Dynamic simulation as a tool for compliance approval with energy performance regulation

Tech Lic Mika Vuolle

Equa Simulation Finland Oy

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Before 2012 – Component based req.

- U-value requirements: U_{max} and $U_{referenece}$

  U_{Wall} = 0.17 W/ m²K U_{Window} = 1.0 W/ m²K

- Ventilation system annual heat recovery reference 45 %.
- Air tightness n_{50} as a reference value n_{50} = 2 1/h.
- Reference values of U-values, ventilation heat recovery and air tightness set the reference to the whole building heat losses.
- Reference building approach. Could be compensated – design freedom!
- Some other requirements as well:
  - window areas
  - specific fan power
  - etc.

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After 2012 – Primary energy req.*

- U-values and ventilation system annual heat recovery requirements are kept as the same.
- Air tightness is changed from n_{50} from $q_{50.}$
- Building heat loss requirements are kept pretty much the same as before.
- Improvements are set via the primary energy requirements [kWh_{PE} / m^2].
- The larger design freedom was sought-after!
- PE limits are set for 8 building categories
- Summer overheating analysis
  degree hours over cooling setpoint limit less than 150 °Ch.

*D3 National Building Code of Finland - Energy Efficiency of Buildings

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Standard use of buildings

Type of building	Period of use			Degree of use -	Lighting W/m²	Devices W/m²	Persons[a] W/m²	Density of persons m²/person
	hours	h/24h	d/7d					
Separate small house and terraced and linked house	00:00-24:00	24	7	0.6	8[b,c]	3	2	43
Residential building block	00:00-24:00	24	7	0.6	11[b,c]	4	3	28
Office building	07:30-18:30	11	5	0.65	12[c]	12	5	17
Commercial building	08:00-21:00	13	6	1	19[c]	1	2	43
Commercial accommodation building	00:00-24:00	24	7	0.3	14[c]	4	4	21
School building and day care centre	08:00-16:00	8	5	0.6	18[c]	8	14	5
Gym, large	08:00-22:00	14	7	0.5	12[c]	0	5	17
Hospital	00:00-24:00	24	7	0.6	9[c]	9	8	11

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Tool categories

A validated dynamic software should be used with:

