

VENTILATIVE COOLING IN NATIONAL COMPLIANCE TOOLS

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Disposition

- Contributing countries
- Objective of this activity
- Case building
- Method
- Results
- Conclusions
- Recommendations



Contributors

Country	Tool
Denmark	Be15 / BSim
Switzerland	Dial +
Belgium	EPB
Italy (South Tirol)	ProCasaClima
Austria	ArchiPHYSIK

* All contributing countries are also participants of Annex 62 on Ventilative Cooling



Objectives

- To investigate how ventilative cooling (VC) is considered in national compliance tools (tool features and barriers)
 - To indicate differences and similarities through tool review and results comparison
- To draw conclusions if VC is sufficiently addressed and influences energy and comfort in national compliance calculations.



Case building

- The same building (office / school) to be calculated by all contributors.
- Building is located in Switzerland (but compliance calculations are done with local national weather data)
- Construction details are provided (but each country was permitted to do changes to envelope U values to fulfill national building code)
- Energy compliance calc. at building level
- Comfort compliance calc. at room level



Room selected for comfort calculation



Method - first attempt

- All contributors were given large freedom and flexibility to perform calculations – It was specified they should follow national building codes.
- They received building and were simply asked to perform compliance calculations and report on energy performance and comfort (if required by national legislation). Heating and cooling demand, over temperature.
- They were asked to answer several open questions about compliance calculations and compliance tool.

Outcome:

- Large variety in the approach to the calculation case.
- It was not possible to compare results.
- It was hardly possible to draw any coherent conclusions.

But, not obtaining expected outcome is also an outcome!



Method - second attempt

- More controlled comparing to the first attempt.
- Contributors were still allowed to modify envelope to fulfill local legislations (none did)
- Though several major criteria with respect to ventilative cooling were predefined:
 - Ventilation strategies: mechanical and /or natural ventilation
 - Ventilation strategies: day and/or night operation
 - Air flows
 - Activation time
- Moreover predefined were:
 - People load
 - Appliance load
 - Heating recovery
 - Infiltration
 - Heating source and set point

Approach this time was closer to sensitivity analysis and variable parameter was ventilation strategy (predefined)



Method - predefined ventilation strategies

Strategy 1: Mechanical ventilation (all year), only occupied hours. Air flow at 0.3 l/sm²

Strategy 2: Strategy 1+ Natural ventilation, only occupied hours (summer). Air flow at 0.3 l/sm²

Strategy 3: Strategy 2 + Mechanical night ventilation. Air flow at 0.3 l/sm²

Strategy 4: Strategy 2 + Natural night ventilation. Air flow at 0.3 l/sm² ← Natural ventilation promotion

Strategy 5: Strategy 2 + Natural and mechanical night ventilation. Air flow at 0.3 l/sm²

Strategy 6: Strategy 5 + Air flow increased to 0.4 l/sm²

Strategy 7: Strategy 5 + Air flow increased to 0.6 l/sm²

Strategy 8: Strategy 7 + Only natural night ventilation at 1.2 l/sm² ← Natural ventilation promotion

Strategy 9: Strategy 5 + Air flow increased to 0.8 l/sm²

Strategy 10: Actual air flow as designed in case building (300 m³/h in class rooms and 150 m³/h in offices) + mechanical night ventilation and natural ventilation possibility.



Method – outcome parameters

- **Energy related:**

- Primary total energy to operate building
- Primary energy for cooling
- Primary energy for heating
- Primary energy for fan

- **Comfort:**

- Hours with temperature above 26 °C
- Hours with temperature above 27 °C



Results – summary of compliance tools features

National compliance tools

Compliance tool	Denmark	Italy-SouthTirol	Austria	Switzerland	Belgium
Tool 1	Be15	ProCasaClima 3.0	ArchiPhysic	DIAL +	EPB
Tool 2	*Bsim (comfort)	TTERMLOG Epix 7	Excel based tool	LESOSAI	
Tool 3		**DOCET	Other tools...	SIA-TEC	
Tool 4		Other tools ...		Other tools...	

- Denmark and Belgium have each one obligatory compliance tool (energy compliance calculation)
- Italy, Austria, Switzerland have many compliance tools.

