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# Driving Safety Through Efficient Lab Design

Enclosed Laboratory

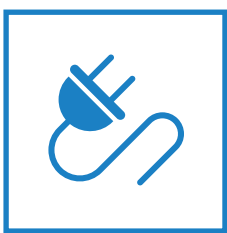


# Features & Benefits



## Increased Safety

- Flow measurements with best-in-class +/- 3% accuracy
- Closed Loop Control of fume hood face velocity, room air flows and room pressure differential
  - Sidewall sensor actually measures fume hood face velocity for user safety
  - Offset room control with adjustment based upon actual pressure measurement maintains containment



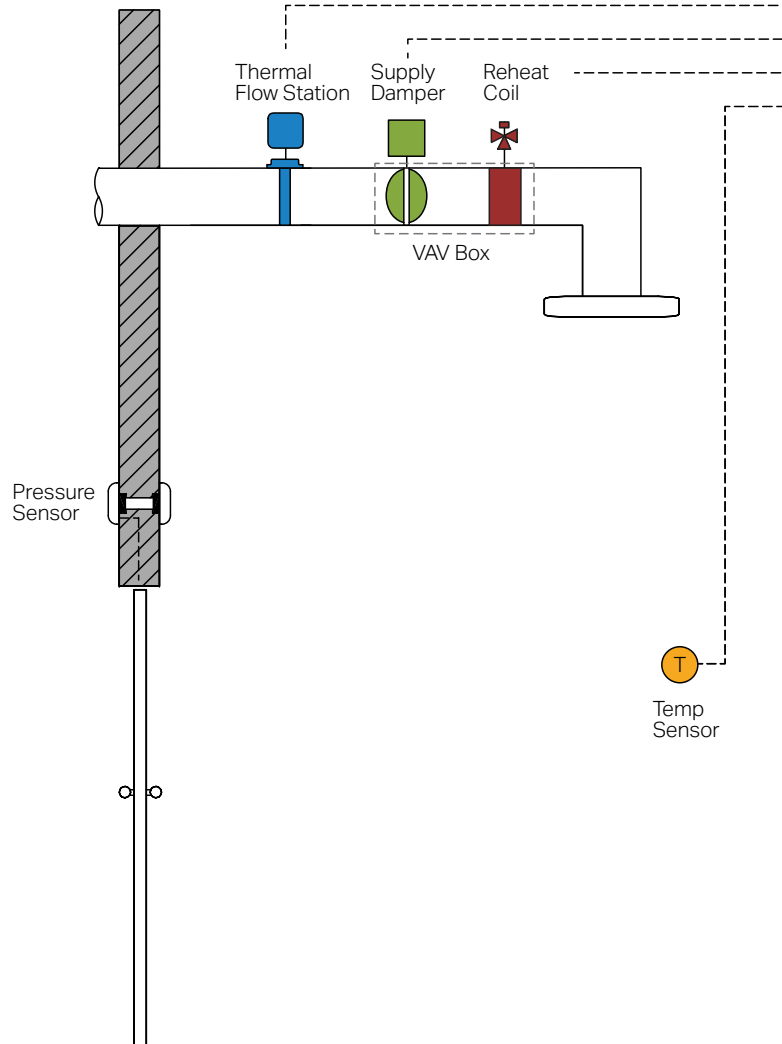
## Energy Savings

- VAV control reduces airflow
- Low-pressure drop dampers, as recommended by US EPA, reduce fan energy



## Initial Cost Savings

- Lower capital cost
- Decreased installation costs
- Reduced system pressure drop allows down-sizing of fans, air handlers and other HVAC equipment

