

Return Duct System Design Requirements

Introduction

The Unico System return duct system is a conventional duct system, only smaller because the system uses less air. It is not a high velocity duct system. Every system must have at least one return air register. Typically, this return register is mounted in the ceiling of a central hall near the unit when the unit is mounted in the attic. Sometimes, however, multiple return openings are required, or the single return needs to be in a different location.

This Tech Note describes the requirements for designing the return system when a single ceiling mounted return is inadequate. To determine the duct size use the ACCA *Manual D* or the ASHRAE *Handbook — Fundamentals* and the requirements specified in this note.

Requirements

Unico has only two requirements:

1. Design the return duct system pressure drop for 0.15 inches of water (37 Pa), including filters.
2. Provide some means of acoustical dampening.

Table 1. Minimum Duct Size

Model	Part No.	Diameter	Length
1218	UPC-04-1218	12 in. (305 mm)	10 ft. (3 m)
2430	UPC-04-2430	14 in. (356 mm)	
3642	UPC-04-3642	18 in. (457 mm)	
4860	UPC-04-4860	20 in. (508 mm)	

Table 2. Minimum Filter Size

Model	Filter Size	Filter Type
1218	14 x 20 in. (356 x 508 mm)	Disposable
2436	14 x 25 in. (356 x 635 mm)	
3642	14 x 30 in. (356 x 762 mm)	
4860	24 x 30 in. (610 x 762 mm)	

IMPORTANT

The duct pressure drop and the filter pressure drop added together must be less than 0.15 inches of water.

For most systems, the filter pressure drop is approximately 0.10 inches of water (25 Pa) and the duct pressure drop is 0.05 inches of water (13 Pa).

Duct Size

As for any duct, the size is dependent on duct length, air flow, and allowable static pressure drop. For most systems, the minimum duct size (see Table 1) is sufficient for up to 25 feet (8 m) with no more than three 90° bends. All Unico Return Ducts are 10-ft (3 m) long so if you need a longer duct, add either another section of the Unico Return Duct or a length of plastic core flex duct between the unit and the Unico Return Duct.

If you cannot use the Unico Return Duct, either use an acoustically lined sheet metal duct or fiberglass duct board. It can be any shape so long as it has the same equivalent area of the standard duct. If you are using a rectangular duct, the duct should have the same area.

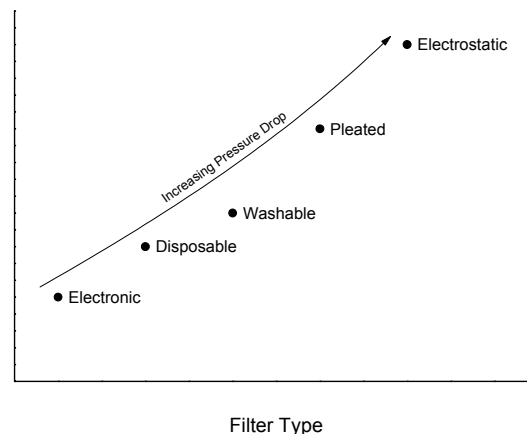


Fig. 1. Typical Filter Pressure Drop

Filter Size

The filter size is dependent on the type of filter and the amount of airflow. Typically, a disposable filter has the lowest pressure drop and an electrostatic filter has the greatest pressure drop (see Fig. 1). In some cases, it will be necessary to oversize the filter if it has a high pressure drop. Consult the filter manufacturer for the actual pressure drop at the required airflow. See *Tech Note No. 118* for various air cleaning devices for the *Unico System*.

Sound Attenuation

Although the Unico air handler is quiet, noise from the blower can travel through the return duct and out the return register, especially when the return duct is short. To reduce the noise transmission, always use an acoustical type of return duct with the return register positioned to eliminate any direct "line-of-sight" from the unit.

The standard Unico Return Duct (see Table 1) has a soft porous lining that reduces the noise in the duct. As an alternate, construct the return duct out of fiberglass ductboard or a sheet metal with fiberglass duct lining. To prevent any direct line-of-sight add at least one 90-degree bend in the return.

Outside Air

The *Unico System* can accommodate up to 100 percent outside air provided the air is filtered and all water coils are freeze protected if necessary. It is left to the installer to build a transition plenum to connect to the outside duct. See *Tech Note No. 105*.

Humidifiers

In most applications, a power cold-air humidifier may be installed in the return duct system. Other types of humidifiers should not be used, especially the bypass type or atomizing type. The installer will need to build a return plenum to mount the humidifier. *Unico recommends consulting with the humidifier manufacturer on its intended usage prior to selecting the humidifier model and capacity.* Do not install a humidifier where freezing can occur unless the humidifier is designed for this purpose. See *Tech Note No. 109*.

General Duct Design Practices

In addition to the Unico System specific rules in the previous paragraphs, the duct system should always follow basic engineering practices. The following guidelines should be followed whenever possible.

1. Multiple returns should be used when conditioning two or more spaces that do not communicate with each other. This is particularly important when heating and cooling separate floors with doors separating them.

2. Avoid creating a negative pressure zone near gas-fired equipment. As an example, do not put a return near a boiler or gas water heater. If the equipment is installed in a basement with a closed door, be sure to install a return for the first floor.
3. It is best to position the return high, near the ceiling, for cooling systems, and low, near the floor for heating systems. When heating and cooling, use two returns, one high and one low. If you can only use one, position it for the most important season. For example if cooling is more important than heating, position the return high. Recognize that one return is not as effective as two for heating and cooling systems
4. An open stairwell behaves like a chimney. Hot air will rise between floors so the heating load for the first floor will be higher than expected from a typical load calculation. Likewise, in cooling the upper floors will have a higher cooling load due to the chimney effect. In some cases, you may want to provide dampers on the returns to pull the air from the best location.