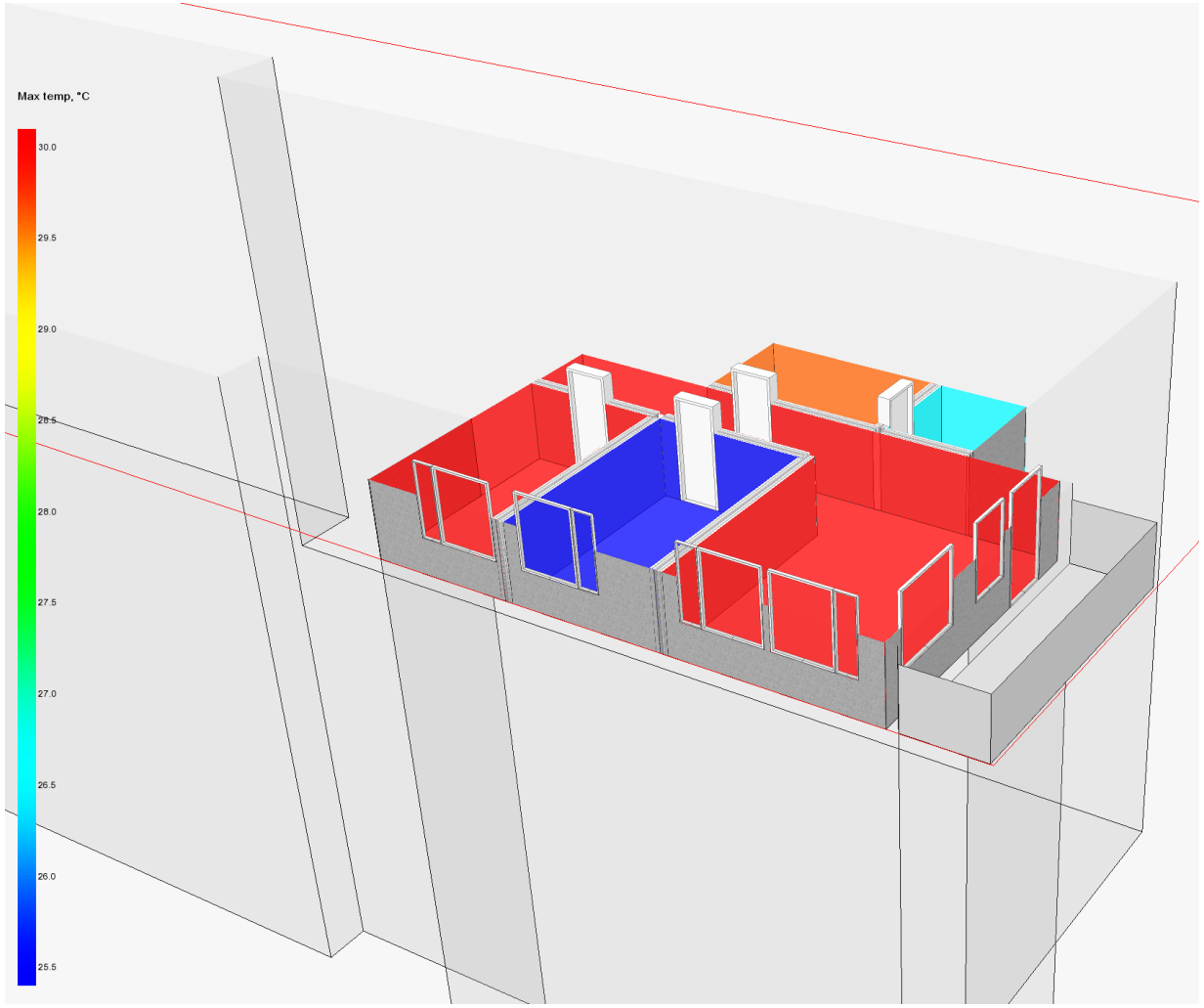
- cooled buildings
- buildings with demand based ventilation system
- overheating analysis of all buildings

Programs have been validated in accordance with the appropriate EN, CIBSE or ASHRAE standards or corresponding national standards or the IEA BESTEST tests.

Commercial validated softwares are available, like IDA Indoor Climate and Energy, RIUSKA etc.

Also good quality monthly method softwares are available. Market has worked.

