Updates to ASHRAE RP-1449 Code Base

Between 1 February and 4 May, I made 29 changes to the RP-1449 models, . Ten of these affected the building parameters or simulation inputs. The remaining changes involved increasing the number of variables output to disk, and refinements to the postprocessing code, to improve our ability to debug the model and validate the simulation inputs.

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1. correct mapping from Type56 outputs to dat files

Prior to this change, infiltration, internal sensible gain, and internal latent gain were incorrectly reported. No other values were affected.

2. lower convection and increase absorbtance for roof

The solar absorbtance of the roof was increased from 0.6 to 0.9. The latter value is consistent with dark colored asphalt shingles.

The convection coefficient of the roof surface was lowered from 64 kBTU/hr/m^2/K to 32 kBTU/hr/m^2/K. The former value is reported by TESS to be accurate for walls.[TODO] Prior research by FSEC used the value 10 W/m^2/K, equivalent to 36 kBTU/hr/m^2/K. [TODO cite] This change was motivated in both cases by the attic air temperature. With the lower convection coefficient, simulated temperatures of the attic, shingle, and roof sheathing were similar to values observed in real monitored houses.

3. window shading changes

Exterior shading devices on windows were also removed, bringing the total transmitted radiation into better agreement with the SHGC.

4. Add TMY3 data & 5. use TMY3 weather data

TMY3 data files for Orlando, Miami, Houston, Atlanta, Nashville, and Indianapolis were downloaded from http://rredc.nrel.gov/solar/old_data/nsrdb/1991-2005/tmy3/by_state_and_city.html . These were converted to the TMY2 format for use with TRNSYS, using the program http://rredc.nrel.gov/solar/old_data/nsrdb/1991-2005/tmy3/agreement_3.html . The new weather files were named differently from the TMY2 data for the same locations, to allow comparison.

6. Increase heating setpoint to 70

The heating setpoint was increased from 68°F to 70°F. This is more consistent with anecdotal evidence of the operation of houses, and with measurements of interior relative humidity over the course of the year.

7. roof slope, building volume

The roof slope was set to 5 in 12. This affects the attic volume, the roof and gable areas, the attic heat and moisture capacity, and the roof angle used for radiation modeling. Previously these values were mutually inconsistent.

8. Add Orlando as zone 0

Orlando is modeled for debugging the building and moisture models. These scenarios are numbered as Zone 0 to maintain unique labels in the same pattern.

9. wcapr=15 in attic

The total moisture capacity in the attic is set to 15 times the capacity of the attic air., using the simple 1-node capacitance model. This is the same value as the occupied space. Previously the occupied space used 15 but the attic used 1.

10. add unvent case in all HERS

Add unventilated scenarios for debugging. Previously only HERS 130 houses were unventilated, and no HERS 130 houses had ventilation. This was an uncontrolled variable when comparing scenarios at different HERS levels.