

Determining Baseline HVAC System Type for New Construction Projects

For the majority of projects, the baseline system type can be determined using the following flowchart:

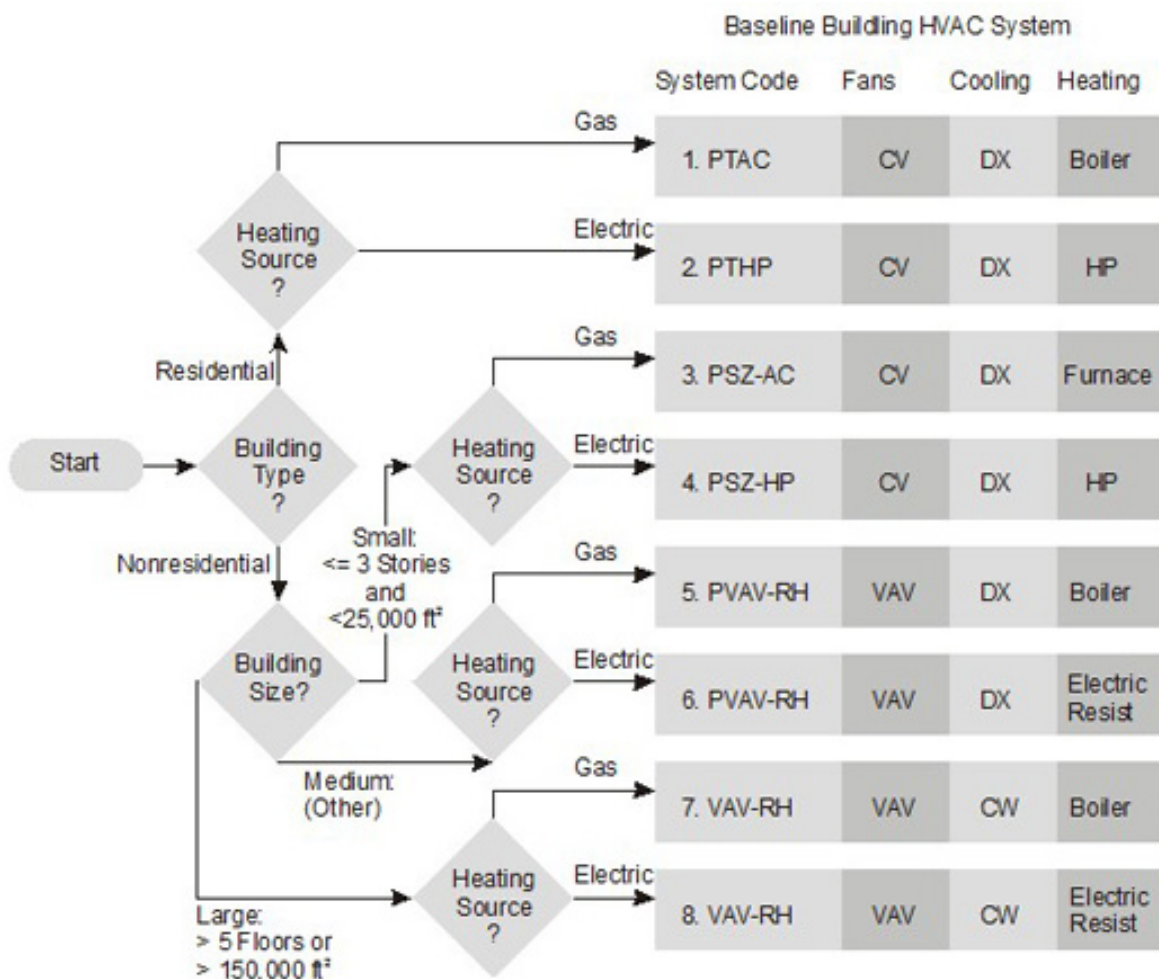


Figure 1. <http://www.comnet.org/mgp/content/hvac-system-map?purpose=0>

There are some exceptions that apply to spaces with unusual internal heat gains, different schedules, special pressurization requirements, or unique outside air needs. These exceptions

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will typically apply to laboratories, commercial kitchens, data centers, and healthcare facilities. When exceptions apply, the baseline system types should be clearly indicated in the ERP Tables.

Below are the exceptions from ASHRAE 90.1-2007 with example scenarios.

G3.1.1a. Use additional system type(s) for *non-predominant conditions* if those conditions apply to more than 20,000 SF of conditioned floor area.

Ex: A 70,000 ft² multifamily building has 21,000 ft² of corridor and stairwell space and has gas heat. Since this space is integral to the function and is not a non-predominant condition of the building, the entire building should be modeled with System 1.