Example – an overheating study



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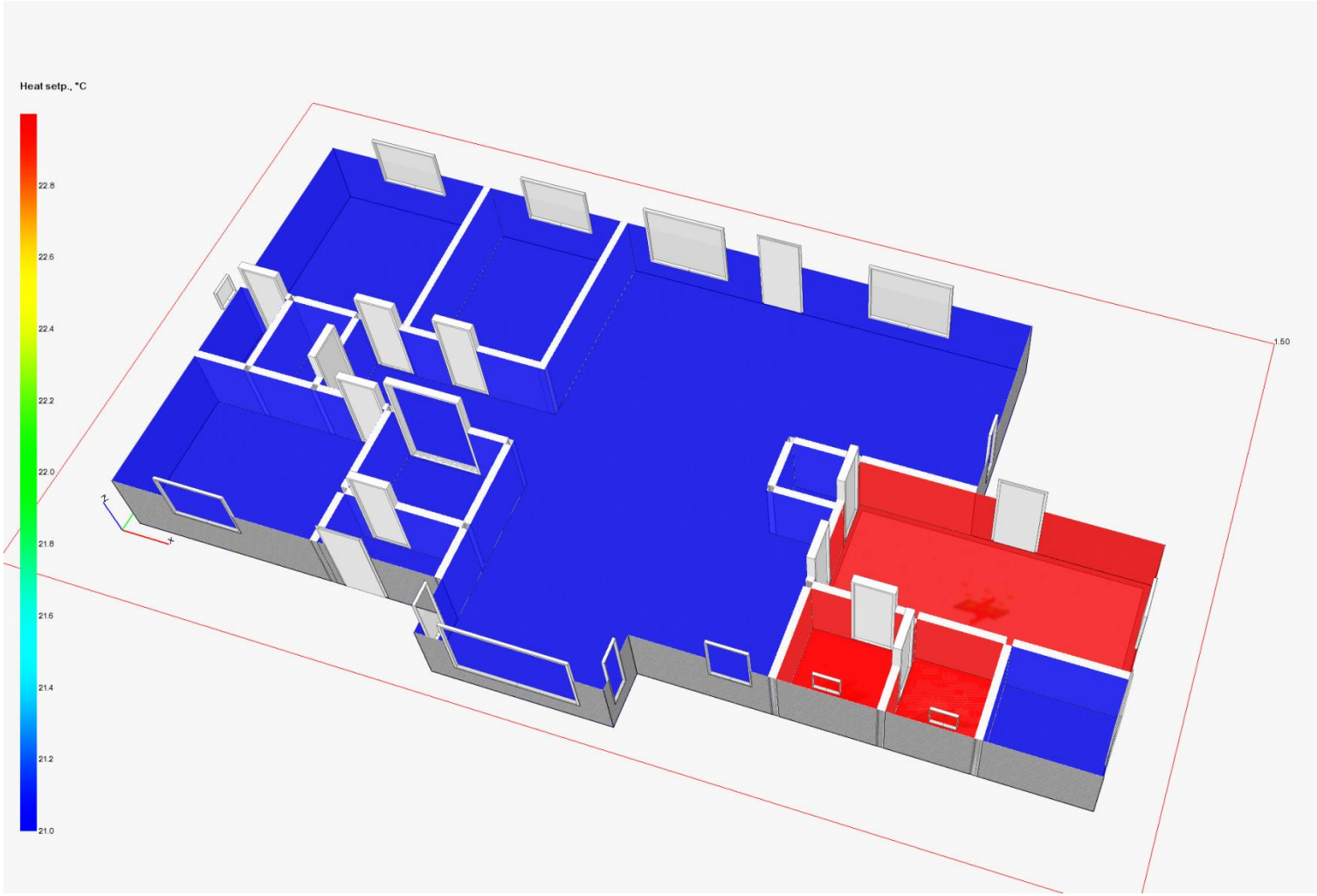
Examples –electrical underfloor heating



