

## High Turndown VAV Laboratory System

(A-5)

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### Design Goal:

To maintain laboratory safety with a VAV design and a constant stack velocity under all conditions.

### Project

A major pharmaceutical manufacturer required a renovation to a medical chemistry laboratory. The project included a series of VAV hoods and a few small offices all located in very small spaces. The VAV hood turn-down ratios drove the selection of the air flow control components.

### Solution

One of the challenges was to maintain low room velocities not only for operator comfort but also for the positive control of hood capture velocities. The other challenge was to maintain constant stack velocities under all flow conditions. The engineer selected a combination of solutions, VFD drives to match the supply system requirements and two bypass duct systems to keep the performance stable under all flow conditions. The dampers in the bypass system were specified to accurately control duct velocities from 1510 ft/min to 185 ft/min, a turndown ratio of 8.5/1. Just as important was the WPD damper's ability to return accurately (no hysteresis) to the same set point whether from an open position or from a closed position.

### Result

The system checked out well with the commissioning agent's velocity reading at his hood within 4/5 ft/min of the duct mounted flow stations. The system was stable with the capture velocities at maximum and minimum hood positions within 6 ft/min of specified flows. Pressurization tests indicated that the laboratory spaces remained negative to corridors at maximum and minimum exhaust flows.

A sketch of this case follows:

