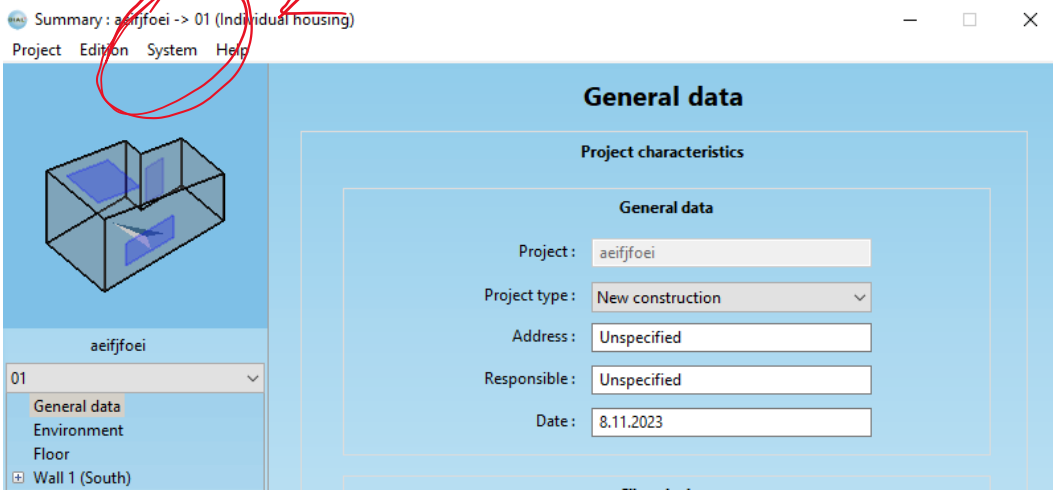
DIAL – INTRO



TASK 1

Indoor environmental quality test.

FORMAL REQUIREMENTS - each report will contain:

- Author´s name and photo
- Description of the space - the function, location, brief information about the design and used materials. Description of the openings and shading strategies, if any. Use the pics of 3D model from DIAL+.
- 1st stage outcomes, with comments, own summary, and suggested strategies
- 2nd stage outcomes, with comments, summary etc.

STAGE 1: Use DIAL+ software to simulate indoor environment in a simple room.

1/ Design a single space – choose a space you know – your own room, place where you spend time at work/at school/ … Place it to your hometown/ home land / area you analysed in the 1st assignment or any other location you know well. See the options in the Dial+ climate data. Define all design parameters (surrounding buildings, windows, materials, …) according to the reality or close to it.

2/ Define simulation parameters: Daylighting and Thermal (including minimal needed technology parameters such as (see Fig. 1.):

– set natural ventilation to 1 gear, Cooling strategy as Manual openings only during daytime. To optimize the model, later you can try other options of the cooling strategy to see the effect.

- At the first stage, set no heating devices and no electric cooling systems. This is good way to be able to set the natural behaviour of the room. Once the model will be working according to your experience, add heating strategy (radiators), and cooling systems (if needed).

- Set target cooling temperature Tmax1 to 25°C (highest comfortable temperature, higher temperature is considered overheating). It will help us later to control the thermal comfort towards the Passiv Haus standards.

- No detailed artificial lighting specification is needed to get general feedback about the daylighting and thermal comfort in the room. Please keep the "Standard" load in the definition of Lighting parameters.

