



Johnson Air Rotation® Systems

Cooling With Air Rotation®

When Johnson Air Rotation® Systems designed an air conditioning unit we found the same air mixing principles held true, that is, the delivery of cooled air, high into the conditioned space, with a low ΔT provides the same even temperature distribution, low stratification numbers and lowered energy consumption. There are an ideal number of air turns for a “heat only” or “cooling only” space and another number of air turns for a combination heating and cooling application, and the number of air turns is determined by our experienced application engineers, based on the activities in the space to be conditioned. The Johnson Air Rotation® System cooling unit retains a quiet and efficient axial, propeller fan, albeit of special design, to handle the higher static pressure over filters and cooling coils. Due to the density of the colder air, we de-rate the throw, up to 300 ft. for air conditioning. Nonetheless, the fan horsepower per ton in the ductless, Air Rotation® System is significantly lower than any ducted or packaged system, frequently on the order of one fourth or less of the air-moving horsepower of other systems.

The Air Rotation® unit is most often located within the conditioned space; therefore, no additional factor need be added for return air duct infiltration from the roof. In the real world, the return air duct to the fan section of the case will not be perfectly sealed, hence additional heat gain must be added to the load calculation. Usually this is a factor built in to the manufacturers selection program. Most of the units are a constant volume air handler with either DX or CW cooling coils. All of the air in the conditioned space is passed over the cooling coil(s) several times per hour, resulting in humidity control anywhere in the space to within a few percentage points. Condensate is removed at the coil(s) and delivered to a drain pan system. The Air Rotation® unit has a full length and width, insulated, stainless steel drain pan in the bottom of the coil module. The drain pan is pitched from each side toward the center where a deep trough is pitched to one end of the unit delivering condensate to a threaded MPT outlet. If a double-stacked coil is used, then second-level condensate pan will have a down-spout system to deliver the condensate to the lowermost drain pan. This prevents splashing and water being absorbed back into the air stream.

Johnson does not recommend a blow-through A-frame coil installed high in the Air Rotation® unit for the following reasons:

- The blow through design requires additional horsepower (added operating cost) and is noisy.
- The air takes the least path of resistance and its path across the coil is not uniform.
- The loading on the compressor(s) is erratic due to non-uniform use of the coil.
- If the unit is equipped with a heat exchanger, the heat exchanger barrel causes the air to be directed to the outside and away from direct entry over the coil.

- A by-pass damper at the apex of the coil is difficult to modulate and further aggravates effective cooling, as it is the least path of resistance and more air will go through it than across the coil.
- The condensate catch pans are split and located at the bottom sides of the coil making them less effective at condensate collection and removal.
- The coil and condensate catch pans are difficult to access and their location makes it nearly impossible to properly service and clean. Dirty drain pans are a common source of Legionaire's Disease and other "sick building syndrome" problems.
- Changing filters and preventive maintenance are often neglected and abused, as the filters are difficult to change and located out-of-sight.
- The A-coil design limits the unit tonnage. Our "draw-through" design enables us to provide the necessary space tonnage in fewer units, frequently half the number of units of other system designs.
- The unit is top-heavy and may require seismic or structural support.

Our preferred design is the "draw-through" unit, primarily for the even airflow across the coils and the ability to handle condensate removal at floor level. Additionally, all of the cooling coils, filters, etc. being at floor level are easily serviced, and the units are more easily maintained. A lockable access door provides easy entry to the Johnson Air Rotation[®] unit for maintenance and inspection. A galvanized walkway down the center and over the drain pan permits maintenance persons to service the fan system. "If it is easy to get to, it will probably be serviced". The easy- to-service philosophy assists the owner in properly maintaining the equipment and assures the original operating savings projections for the life span of the equipment.