Ex 2: A 70,000 ft² multifamily building has a 21,000 ft² day care center on the first floor of the building and has gas heat. Since this space is a non-predominant condition of the building, the residential space would be modeled as System 1 and the daycare area would be modeled as System 3.

Ex: A 70,000 ft² multifamily building has 21,000 ft² of electrically heated corridor and stairwell space (e.g. VRF heat pump) and gas heat for all spaces (e.g. boilers). Since this is a non-predominant condition applied to more than 20,000 SF of conditioned floor area, (i.e. non-predominant condition is electric heat), the corridors and stairwells would be modeled as System 2 (PTHP) and the remainder of the building would be modeled as System 1 (PTAC).

G3.1.1b. If the baseline HVAC system type is 5, 6, 7, or 8, use separate single-zone systems conforming with the requirements of System 3 or System 4 for any spaces that have occupancy or process loads or schedules that differ significantly from the rest of the building. *Peak thermal loads that differ by 10 Btu/h ft² or more from the average of other spaces served by the system or schedules that differ by more than 40 equivalent full load hours per week from other spaces served by the system* are considered to differ significantly. Examples where this exception may be applicable include, but are not limited to, computer server rooms, natatoriums, and continually occupied security areas.

Ex. A six story, 150,000 ft² office building with boilers and chillers includes a 15,000 ft² data center. The baseline system type for the majority of the building is System 7, but the data center space is system 3.

G3.1.1c. If the baseline HVAC system type is 5, 6, 7, or 8, use separate single-zone systems conforming with the requirements of System 3 or System 4 for any zones having special pressurization relationships, cross-contamination requirements, or code-required minimum circulation rates (laboratory, healthcare centers)

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G3.1.1d. For laboratory spaces with a minimum of 5,000 cfm of exhaust, use system type 5 or 7 that reduce the exhaust and makeup air volume to 50% of design values during unoccupied periods. For all-electric buildings, the heating shall be electric resistance.

LABORATORY HVAC SYSTEMS

When G3.1.1d applies to a laboratory space, the baseline systems will either be System 5 or System 7, depending on the building's heating source. This exception requires VAV for both the supply fan and the exhaust system. When this exception does not apply, a separate laboratory system (either System 3 or System 4) may be required if exceptions G3.1.1b or G3.1.1c apply.

WAREHOUSE HVAC SYSTEMS: ASHRAE 90.1 2010 – Additional System Types (9 & 10 – Heated Storage)

If the proposed design includes heated-only storage, ASHRAE 90.1-2010 Appendix G may be used to establish baseline.

Ex: A four story facility is 230,000 ft² in aggregate with 60,000 ft² of process area, 30,000 ft² of cooled space, and 140,000 ft² of heated-only warehouse/storage.

Path 1: ASHRAE 90.1-2007

Heated-only warehouse and storage, 140,000 ft²: System 7, Packaged VAV w/ Reheat (since total building ft² > 150,000)

30,000 ft² cooled space: System 3, Packaged Rooftop AC (per exception G3.1.1b)

60,000 ft² process space: System 3, Packaged Rooftop AC (per exception G3.1.1b)

Per Table G3.1.10, where no cooling system exists or no cooling system has been specified, the cooling system shall be identical to the system modeled in the baseline building. Although the heated-only warehouse has no cooling in the proposed design, it must be modeled with cooling if this path is used.

Path 2: ASHRAE 90.1-2010

Heated-only warehouse and storage, 140,000 ft²: System 9 – Heating and Ventilation, no cooling system modeled in the baseline and proposed.

Per Appendix G 2010 exception G3.1.1f, if the baseline HVAC system type is 9 or 10, all spaces that are mechanically cooled in the proposed building design shall be assigned to a separate baseline system determined by using the area and heating source of the mechanically cooled

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spaces. In other words, the remainder of the building is treated as if it were a separate building when determining HVAC system types.

60,000 SqFt process space: System 5, Packaged VAV with Reheat (per exception G3.1.1f above)

30,000 SqFt cooled space: System 3, Packaged Rooftop AC (per exception G3.1.1b as a result of exception G3.1.1f)

If this path is used, ASHRAE 90.1-2007 Appendix G still applies to all building components with the exception of the baseline heating system for the warehouse and storage. Systems 9 and 10 must follow the requirements of ASHRAE 90.1-2010 (e.g. G3.1.2.9.2 and G3.1.2.10 for design air flow rates and fan power). The ERP Tables should explicitly note that ASHRAE 90.1-2010 was used to establish baseline HVAC system types.