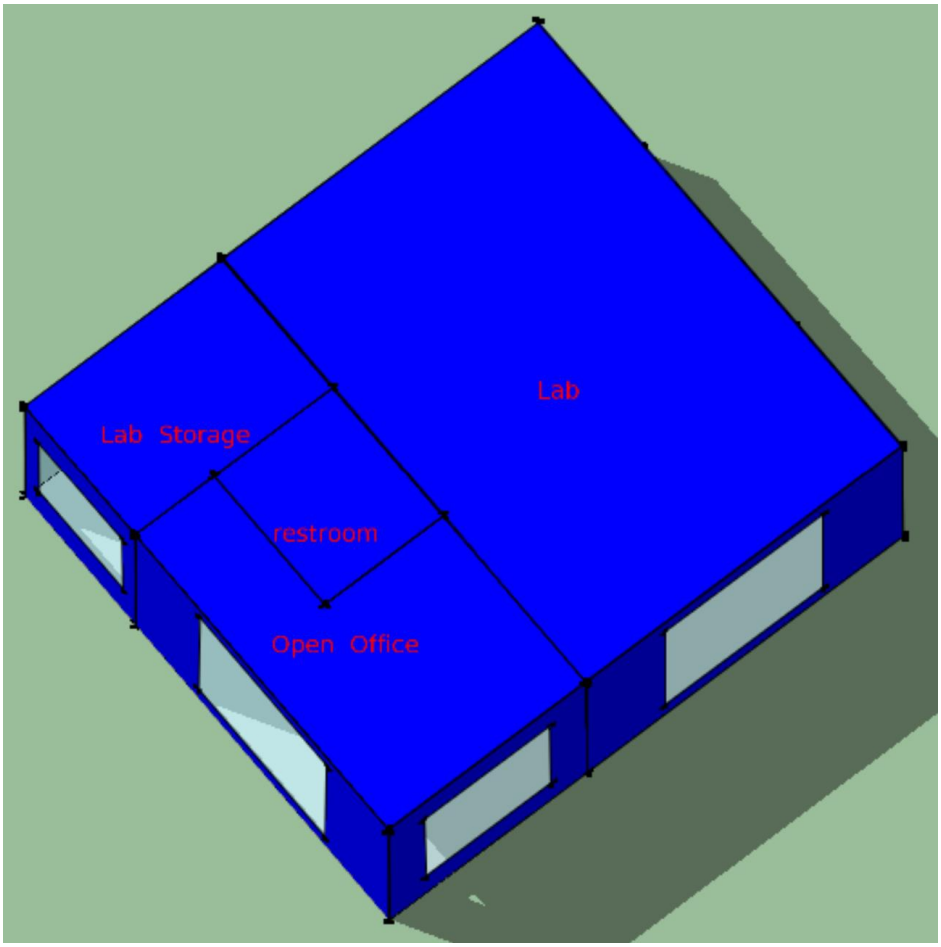
Modeling Air Transfer between rooms in IESVE

FAQ Document for Users

Air Transfer between rooms generally occurs when a room is positively pressurized (clean room, labs) or negatively pressurized (restrooms, hospital isolation room). This can be modeled in VE using transfer air.

There are three approaches to model a negatively pressurized room and one approach to model a positively pressurized room. All of these approaches are explained below. Furthermore, the attached cab file is of a 4-room building with an office, restroom (negatively pressurized), lab (positively pressurized), and lab storage (negatively pressurized).



