IEA Annex 71: Whole model empirical validation of a full-scale building including building service equipment and synthetic users

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IBPSA Project 1

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Empirical validation study

- The study follows on from an empirical validation study undertaken as part of the recent IEA EBC Annex 58
- Simulation programs in the study included IESVE, IDA ICE, TRNSYS, EnergyPlus, ESP-r, Wufi and programs based on Modelica and Matlab
- The experimental data sets and their documentation is still publicly available, with a significant number of downloads (currently 60 and 36 for Experiment 1 and 2 respectively)

Project definition

IEA Annex 58 Twin House Experiment

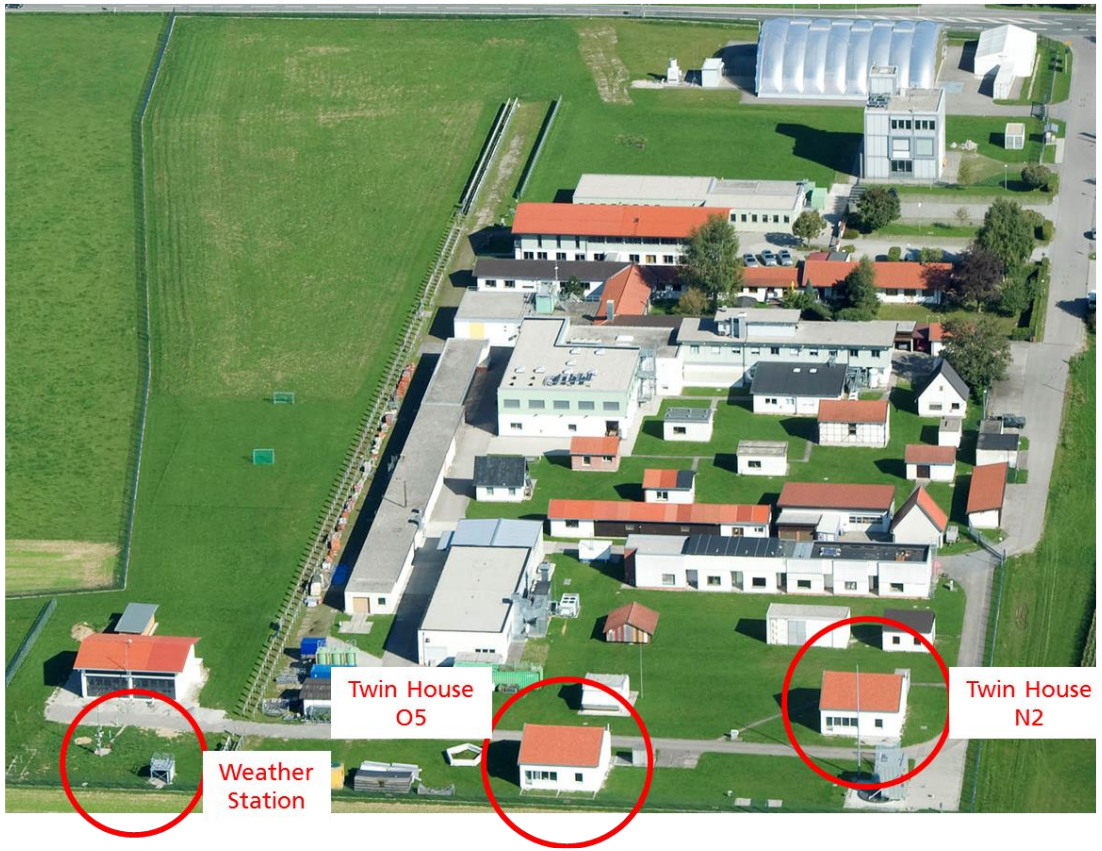


Figure 1b: Location of Twin Houses in Holzkirchen, Germany.

