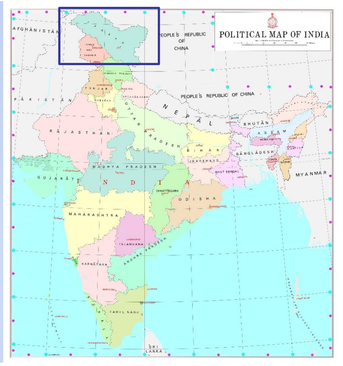
Fachhochschule Nordwestschweiz
Hochschule für Technik

HIMALAYAN INSTITUTE OF ALTERNATIVES, LADAKH
An Alternative Institute for Mountain Development

Ausstellungs-Nr. U12

Performance Evaluation Tool

for Passive Solar Houses (PSH) in Ladakh



Goal:
Developing a performance evaluation tool based on a monthly calculation method for PSH in Ladakh.

Basis:
- Monthly method of SIA 380/1
- Trombe wall method of ISO/TR 52016-2:2017
  - Corrections on ISO/TR by Revision paper

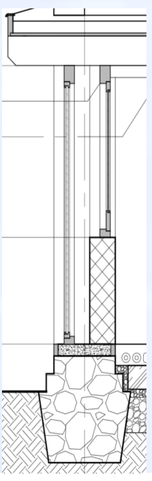
Main challenge:
Adaption of Trombe wall method for specific Ladakhi Trombe wall.

Procedure of developing the evaluation tool:

1. Basic functioning of tool
   Inputs: Climate data, standard values, building specific values relevant for thermal behaviour of building. Real measured room temperatures.
   Output: Remaining heating demand to achieve defined room temperatures
2. Monthly method of SIA 380/1
   Programming basic tool excluding method for Trombe wall.
3. Integrating Trombe wall method
   Programming tool with Trombe wall calculation method of ISO/TR and Revision paper.

Control:
Tool works correctly if **output = zero heating demand**

Ladakhi Trombe wall

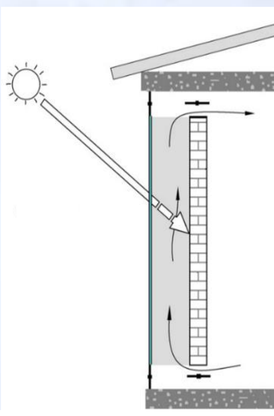


- A south facing glazed facade with a black painted masonry wall with embedded water bottles for higher thermal capacity behind absorbs the sunlight and heats the air in the air gap.
- The heat stored in the masonry wall during the day heats up the house at night.
  - ➡ Heat gains due to transmission
  - ➡ Heat gains due to thermal capacity
- Inner windows can be opened to let the heated air in the air gap into the room.
  - ➡ Heat gains due to ventilation

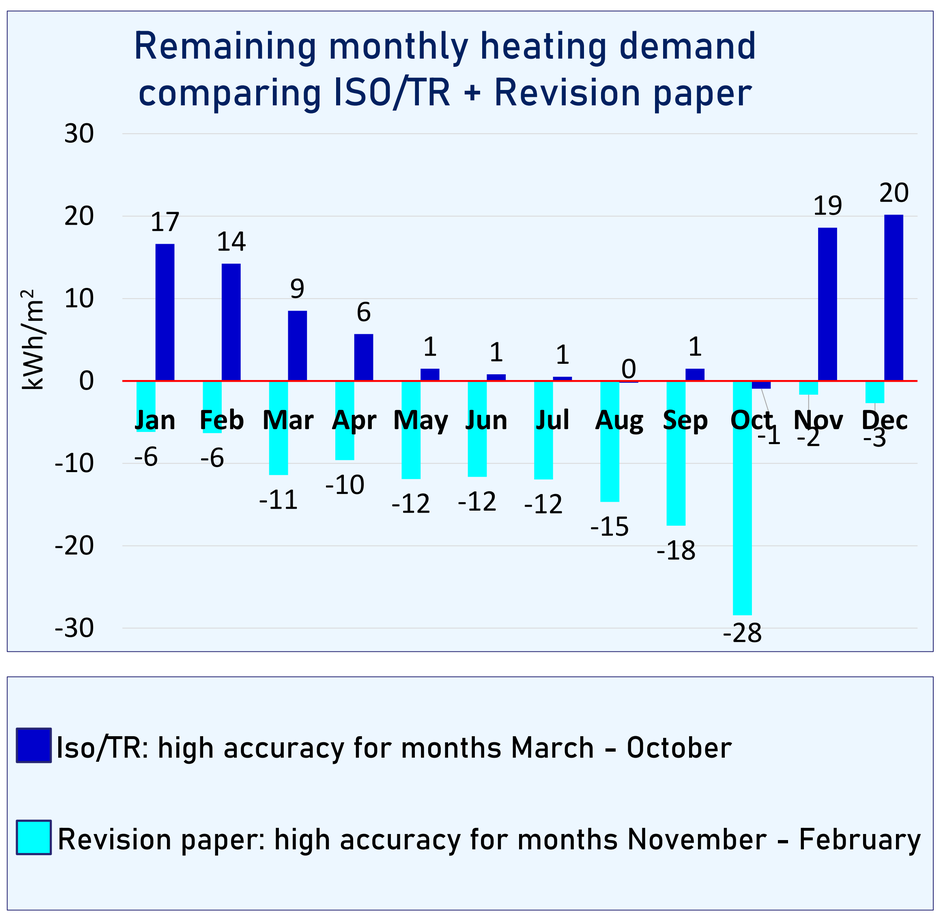
Differences

Trombe wall Calculation method of ISO/TR and Revision paper

- A south facing glazed facade with a black painted masonry wall behind absorbs the sunlight and heats the air in the air gap.
  - ➡ Heat gains due to transmission
- Automatic vents on top and bottom of the masonry wall open and close depending on the temperature in the air gap.
  - ➡ Heat gains due to ventilation
  - ➡ No heat gains due to thermal capacity



Results of control:
Both methods for Trombe wall result in incorrect **output = positive / negative heating demand**



Conclusion:
- Evaluation tool excluding Trombe wall functions correctly.
- Method for specific Ladakhi Trombe wall needs further development.
- Both compared methods show high accuracy for different seasons.
- These results lay basis for further developing method for specific Ladakhi Trombe wall.

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Sources

www.fhnw.ch/technik