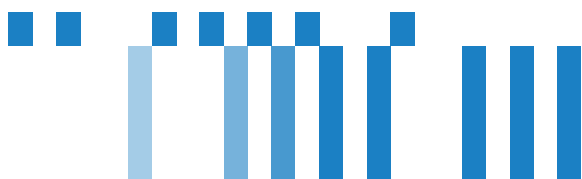


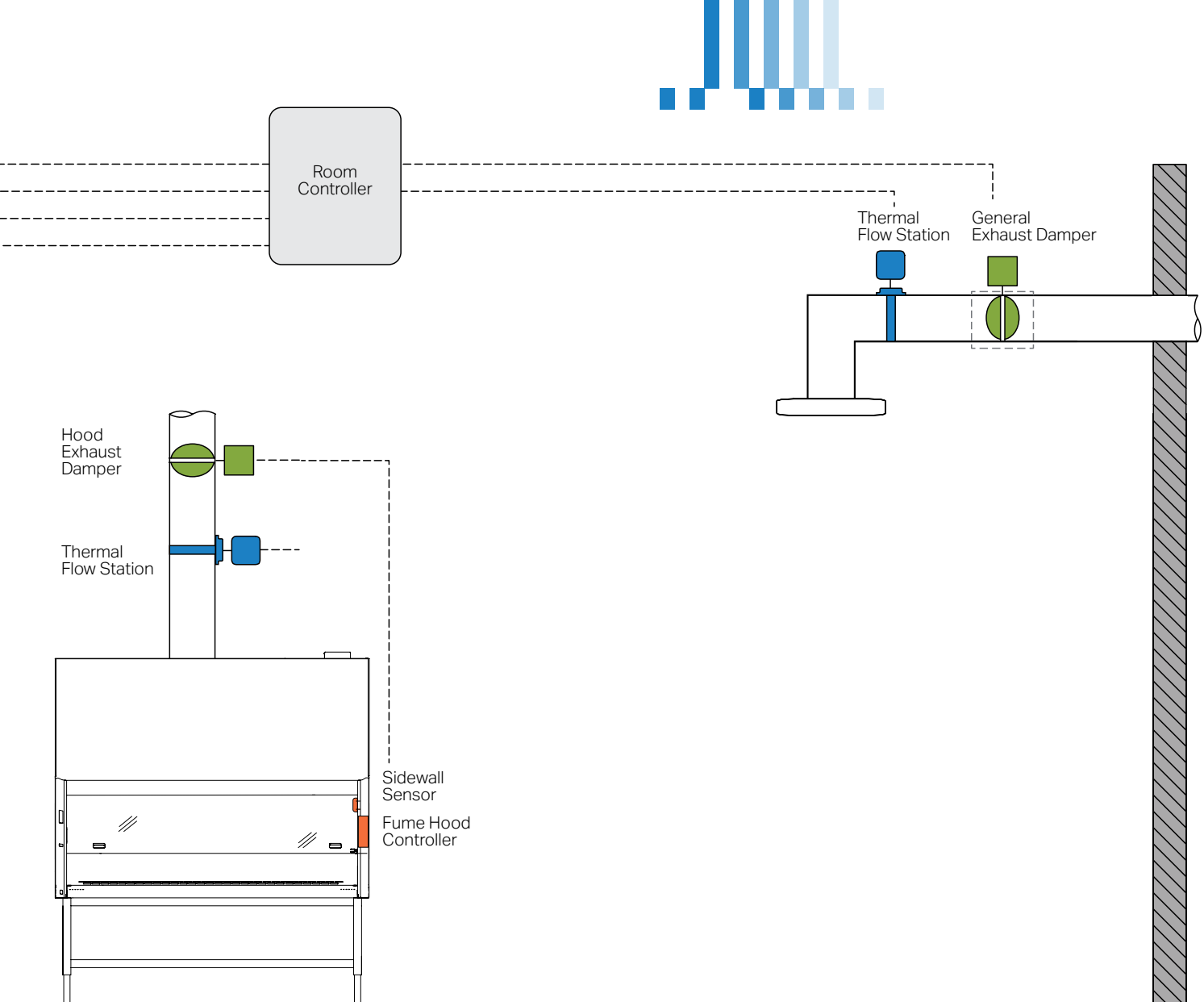
## Enclosed Labs

- Door is normally closed
- VAV reduces airflow to save energy
- Fume hoods, snorkels, and biosafety cabinets provide primary containment
- Negative room pressure differential provides secondary containment
- General exhaust required to maintain minimum ventilation (ACH)
- Space temperature maintained for occupant comfort and experiment integrity

## General Sequence of Operation

The room controller simultaneously controls room balance, ventilation and temperature in the laboratory.





## Room Balance and Room Pressure Control Sequence of Operation

The room controller continuously maintains a constant flow offset between supply and exhaust volumes. If the offset becomes too large, indicating that the room balance is too negative, the room controller closes the general exhaust and then opens the supply to its maximum setpoint. If the offset becomes too small, indicating that the room balance is not negative enough or positive, the room controller closes the supply to its minimum ventilation or cooling flow and then opens the general exhaust.

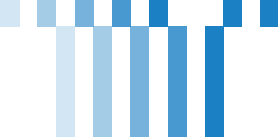
The room controller simultaneously measures the room pressure differential and resets the flow offset to maintain room pressure at setpoint. If the room pressure differential is too negative, the room controller decreases the control offset to its minimum setpoint until room pressure setpoint is reached. If the room pressure differential is not negative enough, the room controller increases the control offset to its maximum setpoint until room pressure setpoint is reached.

