

## **Pharmacy South (1038)**

The Pharmacy South building, built in 2010, is primarily served by a variable air volume (VAV) system comprised of three air handling units (AHUs): two recirculating air units (RAUs) and one outside air unit (OAU). The three units operate in parallel to supply air throughout the building zones, where airflow and temperature are adjusted by each zone's thermostat. The RAUs pull recirculated air from the four floors of the building into them, pass it through a wall of filters, add heating or cooling/dehumidification as necessary, and push it into the supply ductwork. The OAU supplies the building with fresh air to replace the air that is removed through the building's exhaust system through fume hoods and other means. It varies its airflow depending on the amount of exhaust being drawn out of the building. The OAU heats or cools/dehumidifies the outside air before it joins the supply ductwork from the RAUs. When weather conditions are favorable, the OAU also has the capability to recover energy from the exhaust air system to pre-condition the incoming fresh air. This energy recovery system uses a glycol loop that allows for thermal energy transfer without mixing the air streams.

The two Return Air Handling Units have each been sized and equipped with an outdoor air intake to provide and condition outdoor air to the building in the event the Outdoor Air Unit serving the building has to be taken out of service.

In laboratory areas, constant and variable volume terminal units maintain air flow through the fume hoods and for general exhaust from these areas. Supply air for these spaces is modulated to maintain a fixed offset between exhaust air and supply air, to maintain space temperature, and to maintain minimum air change rates. All of the air supplied to laboratories is exhausted and is not recirculated within the building. The offset between the exhaust air and supply air to each space is intended to keep each laboratory under negative pressure with respect to the corridor.

Offices, classrooms, and corridor spaces are supplied by variable volume terminal units located within the above ceiling supply ductwork downstream of the central AHUs. These zone terminal units modulate the flow of conditioned air to maintain space temperatures. The air from these spaces is recirculated to the central return air units where it passes through a filter bank before being conditioned and discharged into the air distribution ductwork where it is supplemented with ventilation air for the outside air unit before being supplied to the building.

### **VARIABLE VOLUME AIR HANDLING SYSTEM (OAU-1, RAU-1 AND RAU-2)**

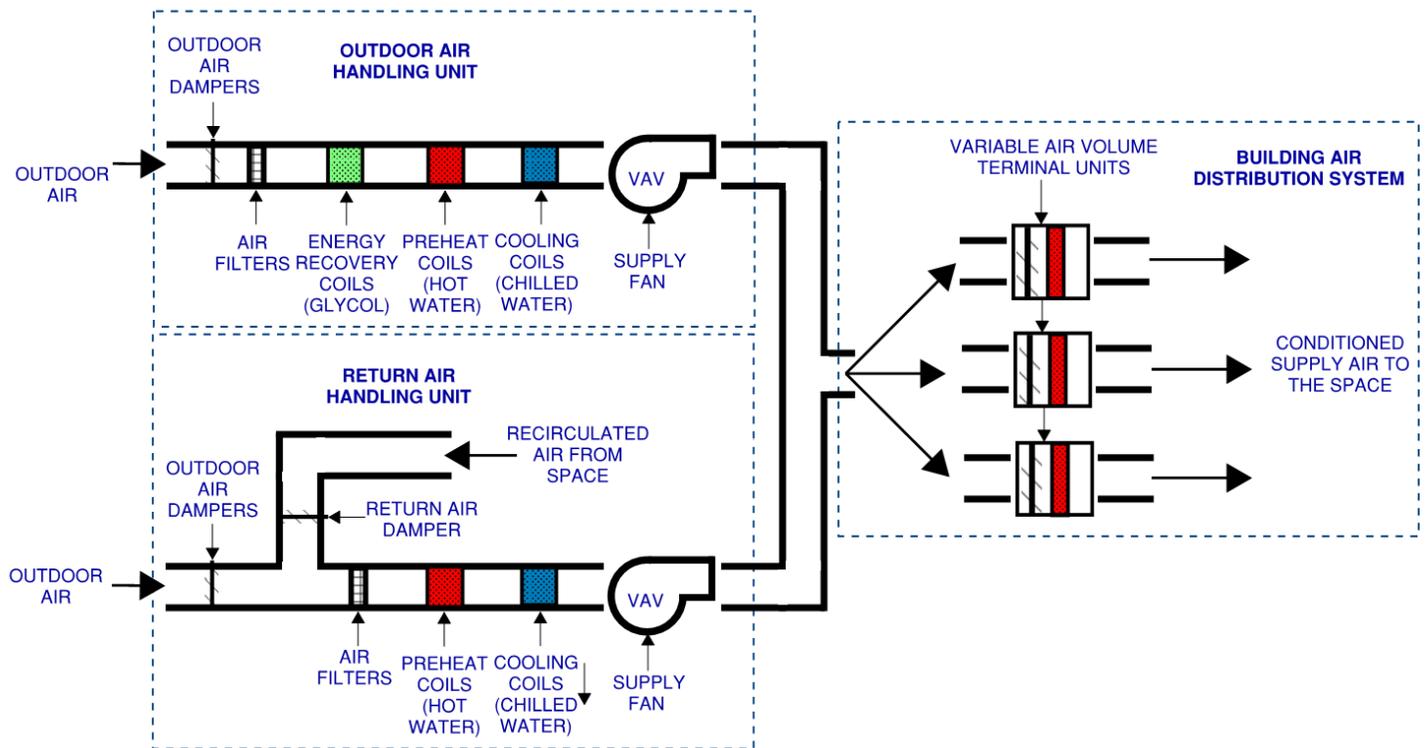
The three Air Handling Units deliver a variable volume of conditioned air consisting of a mixture of recirculated building air from non-laboratory spaces (supplied from RAU-1 and RAU-2) and fresh air from outside of the building (supplied by OAU-1). Overall, ventilation air from outside was designed to comprise 44% of the total supply air to the building. The building return air is filtered and cooled with chilled water coils in the building's two return air handling units before being discharged to a common supply ductwork system. Air from outside the building is filtered, preconditioned with a glycol energy recovery coil, heated and cooled with hot water and chilled water coils as needed to discharge cold ventilation air to the common supply ductwork system. The cold air discharged from the RAUs and OUA are combined in the supply ductwork and distributed to rooms throughout the building through above ceiling ductwork.

Variable Air Volume zone terminal units (VAVs) located downstream of the AHUs in the supply air ductwork are equipped with an air damper to regulate the volume of air delivered from the central AHU to the space

based on the current space temperatures. Many of the zone terminal units also include a fan, a hot water coil and a filter combination that will mix in air from the above ceiling plenum with the conditioned air from the central AHU when the space requires heating.

Air is recirculated back to the air handling unit from office and classroom spaces via ceiling mounted air return registers through a plenum space above the ceiling. Exhaust is provided in restrooms on each floor to remove odors and in all laboratory spaces to remove fumes and for space and building pressurization purposes.

Chilled water is supplied throughout the building from the campus chilled water system. Heating hot water, distributed throughout the building for heating, is provided by a steam-to-water heat exchanger using steam from the campus steam system.



**VARIABLE VOLUME AIR HANDLING UNIT SCHEMATIC**