Fraunhofer Institut Bauphysik

Bauaufsichtlich anerkannte Stelle
für Prüfung, Überwachung und
Zertifizierung
Zulassung neuer Baustoffe, Bauteile
und Bauarten
Forschung, Entwicklung,
Demonstration und Beratung auf
den Gebieten der Bauphysik

Institutsleitung
Univ.-Prof. Dr.-Ing. Gerd Hauser
Univ.-Prof. Dr.-Ing. Klaus Sedlbauer

Specific study in relation to the EPBD – Requirements in the EU Member States to summer comfort and energy consumption for cooling (EPBD Article 4)

Supported by:
EPBD Building Platform represented by the coordinator INIVE eeig.

Executed by:
Fraunhofer-Institut für Bauphysik, Stuttgart - Holzkirchen - Kassel
Hans Erhorn
Heike Erhorn-Kluttig

In cooperation with:
Instituto Nacional de Engenharia, Tecnologia e Inovação, I.P. - INETI
Hélder Gonçalves
Susana Camelo

Stuttgart, 15. August 2008

Fraunhofer-Institut für Bauphysik
Nobelstraße 12 · D-70569 Stuttgart
Telefon +49 (0) 711/970-00
Telefax +49 (0) 711/970-3395
www.ibp.fraunhofer.de

Institutsteil Holzkirchen
Fraunhoferstr. 10 · D-83626 Valley
Telefon +49 (0) 8024/643-0
Telefax +49 (0) 8024/643-66
www.bauphysik.de

Projektgruppe Kassel
Gottschalkstr. 28a · D-34127 Kassel
Telefon +49 (0) 561/804-1870
Telefax +49 (0) 561/804-3187

Content

1 Foreword

This work has been initiated and supported by the Buildings Platform. The purpose of the investigation was to document the status of setting requirements in the Member States regarding summer comfort and energy consumption for cooling and the plans for the future.

In addition to this information statements concerning advantages and drawbacks of the currently used summer requirements have been provided by the individual Member State experts for other Member States to learn from.

The report follows the questions and hence the answers from the individual Member States. Answers from all Member States related to one specific question are thus found in the same section of the report. Summaries across questions are collected where possible and presented in the conclusions and recommendations section. The full questionnaire is found in Appendix I.

Sincere thanks to all the persons who kindly helped us with national information for this survey. A list of the experts that answered for the Member States is found in Appendix II.

2 Introduction

The objective of this study is to provide the EC DG-TREN (European Commission, Directorate-General for Energy and Transport) and all stakeholders with an overview of the requirements in the Member States to summer comfort and energy consumption for cooling (EPBD Article 4).

EPBD: Article 4 – Setting of energy performance requirements:
Member States shall take the necessary measures to ensure that minimum energy performance requirements for buildings are set, based on the methodology referred to in Article 3. When setting requirements, Member States may differentiate between new and existing buildings and different categories of buildings. These requirements shall take account of general indoor climate conditions, in order to avoid possible negative effects such as inadequate ventilation, as well as local conditions and the designated function and the age of the building.

EPBD: Article 2: Definitions:
Energy Performance of a building: the amount of energy actually consumed or estimated to meet the different needs associated with the standardised use of the building, which may include, inter alia, heating, hot water heating, cooling, ventilation and lighting.

The content of this report follows the order of the questions given in a questionnaire, which was circulated in the spring 2008 to representatives from the 27 Member States of the European Community plus Croatia and Norway. Among these countries 22 answers were returned from: Austria, Belgium (Flanders), Bulgaria, Cyprus, Czech Republic, Denmark, Finland, France, Germany, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Norway, Poland, Portugal, Romania, Slovak Republic, Slovenia, Sweden and United Kingdom (England & Wales). As support to the experts a report of the Concerted Action "Supporting transposition and implementation of the Directive 2002/91/EC CA – EPBD (2005 – 2007)" on "Summer requirements in building regulations" by Helder Gonçalves from May 2007 [1] was sent together with the questionnnaire.

In some countries there is a special situation as the legislation regarding requirements for building energy performance is defined on regional level. This means that definitions and requirements may differ from region to region. In the case for these requirements this is true for: Belgium, Italy and United Kingdom.

From the responses it was possible to get an overview of the current status of the requirements in the Member States to summer comfort and energy consumption for cooling. The answers have been analysed in the best possible way and supplemented by knowledge from the project group. The full questionnaire is given in Annex 1.

The study represents the situation in the listed Member States as of June 2008. It is based on the on the information provided by the respondents and not on analysis of legal texts. Therefore omissions may be possible.

3 Results of the questionnaire

The questionnaire was sent to 27 Member States (plus Croatia and Norway) or in case of Belgium, Italy and United Kingdom to the representative regions. Due to the short response time only 22 representatives could answer the questionnaire. While the countries from North, East and Central Europe had a rate of return of more than 85 %, only 50 % of the South European countries answered.

3.1 General information regarding present summer comfort and cooling energy requirements in the national building regulations

The evaluation of the questionnaire shows that 2/3 of all Members States represented in the study explicitly refer to summer conditions in their building regulations and have fixed corresponding requirements. This is true for all Central European and for most of the North and East European Member States. It is noticeable that only half of the countries in the South European region possess such regulations.

The existing requirements in the Member States are currently mainly set for new buildings. However in ¼ of the Member States there are also actual summer requirements for existing buildings, though mostly in connection with (major) renovations. In most countries the requirements cover residential and non-residential buildings. Two countries have fixed requirements to residential buildings only, one country to non-residential buildings only.

In 6 countries exist not only summer requirements but additionally also recommendations in the building regulation. One country possesses recommendations only. At least 5 countries have neither requirements nor recommendations regarding summer comfort or cooling energy performance in the currently valid building regulations.

In 8 countries there are mandatory measures at the building envelope, which have to be realised to avoid high solar gains. These contain requirements for minimum thermal insulation, solar protection and limited glazing area. Only very few (four) countries have defined mandatory measures at cooling systems or their components like peak load efficiencies, automatic controls and temperature set points. In two countries certain components/systems are not allowed to be installed (individual cooling systems, pumps without stop system).

13 out of the 22 responding countries have already included calculation procedures for cooling energy in their building regulations and 11 have also included calculation procedures for summer comfort, however most of them are simplified or use indirect indicators.

Table 1: Answers to questions concerning the general information regarding the present summer comfort and cooling energy requirements in the national building regulations.

Building types		1 Austria	2 Belgium-Flanders	3 Bulgaria	4 Cyprus	5 Czech Republic	6 Denmark	7 Finland	8 France	9 Germany	10 Hungary	11 Ireland	12 Italy	13 Latvia	14 Lithuania	15 Luxembourg	16 Norway	17 Poland	18 Portugal	19 Slovak Republic	20 Slovenia	21 Sweden	22 UK: England and Wales	Total
1.1 Does your building regulation explicitly refer to summer conditions?																								
New	Res.	X	X	X	No summer requirements	X	X	X	X	X	X			No summer requirements	X	X	X	No summer requirements	X	X			X	15
	Non-res.	X		X		X	X	X	X	X	X	X			X		X		X	X			X	14
Exist.	Res.	X							X		X				X	X			X	X				7
	Non-res.	X							X		X				X				X	X				6
Spec. buildings																				X				1
Comments						X	X	X			X				X	X			X	X		X	X	10
1.2 Does the building regulation contain summer requirements (mandatory)?																								
New	Res.	X	X	X	No summer requirements	X	X	X	X	X	X			No summer requirements		X	X	No summer requirements	X	X			X	14
	Non-res.	X		X		X	X	X	X	X	X	X					X		X	X			X	13
Exist.	Res.	X							X		X					X			X	X				6
	Non-res.	X							X		X								X	X				5
Spec. buildings																				X				1
Comments						X		X							X	X			X	X		X	X	8
1.3 Does the building regulation contain recommendations (not mandatory)?																								
New	Res.				No summer requirements			X						No summer requirements		X	X	No summer requirem.	X	X	X			6
	Non-res.							X				X					X		X	X				5
Exist.	Res.															X			X	X	X			4
	Non-res.																		X	X				2
Spec. buildings																				X				1
Comments								X	X		X				X	X		X			X	X		8
1.4 Does it contain mandatory measures at the building envelope?																								
New	Res.				No summer requirements				X				X	No summer requirements	X	X	X	No summer requirements	X		X		X	8
	Non-res.								X				X		X		X		X				X	6
Exist.	Res.								X						X				X		X			4
	Non-res.								X						X				X					3
Spec. buildings															X									1
Comments			X						X		X		X		X	X			X		X		X	9
1.5 Does it contain mandatory measures at (to be) installed cooling systems?																								
New	Res.	X			No summer requirements			X	X					No summer requirements			X	No summer requirements						4
	Non-res.	X						X	X								X							4
Exist.	Res.	X							X															2
	Non-res.	X							X															2
Spec. buildings																								-
Comments		X						X	X						X		X					X		6
1.6 Are certain measures/systems prohibited by the building regulation?																								
New	Res.				No summer requirements				X					No summer requirements				No summer requirements	X					2
	Non-res.								X										X					2
Exist.	Res.								X										X					2
	Non-res.								X										X					2
Spec. buildings																								-
Comments									X										X					2
1.7 Is a calculation procedure for cooling energy included in your building regulation?																								
New	Res.		X	X	No summer requirements	X		X	X	X	X	X		No summer requirements			X	No summer requirements	X		X			11
	Non-res.	X	X	X		X		X	X	X	X	X					X		X				X	12
Exist.	Res.		X	X		X			X	X	X	X							X		X			9
	Non-res.	X		X		X			X	X	X	X							X				X	9
Spec. buildings																								-
Comments				X		X		X		X	X	X			X				X	X			X	10
1.8 Is a calculation procedure for summer comfort included in your building regulation?																								
New	Res.	X	X		No summer requirements		X	X	X		X			No summer requirements			X	No summer requirements	X	X				9
	Non-res.						X	X	X		X	X					X		X	X			X	8
Exist.	Res.	X	X						X		X								X	X				6
	Non-res.								X		X								X	X			X	5
Spec. buildings																				X				1
Comments								X			X				X				X	X			X	6

Table 2: Comments to questions concerning the general information regarding the present summer comfort and cooling energy requirements in the national building regulations.

