Effects of Duct and Discharge Orientation

System effect is a catch-all term used to describe deviation of an installed fan from its specified or nameplate performance. The exact cause of system effect is often complicated, with contributing factors ranging from duct run layout to improper running speeds. The dangers of unaccounted-for system effect include premature (sometimes catastrophic) equipment failure, increased power consumption, and poor performance.

One major form of system effect is a fan's interaction with ductwork. Duct-fan system effect in the HVAC industry is associated with a negative impact on a fan's performance, though some fans rely on the presence of duct in order to function properly. Negative fan interactions with ductwork often occur when site static pressure differs from design static, or when duct runs are poorly configured.

Figure 1: Good duct install

To prevent system effect it should be ensured that building parameters are accurate for a given job. Furthermore, as a project evolves, additions and changes should be carefully tracked and accounted for. Duct runs should be designed to minimize the disruption of airflow, especially in near vicinity to fans/blowers.

One example of a poor duct design would be an elbow placed just prior to a fan inlet. This disturbs the entering air, distributing it unevenly across the fan and preventing maximum performance. To prevent this, Rupp recommends a straight duct run with length equal to three times the blower diameter to be placed at the fan outlet or prior to a fan inlet.

Figure 2: Poor duct install

While prevention is the easiest and cheapest solution to system effect, mitigation is sometimes the only option available. In these cases a good knowledge of the available fan options for each model is often useful. Unit orientation, discharge orientation, and inlet/outlet position can all help to reduce the effects of sub-optimal ducting and space constraints.