

## System Selection

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There are a number of variations of all air systems available to the designer. Deciding which system to employ is not always an easy task and requires careful consultation between the designer and the owner. Before making such a decision, consideration of the performance, capacity and reliability aspects of the desired system must be weighed against the cost (installed and operating) and spatial limitations of the project. The following paragraphs identify some of the more critical determinations that guide most system selections.

### Building Use

The intended use of the structure is also a major determinant in the selection of a system. For example, office buildings where there is a daily operational schedule often employ fan powered terminals with auxiliary heating coils serving their perimeter zones. These terminals allow the central system to be turned off or "set-back" during times the building is unoccupied. The fan terminal can maintain minimal heating requirements during these periods by cycling its integral fan and heating coil.

### Contamination Constraints

Many times the intended use of a building creates special constraints that must be considered in the selection of the system components. Hospitals and other medical facilities generally discourage the use of hot water reheat coils on terminals serving patient areas as the coil may harbor bacterial growth. Double duct systems are often employed in these areas as they eliminate the need for such coils. In addition, operating and cleanroom areas usually

require constant volume (dual duct) systems with internal insulation liners to maintain required ventilation and contaminant control (pressurization) rates.

### Acoustical Constraints

Other facilities such as broadcast studios, theatres, and libraries require very low noise levels. Equipment must be selected (and located) to comply with these constraints. Single duct (with/without reheat) terminals are generally used in these applications. Fan powered terminals are usually not considered for such applications due to their intrinsically higher radiated noise levels.

### Maintenance / Accessibility Considerations

Finally, certain building types require an inordinately high level of reliability of the terminal unit components due to the difficulty and costs associated with performing preventative maintenance and repairs on the equipment. For example, the cost of gaining access to a terminal unit mounted above a clean room may be prohibited if the space must then be disinfected and re-qualified. When such costs are likely, the selection of a simple, low maintenance terminal such as a mechanical type is prudent. Problems such as this may also be avoided by locating the terminal such that access through the clean room is not required.

### Building Size

The selection of the central system air handler greatly influences the type of terminal units that are employed. Large buildings often consist of many zones and require significant amounts of air to con-

dition and ventilate these spaces. Central system air handlers are generally employed which are then ducted to the various zones. Interior zones, which tend to be somewhat uniform in their cooling demands (and require little or no heat), are generally serviced by single duct VAV terminals. Perimeter zones whose cooling and heating loads vary significantly are often serviced by either constant or variable volume fan terminals with auxiliary reheat coils.

In very small buildings or low-rise buildings which are occupied by numerous tenants (such as shopping malls), small package air conditioning equipment may be employed. Many times this equipment requires that constant airflow delivery be maintained. In this case, low pressure bypass terminals are often employed.

### Environmental Factors

Key to the selection of a system is the environment in which it is installed. The environment consists not only of the physical environment but also the operational and legal environment. Certain legislated requirements, such as ventilation requirements and local building codes may affect the system selection. For example, reheat coils may be required for use (with single duct VAV terminals) in interior zones when significant ventilation rates must be maintained, as the minimum air flow into the space must be reheated to prevent overcooling during periods of minimum demand. Local building codes may discourage the use of certain types of terminals (such as fan powered) when they prescribe major protective treatment be employed for compliance.

System selection is directly influenced by the physical environment. The variation in cooling and heating loads of the zone served by a terminal largely determines its type. Fan powered terminals are ideal for zones (such as outside offices) where loads vary greatly, either by season, solar load, or occupancy. Single duct terminals (or constant volume fan terminals) are generally employed where significant variations in load are not expected.

### Cost Factors

Finally, a clear analysis of expected costs should be prepared prior to system selection. These costs should include installed costs, operation costs, and maintenance costs. The relative importance of these costs may affect the system selection itself. For example, installation and maintenance costs could be more important to a developer/owner (where tenants are billed for utilities) while operational costs might drive equipment selection for an owner occupied structure. Variable volume terminals (single duct or fan powered) with electric heat might offer lower installed costs, while these terminals with hot water reheat might offer lower operational costs. This might be reversed in areas where electricity costs are lower in relation to gas or fuel oil costs (for running boilers for hot water generation).

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Facility Type

Terminal Type	Office Space, Educational Facilities				Hospitals, Clean Rooms, Laboratories			Noise Sensitive Applications			Other Facilities		
	Large Building		Small Building		Patient* Areas	Operating* Areas	Laboratory* Spaces	Broadcast Studios	Theatres	Libraries	Public Use	Shopping Centers	Hotels, Multi-Residential
	Interior Zone	Exterior Zone	Interior Zone	Exterior Zone									
Single Duct													
VAV without Reheat	○	●	○	●	○	●	○	○	○	○	○	○	○
VAV with Reheat	○	○	○	○	○	○	○	○	○	○	○	○	○
Dual Duct													
VAV (No mixing)	●	○	●	○	○	○	○	○	○	○	○	○	○
VAV (With mixing)	○	○	○	○	○	○	○	○	○	○	○	○	○
Constant Volume	○	○	○	○	○	○	○	○	○	○	○	○	○
Fan Powered													
VAV with Reheat	○	○	○	○	○	○	○	○	○	○	○	○	○
Constant Volume w/ Reheat	○	○	○	○	○	○	○	○	○	○	○	○	○
Low Temperature	○	○	○	○	○	○	○	○	○	○	○	○	○
By-Pass	○	○	○	○	○	○	○	○	○	○	○	○	○

\* Sealed lining is recommended to minimize introduction of airborne fibers into occupied space.

### Legend

- Often used for this application.
- ◐ Sometimes used for this application (restrictions may apply).
- Not Recommended for this application.