Country	Comments
1.1 Does your building regulation explicitly refer to summer conditions?	
Czech Republic	Czech technical standard refers to specified design values for indoor temperatures during summer.
Denmark	If change of use or major rebuild the requirements are the same as for new buildings.
Finland	Regulations are not applied to (1) Industrial buildings with high internal process heat loads, (2) Summer cottages, (3) Green houses or other buildings that couldn't be used to their purpose, if regulations applied.
Hungary	Existing: in the case of major renovation.
Lithuania	Building Code of Heating and Ventilation refer to summer conditions.
Luxembourg	Existing buildings only in case of modifictation/extension.
Portugal	For existing buildings: Residential buildings: only in the case of strong rehabilitation. Non-residential buildings: in the calculation procedures.
Slovak Republic	Not specified on types and age
Sweden	The part on thermal comfort in the building code only refers to the winter conditions, but in the part on energy management it says that "Buildings shall be designed in such a way that energy consumption is limited by low heat losses, low cooling demands, efficient use of heat and cooling and efficient use of electricity." When it comes to the demands on the indoor temperature, there is a clause in part 6 saying "Buildings and their installations shall be designed so that the quality of air and water, as well as light, humidity, temperature and sanitary conditions are satisfactory during the building's working life, thereby avoiding conditions detrimental to human health." The conditions deterial to human health is defined by the National Board of welfare and health, in their regulations and general advice on temperature. The Swedish work environment authority puts up the demands in non residential buildings
UK: England and Wales	EPC recommendations include some relating to overheating
1.2 Does the building regulation contain summer requirements (mandatory)?	
Czech Republic	Czech technical standard contains requirement for maximum

Country	Comments
	temperature and maximum daily increase of internal temperature.
Finland	General requirement: All new buildings (residential and non-residential) should be designed so that overheating is avoided. To avoid overheating, structural shading shall be used in the first place to avoid mechanical cooling.
Lithuania	Requirements for limit indoor air temperature are in Hygiene Norm.
Luxembourg	Existing buildings only in case of modification/extension.
Portugal	Solar factor requirements.
Slovak Republic	Only for allowed max. temperature.
Sweden	Indirectly because the demands on the building is to build to avoid the problems.
UK: England and Wales	Not strictly speaking mandatory but "deemed to satisfy" ways of complying.
1.3 Does the building regulation contain recommendations (not mandatory)?	
Finland	The monthly average indoor temperature calculated with the national method D5 shouldn't exceed 25°C (guideline, not mandatory).
France	Recommendations are given in the energy performance certificate.
Hungary	Design input values on natural ventilation, night ventilation orientate the designer.
Lithuania	Requirements for indoor air temperature are in Hygiene Norm.
Luxembourg	Advise NOT to install air conditioning.
Slovenia	Reducing cooling needs with passive measures - design, shading, night ventilation.
Sweden	Part 9.5 says "Heating and cooling installations in buildings shall be designed in such a way that they provide adequate efficiency during normal operation." and "The demand for cooling shall be minimised by constructional and engineering measures. (BFS 2006:12) and as a general advice. "General recommendation: To reduce the demand for cooling in the building, further measures should be considered such as the selection of window size, window location, sun-shading, sunlight protection glass, electric efficient lighting and equipment to reduce internal heat loads, night cooling and accumulation of cold in the building structure."
1.4 Does it contain mandatory measures at the building envelope?	
Belgium-Flanders	If you don't fulfill the overheating requirement, than you have to change your envelope. Only in certain cases when you don't meet the requirement.

Country	Comments
France	When building envelope insulation is realised (new building) or is modified (existing buildings), minimal requirements (resistances) has to be respected.
Hungary	No mandatory measures but the algorithm is informative (g-value in summer, solar access, thermal mass).
Italy	Walls structure, shading.
Lithuania	Regulation for installation of windows and doors contains requirements for glass units and protection measures due solar radiation.
Luxembourg	If the part of glass > 30% of external walls and the roof sun protections have to be installed with a reduction factor FC<= 0,3.
Portugal	New buildings: Uvalues (max). Existing buildings: Uvalues in case of strong rehabilitation.
Slovenia	Solar protection (shading devices, glass transmittance).
UK: England and Wales	Glazing area limits (but see note above about "deemed to satisfy").
1.5 Does it contain mandatory measures at (to be) installed cooling systems?	
Austria	Regular inspection over 12 kW.
Finland	The cooling system – if used – has to be designed so that its efficiency is good during peak loads and part loads. The system has to be insulated well to avoid the condensation and thermal losses. No detailed guidelines or minimum values (efficiency) given for the cooling systems
France	When a cooling system is installed in a building (new or existing), requirements are to be respected : minimal performances, automatic regulation based on ambient temperature, pumps with stop system, regulation to avoid that cooling and heating system works at the same time in the same area.
Lithuania	Requirements for limit indoor air temperature are in Hygiene Norm.
Norway	The set point temperature for ventilation cooling systems is set to 22 degrees Celsius in the national procedure for energy calculation NS 3031 "Calculation of energy performance of buildings – Method and data".
Sweden	9.6 Efficient use of electricity. Building services installations, which require electrical energy, such as ventilation, lighting fixtures, electrical heaters, circulation pumps and motors shall be designed so that the power requirement is limited and energy is used efficiently.
1.6 Are certain measures/systems prohibited by the building regulation?	

Country	Comments
France	Systems that doesn't respect minimal requirements (minimal performance in existing buildings, pumps without stop system)
Portugal	In some cases it is not possible to use individual cooling/heating systems.
1.7 Is a calculation procedure for cooling energy included in your building regulation?	
Bulgaria	There is a calculation procedure for cooling load calculation based on the ASHRAE method.
Czech Republic	Calculation procedure is not included directly in the regulation, there is only a reference to the Technical Standard.
Finland	The indoor temperature of typical room or space in summer conditions has to be estimated when relevant. The calculation can be made according to the method set in the building regulations (D5) that follows the main principles of prEN13790. Also EN-standards and other methods can be used.
Germany	For residentials it is not really a calculation procedure but an addition to the maximum allowed primary energy demand by an amount for primary cooling energy.
Hungaria	A very simplified estimation is included, for problematic building simulation is advisable.
Ireland	For residentials a procedure is offered for calculating risk of overheating, but is not mandatory. For non-residentials, measures to minimise risk of overheating are required, and a calculation procedure is offered, but alternative procedures are also permitted.
Lithuania	Building Code of Heating and Ventilation has general instructions for calculation procedure.
Portugal	Existing buildings: only in the case of strong rehabilitation.
Slovak Republic	It will be done through 13790.
UK: England and Wales	Housing expected to be added in 2010.
1.8 Is a calculation procedure for summer comfort included in your building regulation?	
Finland	The monthly average indoor temperature can be estimated according to the national method D5. Also other calculation methods can be used (for example dynamic tools).
Hungary	Simplified estimation is included.
Lithuania	Building Code of Heating and Ventilation has general instructions for calculation procedure.
Portugal	No directly, but there are indoor conditions to be used in the energy calculation procedures for cooling.
Slovak Republic	Yes, but only for highest int. temp.

Country	Comments
UK: England and Wales	Several options.

3.2 Type of present summer comfort and cooling energy requirements in the national building regulations

The analysis of the questions concerning various possibilities for setting requirements to secure summer comfort and limit the cooling energy in the Member States leads to no clear tendency towards one influence parameter.

In five countries there are requirements for the limitation of the glazed window area, mostly related to the floor area (between 15 and 25 %). This limits in general not the actual building but refers to the underlying reference building. Therefore it is generally still possible to build totally glazed buildings, however it requires compensating measures to restrict the cooling loads to the same amount as in the reference building.

Firm requirements regarding shading systems exist in seven countries. In some of the countries these refer also to the reference building. Other countries combine the requirements to shading systems with defined window opening areas.

The most commonly set summer requirements by the Member States concern the thermal quality of building components. Eight countries possess such limits. Yet those requirements do not exist mainly in South European Member States, quite the contrary, in most instances this type of requirements is used in North and Middle Europe.

In eight countries there are requirements to the building mass though mainly again referring to the underlying reference building.

There is no country with minimum ventilation rates in summer for night ventilation. Some countries give recommendations to minimum ventilation rates, but those are mostly coupled with hygienic requirements (CO_2) and not specifically designed for summer conditions.

Holistic requirements concerning solar gains have been defined in 6 countries. Then the calculation method includes often the possibility to combine all relevant parameters (glazing area, glazing quality, thermal quality of building components, solar shading, building mass and night ventilation) to an overall parameter.

The summary of all single requirements (2.1 to 2.5) and the superior overall requirements (2.6) shows that 16 of the 22 analysed countries have requirements to the building design or the construction. There is no uniform

system, neither geographically nor climatically. The requirements seem to have been formed because of building traditional reasons.

Requirements to maximum overheating or cooling loads exist as well in few countries. Some countries have started to assess the theoretical cooling energy demand for buildings without air-conditioning systems in their calculation procedures. This ensures that the later installation of air-conditioning systems will not result in extremely high cooling loads.

The most commonly integrated requirements (in 10 of 22 countries) are though limitations to the total energy consumption or overall environment related values like net, delivered or primary energy demand. Increased cooling energy demands can thus be compensated by measures at the lighting, heating or ventilation systems.

Table 3: Answers to questions concerning the type of present summer comfort and cooling energy requirements in the national building regulations.

