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Research Building - Environmental Analysis (10/7/2018-11/3/2018)

Each week, the e-climate data is analyzed for the following rooms in the research building. It is noted (Y/N) if the temperature went above or below the recommended range, if the RH went above or below the recommended range, and if the RH changed more than 10% in less than 24 hours. Each (+) in the chart below (Table 1) represents a week where it went outside of the Winterthur guidelines.

> The new guidelines were implemented in June 2016 and state that there should be a stable temperature within a range of 60-77° F, with a summer relative humidity (40-60% within the range an allowable fluctuation of +/- 10% in 24 hours), and a winter relative humidity (30-55% within the range an allowable fluctuation of +/- 10% in 24 hours)

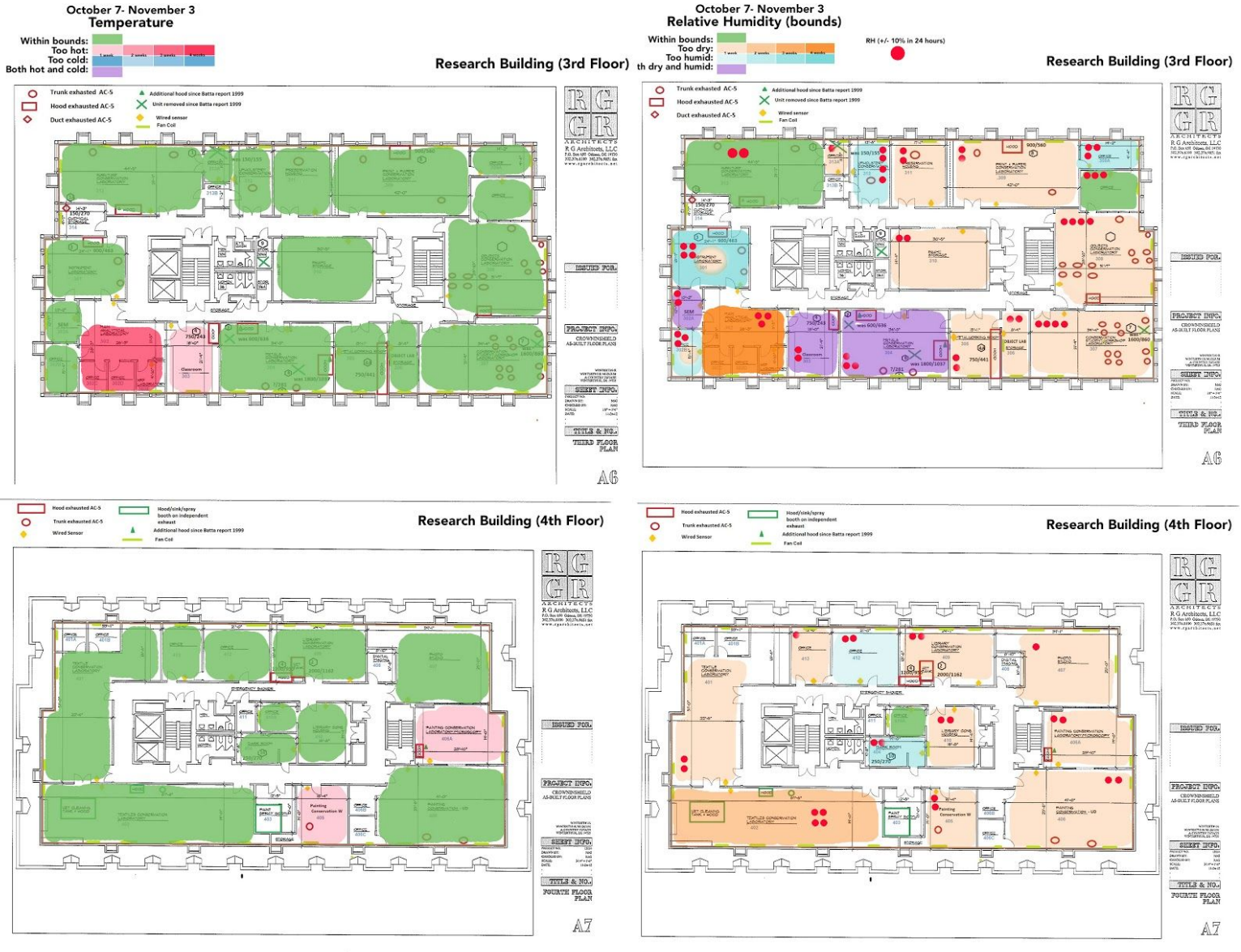
Table 1

Room Name	Low RH (too dry)	High RH (too humid)	+/-10% in 24 hours	Low temp (too cold)	High temp (too hot)
Lower floor, 1st floor, and 2nd floor - Research Building					
Furniture storage			+		
Crate Room	+	+	++++		
Dorrance Gallery	+++		+++		++++
Loan processing					
Room 220			+		
3rd Floor - Research Building					
Frame storage	+		++		
Furniture lab			++		
Furniture office	+		+		
Furniture upholstery		++	++++		
Metal working	+		++		

