Dallas Technical and Poster Session Papers Questions and Comments

This is a compilation of the written questions and comments submitted to authors by attendees at the 2013 ASHRAE Winter Conference in Dallas, Texas. All authors were given the opportunity to respond.

The questions/comments and authors' responses are published with the papers in the hardbound volume of *ASHRAE Transactions*, Vol. 119, Part 1.

DA-13-003

Evaluation of Calculation Models for Predicting Thermal Performance of Various Window Systems

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Masahiro Katoh

Masaya Hiraoka

Jun Owada

Daniel Lu, Student, University of Texas at Austin, Austin, TX: Why was the AFW winter case oriented north while AFW summer case was oriented southeast?

Yuichi Takemasa: The measurements for AFW were conducted in an actual building and we selected appropriate orientations for the reproducibility calculations to consider typical seasonal solar gain. We selected southeast for the summer study because it was the severest orientation for the cooling with high incident solar radiation. Similarly, we selected north for the winter study because it was the severest orientation for the heating with less incident solar radiation.

Alexander Knirsch, Dipl. Eng., TRANSSOLAR Inc., Stuttgart, Germany: Why is the model simplified because the window has two surfaces? What are the reflection coefficients of the blinds? What are the SHGC values of the glazings?

Yuichi Takemasa: Considering the heat conductivity and the thickness of the glass, the heat resistance of the glass pane is usually small compared to the heat resistance for convective and radiative heat transfer coefficients on the indoor and outdoor surfaces. Therefore, we consider that the differences of the surface temperatures between the indoor side and outdoor side are small and negligible in the window models. The relatively small temperature differences were also observed by measurements we conducted before this study. As for reflection coefficients of the blinds, please refer to the tables in the paper for thermal performance values for glazing and blinds. Since SHGC values for glazing are not directly handled in this paper, they are not shown. However, they can be estimated from the thermal performance values for each glazing shown in the tables of the paper.

Pratik Raval, Project Manager, TRANSSOLAR Inc., New York, NY: In response to the speaker's answer about very little temperature difference between two surfaces of a window pane: Actually, the surface temperature difference is non-negligible if there is a low-e.

Yuichi Takemasa: We consider that even if low-e double glazing is used, the temperature difference between the two surfaces of the same low-e glass sheet is relatively small. When low-e pane is used, it is true that the total heat resistance of the window becomes larger. However, the heat resistance of the low-e glass due to heat conductance, which might have some effect on the temperature difference between the two surfaces, is still small and almost the same as the glass without low-e coating. Therefore, the heat resistance of the low-e glass is not considered a dominant factor in the heat balance equations in the window models.

DA-13-009

Experimental Study of Surgical Wound Temperatures

Milton S. Goldman, MD, PE **Sheldon M. Jeter, PhD, PE** **Nelson C. Goldman, MD**
Life Member ASHRAE

Anand K. Seth, Principal, Cannon Design, Boston, MA: Do you know what types of OR lights were used and if heat from OR lights caused any effect on wound temperature?

Sheldon M. Jeter: This OR seemed relatively standard or even somewhat old in design. It had ordinary incandescent lamps that tend to warm the surgery site. Even so, the wound temperature was never high.

DA-13-010

Pumping System Bypass Orifice Testing and Analysis

Greg Towsley **Arturo Benavente** **Ronald L. Dougherty, PhD, PE**
Member ASHRAE

Ray Horstman, Associate Technical Fellow, Boeing, Seattle, WA: The orifice pressure drop using taps near the orifice would be useful for the C_d calculation, but of course the system pressure drop would be less due to pressure recovery downstream. Did you investigate the system loss for the orifices?

Ronald L. Dougherty: The pressure taps for measuring pressure drop across these orifices were approximately 6 in. (15 cm) upstream of the entrance to the orifice and 6 in. (15 cm) downstream of the exit of the orifice. Thus, for 1/8 in. orifices, the taps were about 50 diameters upstream/downstream of the orifice; but for 7/8 in. orifices, the taps were only about 7 diameters upstream/downstream of the orifice. There were no pressure measurements downstream of the downstream tap. So, if I'm understanding your question, we did not make measurements to see if there was any pressure recovery after that downstream tap.