Building types		1 Austria	2 Belgium-Flanders	3 Bulgaria	4 Cyprus	5 Czech Republic	6 Denmark	7 Finland	8 France	9 Germany	10 Hungary	11 Ireland	12 Italy	13 Latvia	14 Lithuania	15 Luxembourg	16 Norway	17 Poland	18 Portugal	19 Slovak Republic	20 Slovenia	21 Sweden	22 UK: England and Wales	Total
2.1 Limitation of glazed areas or window openings																								
New	Res.							X						No summer requirements	X		X	No summer requirements						3
	Non-res.							X				X			X		X							4
Exist.	Res.														X									1
	Non-res.														X									1
Spec. buildings																								-
Comments								X	X			X			X		X							5
2.2 Shading requirements																								
New	Res.												X	No summer requirements		X	X	No summer requirements	X		X			5
	Non-res.											X	X				X		X					4
Exist.	Res.															X					X			2
	Non-res.																							-
Spec. buildings																								-
Comments									X			X			X	X			X					5
2.3 Maximum U-value requirements (not only for winter)																								
New	Res.		X		X	X			X					No summer requirements		X	X	No summer requirements	X					7
	Non-res.		X		X	X			X								X							5
Exist.	Res.		X		X				X							X								4
	Non-res.		X		X				X															3
Spec. buildings																								-
Comments			X												X									2
2.4 Minimum building mass requirements (inertia)																								
New	Res.	X											X	No summer requirements				No summer requirements	X	X				4
	Non-res.											X	X						X	X				4
Exist.	Res.	X																		X				2
	Non-res.																			X				1
Spec. buildings																				X				1
Comments									X			X			X				X					4
2.5 Minimum summer ventilation rate. If night ventilation is required please state under comments.																								
New	Res.								X					No summer requirements			X	No summer requirements						2
	Non-res.								X								X							2
Exist.	Res.								X															1
	Non-res.								X															1
Spec. buildings																								-
Comments									X						X		X							3
2.6 Limitation of solar gains																								
New	Res.			X						X				No summer requirements	X			No summer requirements	X					4
	Non-res.			X						X		X			X				X					5
Exist.	Res.														X									1
	Non-res.														X									1
Spec. buildings																								-
Comments									X	X					X				X					4
2.7 Limitation of overheating time. In case of no air-conditioning or in case of defect air-conditioning (worst case scenario).																								
New	Res.		X						X		X			No summer requirements	X		X	No summer requirements						5
	Non-res.								X		X	X			X		X							5
Exist.	Res.								X		X				X									3
	Non-res.								X		X				X									3
Spec. buildings																								-
Comments			X						X		X	X			X		X							6
2.8 Limitation of cooling energy needs. In case of air-conditioning or in case of no air-conditioning (theoretical cooling needs).																								
New	Res.								X					No summer requirements			X	No summer requirements	X	X				4
	Non-res.	X							X								X		X	X				5
Exist.	Res.								X											X				2
	Non-res.	X							X											X				3
Spec. buildings																				X				1
Comments		X							X											X				3

Table 3: Answers to questions concerning the type of present summer comfort and cooling energy requirements in the national building regulations. (Cont.)

Building types		1 Austria	2 Belgium-Flanders	3 Bulgaria	4 Cyprus	5 Czech Republic	6 Denmark	7 Finland	8 France	9 Germany	10 Hungary	11 Ireland	12 Italy	13 Latvia	14 Lithuania	15 Luxembourg	16 Norway	17 Poland	18 Portugal	19 Slovak Republic	20 Slovenia	21 Sweden	22 UK: England and Wales	Total
2.9 Overall requirement. CO_2-emission or primary energy incl. cooling energy.																								
New	Res.		X			X	X		X	X				No summer requirements			X	No summer requirements	X		X			8
	Non-res.		X			X	X		X	X		X					X		X					8
Exist.	Res.								X	X											X			3
	Non-res.								X	X														2
Spec. buildings																								-
Comments						X	X		X	X	X						X				X			7
2.10 Others																								
New	Res.						X							No summer requirements				No summer requirements						1
	Non-res.						X																	1
Exist.	Res.																							-
	Non-res.																							-
Spec. buildings																								-
Comments							X																	1

Table 4: Comments to questions concerning the type of present summer comfort and cooling energy requirements in the national building regulations.

Country	**Comments**
2.1 Limitations of glazed areas or window openings.	
Finland	Glazing area; reference value 15 % of floor area and max. 50 % of façade area, note: the purpose of this is mainly because of the thermal losses of the heating, but also has an effect on the summer comfort.
France	Limitations are included in the calculation of the reference building. The consumption and summer comfort of the project building must be better than this reference building.
Ireland	Suggested as examples, not mandatory.
Lithuania	For buildings of 1950 -1995 year construction: up to 20 % from floor area. New buildings: reduction of required U-value when area of windows is more 25 % of wall area.
Norway	Maximum 20% of heated floor area.
2.2 Shading requirements.	
France	Near and far shades are included in the calculation of the reference building. The consumption and summer comfort of the project building must be better than this reference building.
Ireland	Suggested as examples, not mandatory.
Lithuania	In accordance with window type Regulation on Windows and Doors requires shading measures.
Luxembourg	If the part of glass > 30% of external walls and the roof sun protections have to be installed with a reduction facto FC <=

Country	Comments
	0,3.
Portugal	Not directly but included in the calculation procedure.
2.3 Maximum U-value requirements (not only for winter).	
Belgium-Flanders	Existing buildings: only new and renovated parts.
Lithuania	Only for winter.
2.4 Minimum building mass requirements (inertia).	
France	Daily and seasonly inertia are fixed in the calculation of the reference building. The consumption and summer comfort of the project building must be better than this reference building.
Ireland	Suggested as examples, not mandatory.
Lithuania	Building mass (inertia) is included into determination of design outdoor temperature value.
Portugal	Not directly but included in the calculation procedure.
2.5 Minimum summer ventilation rate. If night ventilation is required please state under comments.	
France	Minimum ventilation rate is required by another regulation (hygienic regulation, for residential building, it's defined by the arrêté du 24 mars 1982).
Lithuania	Calculation of ventilation is based on estimation of overall heat gains in considered spaces.
Norway	Minimum values for ventilation rate to be used in energy calculations are set in national procedure for energy calculation NS 3031.
2.6 Limitations of solar gains.	
France	Solar factors for glasses and walls are fixed in the calculation of the reference building. The consumption and summer comfort of the project building must be better than this reference building.
Germany	For buildings without air-conditioning.
Lithuania	In accordance with window type Regulation on Windows and Doors requires special measures.
Portugal	Not directly but included in the calculation procedure.
2.7 Limitation of overheating time. In case of no air-conditioning or in case of defect air-conditioning (worst case scenario).	
Belgium-Flanders	Indicator of overheating may not be higher than 17500 Kh.
France	In case of building without air-conditioning or in witch air-conditioning could be avoided, the maximum conventional interior temperature of the project building must be inferior to the same indicator, calculated for the reference building.

Country	Comments
Hungary	No clausula on defect.
Ireland	Suggested as guidance, not mandatory.
Lithuania	Limitation of indoor air temperature by Hygiene norm.
Norway	Upper temperature for indoor air should not exceed 26 degrees Celsius more than 50 hours pr. year in areas for occupational activities.
2.8 Limitation of cooling energy needs. In case of air-conditioning or in case of no air-conditioning (theoretical cooling needs).	
Austria	In case of air conditioning limitation of cooling energy and in case of non air conditionings minimum building mass.
France	A project building with air-conditioning and in witch air-conditioning could be avoided (defined in the regulation), the consumption of the project must be inferior to a reference building without air-conditioning. In the other cases of buildings with air-conditioning, the consumption of the project must be inferior to a reference building with performant air-conditioning.
Slovak Republic	Not in regulation, but ib decree.
2.9 Overall requirement. CO_2-emission or primary energy incl. cooling energy.	
Czech Republic	The building has to fulfil the EP requirements (expressed in delivered energy).
Denmark	Mechanical cooling is included in the total requirement to maximum (primary equivalent) energy supply needed to the building.
France	Primary energy global requirements.
Germany	For buildings with air-conditioning.
Hungary	Primary energy consumption is limited, the cooling energy need is included.
Norway	Net energy demand.
Slovenia	Maximum net energy demand.
2.10 Others.	
Denmark	Overheating (more than 26°C) is assumed removed by a standard AC if no mechanical cooling is installed. The consumption for this is included in the needed energy supply to the building.

3.3 Details on calculation procedure

As discussed in chapter 3.1, in 13 out of the 22 responding countries a calculation procedure for cooling energy already exists as part of the building regulation. In six of these countries, the method is CEN conform. In most cases it is a national application of EN ISO 13790.

Most of the countries that have applied a calculation procedure for cooling energy use a monthly based calculation method. Three countries allow alternatives to the monthly method such as an hourly method or simulation tools. Only one country (France) uses as only method the simplified hourly calculation method from EN ISO 13790. In Ireland there is no preference for any of the method types, neither CEN nor a national method. Any method and programme is allowed.

The principles of the national methods are compiled in table 7.

Table 5: Answers to questions concerning the details of calculation procedures.

Building types		1 Austria	2 Belgium-Flanders	3 Bulgaria	4 Cyprus	5 Czech Republic	6 Denmark	7 Finland	8 France	9 Germany	10 Hungary	11 Ireland	12 Italy	13 Latvia	14 Lithuania	15 Luxembourg	16 Norway	17 Poland	18 Portugal	19 Slovak Republic	20 Slovenia	21 Sweden	22 UK: England and Wales	Total
3.1 Is the calculation procedure for the overheating time or the cooling energy needs CEN conform?																								
New	Res.					X	X	X											X					4
	Non-res.			X		X	X	X		X									X					6
Exist.	Res.					X													X					2
	Non-res.			X		X				X									X					4
Spec. buildings																								-
Comments						X	X	X			X	X			X				X					7
3.2 Is it a monthly calculation method?																								
New	Res.		X			X	X	X									X		X		X			7
	Non-res.	X	X			X	X	X		X							X							7
Exist.	Res.		X			X													X					3
	Non-res.	X				X				X														3
Spec. buildings																								-
Comments				X						X		X			X		X							5
3.3 Is it an hourly calculation method (simplified)?																								
New	Res.					X			X								X							3
	Non-res.					X			X								X							3
Exist.	Res.					X			X															2
	Non-res.					X			X															2
Spec. buildings																								-
Comments						X						X			X		X							4
3.4 Is it a simulation method (hourly)?																								
New	Res.																X							1
	Non-res.																X		X					2
Exist.	Res.																							-
	Non-res.																		X					1
Spec. buildings																								-
Comments												X					X							2

Table 6: Comments to questions concerning details of calculation procedure.

Country	Comments
3.1 Is the calculation procedure for the overheating time or the cooling energy needs CEN conform? If yes refer to specific CEN standard under comments.	
Czech Republic	EN ISO 13790.
Denmark	EN/ISO 13790.
Finland	National method D5 is adapted from prEN 13790 monthly method with modifications.
Hungary	No CEN related, simple estimation of daily mean indoor temperature, based on quasi steady state equation + amplitude, depending on thermal mass.
Ireland	Different methods are allowed.
Lithuania	At present there is no special calculation procedure for cooling - it shall be introduced in near future.

Country	Comments
Portugal	CEN 13792.
3.2 Is it a monthly calculation method?	
Bulgaria	A procedure based on EN ISO 13790 has been tested. Significant deviations comparing to hourly dynamic method have been found for some types of buildings due to the heat transfer through the roof. There is no accurate CEN standard for calculation of U-value for summer conditions.
Germany	For residentials it is a simplified yearly method (addition of an amount of primary cooling energy).
Ireland	Different methods are allowed.
Lithuania	In regard to existing EPB certification regulation it will be monthly with some hourly details.
Norway	Allowed for simple buildings.
3.3 Is it an hourly calculation method (simplified)?	
Czech Republic	Only for buildings with low heat inertia.
Ireland	Different methods are allowed.
Lithuania	In regard to existing EPB certification regulation it will be monthly with some hourly details.
Norway	For large complex buildings with ventilation cooling, dynamic loads etc.
3.4 Is it a simulation method?	
Ireland	Different methods are allowed
Norway	For large complex buildings with ventilation cooling, dynamic loads etc.