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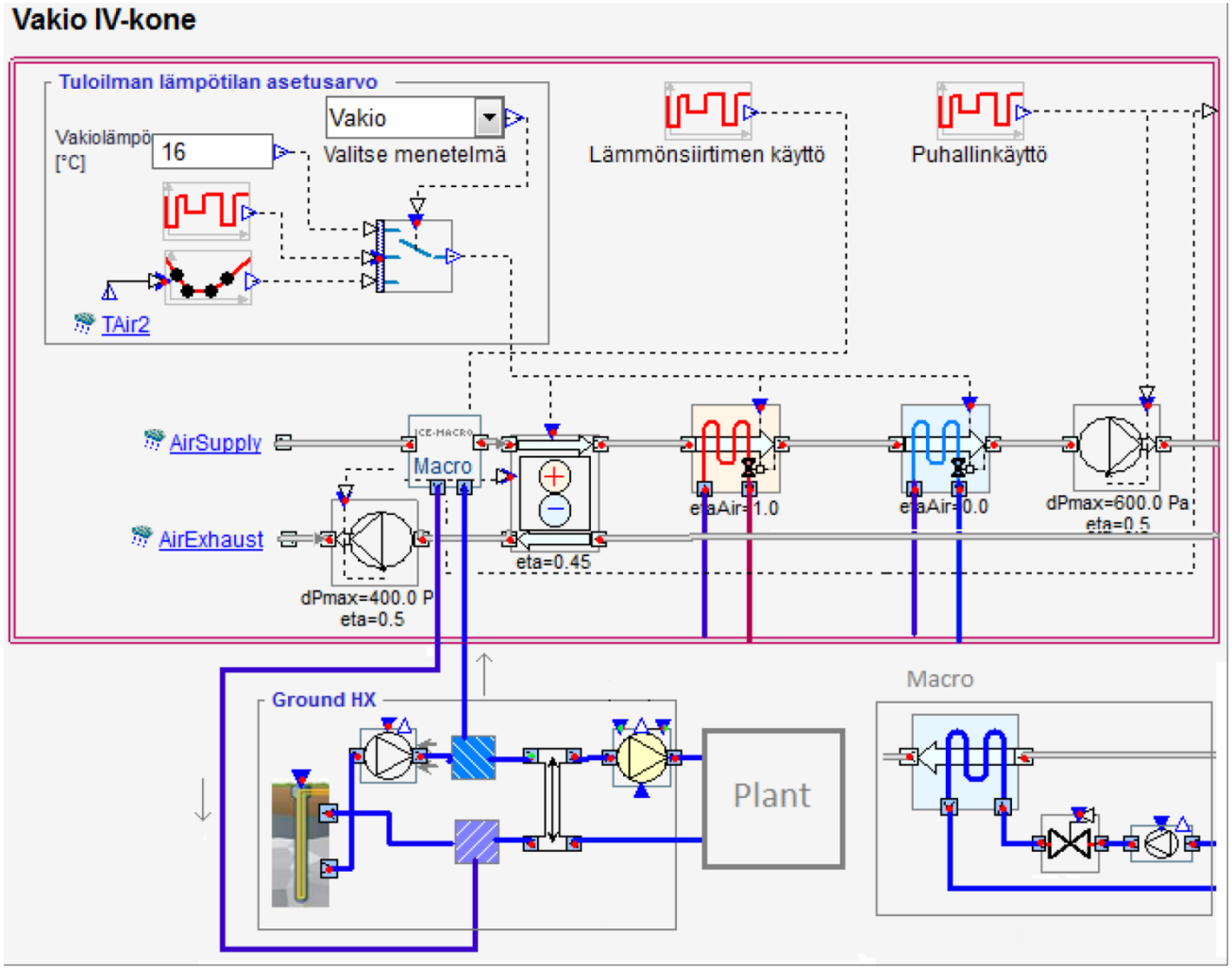
Examples –GSHP + preheating/ cooling coil



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A challenge

Demand based ventilation CO_2 + Temp with chilled beams

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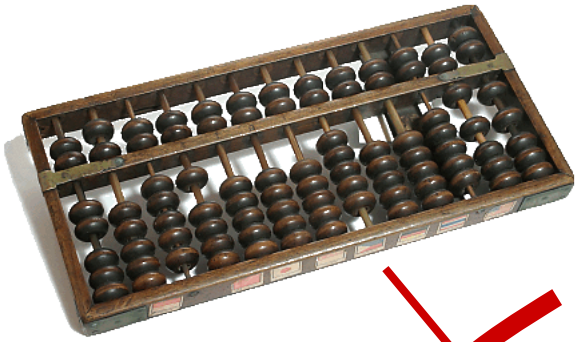
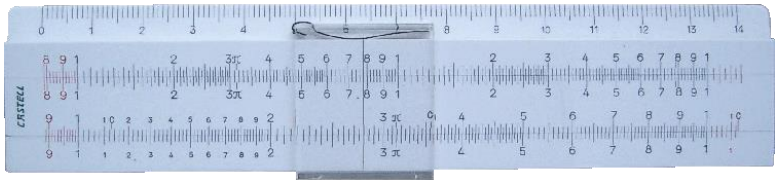
Conclusion

- The task of energy calculation is to support the decision making process with reliable results. And code compliance calculation should not be a separate task.
- Building code calculation methods seem to support the standard existing systems. How about new innovative systems? Or new combinations? When a new set of factors could be defined? Transparency?
- Better and wider scope of validation tasks to ensure quality of the softwares
- Better and reliable input information from the manufacturers at standard way and terms.
- How does our field look from outside the field? How about if it is compared to other industrial branches?

What are we looking for?





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