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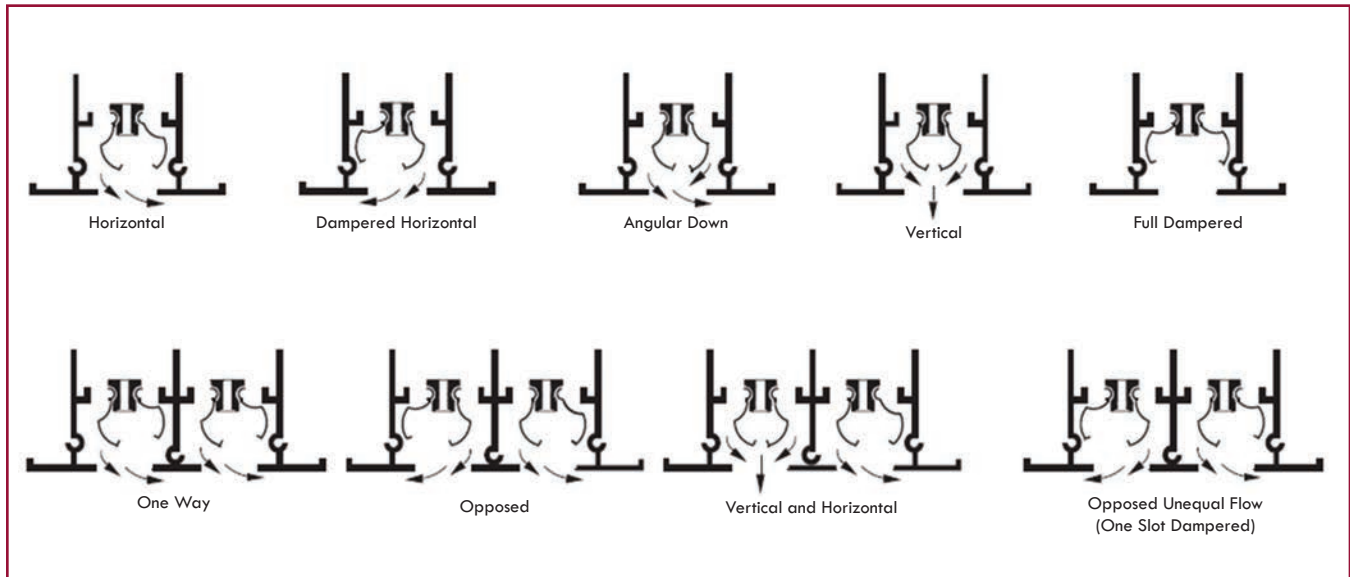


Figure 1: Adjustments available for the popular “ice tong” type slot diffuser.

## Slots are Adjustable

By Dan Int-Hout, Fellow ASHRAE

I have been doing a series of talks and webinars on the subject of the “basics of air distribution.” Several of these talks have been with air balancers, and what I have discovered is that some younger engineers and air balancers aren’t aware that linear slots are adjustable. They assumed diffusers were placed at the window and designed to blow down.

No wonder so many perimeter environments are uncomfortable and drafty. This is also true for most restaurants where I have eaten, hotel ballrooms and conference rooms that had slots, as well as most engineer offices that had slots. Come to think of it, almost every location I have been in that had linear slots were uncomfortable.

Here’s the deal. Almost all linear slot diffusers are adjustable from horizontal to vertical. There are a few with fixed deflection. (Often, of course, these are located where they should have been

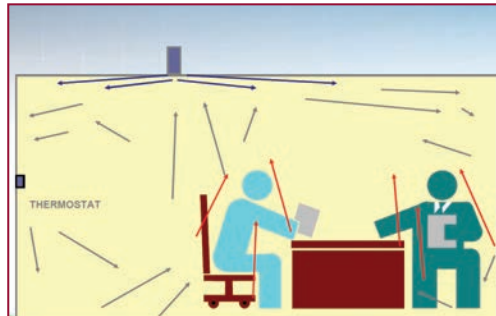
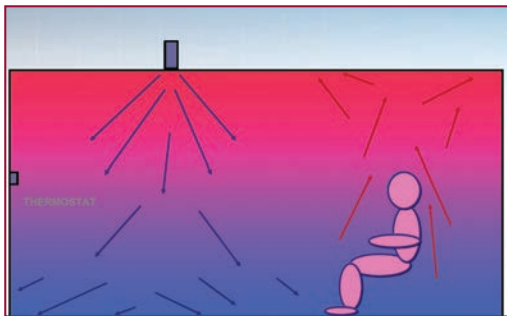
adjustable.) The deflectors in most slots can be switched from deflecting left to deflecting right (and of course, down). When shipped, the factory does not know how they should be adjusted, and often there is a wide degree of variance in the factory settings, which are also subject to shipping issues, installer manipulation, and general handling issues.

In practice, almost all slots should be adjusted to blow air horizontally along the ceiling. In a perimeter, the ideal location (according to research published by several manufacturers back in the late

1970s when we were actually researching this issue) is a couple feet away from the window, set to discharge some air toward the window, and some into the room. This results in a good compromise between heating and cooling performance, and has a chance of complying with the requirement in ASHRAE Standard 62.1 that states that the 150 fpm (0.76 m/s) throw makes it to within 4.5 ft (1.4 m) from the floor when heating. (Failure to comply with this requirement requires a 25% increase in ventilation air to compensate for the inevitable short circuiting that will result.)

There is also a requirement that the discharge air not be more than 15°F (8.3°C) above room temperature, or the same penalty applies. The data (and the *ASHRAE Handbook*) also explain that delivering air more than 15°F (8.3°C) above room temperature will likely exceed ASHRAE Standard 55’s maximum room vertical stratification limits, and void compliance with that standard.

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**Figure 2 (left):** Poorly adjusted/selected diffuser. **Figure 3 (right):** Properly adjusted/selected diffuser.

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Failure to adjust slots in interior spaces results in cold air being directed down on occupants. This is always unacceptable. I can't begin to number the times I have suffered in an ASHRAE technical meeting in a fancy hotel where there was a slot overhead blowing cold air directly on me. I have learned to wear a sport jacket in all ASHRAE meetings. I am tempted to take gloves and a scarf.

Adjusting a linear slot requires that the design engineer state clearly in the design documents that the slots must be adjusted, per instructions, prior to balancing. When adjusted from vertical to horizontal, the pressure drop almost always increases significantly, and must be accounted for in the system balance.

While some may argue that a balancer won't do this even if required to, it is assured that if the engineer does not state this requirement, it won't happen. In reality, the adjustment should probably be done by the installing contractor. I found one contractor who always adds 10 minutes per linear to his estimates to allow for adjustment of the slots. Sadly, he is in the minority. Failure to adjust linear slots will almost always result in stratification in the space, poor thermostat response (because the space is no longer well mixed) and likely occupant dissatisfaction.

The ball is in the court of the design engineer who must specify the proper adjustment and has responsibility for that adjustment.

*Dan Int-Hout is a chief engineer at Krueger in Richardson, Texas. He is a member of SSPC 55, SPC 129 and consultant to SSPC 62.1. ■*