Table 7: Answers to question concerning the description of the national methodology and calculation procedure.

Country	Answers
3.5 Describe your national methodology and calculation procedure and include the following points: - Are internal gains (people, lighting, equipment, system losses) taken into account? - Are ventilation strategies (natural/mechanical/night ventilation) taken into account? - Can passive cooling technologies be taken into account? If yes, please specify. - Characteristic output (final energy, primary energy, CO_2, maximum temperature, overheating hours). - Calculation time necessary for an average office building. - Methods on how to include systems that can't be calculated with your regular	

Country	Answers
calculation procedure (method of equivalence or similar).	
Austria	The calculation procedure takes into account internal gains, ventilation strategies (natural/mechanical/night ventilation) as well as passive cooling. The characteristic output is finale energy (details see ÖNORM B 8110-3, ÖNORM B 8110.-6 and ÖNORM H 5058).
Belgium-Flanders	Monthly method, including internal gains and solar gains. It is not possible yet to bring into account ventilation strategies and passive cooling technologies (a study is launched to ameliorate the calculation procedure on the cooling/overheating calculation). The output is primary energy use for cooling and for residential buildings an overheating indicator. If you have an innovative system, there are two ways to evaluate it. One way is for systems produced by a manufacturer: he can get a declaration of equivalence. The other way is for systems specific in one building, this method is under development and will be based on hourly simulations.
Bulgaria	The Bulgarian national methodology is based on calculation and measurement. The theoretical model of the building is callibrated with measured data for the energy consumption in the building for past period (usually for the past 2-3 years). The methodology includes all the components required by the Directive. Natural ventilation is evaluated by simulation as infiltration. Some simple passive cooling technics are calculated very easy by the software, other are to be implemented into the calculation procedure. The output results present: final energy, primary energy - both by processes: heating, ventilation, DHW, etc., CO2. No results for the maximum temperature and the overheating hours. The time necessary for summer modelling of the building is less than for winter, because significant part of the input data are used from the "winter" input.
Cyprus	The national methodology under discussion will probably take into account the following: Internal gains (people and equipment including lighting on average basis for residential buildings, more detailed calculation for non residential buildings) Ventilation (natural and mechanical) No passive cooling methods at the moment.
Czech Republic	The cooling energy demand can be calculated from monthly, daily and hourly simplified values. In the method we have not used degree-day method. Ventilation modes are take into account in the national methodology. The calculation method also includes heat gains (internal and external) - internal heat gains from occupants, appliances, lighting influences. Passive cooling is not taken into account. Calculation output is

Country	Answers
	delivered energy. Calculation time for an average office building to perform only cooling demand is about 2 hours (if all input data are available).
Denmark	The Danish methodology and calculation procedure in relation to summer comfort and energy consumption for cooling includes the effect of: - Window orientation, glazing size and type (inclusive of solar rejecting glazing), permanent shading (overhang, fins, horizon angle) and movable solar shading (external, between panes, internal) inclusive of control dependent on external solar radiation - Internal gains (persons, equipment etc.) inclusive of lighting and lighting control and also heat loss from boilers and pipes (room heating and DHW) dependent on insulation and control - Ventilation: Natural, mechanical and hybrid inclusive of window airing; Occupied hours and none occupied hours ("night" time) - Building thermal mass The same methodology and calculation procedure is used for residential and non-residential buildings. The building is in all cases assumed to be one thermal zone. The global efficiency of the cooling system inclusive of all losses is to be given by the person performing the calculation together with the increase in cooling demand due to dehumidification. In the case of overheating in rooms (more than 26°C room temperature) and no mechanical cooling installed, the overheating is assumed removed by a standard AC unit. Mechanical cooling is to be assumed for the whole building if mechanical cooling covers more than 20% of the gross floor area. The calculation of summer comfort and energy consumption for cooling is an integrated part of the total calculation together with all the other demands included in the needed energy supply to the building e.g. room heating, DHW, power for pumps, fans, lighting etc. The specific additional time for calculating summer comfort and energy consumption for cooling together with all the other demands is very limited for all building types residential and non-residential. The reason for this is the re-use of data from the heating calculation and the use of a one zone thermal model only. Depending on initial design of the building it can of course in some cases require an effort and take time to adjust the design of a building to meet the requirements. Special systems e.g. special passive cooling technologies that can't be calculated by the Danish calculation procedure is handled by the building authorities in relation to the individual building projects. Normally used methods are different variations of equivalence of performance e.g. equivalent

Country	Answers
	efficiency, equivalent thermal capacity, equivalent off set of cooling demand or/and equivalent energy consumption.
Finland	Internal gains: YES Ventilation strategies: Can be used Passive cooling: YES (solar shading, night cooling, internal mass), NO (ground heat exchangers) Final energy, maximum monthly average indoor temperature: YES. Primary energy, CO2, overheating hours: NO Calculation time for an average office: 2 h, if input data is known If systems that are not covered by the national calculation method D5 should be used, other dynamic methods are allowed to be used
France	The calculation method takes into account : all internal gains, solar gains, ventilation strategies and systems (natural/assisted natural/mechanical simple or double flow), possibility to take into account free-cooling, thermic recuperation on water distribution by thermodynamic system ("PAC sur boucle d'eau"). The indicators used for regulation are primary energy conventional consumption and maximum conventional temperature. The calculation take an average of one minute. Checking and introducing calculation entries takes from half an hour for an individual house, to some days for an big and complex building as an hospital.
Germany	Implementation of a new building regulation concerning requirements (Energieeinsparverordnung) and calculation (DIN V 18599; July 2005) of energy performance of buildings, including cooling. The regulation distinguishes between residential and non-residential buildings. For residential buildings the requirements are based on benchmarks for buildings with a comparable size. These benchmarks cover only the energy demand for heating, ventilation and domestic hot water. If cooling equipment will be additionally installed in residential buildings, this energy demand has to be subsidised by a lower demand for the heating and DHW system. For non-residential buildings the requirements based on the energy demand of a reference building. This reference building has the same size and function as the planned or analysed building, but has fixed (reference) technologies for building construction and service systems. The planned or analysed building can subsidise between different technologies, but the designer has to guarantee that the total primary energy demand of the real building is below the total primary energy

Country	Answers
	demand of the reference building. Is for example the cooling demand higher than in the reference building, the energy demand for lighting, heating, ventilation or warm water in the real building has to be reduced in order to fulfil the limitation. Additional there exists a building regulation (DIN 4108) since more than 50 years with recommendations for the design of buildings in order to avoid overheating problems. These recommendations have been extended to specific requirements for the maximum solar gains for new buildings since 1995 with the latest update in July 2003. The designer of a building has to document that the solar gains of a building or a zone does not exceed a limited value. This limited value depends on different influence factors like climatic region, building mass, night ventilation, orientation, glazing system and shading systems. This documentary proof is obligatory in order to avoid high cooling loads and limits the energy demand which can be subsidised by other building service systems (see DIN V 18599). For small window to floor area ratios (< 10%) no proof is needed. The procedure: Sreal < Smax with: Sreal: the solar gain factor of the most extreme room in the building Smax: the max. allowed solar gain factor for all rooms in the building Sreal = (Aw/AG)*fC*g Sreal: the solar gain factor of the most extreme room in the building with: Aw/AG: fraction of window to floor area of the room g: the solar gain fraction of the glazing system fC: shading fraction from shading devices Smax = Sum of Sstrategies with: Smax: the max. solar gain factor for all rooms in the building Sstrategies: correction factors depending on their influence to the overheating risk Strategies:

Country	Answers
	- Climatic regions: 0.04 (standard); 0.015 – 0.03 - Building construction: 0.115 fenvelope(standard); 0.06 – 0.1 - Night ventilation: 0.2 – 0.3 - Solar protecting glazings: 0.03 - Orientation: 0.1 fwindow The building energy regulation (Energieeinsparverordnung) demands that after the renovation of the building the owner has to assure that the energy performance will not be worse than with the original installed equipment. Therefore the former requirements from the stage of erecting a building are at least kept for the existing building stock.
Hungary	The sum of the gains for a day should be calculated first. It includes: the internal gains (default values for some type of use: residential, school, office, taken from other standards for specific use) the solar gains (default values of irradiation for different orientations, "summer g-values, if movable shadowing devices are applied) - shadowing by opposite buildings or topography must be proven (shadow mask calculator provided free). Difference of daily mean indoor and outdoor temperature is to be calculated, using default ACH values (given in the function of the position of windows), correction for night ventilation should be used. The above mean temperature difference is limited in the function of the thermal mass (considering the different indoor temperature amplitudes)
Ireland	See Appendix E from Building Regulations Technical Guidance Document L 2006 at www.environ.ie.
Italy	-
Latvia	-
Lithuania	There is no mandatory calculation method. According to Regulation of Heating and Ventilation it is possible to use EN calculation methods.
Luxembourg	-
Norway	Internal gains, ventilation strategies, night ventilation and passive cooling can be taken into account in the calculations. Technologies for passive cooling can be for instance solar shading and use of thermal inertia (thermal mass). Final output is the net energy demand for the respective building. Calculation time for average office building not known at the moment. Energy requirements in the Norwegian building regulations:

Country	Answers
	The new energy requirements in the Norwegian building regulations came into force on the first of February 2007. There is a two and a half year overlap with the previous requirements. I enclose an English translation of the Norwegian buildings regulations concerning energy requirements. In short, any building shall meet the requirements to energy performance, either according to § 8-21 a) - energy efficiency performance or § 8-21 b) – total net energy consumption. It should be noticed that energy demand for cooling is included in the threshold values for net energy demand in § 8-21 b). Minimum performances according to § 8-21 c) shall not be exceeded under any circumstances. The requirements will also apply to buildings undergoing major renovations. In addition, there is a requirement in the building regulations, which requires that the indoor climate in buildings shall provide satisfactory health conditions and comfort. The guidelines for the Norwegian technical building regulations specify a recommended upper temperature for indoor air. This is set to 26 degree Celsius in areas for occupational activities. It can be accepted that this indoor temperature is exceeded for the fifty highest hourly outdoor temperatures per year. Procedure for calculation: The national building code refers to the national procedure for energy calculation NS 3031 "Calculation of energy performance of buildings – Method and data", which again is based on EN ISO 13790 et. al. Specific requirements regarding summer requirements: • Calculation of total energy demand in 13 building categories, inclusive energy for cooling • For some building categories, offices, retail businesses, hospitals, universities, a dynamic calculation is required (hourly calculation or better). This is to check against overheating in areas used for occupational activities. • A dynamic calculation is also required if the building has cooling batteries in the ventilation system. • The set point temperature in the cooling calculations for ventilation based cooling shall be 22 degrees Celsius. • There is a lower limit to the allowed air change rate for net energy demand calculations. In addition zoning is required for buildings that receive a lot of solar heat gain. There are also requirements to zoning if there are different building categories, if there are different technical installations serving different parts of the building or if the internal gains are significantly different in different parts of the

