ALBUQUERQUE PUBLIC SCHOOLS

Facility Design & Construction / Maintenance & Operations

MECHANICAL SYSTEMS DESIGN STANDARDS

Appendix A

RECOMMENDED HVAC SYSTEMS BY TYPE OF SPACE

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APPENDIX A: RECOMMENDED HVAC SYSTEMS BY TYPE OF SPACE

A. GENERAL

1. The District has a number of different HVAC systems installed which may be considered for various applications as suggested below. (See ***MECHANICAL SYSTEMS DESIGN STANDARDS - Section 4.5 HVAC Systems*** for more detailed descriptions.) We ask the Design Engineer to carefully evaluate the advantages and disadvantages of using their approach and research APS' history with it before proposing a given system to the project team. Possible systems include the following:

    a. Hot water heating, air washer cooling
    b. Furnace heating, air washer cooling
    c. Package units (gas heating, DX cooling)
    d. Hot water heating, chilled water cooling (VAV system)
    e. Ground-source heat pumps
    f. Variable refrigerant flow system w/ ERV ventilation
    g. Hybrid system: gas or hot water heating, both air washer and refrigerated air cooling (air washers used for most cooling conditions and refrigerated air for high temperature and/or humidity conditions).

2. Beyond safety and code compliance, important considerations in HVAC system selection include the following:

    a. Comfort/Controllability
    b. Maintenance/Durability
    c. Energy consumption
    d. Water consumption
    e. Potential for roof leaks.

3. For a large space with continuous high ventilation requirements, such as cafeteria or gymnasium:
    - ✓ Provide peak cooling with one or more air washers.
    - ✓ Down-size the main air handler accordingly.
    - ✓ Design each large space to be cooled and ventilated at maximum occupancy load.

4. For a special space such as kitchen, locker room, or shop area that has higher ventilation requirements during certain parts of the day, design as follows:
    - ✓ Use hot water unit heaters or convectors for the primary source of heat.
    - ✓ For make-up air, transfer air from adjacent large space (e.g. cafeteria, gym).
    - ✓ Each space should have a separate manually switched power exhaust. Some areas can be grouped together on one exhaust system, depending on floor plan (e.g., locker room, shower area, toilet area, coach's office, etc.).
    - ✓ Do not use hot water coils in rooftop units, as it presents a freeze hazard.
    - ✓ Do not use gas-fired units where hot water is available.
    - ✓ For cooling special use spaces, use individual evaporative coolers with separate ductwork.

B. CLASSROOM. Refer to appropriate system(s) under square footage categories below.

1. **Cooling:** Central air washer system, central chiller, Variable Refrigerant Volume (VRV), package units, or DX system.
2. **Heating:** Hot water with duct coils or VRV.
3. **Ventilation:** Operable windows plus exhaust fan(s) or ERV.

C. ADMINISTRATION. Always at high schools and whenever practical at other facilities, provide a system separate from the main building system to accommodate unique occupancy schedules.

1. **Zoning:** Designer is expected to establish at least eight (8) distinct controllable zones in Administrative areas.
2. **Cooling:** Single air washer located in a mechanical room with thermostatically controlled zone control, chilled water with staged compressors and controls, or Variable Refrigerant Volume (VRV) system.
3. **Heating:** Gas furnace, air handling unit with hot water duct coils, or VRV.
4. **Ventilation:** Air handling unit.

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1. **Zoning:** Provide separate unit for Workroom, if anticipated heat loads warrant.
2. **Cooling:** Refrigerated air or a different system decided at the conceptual design meeting. System choice must address humidity control.
3. **Heating:** Furnace (inside) or air handling unit with hot water duct coils
4. **Ventilation:** Air handler associated with heating and cooling equipment. Exhaust fans with operable windows.

E. COMMONS AREA

1. **Cooling:** Centrally located air washer; chilled water if building has chilled water system.
2. **Heating:** Use main building heating system; hot water system if building has boiler.
3. **Ventilation:** Use air handling unit that supplies heating and cooling above.

F. CAFETERIA / KITCHEN

1. **Zoning:** Provide separate cooling unit for kitchen.
2. **Cooling:** Air washer in kitchen. For cafeteria, consider the same system as the other buildings on campus.
3. **Heating:** Hot water or gas unit heater in kitchen. For cafeteria, consider the same system as the other buildings on campus.
4. **Ventilation:** Kitchen should be negatively pressurized with respect to cafeteria. Provide means of make-up air for kitchen hood. Interlock hood and make-up air source. For cafeteria, consider the same system as the other buildings on campus. Provide detailed Sequence or Operation for interaction/control of kitchen/cafeteria HVAC components.

