ENGINEERING BULLETIN

SUBJECT: **SMUDGING**
PRODUCT: DIFFUSERS

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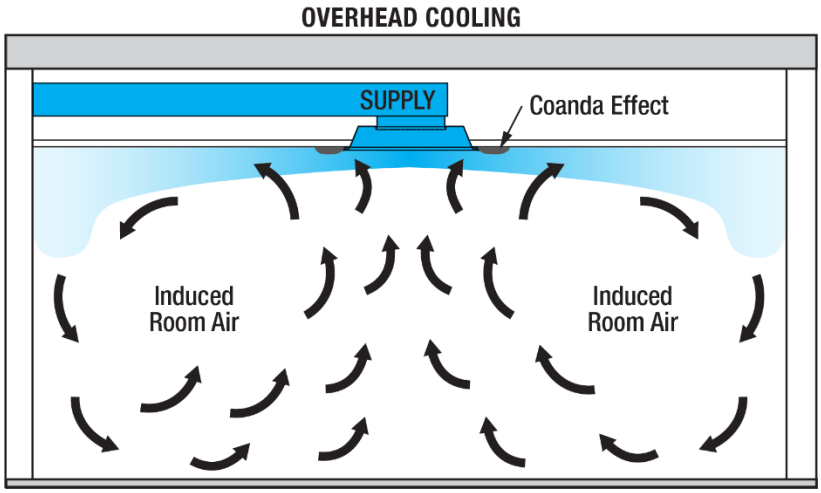
Dirt on the face of diffusers or the immediately surrounding ceiling is called smudging. It usually happens on ceiling diffusers that discharge air parallel to the ceiling. Many times, occupants think that this smudging implies dirty coils or ducts. Normally, that is not the case.



When air jets leave the diffuser face, they connect themselves to the ceiling. This is called Coanda Effect. **The ASHRAE HANDBOOK HVAC SYSTEMS AND EQUIPMENT 2016 chapter 20, page 2 describes Coanda effect as,**

"An airstream moving adjacent to or in contact with a wall or ceiling creates a low-pressure area immediately adjacent to that surface, causing the air to remain in contact with the surface substantially throughout the length of throw. This Coanda effect, also referred to as the surface or ceiling effect, counteracts the drop of a horizontally projected cool airstream."

The Handbook further states,

"Supply airflow from an outlet entrains room air into the jet. This entrained air increases the total air in the jet stream."

So, as the jet crosses the ceiling it is constantly entraining more room air into the jet. The air velocity creates the low-pressure area. The higher the velocity, the lower the pressure. The highest velocity is closest to the diffuser discharge area. For perforated diffusers it is across the entire face of the diffuser.

The Handbook also states,

"Smudging is the deposition of particles on the air outlet or a surface near the outlet. Particles are entrained into the primary discharge jet and impinged onto the device or ceiling surface in areas of lower pressure. Smudging tends to be heavier in high-traffic areas near building entrances, where particulates are brought into a space."

Actual research was done on smudging. Owens Corning tested a two-slot linear diffuser in a large box using National Bureau of Standards standard dirt (from ASTM 52.1) in 1975, and they found that the dirt impingement on the diffuser and adjacent ceiling tiles was not from the supply duct but rather from room dirt entrained by the low-pressure high velocity jet. So, if your air conditioning system is well-maintained and your filters are cleaned or changed regularly, there will be very little smudging, if any, related to your air conditioning equipment. Smudging can normally be reduced by cleaning your carpets and floors and reducing dirt carried into the building.

The dirt on the diffusers can usually be easily wiped off with a damp cloth or disinfecting wipe. Be sure to dry the diffuser after cleaning to reduce the possibility of more dirt impinging on the surface of the diffuser.