Country	Answers
	building. With regard to the aspect of solar contribution, the procedure for energy calculation NS 3031 specifies that; "in cases where parts of a building gets lot of solar heat gain, and other parts of the building gets moderate solar heat gain, the building shall be portioned into zones for the energy demand calculations. As for buildings with moderate use of transparent areas, and efficient outside shading, it is sufficient to calculate the building as one zone". In the case of large window and glass areas and/or little efficient sun shading, the building shall be portioned into zones based upon the following • When the product of area of windows, doors and glass □sol, divided by the conditioned floor area and the total solar energy transmittance for window and shading, supersedes 5 % (□sol > 5 %), the building shall be portioned in at least three calculation zones - One zone with sun exposed facade (orientation south, southeast or southwest) - One zone with little exposure to the sun (north, northeast, northwest) - One zone in the middle of the building; • The depth of zones with sun exposed facades and facades with little exposure to the sun can be set to 4 to 5 meters. Where there is a very "slim" building design, overall depth less than 10 meters, one can reduce the number of zones to two, one sun exposed and one not exposed to the sun. • Conservatories, atriums, glass buildings or similar with all nearly all facades of glass shall be calculated as at least one zone • Total solar energy transmittance for window and shading is defined in the detailed calculation procedures. With variable total solar energy transmittance on different facades, the values for the sun exposed shall be used (south, southeast, southwest) NOTE: For buildings where the product of area of windows, doors and glass, □sol, and the total solar energy transmittance for window and sun shading, is less 5 % (□sol < 5 %), there will normally be no need for zoning due to sun contribution.
Poland	-
Portugal	(Transfer of the marked text parts of the questionnaire:) Internal gains (people, lighting, equipment, system losses) are taken into account. Ventilation strategies (natural/mechanical/night ventilation) are taken into account.

Country	Answers
	Passive cooling technologies are taken into account. Characteristic output: primary energy, CO_2.
Slovak Republic	-
Slovenia	Internal gains are taken into account, very simplified (expressed as sum of all ginternal gains in W/m²). For new non-residential buildings it could be more elaborated, if the necessary data are available. Ventilation strategies are calculate according to SIST EN ISO 13790 Characteristic output is final energy.
Sweden	-
UK: England and Wales	-

3.4 Planned requirements regarding summer comfort and cooling energy in the national building regulations

In table 8 the different countries report on planned changes to the currently used procedure. The majority (12 of the 22) plan to make revisions of their methods within the next 5 years. Most of them are trying to implement a calculation procedure based on the principles of EN ISO 13790. Only very few are looking for improvements of the performance of single building elements or component efficiencies. Three countries (two from the South) are in progress of setting up requirements for the first time.

The planned approaches follow the mainstream of the existing ones (analysed under 3.1). They all plan to implement a calculation procedure for cooling energy in the building regulation and to have mandatory measures fixed for the building envelope, such as minimum U-values and minimum shading coefficients.

Table 8: Answers to question concerning the defined plans to change the present summer requirements in the national building regulation within 5 years.

Country	Answers
4.1 Are there defined plans to change the present summer requirements in the national building regulation within 5 years? If yes please report on the planned changes. To be filled out only in case that there are summer requirements in the present national building regulation.	
Austria	No.
Belgium-Flanders	Not yet known. A change of calculation procedure is planned.
Bulgaria	The calculation procedure for winter conditions has been extended for summer. The base is EN ISO 13790. Same procedure for residential and non-residential buildings.
Czech Republic	(Transfer from questions 4.8 and 4.9) A calculation procedure for cooling energy and summer comfort has already been included in Decree No. 148/2007 Coll. on energy performance of buildings. If a building has or is designed to have a cooling or air-conditioning system the assessment in compliance with CEN Standards (esp. ČSN EN ISO 13790) has to be executed.
Denmark	There are no specific plans to change the existing requirements to summer comfort or cooling energy in the Danish Building Regulations. It might be considered to require calculations with more thermal zones for specific building types and situations in the future.
Finland	Not know at the present.
France	To follow the conclusions of the "Grenelle de l'Environnement", thermal regulations will be reinforced in 2010, 2012 and 2020.
Germany	It is planned that the residentials will be calculated with the same method as the non-residentials. Also the calculation of a theoretical cooling energy is in preparation. This would mean that all buildings, those with and without air-conditioning will calculate cooling energy needs.
Hungary	Probably the calculation method will be improved.
Ireland	-
Italy	No, they will be totally new ones.
Lithuania	(Transfer from questions 4.2 to 4.9) Especially regulation on EPB certification. The requirements of regulation on windows and doors will be extended.
Luxembourg	No changes of requirements in existing regulation for residential buildings are planed, only in the case of extension and/or modification of defined existing buildings. A modification of the

Country	Answers
	existing regulation about non residential buildings is at this time in elaboration. (Transfer from questions 4.2 to 2.9) Regulation for non-residential buildings in elaboration. It will contain mandatory summer requirements, recommendations, mandatory measures at the building envelope (high quality of the shading system), mandatory measures at (to be) installed cooling systems (high efficiency, tube insulation). A summer comfort calculation procedure will be included as well.
Norway	New energy requirements in the Norwegian building requirements came into force on the first of February 2007. The requirements are to be slightly adjusted within the next one/two years. The requirements are planned to be upgraded within the next five years, moving into the direction of low-energy buildings.
Portugal	Changes in the Epmax are necessary.
Slovak Republic	The regulation should be revised in 2009, latest 2010. There not exactly specified the change yet.
Slovenia	-
Sweden	-
UK: England and Wales	-

Table 9: Answers to questions concerning the planned requirements regarding summer comfort and cooling energy in national building regulations. To be filled out only in case that there are no summer requirements in the present national building regulation.

Building types		1 Austria	2 Belgium-Flanders	3 Bulgaria	4 Cyprus	5 Czech Republic	6 Denmark	7 Finland	8 France	9 Germany	10 Hungary	11 Ireland	12 Italy	13 Latvia	14 Lithuania	15 Luxembourg	16 Norway	17 Poland	18 Portugal	19 Slovak Republic	20 Slovenia	21 Sweden	22 UK: England and Wales	Total
4.2 Will your building regulation explicitly refer to summer conditions?																								
New	Res.	-	-	-		-	-	-	-	-	-	-	X	No summer requirem. planned	-	-	-	X	-	-	-	-	-	2
	Non-res.												X					X						2
Exist.	Res.																							-
	Non-res.																							-
Spec. buildings																								-
Comments					X																			1
4.3 Will the building regulation contain summer requirements?																								
New	Res.	-	-	-		-	-	-	-	-	-	-	X	No summer requirem. planned	-	-	-	X	-	-	-	-	-	2
	Non-res.												X					X						2
Exist.	Res.																							-
	Non-res.																							-
Spec. buildings																								-
Comments					X																			1
4.4 Will the building regulation contain recommendations?																								
New	Res.	-	-	-		-	-	-	-	-	-	-		No summer requirem. planned	-	-	-	X	-	-	-	-	-	1
	Non-res.																	X						1
Exist.	Res.												X											1
	Non-res.												X											1
Spec. buildings																								-
Comments					X																			1
4.5 Will it contain mandatory measures at the building envelope? If yes, please describe under comments.																								
New	Res.	-	-	-	X	-	-	-	-	-	-	-	X	No summer requirem. planned	-	-	-	X	-	-	-	-	-	3
	Non-res.				X								X					X						3
Exist.	Res.				X																			1
	Non-res.				X																			1
Spec. buildings																								-
Comments					X																			1
4.6 Will it contain mandatory measures at (to be) installed cooling systems? If yes, please describe under comments.																								
New	Res.	-	-	-	X	-	-	-	-	-	-	-	X	No summer requirem. planned	-	-	-		-	-	-	-	-	2
	Non-res.				X								X											2
Exist.	Res.				X																			1
	Non-res.				X																			1
Spec. buildings																								-
Comments					X																			1
4.7 Will certain measures/systems be prohibited by the building regulation? If yes please describe under comments.																								
New	Res.	-	-	-		-	-	-	-	-	-	-		No summer requirem. planned	-	-	-		-	-	-	-	-	-
	Non-res.																							-
Exist.	Res.																							-
	Non-res.																							-
Spec. buildings																								-
Comments					X																			1
4.8 Will a calculation procedure for cooling energy be included in your building regulation?																								
New	Res.	-	-	-	X	-	-	-	-	-	-	-	X	No summer requirem. planned	-	-	-	X	-	-	-	-	-	3
	Non-res.				X								X					X						3
Exist.	Res.				X													X						2
	Non-res.				X													X						2
Spec. buildings																								-
Comments					X																			1
4.9 Will a calculation procedure for summer comfort be included in your building regulation?																								
New	Res.	-	-	-		-	-	-	-	-	-	-	X	No summer requirem. planned	-	-	-		-	-	-	-	-	1
	Non-res.												X											1
Exist.	Res.																							-
	Non-res.																							-
Spec. buildings																								-
Comments																								-

Table 10: Comments to question concerning the planned requirements regarding summer comfort and cooling energy in national building regulations.