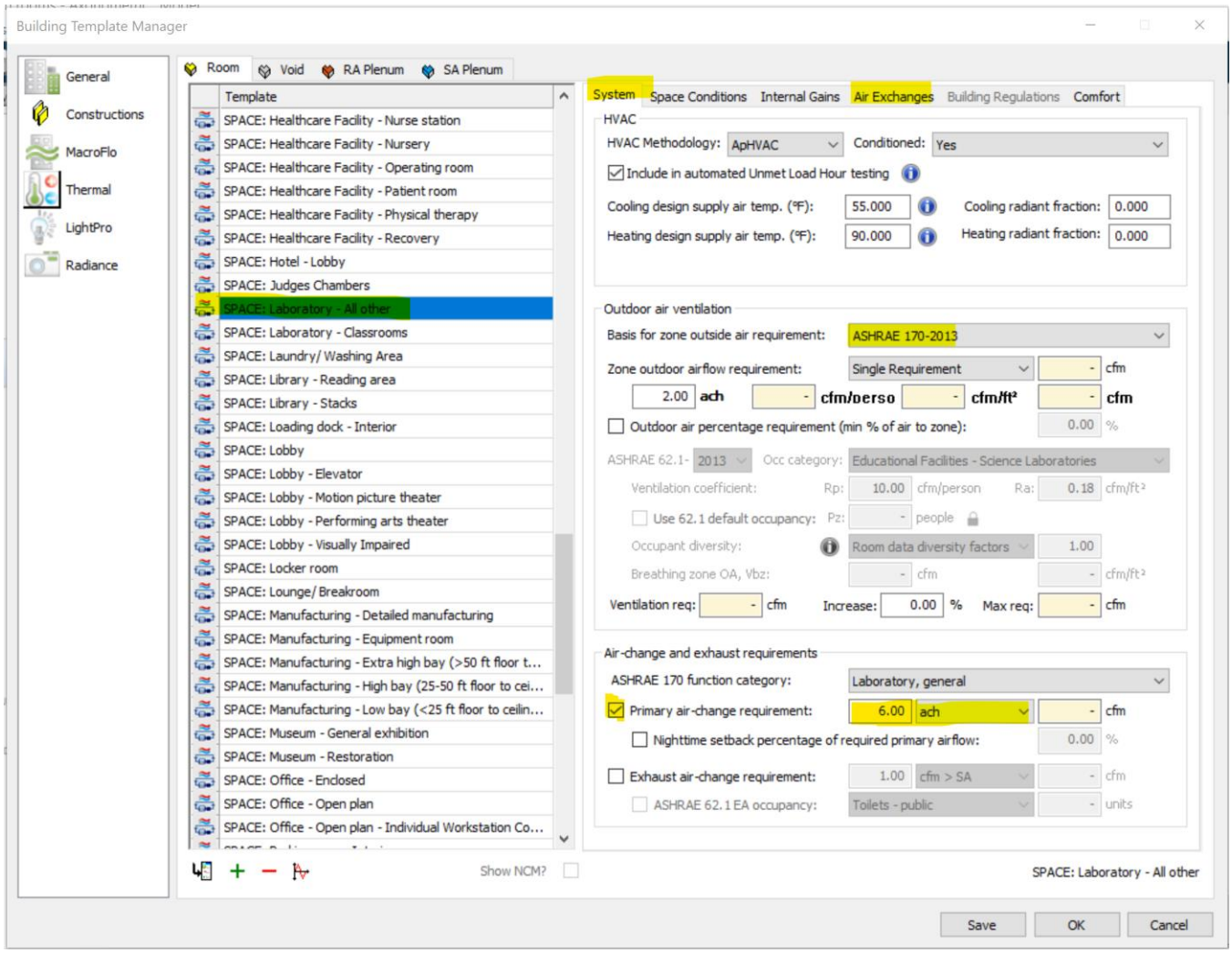
Example systems for all of the following systems are modeled:

- 1 negative pressure_Room air supply is 100 PC transfer air
- 2 negative pressure_Room air supply Primary and transfer air
- 3 negative pressure_Room air supply from one room
- 4 negative pressure_non principle multiplex

Positively Pressurized Room

A positively pressurized room will be modeled as normal, with an increased airflow into the space. Air will transfer from a positively pressurized room to the adjoining room. The following information may need to be updated at the template level:

a) If there is any air-change requirement, make sure to reflect that in the thermal template.



b) If there is any exhaust hood, then only that will be represented as an exhaust. In the attached cab file, I have kept the exhaust as zero for the Lab space.

c) Make sure that the infiltration is equal to zero, to be set in the 'Air Exchanges' tab. Since the room is positively pressurized there will be no infiltration in the room.