Project definition

IEA Annex 58 Twin House Experiment

View of West

View of East

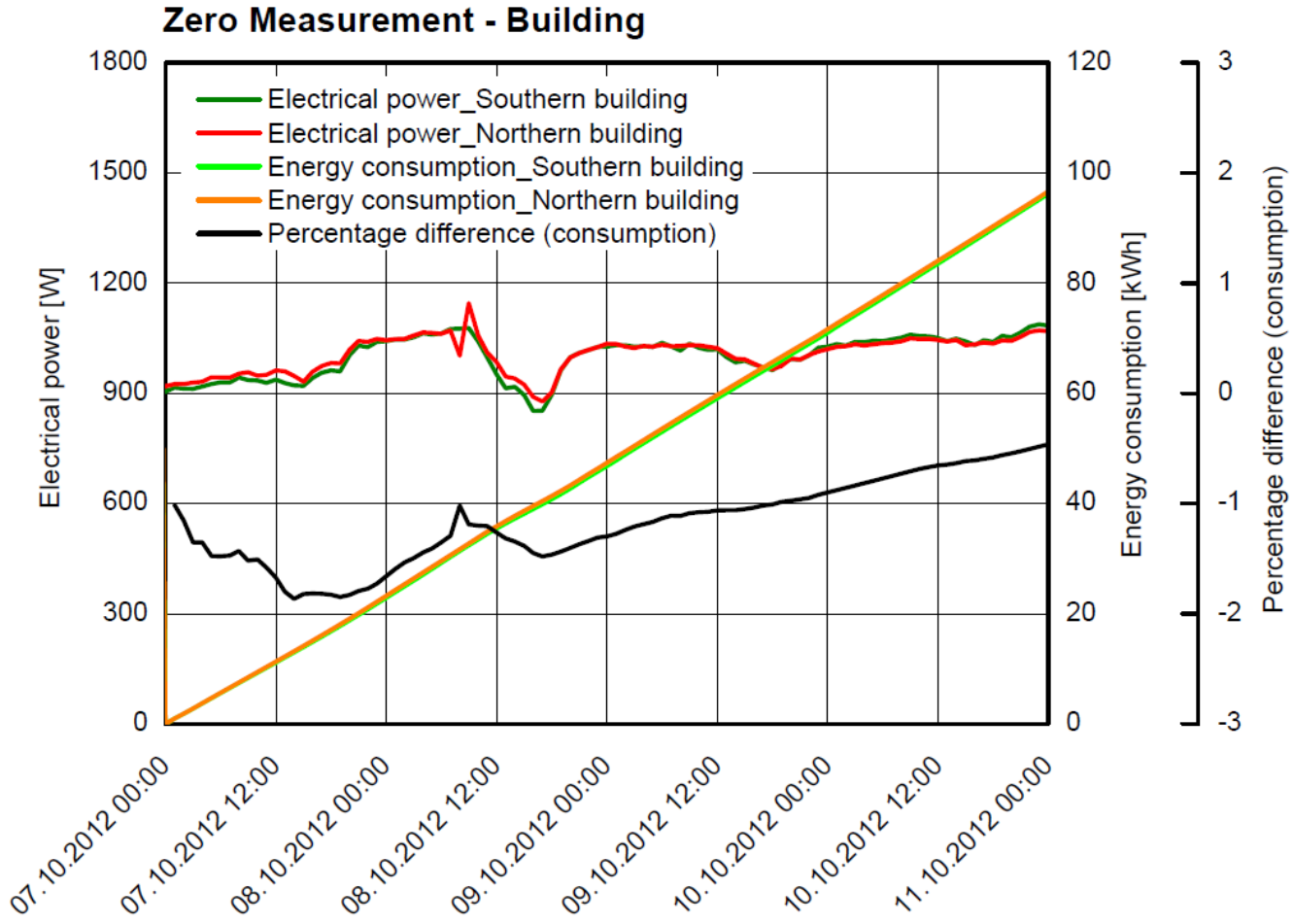
View of South

View of North

Figure 1a: Views of Twin Houses in Holzkirchen, Germany

