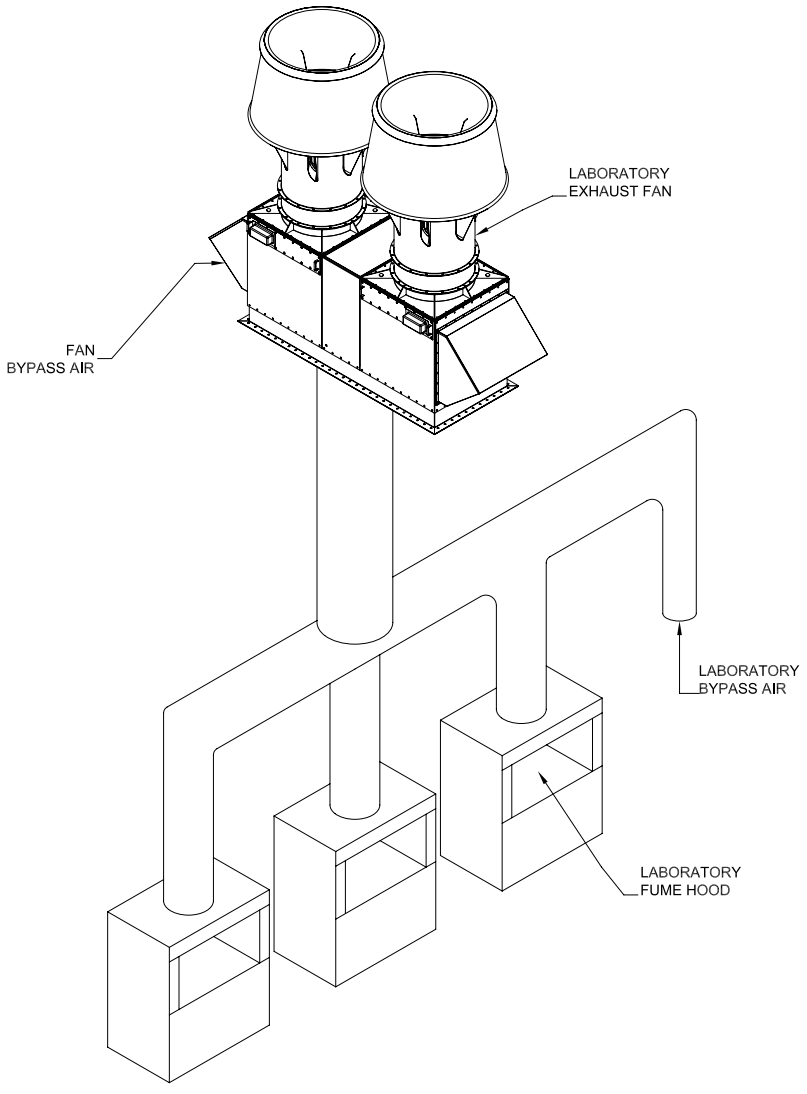
LAB EXHAUST

Information and Recommendations for the Engineer

Variable vs. Constant Flow Systems

When selecting laboratory exhaust fans one of the first questions that need to be answered is if the system is going to be variable or constant flow. This initial breakdown of the system will determine how the fan is selected and what accessories are required.

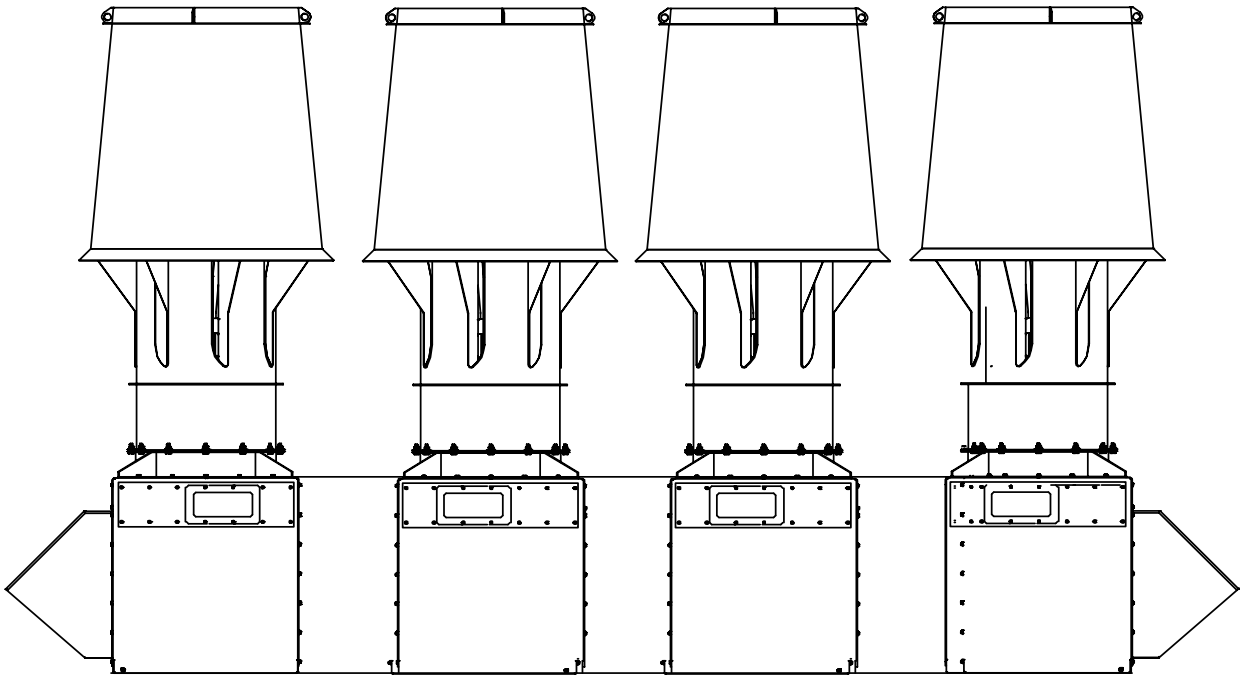
A constant flow system will have a set number of laboratory hoods that are either all running or all shut off. Situations where the fan is only turned on when it is needed and is not running 100% of the time are also commonly constant flow systems. If this is the case then the only air parameters that need to be considered are static pressure and flow. However, there can be special cases where make-up bypass air is still used to attain additional plume height.



A variable flow system is a system with more than one laboratory hood where any number can be turned on or off at any given time. In order to maintain a constant and safe plume height out of the fan exhaust system, the inlet flow of the fan system must be kept constant. A variable frequency drive (VFD) on the motor may be used to vary the fan speed to match the flow rate coming out of the building. However, if the fan speed is varied, the fan airflow will vary, creating a potential for the over-all outlet velocity and plume height of the system to be less than the specification requirements. This situation may lead to dangerous laboratory effluent being pulled into the building's make-up air (intake air).

A solution to the variable flow system is to make up the extra air not being pulled through the laboratory hoods with an additional air source to maintain the same flow going through the fan. To achieve this, the system can use extra air from within the building or pull air through a bypass damper on the mixing plenum box of the exhaust fan. General practice is to pull the air through the bypass damper that is built into the mixing plenum box since this is un-conditioned air that no energy was used to heat, cool or otherwise condition. Pulling the extra, conditioned air out of the building itself wastes energy and reduces the overall efficiency of your building. Pulling the additional bypass air from within the building may also require extra supply air to be brought into the building to account for the extra exhaust.

Using a variable volume system with a mixing plenum box and bypass damper can provide increased dilution of the fan exhaust. Having multiple fans attached to a common mixing plenum box can offer greater incremental energy control of your fan systems and offer additional energy savings.



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