* Documents thermal comfort but other dynamic tools can be also used
** Only for residential buildings
Obligatory tool
Not obligatory tool (other can be used)
Software used in this investigation



Results – summary of compliance tools features

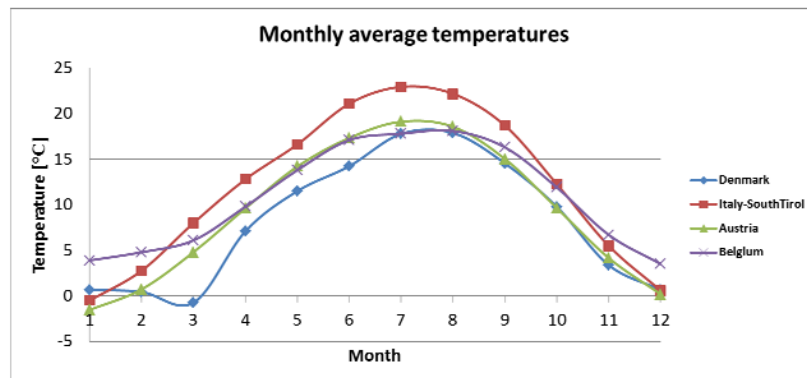
Compliance calculation: building, room , zone , not calculated

Compliance calculation	Denmark	Italy-SouthTirol	Austria	Switzerland	Belgium - office/educational use	Belgium - residential
Comfort	Room level	Not calculated	Room level (design day)	Room level	Not calculated	Building level
Energy	Building level	Building level	Building level	Heating : Building level Cooling : Room level	Zone level (with same functions)	Building level



Results – summary of compliance tools features

Calculation time step (energy compliance)



- Switzerland performs hourly calculations



Results – summary of compliance tools features

Set points (energy compliance)

Country	Heating set point	Mechanical cooling set point	Set point for increased ventilation	Night cooling activation	Comment
Denmark	20 °C	25 °C	23 °C	24 °C	Set points apply for standard energy performance calculation and in that respect they are considered as requirement.
Italy-SouthTirol	20 °C	26 °C	-	-	
Austria	20°C	27°C	-	25°C	
Switzerland	20 °C	26 °C	-	-	Heating set point applies for heating energy calculation and is therefore considered as requirement Cooling set point applies at the room level and is not mandatory -> recommended
Belgium - non residential	depends on function and inertia	depends on function and inertia	-	-	
Belgium - residential	18 °C	23 °C	-	-	

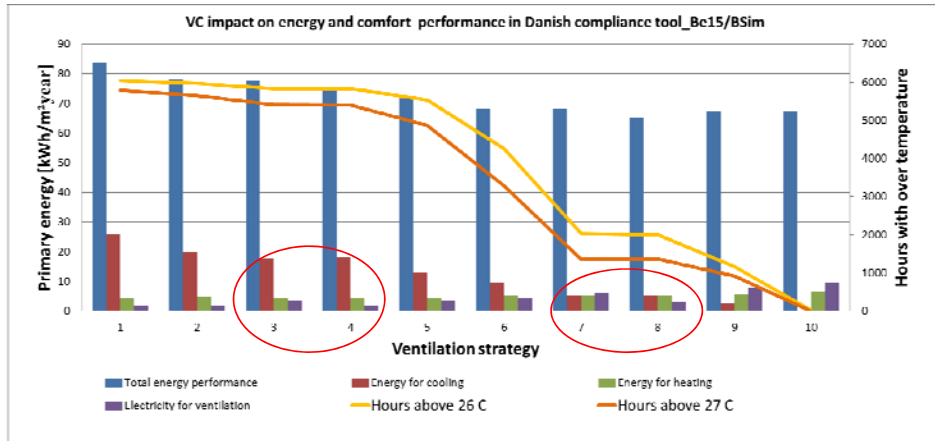
Results – summary of compliance tools features

Proof recognition (energy compliance)

Proof type	Denmark	Italy-SouthTirol	Austria	Switzerland	Belgium - office/educational use	Belgium residential
Burglary proof	should be regarded	not regarded	not regarded	not regarded	not regarded	regarded
Acoustic proof	should be regarded	not regarded	not regarded	not regarded	not regarded	not regarded
Air quality proof	should be regarded	not regarded	not regarded	should be regarded	not regarded	not regarded
Rain proof	should be regarded	not regarded	not regarded	not regarded	not regarded	not regarded
Insect proof	not regarded	not regarded	not regarded	not regarded	not regarded	not regarded