Country	Comments
4.2 Will your building regulation explicitly refer to summer conditions?	
Cyprus	No. (Transfer from question 1.1) It will refer only to the internal temperature of the buildings.
4.3 Will the building regulation contain summer requirements?	
Cyprus	Not decided yet. (Transfer from question 1.2) Probably it will refer to solar factors of the glazing and shading.
4.4 Will the building regulation contain recommendations?	
Cyprus	Yes. (Transfer from question 1.3) It will.
4.5 Will it contain mandatory measures at the building envelope? If yes, please describe under comments.	
Cyprus	Minimum U-value requirements and probably solar factor for the glazing.
4.6 Will it contain mandatory measures at (to be) installed cooling systems? If yes, please describe under comments	
Cyprus	Only maintenance and inspection with recommendations for improvements. (Transfer from question 1.5) It will refer to the system efficiency of the cooling system. otherwise the worse system efficiency is to be used in the calculations.
4.7 Will certain measures/systems be prohibited by the building regulation? If yes please describe under comments.	
Cyprus	Most probably, no.
4.8 Will a calculation procedure for cooling energy be included in your building regulation?	
Cyprus	Yes. (Transfer from question 3.2) It will be a monthly calculation method. (Transfer from question 1.7) The building regulation including that calculation procedure is

Country	Comments
	not in force yet.

3.5 Advantages and drawbacks of the summer requirements

Most Member States reported that it is a great advantage to use the methods from EN ISO 13790 since the calculation time is reduced as there is no extra input needed in addition to the winter calculation. Some countries pointed out that there is an increased awareness for summer comfort and for the importance of passive strategies, like solar protection, thermal mass and increased night ventilation. This leads to a better building quality. Another advantage reported by some countries are simple to use methods, which allow designers to make their own assessment of different strategies without using complex simulation tools.

As drawbacks some countries referred to increased costs through high sophisticated calculations for non-residential buildings. Others pointed out that the used indicators like overheating hours are not easy to understand and interpret for non-experts. The main reported drawback is the lack of calculation algorithms for innovative solutions in most of the Member States. The majority of procedures do not foresee any rules for how to handle these items (like e.g. the method of equivalence) and therefore new products struggle to overcome this barrier.

Table 11: Answers to question concerning advantages and drawbacks of the summer requirements.

Country	Advantages	Drawbacks
5.1 Please summarise the advantages and drawbacks of your summer requirements method. Please refer if possible to the following points: - necessary calculation time - comprehensibility (easy to understand or not) - base for technology improvements or new developments - calculation results are met by reality (or not) - increase of building costs (investment and/or operation costs) - changes in indoor climate (or not) - changes in building quality - changes in cooling energy needs and costs - changes in overall energy needs - increased awareness and/or use of passive strategies - others		
Austria	- Simple calculation for residential buildings. - Changes in building quality. - Increased awareness of passive strategies. - Changes in cooling needs and costs.	- High sophisticated calculation for non residential buildings. - Increase of costs for non residential buildings.
Belgium-Flanders	- Calculation time: as calculating the energy performance, the software also calculates the overheating indicator. No extra time is needed. - Increased awareness and lower change to have problems with summer heating in residential buildings.	- Comprehensibility: 17500 Kh is not really easy to understand, it is a fictive, calculated chance to have overheating in the building. It does not mean when your building is below this level, that all rooms will be ok. - Base for technology improvements or new developments: as ventilation strategies and passive cooling can not be calculated, it is not a stimulus.
Bulgaria	- Same calculation procedure for winter and summer. - No extra time needed for summer calculation. - The procedure in preparation	- The building description is used for both winter and summer energy calculations. This step is the most time consuming calculating the energy performance.

Country	Advantages	Drawbacks
	is based on EN ISO 13790 and easy to understand. - Specific calibration procedure for summer conditions is in preparation. Thus the theoretical model is to be linked to the registered energy consumption for past period. This is done for winter conditions and is to be adopted for the summer calculations. - Special attention is given to RES utilisation. Fraction of RES in building annual energy budget is calculated.	
Cyprus	Cannot make any comments yet because we do not have the methodology or the software tool ready yet, but somehow they will have the following characteristics: - Easy to understand, user friendly, simple. - Results should meet reality in an acceptable percentage. - Should not increase substantially the initial or operational cost of the building and should be of the customer's interest. - Improve the quality of the indoor environment and the quality of the building. - Should promote the reduction in the energy demand and the use of RES.	
Denmark	- Large impact on building design with a very little calculation effort due to the use of a one zone thermal model for all building types and situations. - Better buildings in relation to summer comfort and energy for cooling inclusive of	- The use of a one zone thermal model for all building types and situations simplify the calculations but can lead to large errors in the calculated summer comfort or energy for cooling.

Country	Advantages	Drawbacks
	balancing winter and summer conditions. - Increased awareness on summer conditions inclusive of the importance of solar protection, thermal mass, summer ventilation and cooling system efficiency.	
Finland	- The calculation time is fast, because of the monthly method. - The current requirements for the summer comfort have made a leap to the better indoor environment especially in the residential buildings where dynamic simulation is rarely used in the building process. First time there is a possibility to calculate easily the summer comfort. - Increased awareness and use of passive strategies is expected to be part of the normal design process.	- Complicated HVAC systems cannot be calculated with the national method, other tools have to be used. - The history of the new calculation method is short (in force from Jan 1st 2008), so any comments concerning results meeting the reality cannot be given. - National "official" implementation of the energy calculation method D5 does not exist. Currently there are several implementations (tools) available and some times they can give varying results.
France	- The energy and summer comfort global requirements leads to an increase of awareness and reflexion to use passive strategies. - Global requirements are necessary to allow technico-economic optimisation. It's furthermore necessary when the requirements are severe and regularly reinforced, to promote intelligent conception and reduce the cost of performance. - The distinctive requirements between: - buildings without air-conditioning that has to respect summer comfort passive requirements, - buildings with air-conditioning and in witch air-	- For non specialists, the global requirements are hard to understand. - The summer comfort indicator (conventional indoor temperature) is frequently understood has a provisional average indoor temperature of the building during summer, instead of a miximal conventional indoor temperature obtained in the hottest area of the building, for the 5 hottest hours of the summer. - Conventional indicators are hard to compare with real consumptions. It's hard to explain what is an intrinsic performance and intrinsic consumption. - Global requirements need

Country	Advantages	Drawbacks
	conditioning could be avoided (defined in the regulation), that has to consume less energy than a reference building without air-conditioning, and less than a maximal consumption for residential buildings, - other buildings with air-conditioning that has to globally consume less energy than a reference building with performant air-conditioning, and, for residential buildings, less than a maximal consumption, Is important to adapt and optimize the requirements for each type of buildings in each climate (France has very different climates). - Global requirements for the whole building are important to compare different technics with different perimeters and to show the necessary technology improvements to prepare requirements reinforcements.	global calculation methods, then a precise description of the project building and then a long description work.
Germany	- Simple method for residential building showing the influences of different factors on the solar gains. - The result of the summer calculation for air-conditioned buildings needs no extra time as cooling energy is part of the energy use calculation. - The detailed method (air-conditioned buildings) allows the use of characteristics of improved systems and components. This accelerates the further development of systems and technologies. - Calculation results are met by reality for the detailed	- Better products can't be assessed with the simple method (for buildings without air-conditioning) as the standard defines default values for e.g. shading systems. - The detailed method for air-conditioned buildings sets currently the reference building with the same solar shading characteristics as the real building. Therefore a better solar shading system is not rewarded. Similar with the building mass, the building orientation and the size of the windows.

Country	Advantages	Drawbacks
	method (air-conditioned buildings). This was proven by the VERU studies (source Fraunhofer-IBP). - Increased awareness and use of passive strategies. - By calculating the energy needs for cooling the awareness on this energy consumption has increased and systems with better efficiency and renewables become more interesting.	
Hungary	- Simple, easy to calculate.	- The general problem of the regulation is, that whilst the heating energy need, hot water, etc. can be calculated for, and expressed with, one figure for the whole building, cooling energy need should be calculated room by room, moreover, in the early stage of the design, when neither the constructional details, nor the use of the rooms are defined.
Ireland	- Insufficient feedback on market professional experience to respond usefully	- Insufficient feedback on market professional experience to respond usefully
Luxembourg	- No complicated calculations i.e. cost reduction. - Limitation of energy consumption of the ventilation devices. - Easy to understand. - Cooling demand is avoided or reduced > energy cost reduce. - Indoor climate increases. - Building quality increases because building can be used even if there are technical problems with the cooling system.	
Poland		- Lack of requirements for summer comfort and for cooling results in increasing

Country	Advantages	Drawbacks
		number of hours of overheating. New and renovated residential buildings (usually naturally ventilated) offer very low level of comfort in summer. Number of simple split AC unit in residential buildings is increasing. Moreover almost all new non residential building are equipped with cooling systems or AC systems. At the moment peak power demand for air conditioning is estimated as 480 MW. - Lack of shading devices in windows results in glare problems that is extremely important in offices with video display units VDU.
Portugal	- Residential: simple	- Ep<EPmax (Epmax is to high) - Non-residential Epmax (IEE) need changes
Sweden	- The temperature demands are set by the authority with the knowledge about human needs. - We have functional demands. - The compliance is checked on local level.	- Not always easy to verify. - Not all personnel in the local level are competent enough.

3.6 Impacts of the summer requirements

Most of the countries reported that the summer requirements have been fixed without extensive studies on the possible impact. Only 2 countries referred to brief studies on full cost calculations (investments vs. savings) and on overheating periods. However some country experts wrote that the requirements improved the dialogue between architects and consulting engineers.

Table 12: Answers to question concerning the impacts of the summer requirements.

Country	Answers
6.1 Has there been made a study or another kind of assessment of the impact of the national summer requirements before or after the requirements were fixed? If yes, please add the results of the study in terms of: - energy saved (for cooling) - additional costs created (due to additional construction elements or installation needed in order to comply) - or costs saved (e.g. due to avoidance of AC systems)	
Austria	-
Belgium-Flanders	No studies available.
Bulgaria	-
Cyprus	A brief study made showed that an investment of not more than 10% of the initial cost of the buildings used to be build prior to the regulation and concerning measures for the reduction of the heating and cooling needs of the buildings, could give savings up to 30%.
Czech Republic	-
Denmark	No specific study or assessment of the impact of the summer requirements has been made. A typical statement by consultant engineers is that the summer requirements in the Danish Buildings Regulations have improved the dialog between architect and consultant engineer in the early stages of the design process in relation to e.g. glazing area and solar protection.
Finland	No.
France	-
Germany	Not that we know of.
Hungary	No study was carried out till date, nevertheless the designers pay more attention to the problem of glazed area, glazing type, solar access, etc.
Ireland	Not that we know of.
Italy	-
Latvia	-
Lithuania	-
Luxembourg	Statistics of summer temperatures using dynamic simulations.
Norway	-
Poland	-
Portugal	-
Slovak Republic	Not.