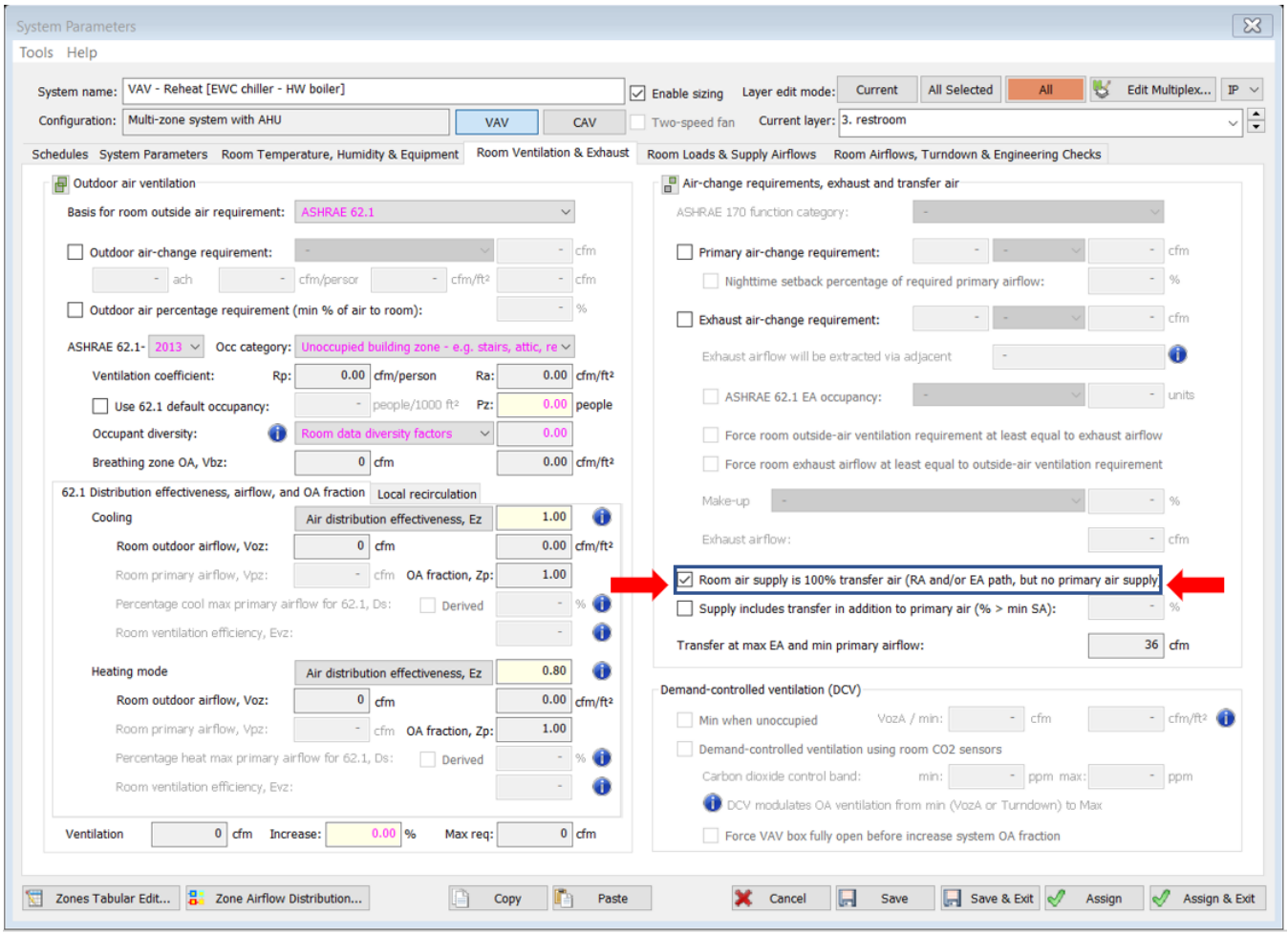
Negatively Pressurized Room

A negatively pressurized room can be represented in multiple ways.

1) Approach 1: 100% Transfer Air (many-to-1)

Approach 1 shows an example of a system where the system doesn't have any primary air entering the space and the air coming to the spaces is from the transfer air of all the adjoining spaces.

If 100% of the air entering the space is from the adjoining spaces, i.e. there is no primary air entering the space. Check the "Room air supply is 100% transfer air" tab in the System Parameter of ApacheHVAC.



