

Concentric Diffusers Types and Benefits by



Concentric Diffusers were originally developed to provide a simple single point air conditioning system. The term “concentric” means to have one thing surrounded by another (as in concentric circles). In a concentric air conditioning application, the return intake is surrounded by the supply air discharge of the unit. Through the years, this type system has gone through several innovations. Types of concentric systems, their benefits and problems, will be discussed. The basic concentric systems are as follows:

1. Duct-in-a-Duct design with separate diffuser (transition at unit).
2. Concentric Diffuser/Plenum (with transition) for flexible duct.
3. Concentric Diffuser/Plenum (with transition) for hard duct.

Duct-in-a-Duct System

The duct-in-a-duct system contains a return transition and return air duct surrounded by the supply duct. The return transition is attached to the a/c unit. This system is the original design for concentric applications. It has inherent problems because it has a negative pressure system enclosed in a positive pressure duct. **The installer is required to seal the ductwork** as he installs it to prevent recirculation back into the unit. Both the supply and return ductwork must be field cut to the proper length to match the diffuser size at the ceiling level. This is very difficult process, and if not done properly, the air recirculates from the supply to the return before entering the building. Another problem with this system is that it must be located directly under the air conditioning unit. It cannot be offset to meet ceiling grid patterns.

The benefit of this system is that it allows the supply air to spread to all sides of the diffuser for better airflow patterns. **It also appears to be less expensive, but it really has a much higher installed cost.**

Concentric Diffuser/Plenum for Flexible Duct

The concentric/plenum system that is designed for flexible duct is similar to the duct-in-a-duct system in that it provides a single point for the air distribution. It differs because the return transition is placed inside a supply plenum at the ceiling level. This allows the diffuser to be attached to the transition and supply plenum in a controlled factory setting where the entire system can be sealed to prevent air leaks. RRS provides a molded fiberglass transition on 5 ton and smaller systems for better performance. The ductwork from the unit to the diffuser/plenum is flexible duct, which allows the diffuser to be adjusted for different ceiling types.

This system is the preferred system for units up to 7 tons because 20 inch round duct can be utilized. On systems 10 tons and larger, multiple ducts (2 supply, 2 return) must be used. This requires the plenum box to be larger and more expensive than necessary to accommodate the multiple ducts. **Twenty (20) ton and larger units should not be used with this system.**

The negative to this system is on larger diffusers. It is very difficult to have even airflow on all sides of the 48 inch square diffuser. The diffuser side parallel to the return transition is starved for enough air. This correlates into a lower discharge velocities that lead to recirculation. **RRS (and only RRS) eliminates this problem** by building a supply air duct through the center of the return transition to provide air to the backside of the return transition. This provides lower static for the overall system, thereby saving larger blower motors. We have never understood why our competitors have not copied this feature.

Concentric Diffuser/Plenum for Hard Duct

This concentric system is basically the same as the system for flexible duct, with the exception that 10 ton units and larger have rectangular sheet metal duct. This allows the plenum design to be smaller to save cost and make them more competitive. **This system can be used with units as large as 30 tons.** Many buildings are now designed with exposed ductwork, and this system provides an aesthetic appearance. Also many designers will not approve the use of flexible ductwork.

RRS does provide our exclusive supply air duct through the return air transition on the larger concentric diffusers to provide low static and even 4-way airflow.

Conclusion

Please compare the RRS systems for airflow and static pressure against all competitors! Ours operate correctly, quietly, without recirculation, and the lowest pressure drop in the industry.