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Innovation, Resiliency Create Cornerstone of Office Tower Design

The June 2021 *ASHRAE Journal* article, “Innovation, Resiliency Create Cornerstone of Office Tower Design,” by Shana Scheiber, P.E., Member ASHRAE, and Roger Lautz, P.E., Member ASHRAE, documents an office tower designed and constructed to ASHRAE Standard 90.1-2010 Appendix G that achieved an EUI of 53.1 kBtu/ft²-yr in 2019, an exemplary design and construction

achievement. The metered electric and natural gas use for 2019 was given in Figure 2 of the article, providing an opportunity to compare the 2019 results to a system energy equilibrium (SEE) model of the building that simulates the real-time performance of the building on a given day.

A SEE model of the building with average 2019 weather

data input as defined by Dane County Regional Airport Station of Madison, Wis., gave an EUI estimate of 50.92 kBtu/ft²-yr as shown by the left chart of Figure A below. The right chart of Figure A breaks the SEE model EUI data into four components for the four seasons, illustrating close agreement to the Figure 2 data of the article.

For example, the right chart of Figure A shows a SEE model winter heat value of 11.85 kBtu/ft²-yr. For December, January, and February,

Figure A 2019 SEE model EUI data.

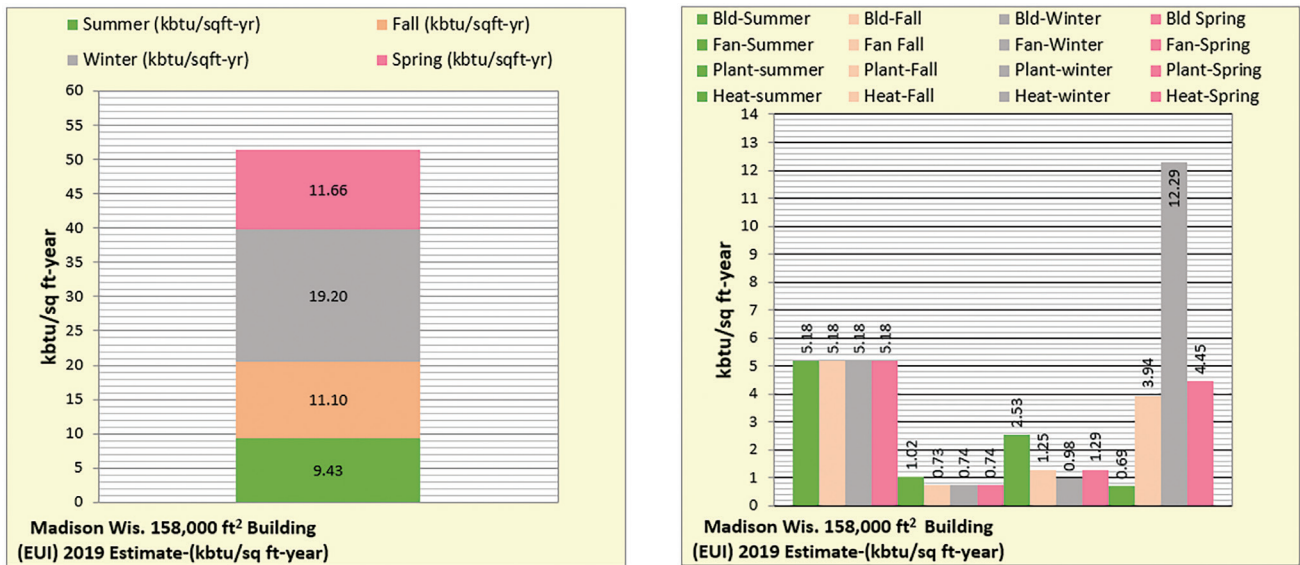
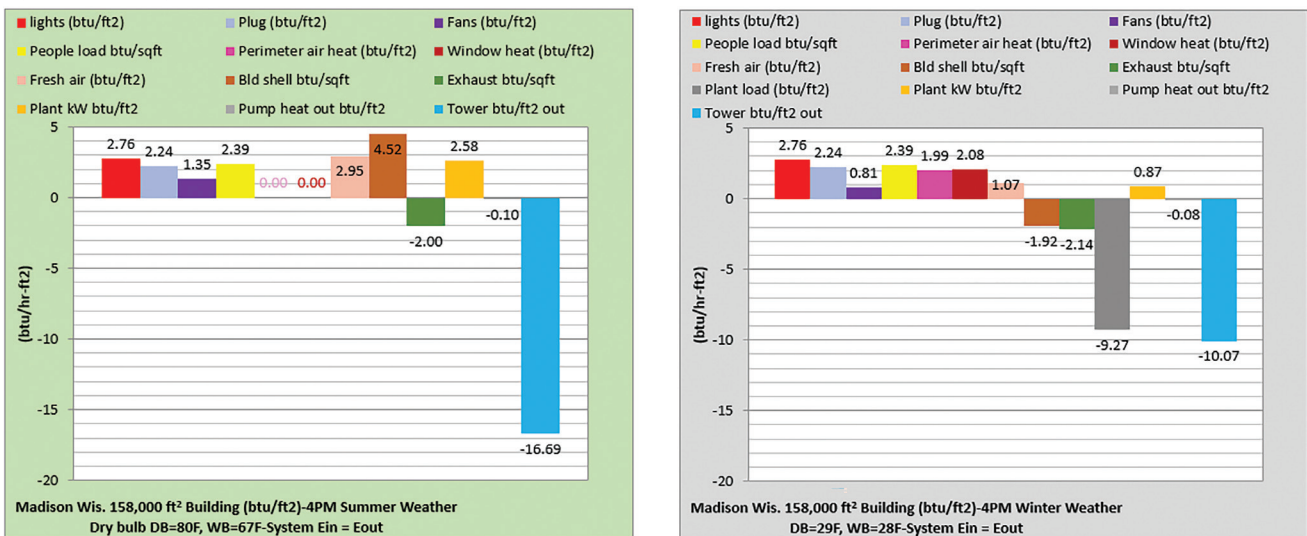


Figure B 4 p.m. energy balance.



the article gives natural gas use of about 1,920 MMBtu/158,000 ft² = 12.15 kBtu/ft²-yr, approximately the same as the SEE model value. Figure A suggests the SEE model is in the ballpark of modeling the real system.

However, several details of the design not given by the article had to be assumed. A more accurate SEE model of the system can be developed if the authors could provide day energy use data for one or more days.

The SEE model can give an energy balance for each hour of a given day, as illustrated by Figure B. Note that the perimeter air heat and window heat is zero during the summer hour, and the building shell goes from “energy in” during the summer

to “energy out” during the winter hour.

SEE models of days with different weather conditions can provide insight into how to better control or modify the system to reduce energy consumption. The SEE model shows that the design of the perimeter heat panels has a significant impact on building energy consumption. This and other details of the design will be addressed at <https://kirbynelsonpe.com>, including how this building design performs at other temperature zones.

My appreciation and congratulations to the authors for an extraordinary design and well-written article.

*Kirby Nelson P.E., Life Member ASHRAE,
Springfield, Mo.*

Author Responds

I'm glad you enjoyed the article regarding the office tower I worked on in Madison, Wis. I am glad you are able to find new ways to analyze and use the 2019 measured data that was included in the article. I agree that measured data is very powerful!

*Shana Scheiber, P.E., Member ASHRAE,
Madison, Wis.*

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