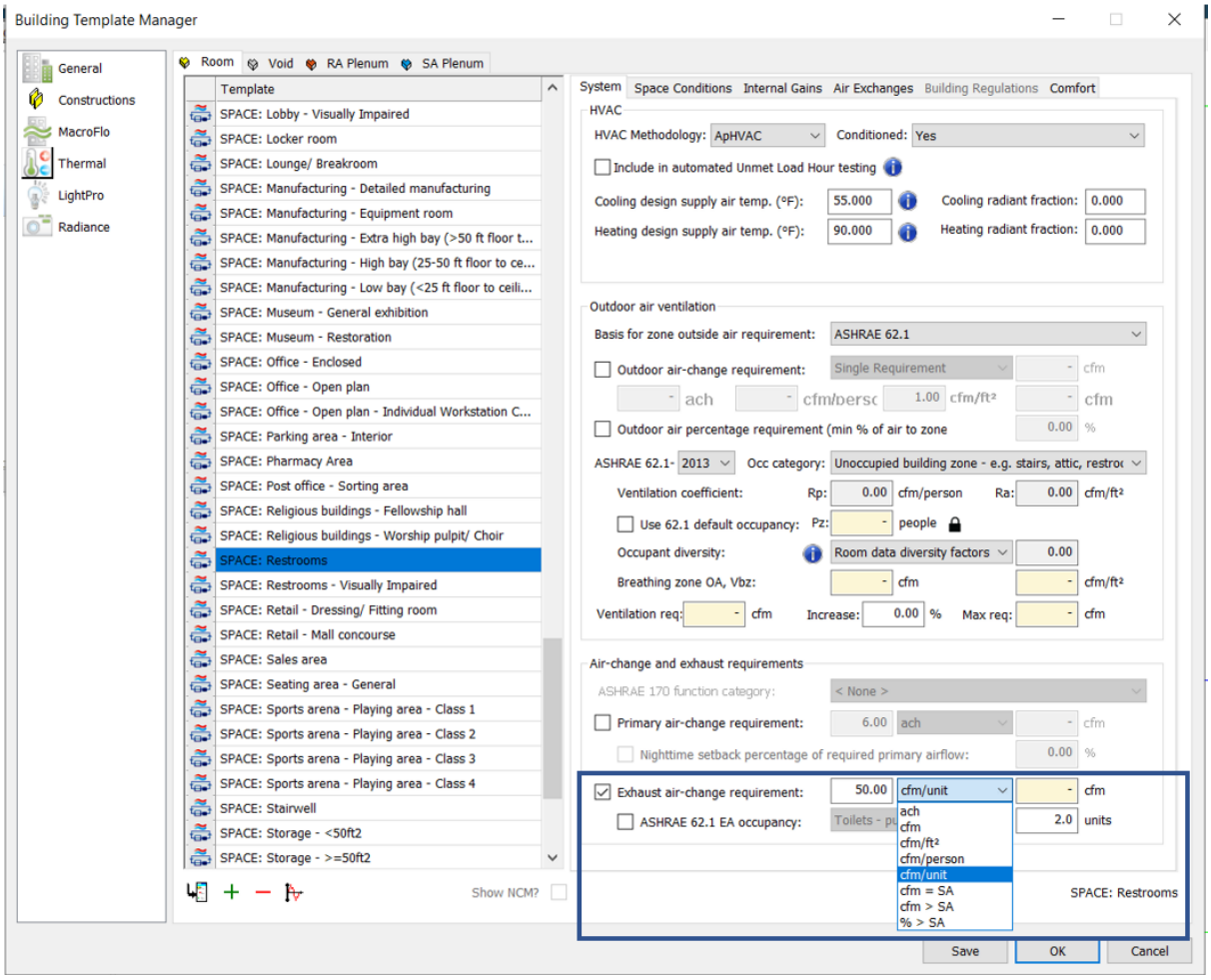
The source of the transfer air comes from a mix of the adjacent room(s) on the same HVAC system.

2) Approach 2: Mixture of Primary and Transfer Air

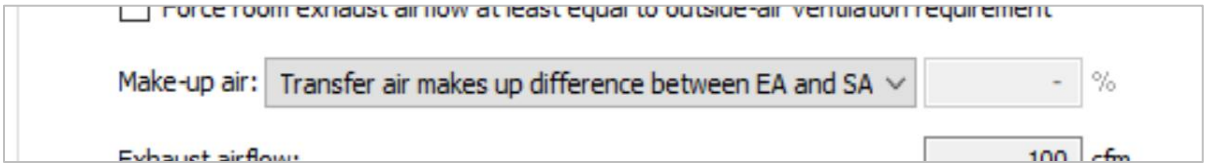
Approach 2 below uses exhaust to represent the negatively pressurized space. In this case, the air entering the space is partially primary air and partially transfer air from other room(s). In this case, the air is being exhausted from the space and the air that is being exhausted is being replaced by the Transfer air.