Country	Answers
Slovenia	-
Sweden	No study connected to the building requirements, but for example the National Board on welfare and health makes, as all Swedish authorities when making regulation, cost benefit analysis connected to the regulation.
UK: England and Wales	-

3.7 Others/comments

As presented below there are very few special remarks to general items by the countries.

Table 12: Answers to question concerning other comments.

Country	Comments
7.1 Other comments?	
Lithuania	The assessment study is foreseen for first. Lithuanian climate according its monthly values does not suppose air cooling in usual conditions. Cooling or air conditioning is suggested only in special cases, when heat gains are significant.
Luxembourg	No need to define disproportionate mandatory measures and calculation methods for cooling requirements concerning housing and residential buildings in the climate zone of Luxembourg.
Poland	Two Ministerial ordinances are at the final stage of preparation (after public consultations) and it is very probable that will be published within 1 month. First ordinance will describe the methodology of calculation of energy performance of buildings. The ordinance will describe simplified monthly method for residential building (without cooling) and hourly method based on EN 13790 for other buildings. This method will cover energy for cooling as well as energy needed for air conditioning. The output of the method is delivered energy corrected by energy carrier factors. Second Ministerial ordinance will introduce changes to Building Code. Among others one new requirement will indirectly address summer comfort and energy need for cooling. The designer of a building will has to proof that the indicator of solar gains through windows and transparent walls does not exceed a limited value. The total solar energy transmittance coefficient of windows or transparent walls should not exceed 0.5, with exception for windows and transparent walls that

Country	Comments
	have share > 50 % of the area of external partition, for which the total solar energy transmittance coefficient should not exceed 0.3. The total solar energy transmittance coefficient of window or transparent wall is defined as: gc= fc*g were: gc: the total solar energy transmittance coefficient of window or transparent wall g: the total solar energy transmittance coefficient of glazing system fc: shading fraction from shading devices Requirement will not apply to vertical surfaces or with angle > 60o to the horizon faced from NW to NE (North +/- 45 o), to windows protected against solar radiation by natural or artificial obstacle and to windows smaller than 0.5 m².
Sweden	Swedish building regulations is very often addressed to buildings, i.e. residential and non-residential buildings. In some cases it could be divided into residential and non residential buildings for example the energy use is divided between these to. You can say the regulations when it comes to buildings has got to parts one were the regulations is made according to the plan and building act(1987:10) and a part for the indoor environment with regulation of the use of the building regulated by either the National Board of welfare and health for residential buildings and the part of the non residential buildings intended for public use according to the Environmental act (1998:808) or use of building intended for working conditions regulated by the Swedish work environment authority according to the Work environment law (1977:1160)

4 Summary

The questionnaire analysis showed some common trends in Europe, which can be summarised as follows:

- Most of the Central European countries reported of summer requirements as part of their national building regulations. The responding Southern European Member States besides France and Portugal have currently no summer requirements. However several Member States from South Europe are now working on procedures for summer requirements.

- Most of the countries reported that the summer requirements have been fixed without extensive studies on the possible impact.

- Most of the summer requirements are set for new buildings, in some Member States they also have to be met in case of major renovations.

- More than 70 % of the MS have set requirements regarding the design or construction of new buildings, but not in a uniform European way.

- More than 50 % of the countries manage their cooling energy requirements through energy performance calculations (final or primary energy demand). In most countries this has been realised by a "reference building approach". Increased cooling demands of the real building can therefore be compensated by efficiency measures at the lighting, heating or ventilation systems.

- Some countries use a benchmark approach (E_{Pmax})

- Only about 1/3 of the Member States have included mandatory (passive) measures at the building envelope in their building regulations, like minimum (summer) insulation, solar protection, limited glazing area and building mass.

- Very few Member States have included mandatory (active) measures at the cooling systems in the building regulations.

- More than 50 % of the Member States fixed a calculation procedure for cooling in their regulation; half of them use already CEN standards or CEN conform methods.

- Most common in the Member States is the monthly based steady state calculation method of EN ISO 13790. Only very few countries allow alternative methods as official proof of the summer comfort.

- Most Member States reported that a great advantage is the reduced calculation time when using the methods from EN ISO 13790. The reason for this is that there is no extra input in addition to the winter calculation needed.

- Some countries pointed out the advantage in setting summer requirements is that there is an increased awareness on summer comfort, which leads to better building quality. They also reported that the new requirements improve the dialog between the architects and consulting engineers.

- The Member States are in favour for simple to use methods, which allow the designers to make their own assessments of different strategies without using complex simulation tools.

- Some Member States reported that the used indicators (like overheating hours) are not easy to understand and to interpret for non-experts.

- The main drawback reported is the lack of calculation algorithms for innovative solutions. The majority of procedures do not foresee any rules for how to handle this items (like e. g. the methods of equivalence). Therefore new products are struggling to overcome this barrier.

5 Conclusions and recommendations

The objective of this study was to provide a snapshot of the requirements in the Member States regarding summer comfort and energy consumption for cooling (EPBD Article 4).

Most of the MS have already implemented summer requirements or are currently working on procedures for this. The requirements are mostly valid for new buildings or major renovations. The experiences with summer requirements are very positive in the Member States. They lead to better building quality and improve the dialogue between architects and consulting engineers during the design process.

There are two types of summer requirements mostly in use:

- Mandatory (passive) measures at the building or the building envelope (minimum insulation, solar protection, limited glazing area, building mass)

- Requirements on the cooling energy demand, if cooling systems are installed

The fixed (mandatory) measures at the building differ between the Member States and are mostly reflecting the building tradition in the countries. The calculation methods to predict the energy need for cooling are much more similar all over Europe. A lot of countries use or are in preparation to use the monthly based steady state method of EN ISO 13790.

The requirements for the cooling energy needs are depending on the energy performance procedure used in the countries. Most common is the "reference building approach" in which reference measures are defined and therefore define the overall energy demand of the reference building. The real building can then compensate an increased cooling energy demand by efficiency measures at the lighting, heating or ventilation system. It only has to be guaranteed, that the energy demand of the real building does not exceed the energy demand of the reference building. The advantage of this approach is

that there is no preference of any technology in the method, only the overall energy demand is the limiting factor.

This kind of method can easily be applied all over Europe, can be used with different calculation methods, is transparent, fair and fully in line with the goal of the Directive to have the focus on a reduced demand and not on special technologies. The used state-of-the-art reference technologies or their efficiencies can be defined by the Commission based on analysing the European market and can be changed if the technologies are improving.

The procedures in the Member States have to develop ways for assessing innovations which can't be calculated with the national building codes yet. The method of equivalence may be one way to avoid that new products struggle to access the market immediately. It is also necessary to keep the methods simple in order to allow the designers to make their own evaluation of different strategies without using complex tools.

As result of the study the authors recommend to the Commission:

- It is most important to continue concentrating on the main goals of the Directive, which are reduced energy consumption of buildings in combination with a good indoor climate, and not on specific technologies. The Commission has to set the benchmarks; the market has to provide solutions. A possible way is a relative tightening of the curently allowed maximum primary energy demand of the countries.

- Member States should be encouraged to apply mandatory passive requirements for summer. Those passive requirements on building design or elements have to reflect building traditions and can not be fixed uniformly all over Europe.

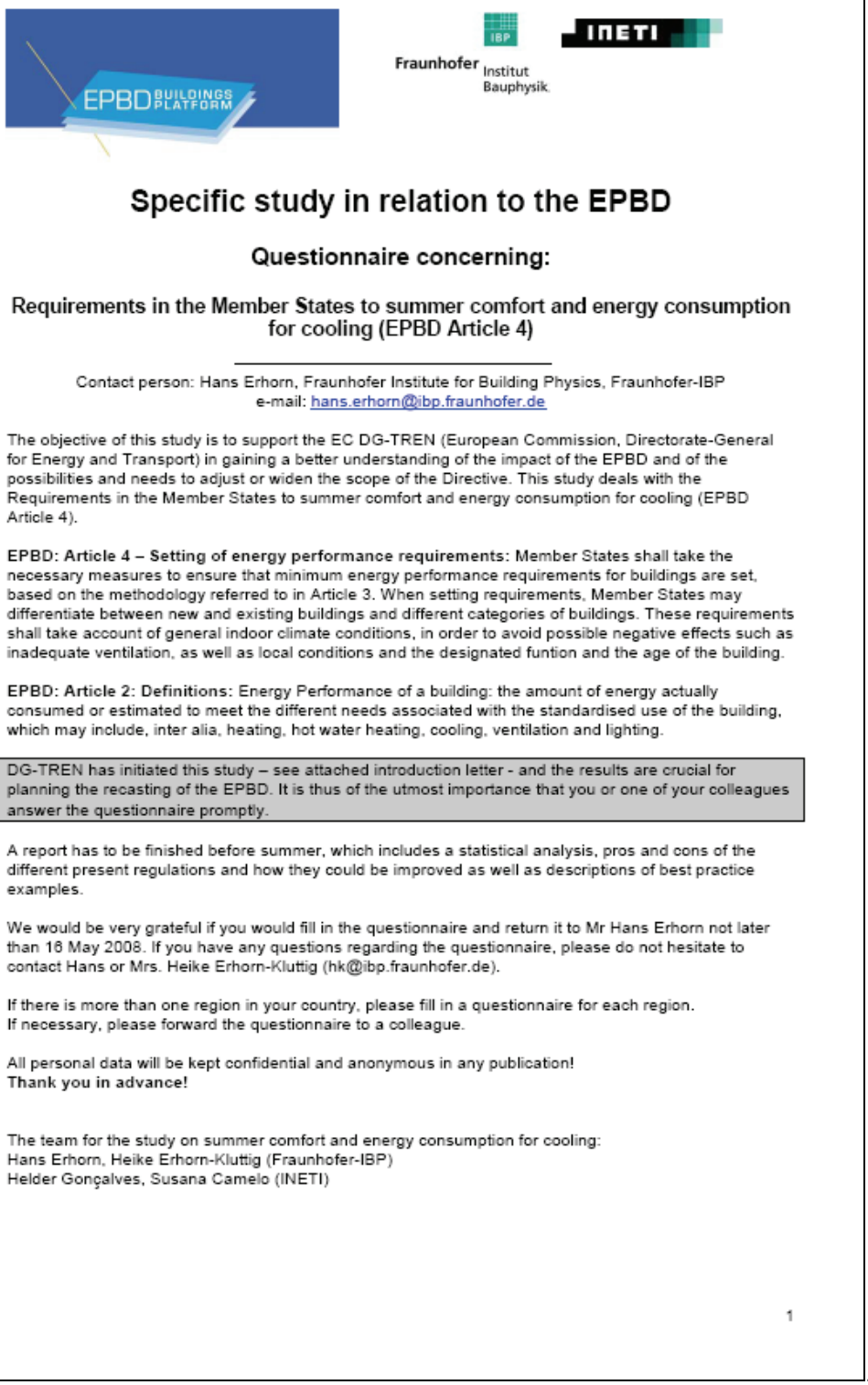
- The calculation methods have to be easy to use and known to the building practitioners, to allow them to make their own assessment of different strategies without using complex software, but should allow integrating innovations. Therefore it is not obligatory to have only one calculation method in Europe.