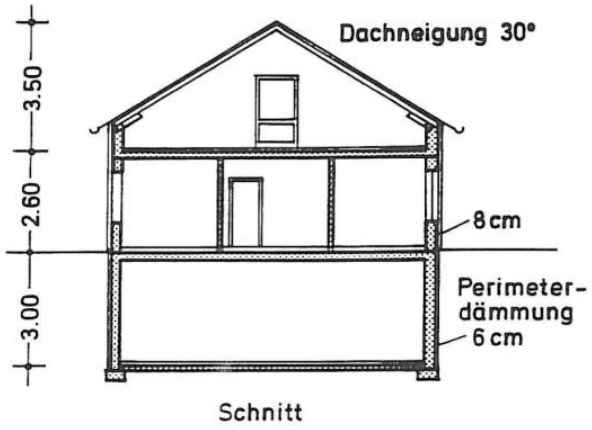
Project definition

IEA Annex 58 Twin House Experiment



Project definition

IEA Annex 58 Twin House Experiment



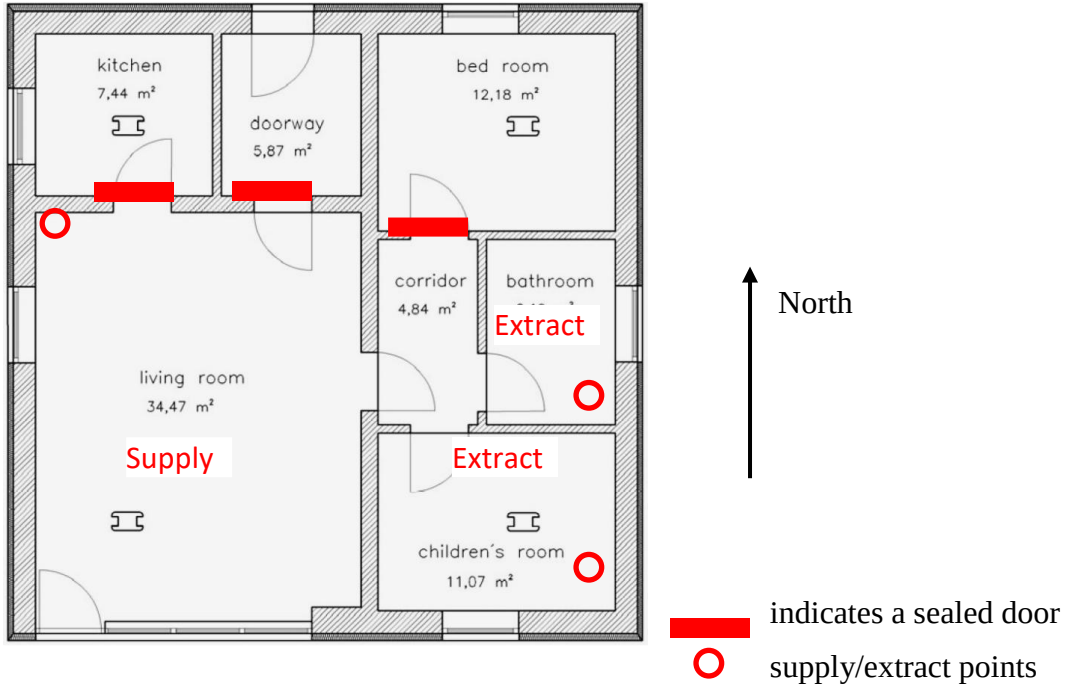
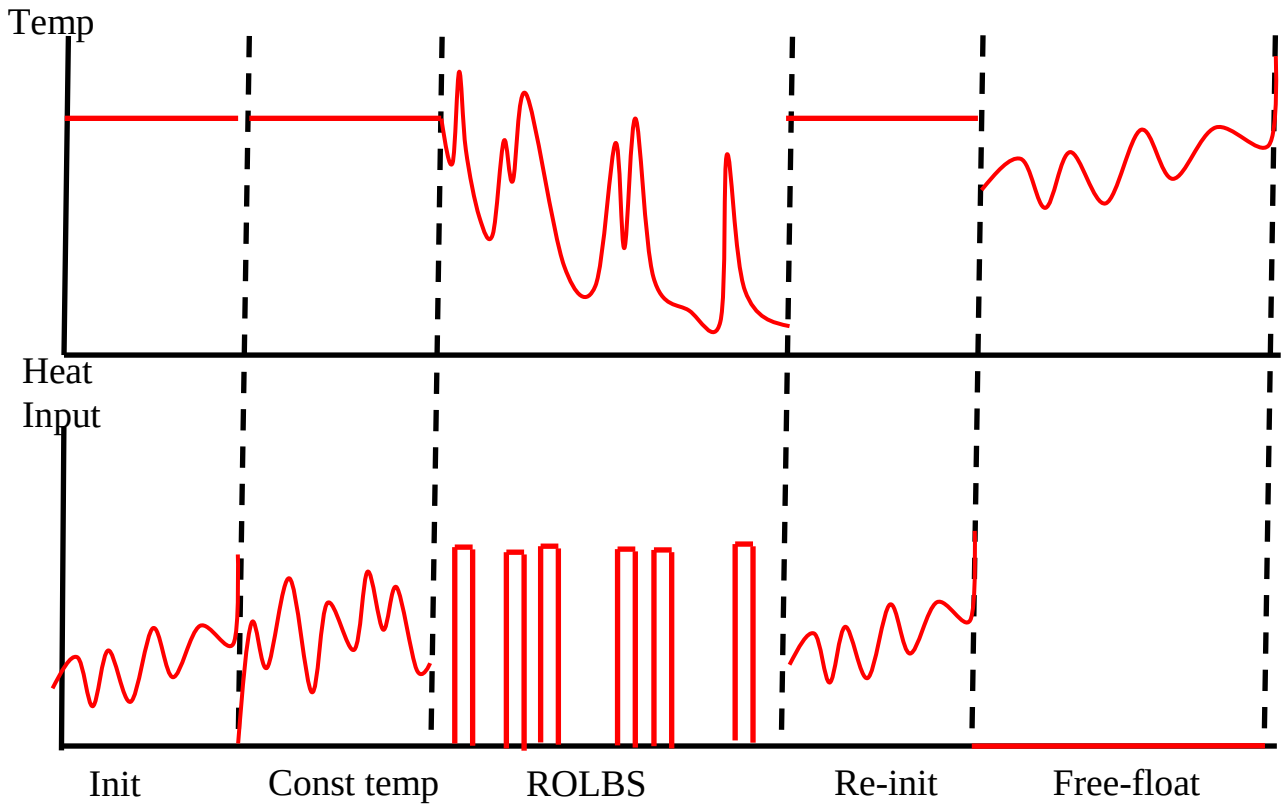