This can be modeled in IESVE using following steps:

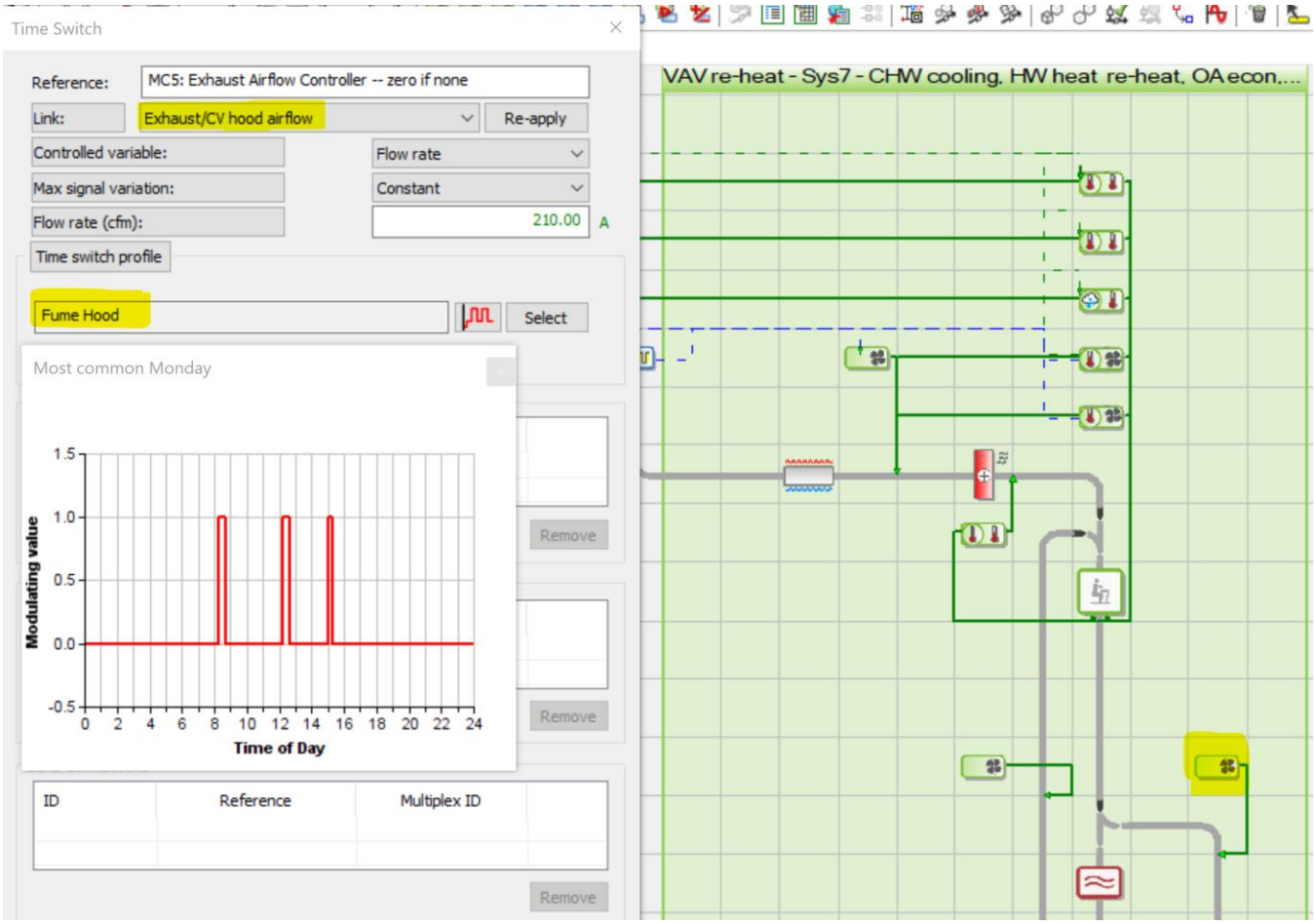
a) Defining exhaust in the thermal template.



b) Then define in the “System Parameter” of the HVAC system where the makeup air will be coming from. To make sure that the air is coming from adjoining spaces make sure to select “100% transfer air.”



Note that this system would be recommended for intermittent fume-hood exhaust systems, whereby the fume hood airflows can be defined on the exhaust air controller and the Time-Switch Profile can represent the opening/closing of the fume hood sash.