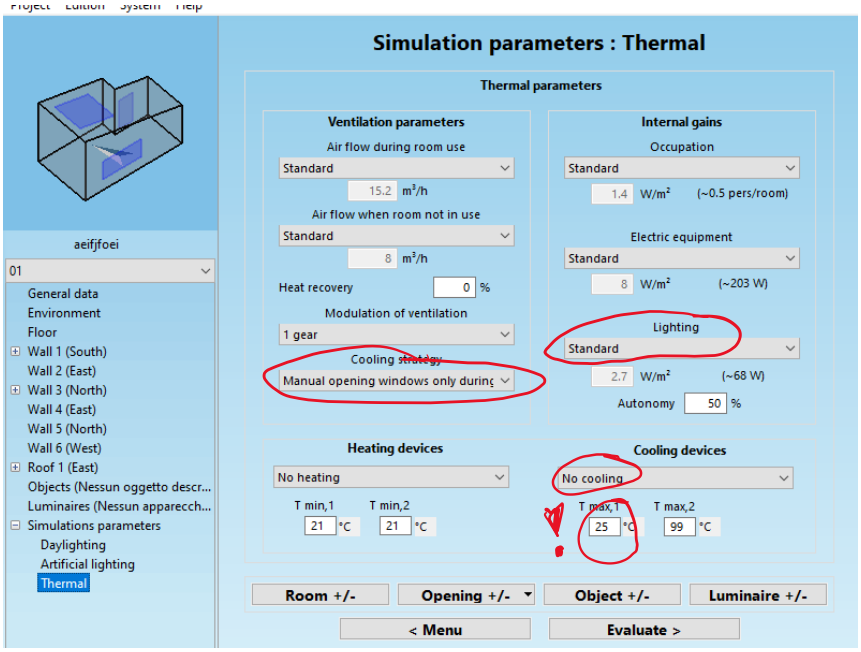


Fig 1 – definition of thermal parameters for simulation

3/ Calculate with these parameters and compare with target values from international standards.

4/ Create the report for Phase 1. Summarize main findings. Define problems and suggest strategies to fix it.

DAYLIGHTING - DAYLIGHT AUTONOMY

Set up: use radiance, height of work plan 0,85m, CIE Overcast sky;
Control, if design reaches required target values, see Fig. 2:

Non-residential:
- set Occupational hours to actual working hours
- target illuminance set to 300 lx, it must be fulfilled at least on 50% of the area, i.e., median for required illuminance 300 > 50 %
- illuminance of at least 100 lx on 95% area

Residential:
- set Occupational hours to sunset - sunrise
- target illuminance set to 150 lx, it must be fulfilled at least on 50% of the area, i.e., median for required illuminance 150 > 50 %

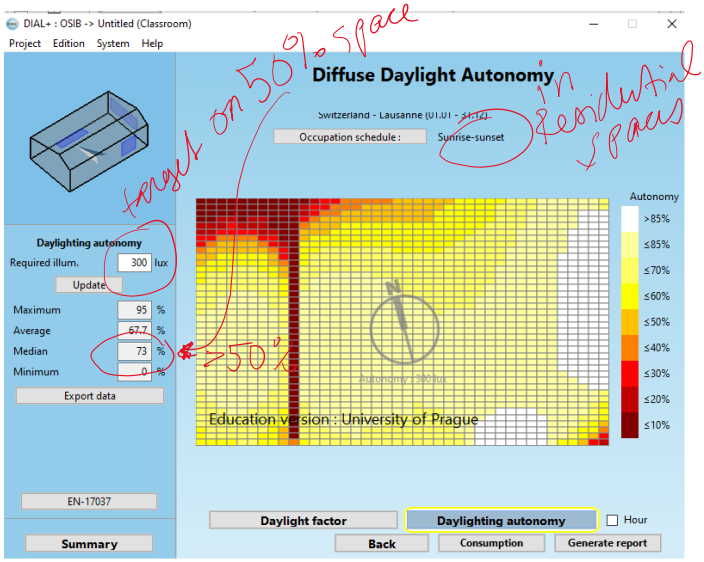


Fig. 2: target values for Daylight Autonomy

THERMAL COMFORT (& HEATING DEMANDS)

Set up: use simulation in 1-hour steps

Assess (see fig. 3) the number of overheated hours (1) and total heating demand (2), check the thermal comfort temperature distribution (3) as well as the temporal map (4). Heat gains caused by each opening separately can be find in Gain control analyses (5)

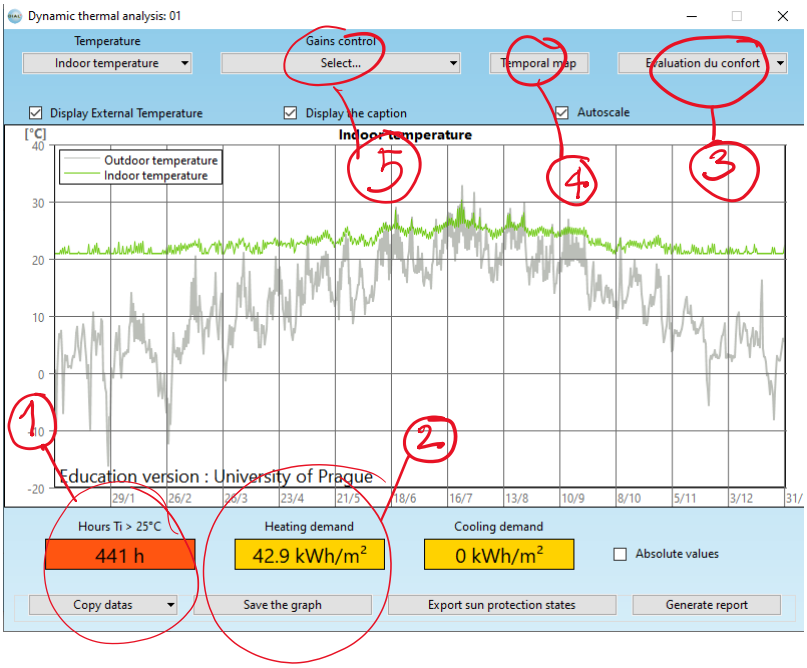


Fig 3: Thermal analysis after implementing the heating systems

Target value for the Hours over 25°C is defined in Passive house standard as maximum 10% of hours per year, i.e. 876h per year.