Objects storage	+		++		
Objects lab	+		++++		
Paper lab	+		++		
Paper office		++	+++		
Preservation housing	+		++		
Student lab	+		++++		
SRAL classroom	++++		+++		+++
SRAL Instruments lab	+	+++	++++		
SRAL office	+	++	+++		
SRAL SEM	+	+	++		
SRAL XRF	+	+	++		
4th Floor - Research Building					
Conservation office		+	++		
Dark room		++	++		
Director’s office	+		+		
Library housing	+		++		
Library Lab	+		++		
Library office					
Paintings classroom	+		++		
Paintings classroom lab	+		++		+
Paintings lab	+		++		+
Photo studio	+		+		
Textile lab	+		++		
Textile wet lab	++		++++		

The above data (table 1) was used to create environmental data overlay maps (fig. 1) for the 3rd and 4th floors to see if there are any correlations between the physical space of the building and the environmental conditions. The increasing opacity in colors for RH and temperature represents the increase in number of weeks that it went outside the boundaries:

Figure 1 - 3rd and 4th Floor of Research Building Environmental Data Overlay Maps



GENERAL OBSERVATIONS

The month of October can be a difficult time for environmental control because of the extreme weather shifting. For outdoor temperature in Wilmington, the beginning of the month had high temperatures in the low 80°'s and by mid-october there were temperatures in the low 30°'s (fig. 2). Because of this, the guidelines for RH and temperature switched over to the winter guidelines during this month.

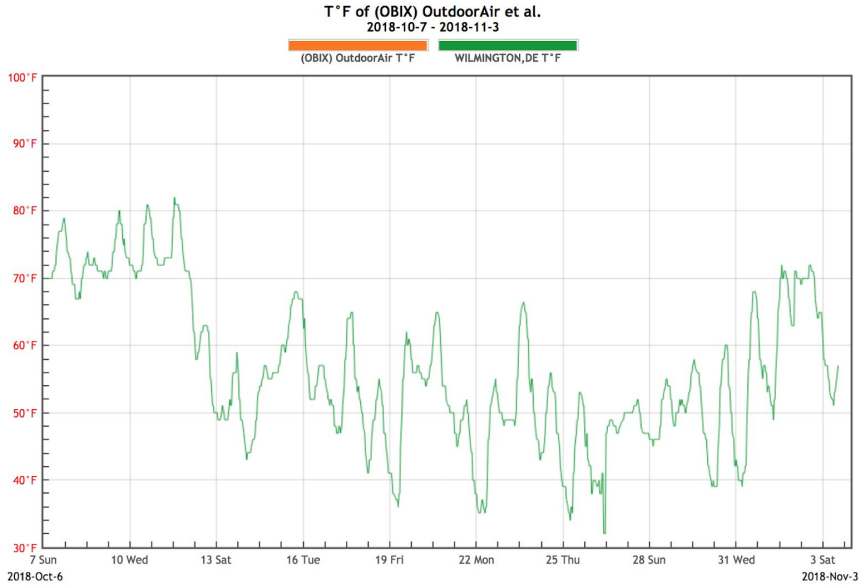


Fig. 2 Outside Weather Data (Wilmington, DE) for October 7, 2018- November 8, 2018

Considering the extreme temperature changes outside, the research building maintained the indoor temperature relatively well. The only rooms in the building that went out of bounds were the SRAL classroom, the paintings classroom lab, and the paintings lab. All of these rooms had temperatures that were warmer than the guideline's uppermost temperature value. The SRAL section of the building has newly installed fan coil system that operates separately from the rest of the building, which may account for irregularities. The paintings classroom and paintings lab are on the southeast uppermost corner of the building and receives the most solar gain. These rooms in the research building appear to consistently have hot and dry conditions likely because of this.

A large portion of the rooms experienced weeks where the relative humidity went below the guideline recommendations. This is likely because of the increase in heat in the building and the unpredictably warm days outside that follow. The areas that experienced the greatest number of weeks with RH going below the recommendations were the SRAL classroom and the textile wet lab. The textile wet lab is a very large room with only one thermostat. There are a lot of large items stored in this room that could prevent good air movement, which may impede on the thermostat from making a representative measurement of the temperature and humidity in the room. Also, the room is south facing, which means it should have the greatest solar gain during the day. Some rooms experienced multiple weeks where the RH went above the recommended

limit. This can happen when the outside temperature drops. Most of the rooms that experience this are on the north side of the building where there is minimal solar gain and lots of trees that both block the sun and hold onto moisture near the building.

There were many spikes in RH-- particularly for this month as the outdoor temperature and RH was so variable with the season change. Since the research building has an exhaust system and none of the air is recycled, it can be difficult for the system to keep up with these changes. The most stable room in regards to staying within the bounds for temperature and relative humidity and also not experiencing significant spikes in humidity is the library office. This room is situated directly in the center of the building.