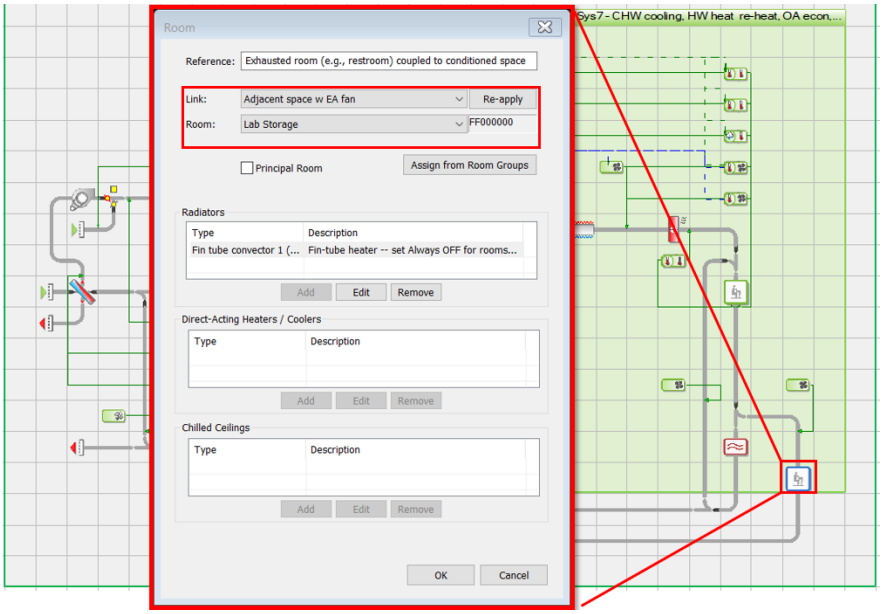


Note that a second controller can be added for say 50% of the airflow (e.g. 2-speed) on the same ductwork to provide stable exhaust during unoccupied hours.

3) Approach 3: 100% of Supply Air for a Room is coming from Another Room (1-to-1)

Approach 3 explains a situation when the air from one room (lab) is exhausted through a second room (lab storage). In other words, the exhaust of room 1 (lab) is supply air for room 2 (lab storage) in a 1-to-1 relationship. As an example, there may be a case where the lab storage room (negatively pressurized) is getting all of its supply air from the exhaust of only the lab (positively pressurized), and no other space. In this case, we can create a one-to-one relation between both these spaces.

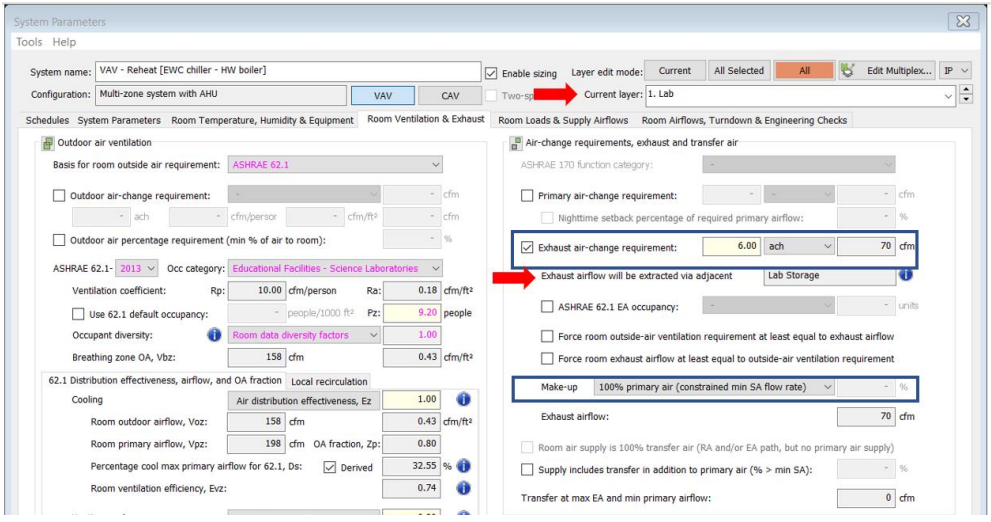
a) Create a non-principle zone/room component that will be negatively pressurized. Make sure that the link is set to "Adjacent space w EA fan." This can be copied from the prototype system 03a.



b) Assign the negatively pressurized space, receiving the air through the exhaust of the positively pressurized space, to the non-principle zone/room component.

c) Make sure the correct space is assigned. This can be done in the System Parameter. The positively pressurized space will be shown on the top right corner and the negatively pressurized will be shown as "Exhaust airflow will be extracted via adjacent". These are marked with a red arrow below.

