Newcomb & Boyd
CONSULTANTS AND ENGINEERS

CASE STUDY:

NET ZERO DESIGN

THE KENDEDA BUILDING FOR INNOVATIVE SUSTAINABLE DESIGN

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Net zero design requires a higher level of leadership and engagement from all parties. Unlike other high-performance metrics that compare performance to a baseline building, net zero design is pass/fail. To ensure the goals are met, the entire Owner-Architect-Contractor team must be fully engaged from the very outset of the project. The most important component of this effort is load reduction. Working together, the team must identify critical loads and then work together to minimize or eliminate them altogether.

The Kendeda Institute for Sustainable Building Design employs radiant slab systems for both heating and cooling. This afforded the project both a challenge and opportunity. The challenge: how to ensure stable interior dewpoint control to ensure the slabs do not condense in the hot and humid environment.

THE OPPORTUNITY: CAN WE TAKE ADVANTAGE OF THE RADIANT EFFECT OF THE SLABS TO IMPROVE OCCUPANT COMFORT?

Dewpoint Control: A major driver of energy use in the design of the Kendeda building was infiltration. As a high occupancy building in a campus environment, turnover in the building throughout the day due to class changes is expected to be high. While vestibules would typically address this situation, there was concern that during high turnover, both doors would be open, thereby short circuiting the impact of the double door. To validate this concern, Newcomb & Boyd evaluated this effect at a similar building on campus by observing entrance doors for a normal school day. As suspected, on average, both doors of the vestibule were open concurrently for approximately 15-20 minutes per hour.

To combat this infiltration, strategies such as deeper vestibules or revolving doors were explored, but ultimately the team determined entrance fans would provide similar performance to a revolving door, without the nuisance or ADA issues associated with the door.

Georgia Tech - Living Building				
Time Frame	**Starbucks Doors (in minutes)**	**Notes**	**1st Floor Doors (in minutes)**	**Notes**
7:45 AM - 8:15 AM	8:23	1 HC	2:10	1 HC
8:15 AM - 8:45 AM	1:06	1 HC	2:45	3 HC
8:45 AM - 9:15 AM	13:56	3 HC	15:17	2 HC
9:15 AM - 9:45 AM	4:22	1 HC	0:46	
9:45 AM - 10:15 AM	14:07		17:19	4 HC
10:15 AM - 10:45 AM	4:51		5:17	
10:45 AM - 11:15 AM	19:25	1 HC	11:44	
11:15 AM - 11:45 AM	9:08		6:42	4 HC
11:45 AM - 12:15 PM	17:41		21:09	
12:15 PM - 12:45 PM	13:59	3 HC + 1 TG	5:21	
12:45 PM - 1:15 PM	9:27		12:29	1 HC + 2 TG
1:15 PM - 1:45 PM	19:04		22:04	1 HC + CL for 9:32 min
1:45 PM - 2:15 PM	16:42	1 HC + CL for 10:06 min	6:22	
2:15 PM - 2:45 PM	14:54	1 HC	11:08	
2:45 PM - 3:15 PM	12:42		22:23	
3:15 PM - 3:45 PM	6:16		7:54	1 HC + 2 TG
3:45 PM - 4:15 PM	14:54	1 HC	15:53	

Thermal Comfort: While thermal comfort is typically considered in terms of space temperature and relative humidity, comfort criteria also include air speed, activity, clothing level, and radiant temperature. Since radiant systems heat/cool surfaces, not air, the team worked with Georgia Tech to determine an appropriate heating and cooling setpoint based on ASHRAE 55 methodology and the expected attire and activity level of a typical college student. To allow greater degree of individual temperature control, ceiling fans are provided in all occupied spaces.

In an attempt to validate these setpoints prior to construction, GT leveraged the resources of an environmental chamber on campus to simulate the various conditions considered. Air movement was simulated through the use of box fans installed in the ceiling. And while the radiant systems could not be simulated, the impact of relative humidity, clothing level, and air speed were validated through the process, resulting in the following space setpoints.

Temperature Setpoint (°F)	Cooling (°F)	Radiant Temperature (°F)	Humidity (%)	Air Speed (fpm)	Clo Value (clo)	Metabolic Rate (met)
Classroom	78	78	50	100	0.57	1.7
Office	78	78	50	100	0.57	1.7
Commons	80	80	50	100	0.36	1.7
Lab Classroom	78	78	50	100	0.57	1.7
Auditorium	78	78	50	100	0.57	1.7