocation software, to be used for efficient system operations and billing (where permitted)
4. Any additional metering required for Renewable Energy Credits (RECs), Alternative Energy Credits (AEC) or other incentive program, if applicable within the jurisdiction.



I. THERMOSTATS:

- Each fan-coil should have its own thermostat located within the space that it serves.
- See the Thermostat section of the Basis of Design for more information.

J. SPECIFICATION FORMAT:

- Project specifications to use industry standard 6-digit CSI Masterformat.



K. INCLUDE SPECIFICATIONS FOR COMMISSIONING (CX): The following specification sections are required in all new construction projects. Commissioning specifications to be reviewed, updated to reflect the current project, and included within the design specification. The HVAC Section (Division 23) must reference the following specifications:

1. **Section 019013 – General Commissioning Specification:** Section includes general and specific requirements that apply to the implementation of commissioning process for HVAC&R systems, assemblies, and equipment.
2. **Section 019013.01 Sample Commissioning (CX) Plan:** Provide a sample Cx Plan. This document outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process. Each commissioning plan should include:
 - a) Commissioning Objectives
 - b) Systems to be Cx.
 - c) Project team contact list, Cx roles and responsibilities of team, general management plan, communication protocols.
 - d) Summary of Cx process, schedule for Cx activities.
 - e) Documentational requirements. Plan for delivery and review of submittals, systems manuals, and other documents and reports.
 - f) Process and schedule for completing construction checklists and manufacturer's prestart and startup checklists for HVAC&R systems, assemblies, equipment, and components to be verified and tested.
 - g) Certifications: installation, prestart checks, and startup procedures have been completed. Ready for testing.
 - h) Verification of testing, adjusting, and balancing (TAB) reports.
 - i) Sample Issues Log and Corrective Action document.
3. **Section 230800 - Commissioning of HVAC:** Section includes commissioning process requirements for HVAC&R systems, assemblies, and equipment.
 - a) If a Building Automation System (BAS/BME/EMS) is to be installed, the Integrated Automation Cx specifications within Section 23 HVAC will also require the following specification. All Cx specifications will also need to reference this specification:
 - a. **Section 250800 - Commissioning of Integrated Automation:** Section includes commissioning process requirements for BAS.



b) The Cx specifications within Section 23 HVAC must also reference the following specifications, as applicable to the project:

- a. **Section 220800 - Commissioning of Plumbing:** Section includes commissioning process requirements for plumbing systems, assemblies, and equipment.
- b. **Section 260800 - Commissioning of Electrical:** Section includes commissioning process requirements for electrical systems, assemblies, and equipment.