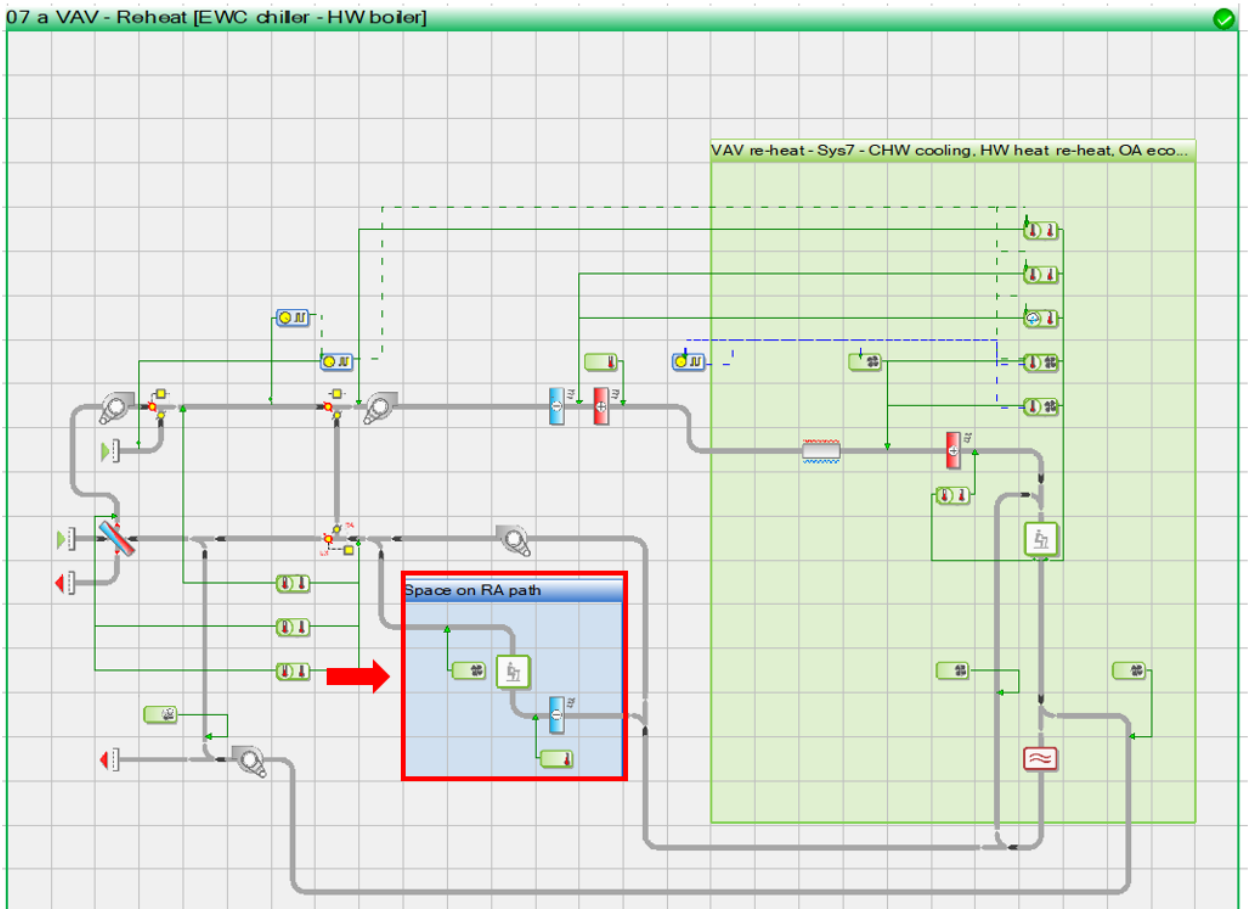
d) Since the air in the positively pressurized space is being exhausted, ensure that the "make up air is set as 100% primary air".



4) Approach 4: Negatively Pressurized Room Assigned to a Non-Principle Multiplex

Approach 4 demonstrates whereby a negatively pressurized room is assigned to a non-principle multiplex (on return air path).