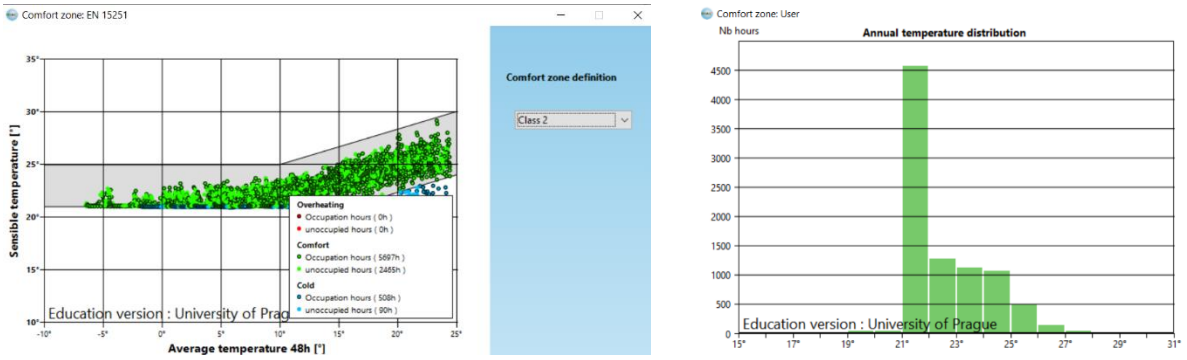


Fig. 4 - Thermal comfort - temperature distribution

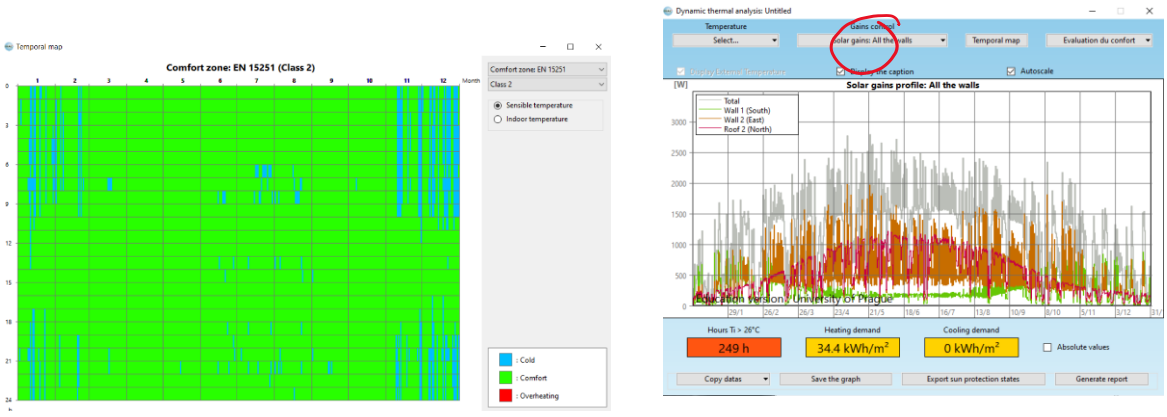


Fig. 5 – Temporal maps (annual comfort zones) and Heat gains analyses.

STAGE 2: Use DIAL+ software to optimize indoor environment in a simple room.

Goal: Limit the number of overheated hours and minimize heating demand to provide thermal comfort while keeping high quality of lighting (daylight autonomy) in the room.

Suggested strategies:

– change of the window parameters – adapt size, position, orientation, material, window openable area, materials and colours on the surfaces;

- materials –add/release insulation thickness or its position in the structure, increase/decrease thermal accumulation in materials,

- shadings - integration of fix shadings, definition of mobile shadings strategies, …

- use information from “Shading study” evaluation and “Natural ventilation”

1/ adapt the model for suggested strategies;

2/ run the analyses to see the effect;

3/ compare the original and new design, see the impact of the changes;

4/ Create the Report for Phase 2. Summarize main findings. Define if the optimization was successful.