Figure 4: Mechanical ventilation

Project definition

IEA Annex 58 Twin House Experiment



Empirical validation study revisited

- The Twin House experiments were full scale, multi-zone, subject to real weather conditions and lasting for approximately two months for each experiment, but the experimental design was deliberately kept simple
- The intention in Annex 71 is to increase the complexity with experiments throughout the winter of 2018/9
- Again, the Twin Houses will be used, but significant changes
  - inclusion of two bedrooms in the upper attic space
  - room-by-room synthetic occupancy profiles
  - comparison of electrical and underfloor heating systems
  - changes to fabric insulation and monitoring of inter-room air flow.

Empirical validation study revisited

- The validation methodology will be a two phase blind validation, as used in Annex 58 and similar to other previous IEA empirical validation studies.
    1. Blind validation (Phase 1). Modellers predict heating energy and indoor climate using the experimental specification
    2. First stage analysis. compares predictions against experimental data
    3. Re-modelling (Phase 2). The measured data is disseminated. Modelling teams are encouraged to investigate differences
    4. Final analysis and archiving of high quality data sets.

Interested to participate?

- It is expected that the detailed specifications and the measured climate data will be released to modelling teams in early spring 2019.
- Contact Paul Strachan (or me):

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1. Strachan, Paul; Svehla, Katalin; Heusler, Ingo; Kersken Matthias. Whole model empirical validation on a full-scale building. In: Journal of Building Performance Simulation (2015), Vol. 9, No 4, pp. 331-350.
2. IEA EBC Annex 58 - BES Model Validation Data. https://pure.strath.ac.uk/portal/en/datasets/twin-houses-empirical-dataset-experiment-1%288a86bbbb-7be8-4a87-be76-0372985ea228%29.html.
3. BES Model Validation Data - Experiment 2. https://pure.strath.ac.uk/portal/en/datasets/twin-houses-empirical-validation-dataset-experiment-2(94559779-e781-4318-8842-80a2b1201668).html.
4. Strachan, Paul; Svehla, Katalin; Kersken, Matthias; Heusler, Ingo. International Energy Agency (IEA) Annex 58: Reliable building energy performance characterisation based on full scale dynamic measurements - Report of Subtask 4a: Empirical validation of common building energy simulation models based on in situ dynamic data (2016). ISBN: 9789460189852