This approach will eliminate the need for defining the exhaust in both the positively pressurized and negatively pressurized spaces. In this approach, the negatively pressurized space will be assigned to a non-principle multiplex. Users can assign multiple spaces to the non-principle multiplex (in the example I have assigned the restroom and the lab storage).



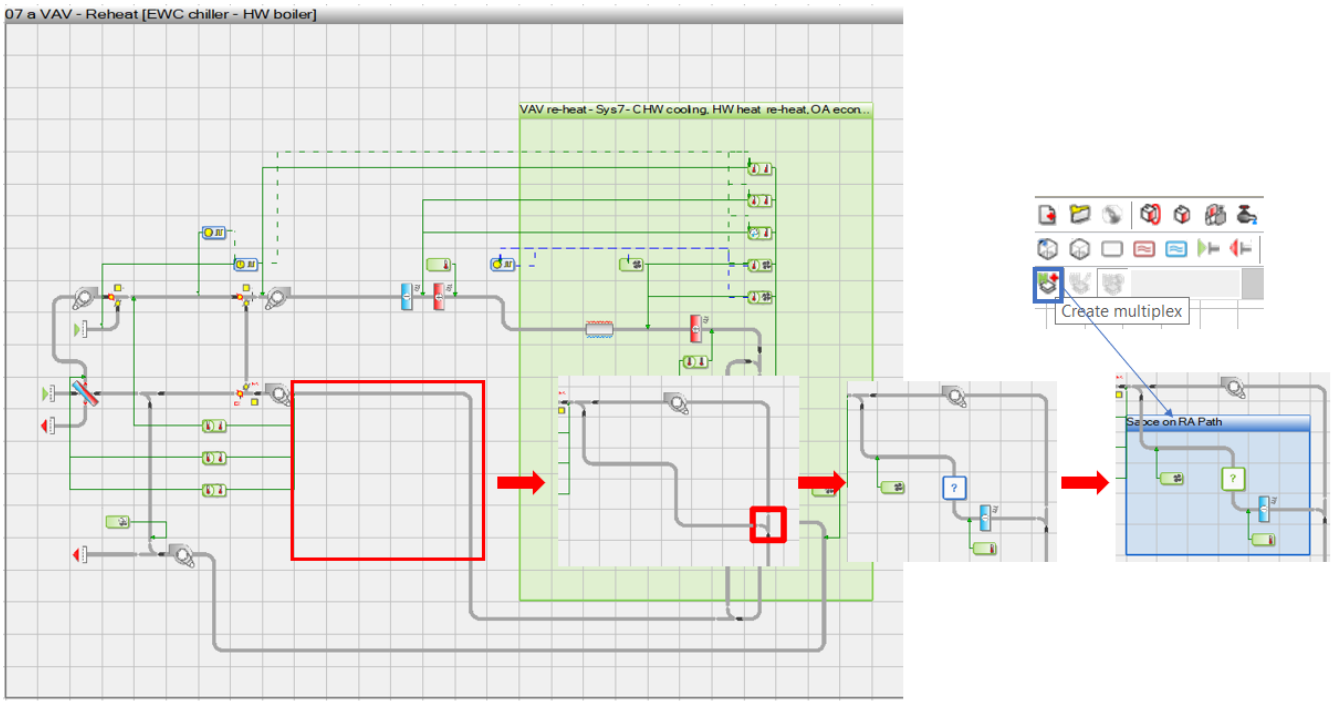
This approach will require the user to manually create a non-principle multiplex using the following workflow:

a) Select a system that best represents your HVAC system (system 7a is shown as an example).
   - Note that the user is not permitted to create a non-principle multiplex on a single-zone system (system type 03 and 04) or packaged terminal units (system type 01 ad 02) which are not coupled to a DOAS (system 90j and 09k)

b) Manually add the ductwork that represents the airflow pathway. In the example shown, partial return air passes through the non-principle room and partial room air bypasses room(s) in the non-principled multiplex.

c) Add components (e.g. coils, fans, etc) and controllers to account for the cooling and heating in the space along with airflow in the space. In the example, a cooling coil with a time switch cooling coil controller is added, which will cool the air to 55 F, and a time switch airflow controller to limit the volume of air.

d) Create a multiplex using “Create multiplex tool.”


07 a VAV - Reheat [EWC chiller - HW boiler]
VAV re-heat - Sys7 - CHW cooling, HW heat re-heat, OA econ...
Create multiplex
Space on RA Path