## Ventilation Control Sequence of Operation

The room controller maintains the supply air volume at or above its minimum setpoint.

## Temperature Control Sequence of Operation

The room controller continuously measures the room temperature. If the room temperature rises above setpoint, the room controller closes the reheat valve and then opens the supply air valve until either the room temperature reaches setpoint or the supply air volume reaches its cooling maximum setpoint. If the room temperature falls below setpoint, the room controller reduces the supply air volume to its minimum ventilation or room balance flow and then opens the reheat valve until room temperature achieves setpoint.

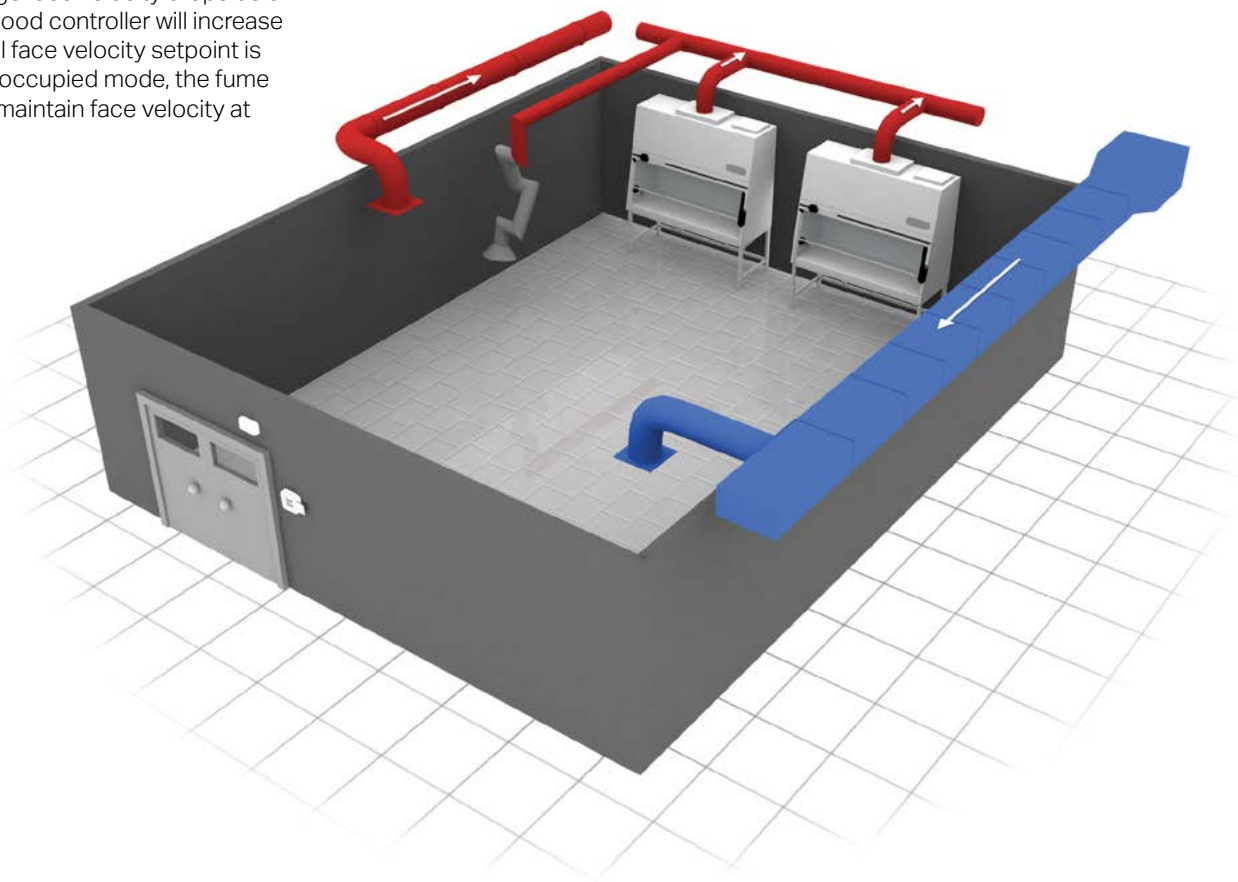


# Enclosed Laboratory

## Driving Safety Through Efficient Lab Design

### Fume Hood Controller Sequence of Operation

The fume hood controller continuously measures average fume hood face velocity using a sidewall sensor. If average face velocity rises above setpoint, the fume hood controller will reduce the exhaust volume until face velocity setpoint is achieved. If average face velocity drops below setpoint, the fume hood controller will increase exhaust volume until face velocity setpoint is achieved. During unoccupied mode, the fume hood controller will maintain face velocity at setback setpoint.



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