G. HIGH SCHOOL GYMNASIUM

1. **Cooling:** Central air washer.
2. **Heating:** Hot water system if building has boiler. If not, use rooftop furnace. DO NOT run hot water piping above wood floor.

3. **Ventilation:** Air handling unit that supplies heating and cooling above.

H. AUXILIARY OR MIDDLE SCHOOL GYMNASIUM

1. **Cooling:** Central air washer.
2. **Heating:** Hot water system or gas-fired furnace (located on mezzanine).
3. **Ventilation:** Air handling unit that supplies heating and cooling above.

I. MINI-GYM

1. **Cooling:** Air washer, central unit in a mechanical room, or DX package unit with exterior door sensor cut off switch and demand controlled ventilation.
2. **Heating:** Gas furnace or boiler.
3. **Ventilation:** Exhaust/relief fans. Include operable window(s) in coach's office.

J. MECHANICAL / BOILER ROOM

1. **Cooling:** Cooling is generally not required in these spaces.
2. **Heating:** Gas or electric furnace. Do not use HW heat generated in the same room being protected by this furnace, as it presents a freeze hazard if the boiler goes down.
3. **Ventilation:** Exhaust fan(s).

K. IDF/MDF (IT ROOM) OR TELECOM ROOM

1. **Cooling/Heating:** Individual DX Split System not tied to central heating/cooling equipment.
2. **Ventilation:** Exhaust fan, sized for highest exchange rate during unoccupied periods in auditorium.

L. PERFORMING ARTS CENTER (PAC). Provide a system separate from the one serving the main building, in order to accommodate special scheduling needs of PACs.

Provide separate systems for the following five (5) functional areas:

a. Main Auditorium
   - **Cooling:** Package unit with economizer, minimum two-stage. Always separate from other zones.
   - **Heating:** Package unit, or package unit used as air handler with hot water from main system.
   - **Ventilation:** Package unit.

b. Backstage
   - **Cooling/Heating/Ventilation:** Defer to overall system type used at the school. Or, if PAC is free-standing, refer to appropriate system(s) under square footage categories below.

c. Classroom and Office
   - **Zoning:** Use the same unit for Classroom and Office in PAC.
   - **Cooling/Heating/Ventilation:** Defer to overall system type used at the school. Or, if PAC is free-standing, refer to appropriate system(s) under square footage categories below.

d. Stage
   - **Cooling:** Package unit.

- **Heating:** Package unit or package unit used as air handler with hot water from main system.
- **Ventilation:** Package unit.

e. Sound/Control Room
- **Cooling/Heating:** Individual DX Split System not tied to auditorium heating/cooling equipment.
- **Ventilation:** Exhaust fan, sized for highest exchange rate during unoccupied periods in auditorium.

M. PORTABLE BUILDING

1. **Cooling:** New portables use an end-mounted combination DX/furnace unit. For portable building renovations: evaluated case-by-case, based on existing cooling system.
2. **Heating:** Interior gas furnace.

N. SMALL ADDITION – LESS THAN 5,000 GROSS SQUARE FEET

A typical building in this category is classroom, kindergarten, or special needs addition.

1. **Cooling:** Central air washer in mechanical room or on ground outside, separate split systems (one per classroom), or Variable Refrigerant Volume (VRV) system.
2. **Heating:** Gas furnace, split system, or VRV.
3. **Ventilation:** Exhaust fans with operable windows or ERV.

O. MEDIUM ADDITION – BETWEEN 5,000 AND 15,000 GROSS SQUARE FEET

1. **Cooling:** Central air washer system, central chiller, Variable Refrigerant Volume (VRV), package units, or DX system.
2. **Heating:** Hot water with duct coils or VRV.
3. **Ventilation:** Exhaust fans with operable windows or ERV.

P. LARGE ADDITION – GREATER THAN 15,000 GROSS SQUARE FEET

1. **Cooling:** Chilled water, ground source system, Variable Refrigerant Volume (VRV) or hybrid system.
2. **Heating:** Hot water with duct coils (or campus primary heating system).
3. **Ventilation:** Exhaust fans with operable windows. For heat pump systems, provide a separate ventilation system, and consider including heat recovery with it (ERV).