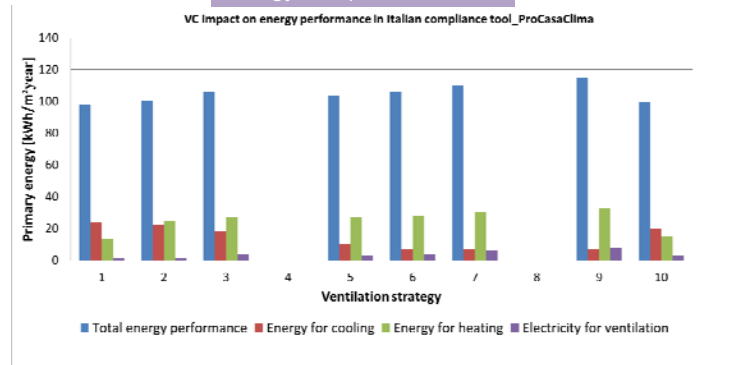
Results – case building Denmark

Energy and comfort compliance results



Results – case building Italy

Energy compliance results



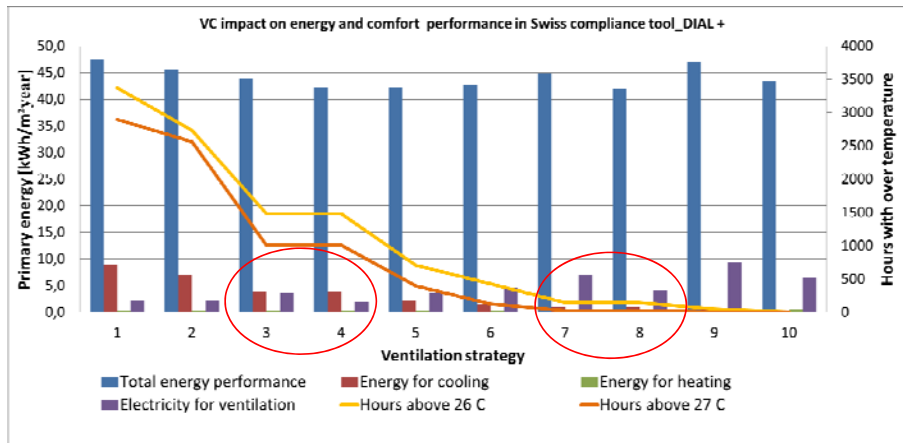
- Mechanical ventilation rates are set for summer and winter together
- Monthly calculations do not allow user to schedule higher ventilation rates over night time and by that take the account for thermal mass.
- Natural day ventilation is considered together with infiltration



* Comfort is not required in Italy

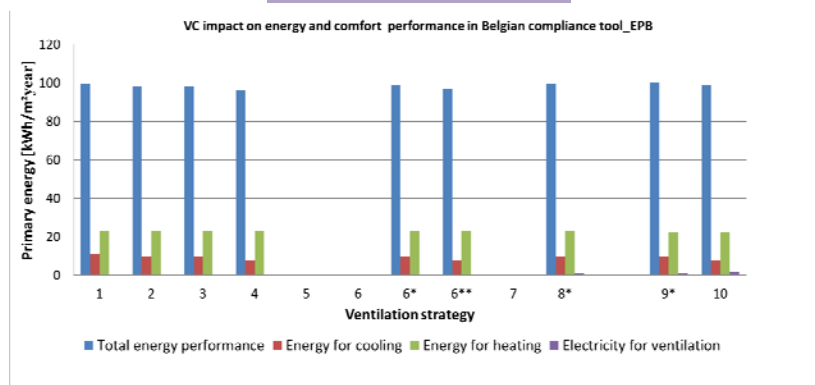
Results – case building Switzerland

Energy and comfort compliance results



Results – case building Belgium

Energy compliance results

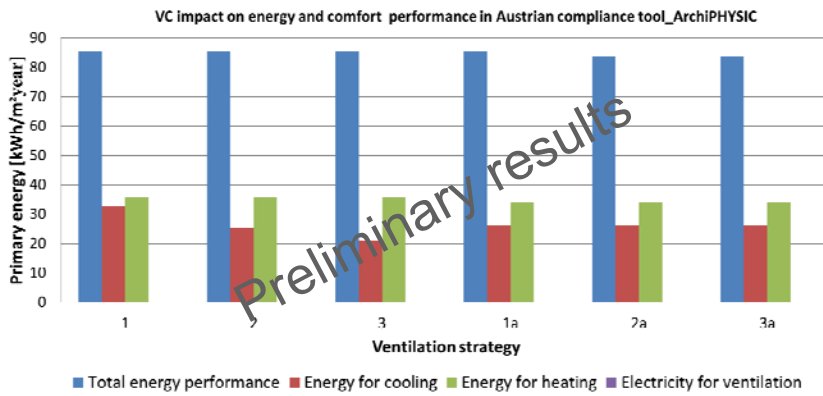


- It is not possible to combine natural and mechanical ventilation at night.
- Software seems to be insensitive to ventilation strategy.



* Comfort is not required in Belgium

Results – case building Austria



- Software seems to be insensitive to ventilation strategy.



THANK YOU

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