DA-13-020

Monitored Performance of Advanced Gas Water Heaters in California Homes

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David Shipley, Senior Technical Specialist, ICF Marbek, Ottawa, ON: Some of your comments suggested the need for changes in the way water heaters are rated. You pointed to the fact that average consumption is lower than in the tests, perhaps because of low-flow fixtures, advanced washing machines, and advanced dishwashers. You also talked about the pattern of hot water draws—the test was a small number of very large draws, but that is not how households typically use hot water. There is a third factor that is important in Canada, where we are typically heating for 70% of the hours in the year and our water heater is inside our conditioned space. That means an ENERGY STAR unit with a tank is actually doing more useful work than a tankless unit, because 70% of its tank losses contribute to our space heating. All this suggests we need a new way to rate water heaters.

Marc A. Hoeschele: I agree with your comments. As the number of new water heating technologies increases, we have added new factors that must be better understood to fully comprehend the associated whole-house energy impacts. Different water heaters (e.g., heat pump or tankless units) have different space-conditioning impacts on basement and conditioned space applications. The National Renewable Energy Laboratory will be publishing a modeling study later this year that looks at the interaction of different water heater types on space-conditioning loads in various climates. In terms of load profiles and usage patterns, both ASHRAE SPC 118.2 and AHRI are working on recommending an improved test procedure methodology that would better represent real-world consumption patterns.

DA-13-023

Short-Term Performance of Gas-Fired Tankless Water Heaters: Laboratory Characterization

Paul Glanville, PE
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Douglas Kosar
Member ASHRAE

Jason Stair

David Ward, Energy Engineering & Design, Framingham, MA: Does the energy-use comparison between tank and tankless DHW heaters account for time of use?

Paul Glanville: Comparing the annual operating cost of gas-fired storage versus tankless water heaters, shown on slides 15 and 16 of my presentation, is from laboratory tests simulating three distinct 24 hour hot-water draw patterns. So, in that sense, it accounts for time of use through simulating a distributed hot-water draw pattern. Please note that there are slight differences in the nonstandard hot-water draw patterns applied to the gas-fired storage versus tankless water heaters; however, daily hot-water draw volumes are similar and permit comparison. The full details of the testing of storage water heaters will be provided in the forthcoming final report for California Energy Commission (Contract No. 500-08-060) but for now can be seen in some detail here at http://apps1.eere.energy.gov/buildings/publications/pdfs/building_america/4-glanville_gti_ba_expert_meeting_92812.pdf.

DA-13-026

A Variable Refrigerant Flow Heat Pump Computer Model in EnergyPlus

Richard Raustad

Paul Doppel, Senior Director Industry and Government Relations, Mitsubishi Electric, Suwanee, GA: This is a positive comment for Richard's work on trying to expand the understanding of how VRF systems are tested, how they operate in the field, and how to best model them. His efforts have led to expanded efforts to work actively on evaluation of VRF systems.

Richard Raustad: I wish to acknowledge the five manufacturers that supported this work. These manufacturers actually co-sponsored this effort through co-funding and also provided guidance as to the actual operation of this system type. Two of these manufacturers were present in the laboratory during the performance testing phase of the project. Each of these manufacturers provided feedback on testing methodology and measured system performance. Of course, further research is necessary to eventually create a robust and technically sound VRF computer model. These efforts are ongoing.

Neal Kruis, Engineer, Big Ladder Software, Boulder, CO: Are you using the average wet bulb because you are not modeling each evaporator separately? Is this average weighted in any way? ASHRAE is developing a standard (205) to get manufacturers' data into the hands of energy modelers; it would be good to discuss this and get your input.

Richard Raustad: Since this is an empirical performance model, only the resulting air-side capacity and system power are modeled. This result is based purely on the average coil entering air wet-bulb temperature and outdoor air temperature (when cooling mode is active). The refrigerant properties are not modeled, which means the model does not have access to refrigerant-side characteristics such as evaporator suction temperature or pressure. I suppose that some form of suction temperature control (or high-side control for heating) could be added to the existing model (i.e., the model would attempt to attain some leaving air temperature). In the current model, the average wet-bulb temperature is weighted by the coil load to capacity ratio so that if there were a 1000 W load in one zone and a 1 W load in another zone, given each zone contained a 1000 W coil, then the coil entering air wet-bulb temperature in the zone with a 1000 W load will be predominant. Equation 2 in the paper describes the load-weighted average coil entering air wet-bulb temperature.