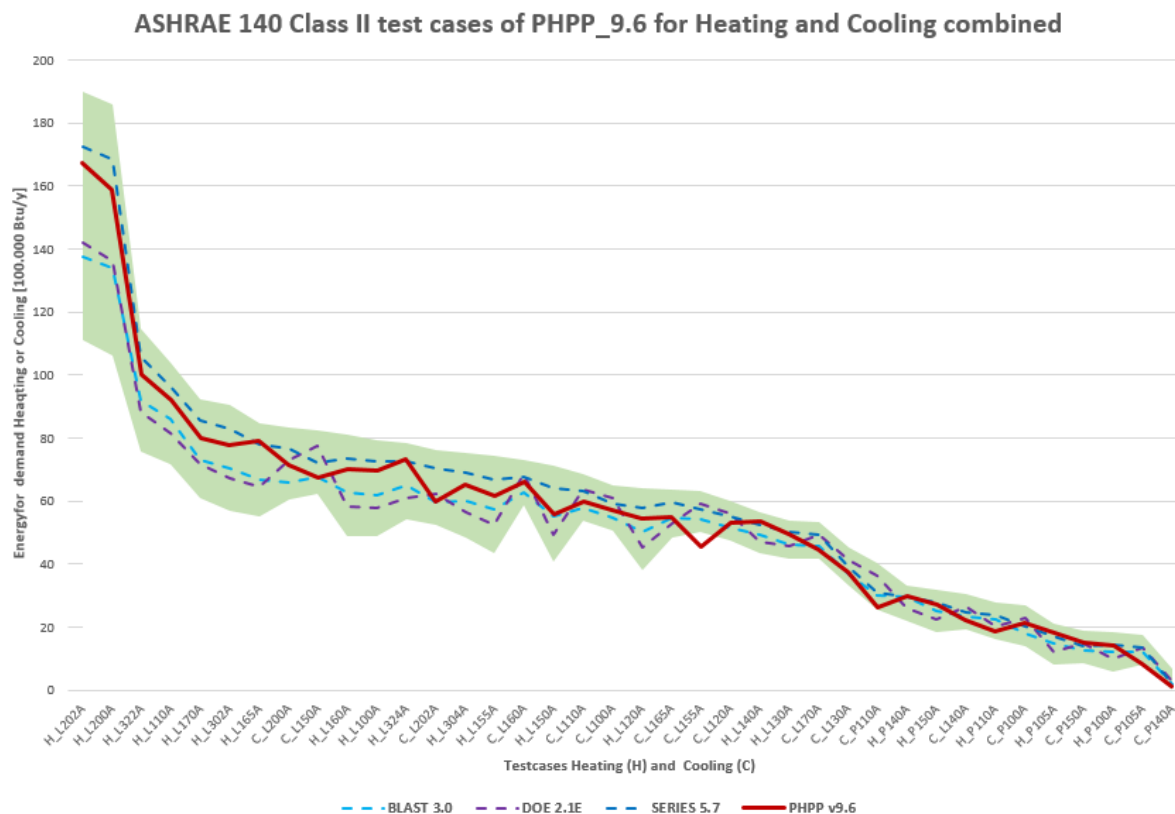**Validation of PHPP v9.6 using ANSI/ASHRAE Standard 140-2017**

In January 2019, the Passive House Planning Package (PHPP) version 9.6 was evaluated in accordance with ANSI/ASHRAE Standard 140, a comparative testing method for building energy programs.

The validation tests consist of a series of carefully described sample case building plans. Results from modelling different test cases with the software being tested are compared to those of reference software results. The class II test cases, geared towards annual building energy use, comprise a total of 38 test cases, 21 for heating and 17 for cooling.

Passive House Canada, Passive House California, New York Passive House and the Passive House Institute contracted Remi Charron Consulting Services, to independently test PHPP version 9.6 using ANSI/ASHRAE Standard 140 in order to offer building officials better insights on the comparability of the results in PHPP with standard test tools and thereby enable the acceptance of PHPP as an energy model for building code energy performance compliance.

The standard emphasizes that deviations from the results of the reference software do not necessarily imply that the program tested is wrong. Accordingly, the procedure does not specify explicit pass or fail criteria. However, informative Annex B22 of the standard provides guidance on developing an acceptance range in which the results of the tested software should fall within.

ASHRAE 140 Class II test cases of PHPP_9.6 for Heating and Cooling combined

Results of PHPP version 9.6 compared to the reference tools and the confidence range in green, arranged according to magnitude of the results

As can be seen in the diagram above, the results of PHPP agreed very well with those of the reference software. For heating, PHPP results fell within the acceptance range in all cases. For sensible cooling, PHPP was within the acceptance range for all but one case, where PHPP predicted a cooling demand that was 9% below the lower limit.

The PHPP has already proven its ability to predict the energy use of buildings in many post-occupancy studies. Good agreement with other building simulation programs was also found earlier. The new results support this general experience following the formal test procedure of ANSI/ASHRAE 140.

New York Passive House   Passive House California   Passivehouse Canada   Passive House Institute