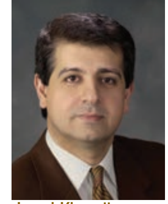
Javad Khazaii

Modeling Real vs. Imaginary

BY JAVAD KHAZAII, PH.D., P.E.

Building an energy-efficient building often begins with an energy (cost) comparison between a design building and an imaginary baseline building as defined in ASHRAE/IES Standard 90.1, Appendix G. Even though this method has contributed to higher performance of buildings and systems, I believe we can do better than that.

I think the current approach made good sense a couple of decades ago when we did not have a thorough and reliable database for the energy consumption of various types of commercial buildings in different climate zones. Now, we have access to a plethora of information gathered by the U.S. Department of Energy (DOE) regarding the average energy consumption per square foot per year of existing commercial buildings.

For example, we can find the average energy consumption of educational buildings in a particular climate zone in the United States by looking in the DOE's Buildings Energy Data Book. This is actual data that can be a useful performance indicator for us, and our energy modeling target.

Let's assume we have changed our method of rating the building performance and instead of comparing two deterministic simulations for the design building and our imaginary building (giving 1 to 20 points if our design building is between 12% to 49% better than the imaginary building performance [cost]), we are comparing between a risk-based simulation for our design building and the current deterministic industry average energy consumption per square foot per year in our specific climate zone. (Of course, before anything else, commercial software needs to be developed that is capable of risk-based energy modeling.)

For example, if we set our new standard requirements to: If the results of the risk-based analysis of the design building shows that there is at least *x*% chance that our design building performs a minimum of *y*% better that the industry average it can score 1 point, and if there is at least *x*% chance that our design building performs a minimum of 2*y*% better that the industry average, it can score 20 points. Likewise, each incremental additional point between *y* and 2*y*% improvement will score an additional incremental point between the limits of 1 and 20 points.

For me, the most obvious advantage of this alternate method is that constructing a baseline using a real industry-proven value, means that we are working toward make a building perform better than an actual benchmark. Using this alternate method, we do not (only) state that the building is performing *m*% better than if we designed it using the standard method, but instead we state that the building is performing *n*% better than the average of existing buildings with similar functionality in its particular climate zone.

In addition, we can communicate the analysis results simply with anyone in the industry, especially the owner who needs to understand exactly what he will receive for his investment.

Most importantly, by using the alternate method, we are encouraging more innovation in building design and technique. For example, let's assume an architect designs an unusual geometry for a building that is very energy efficient compared to most other building shapes. Based on guidelines of the current method, he has to simulate both design and base buildings with the same unusual building geometry. Therefore, the current standard method will not give him a full credit for his innovative design.

However, in the alternate method, its performance is only compared to existing buildings. This means an innovative geometry has a chance to outperform the average existing buildings' energy consumption by a higher percentage. ■

Javad Khazaii, Ph.D., P.E., is an associate engineer with Newcomb & Boyd Consulting Engineering Group in Atlanta.