- The "reference building approach", in which reference technologies are defined for fixing the overall energy demand of a reference building seems the most common approach all over Europe. The advantage is that there is no preference of any technology; the overall energy demand is the only limiting factor. The method can be easily adjusted to any further development of technologies that lead to better efficiencies.

6 References

[1] Gonçalves, H.: Summer requirements in building regulations. Report of Concerted Action "Supporting transposition and implementation of the Directive 2002/91/EC CA – EPBD (2005 – 2007)", May 2007.

Appendix I: Questionnaire sent to the experts in the Member States



EPBD BUILDINGS PLATFORM

Fraunhofer Institut Bauphysik

INETI

Specific study in relation to the EPBD

Questionnaire concerning:

Requirements in the Member States to summer comfort and energy consumption for cooling (EPBD Article 4)

Contact person: Hans Erhorn, Fraunhofer Institute for Building Physics, Fraunhofer-IBP
e-mail: hans.erhorn@ibp.fraunhofer.de

The objective of this study is to support the EC DG-TREN (European Commission, Directorate-General for Energy and Transport) in gaining a better understanding of the impact of the EPBD and of the possibilities and needs to adjust or widen the scope of the Directive. This study deals with the Requirements in the Member States to summer comfort and energy consumption for cooling (EPBD Article 4).

EPBD: Article 4 – Setting of energy performance requirements: Member States shall take the necessary measures to ensure that minimum energy performance requirements for buildings are set, based on the methodology referred to in Article 3. When setting requirements, Member States may differentiate between new and existing buildings and different categories of buildings. These requirements shall take account of general indoor climate conditions, in order to avoid possible negative effects such as inadequate ventilation, as well as local conditions and the designated funtion and the age of the building.

EPBD: Article 2: Definitions: Energy Performance of a building: the amount of energy actually consumed or estimated to meet the different needs associated with the standardised use of the building, which may include, inter alia, heating, hot water heating, cooling, ventilation and lighting.

DG-TREN has initiated this study – see attached introduction letter - and the results are crucial for planning the recasting of the EPBD. It is thus of the utmost importance that you or one of your colleagues answer the questionnaire promptly.

A report has to be finished before summer, which includes a statistical analysis, pros and cons of the different present regulations and how they could be improved as well as descriptions of best practice examples.

We would be very grateful if you would fill in the questionnaire and return it to Mr Hans Erhorn not later than 16 May 2008. If you have any questions regarding the questionnaire, please do not hesitate to contact Hans or Mrs. Heike Erhorn-Kluttig (hk@ibp.fraunhofer.de).

If there is more than one region in your country, please fill in a questionnaire for each region.
If necessary, please forward the questionnaire to a colleague.

All personal data will be kept confidential and anonymous in any publication!
Thank you in advance!

The team for the study on summer comfort and energy consumption for cooling:
Hans Erhorn, Heike Erhorn-Kluttig (Fraunhofer-IBP)
Helder Gonçalves, Susana Camelo (INETI)

1

General information
- Country: Region:

Filled in by:
- Name:
- Organisation:
- e-mail:
- Phone:
- Date:

1. General information regarding present summer comfort and cooling energy requirements in the national building regulations

Please mark true answers with "X" and give comments if necessary.

Questions		New buildings		Existing buildings		Special building types	Comments
		Residential buildings	Non-residential buildings	Residential buildings	Non-residential buildings	Define building type	
1.1	Does your building regulation explicitly refer to summer conditions?						
1.2	Does the building regulation contain summer requirements (mandatory)?						
1.3	Does the building regulation contain recommendations (not mandatory)?						
1.4	Does it contain mandatory measures at the building envelope? If yes, please describe under comments.						
1.5	Does it contain mandatory measures at (to be) installed cooling systems? If yes, please describe under comments.						
1.6	Are certain measures/systems prohibited by the building regulation? If yes, please describe under comments.						
1.7	Is a calculation procedure for cooling energy included in your building regulation?						
1.8	Is a calculation procedure for summer comfort included in your building regulation?						

2

2. Type of present summer comfort and cooling energy requirements in the national building regulations

Please mark true answers with "X" and give comments if necessary.

-> Only necessary to be filled out if your national building regulations include summer comfort and/or cooling energy requirements

To which type of requirements do they belong? (More than one answer may apply.)		New buildings		Existing buildings		Special building types	Comments
		Residential buildings	Non-residential buildings	Residential buildings	Non-residential buildings	Define building type	
2.1	Limitation of glazed areas or window openings						
2.2	Shading requirements						
2.3	Maximum U-value requirements (not only for winter)						
2.4	Minimum building mass requirements (inertia)						
2.5	Minimum summer ventilation rate If night ventilation is required, please state under comments.						
2.6	Limitation of solar gains						
2.7	Limitation of overheating time (in case of no air-conditioning or in case of defect air-conditioning (worst case scenario)) –> please specify under comments						
2.8	Limitation of cooling energy needs (in case of air-conditioning or in case no air-conditionings (theoretical cooling energy needs)) -> please specify under comments						
2.9	Overall requirement (CO_2-emission or primary energy incl. cooling energy) -> please specify under comments						
2.10	Others -> please specify under comments						

3

3. Details on calculation procedure

Please mark true answers with "X" and give comments if necessary.

-> Only necessary to be filled out if your national building regulations include calculations for overheating time and/or cooling energy needs (answers 2.7, 2.8 and 2.9)

Questions		New buildings		Existing buildings		Special building types	Comments
		Residential buildings	Non-residential buildings	Residential buildings	Non-residential buildings	Define building type	
3.1	Is the calculation procedure for the overheating time or the cooling energy needs CEN conform? If yes refer to specific CEN standard under comments.						
3.2	Is it a monthly calculation method?						
3.3	Is it an hourly calculation method (simplified)?						
3.4	Is it a simulation method (hourly)?						

3.5 Describe your national methodology and calculation procedure and include the following points:

- are internal gains (people, lighting, equipment, system losses) taken into account
- are ventilation strategies (natural/mechanical/night ventilation) taken into account
- can passive cooling technologies be taken into account? If yes, please specify.
- characteristic output (final energy, primary energy, CO_2, maximum temperature, overheating hours)
- calculation time necessary for an average office building
- methods on how to include systems that can't be calculated with your regular calculation procedure (method of equivalence or similar)

-> As support you may want to have a look at the attached Concerted Action I report on summer requirements.

4

4. Planned requirements regarding summer comfort and cooling energy in the national building regulations

Please note: The time span for the planned requirements is up to 5 years (to be implemented latest 2012)

-> Please fill out question 4.1 in case there is are summer requirements in your present national building regulations.

-> Please fill out question 4.2 to 4.9 in case your national building regulations will have summer requirements for the first time.

4.1 Are there defined plans to change the present summer requirements in the national building regulation within 5 years? If yes please report on the planned changes.

Questions		New buildings		Existing buildings		Special building types	Comments
		Residential buildings	Non-residential buildings	Residential buildings	Non-residential buildings	Define building type	
4.2	Will your building regulation explicitly refer to summer conditions?						
4.3	Will the building regulation contain summer requirements (mandatory)?						
4.4	Will the building regulation contain recommendations (not mandatory)?						
4.5	Will it contain mandatory measures at the building envelope? If yes, please describe under comments.						
4.6	Will it contain mandatory measures at (to be) installed cooling systems? If yes, please describe under comments.						
4.7	Will certain measures/systems be prohibited by the building regulation? If yes, please describe under comments.						
4.8	Will a calculation procedure for cooling energy be included in your building regulation?						
4.9	Will a calculation procedure for summer comfort be included in your building regulation?						

5

5. Advantages and drawbacks of the summer requirements

5.1 Please summarise the advantage and drawbacks of your summer requirements method. Please refer if possible to the following points:

- necessary calculation time
- comprehensibility (easy to understand or not)
- base for technology improvements or new developments
- calculation results are met by reality (or not)
- increase of building costs (investment and/or operation costs)
- changes in indoor climate (or not)
- changes in building quality
- changes in cooling energy needs and costs
- changes in overall energy needs
- increased awareness and/or use of passive strategies
- others

Advantages of your national requirements	Drawbacks of your national requirements

6

6. Impacts of the summer requirements

6.1 Has there been made a study or another kind of assessment of the impact of the national summer requirements before or after the requirements were fixed?

If yes, please add the results of the study in terms of:

- energy saved (for cooling)

- additional costs created (due to additional construction elements or installation needed in order to comply)

- or costs saved (e.g. due to avoidance of AC systems)

7. Others

7.1 Other comments?

7

Appendix II: List of experts that answered for the Member States

The authors would like to thank all national experts that have contributed with their knowledge to this study:

Table 13: List of national experts the contributed to this study.

Country	Expert
Austria	Wolfgang Thoma, OIB
Belgium-Flanders	Wina Roelens, Flemish Energy Agency
Bulgaria	Nikola Georgiev Kaloyanov, Technical University of Sofia
Cyprus	Pouloupatis Panayiotis, MCIT
Czech Republic	Jan Pejter, ENVIROS and Jana Piecha, Ministry of Industry and Trade
Denmark	Søren Aggerholm, Danish Building Research Institute, SBi
Finland	Jari Shameikka, VTT Technical Research Centre of Finland
France	Olivier Servant, Ministry of Energy, Ecology, Sustainable Development and Spatial Planning
Germany	Hans Erhorn and Heike Erhorn-Kluttig, Fraunhofer Institute for Building Physics
Hungary	András Zöld, Budapest University of Technology and Economics
Ireland	Kevin O'Rourke, Sustainable Energy Ireland
Italy	Gian Mario Varalda, RENAEL
Latvia	Ivo Lems, Construction, Energy and Housing State Agency
Lithuania	Jurate Karbauskaite, Kanaus Technology University, Institute of Architecture and Construction
Luxembourg	Tom Eischen, Ministry of Economy and Foreign Trade
Norway	Gunnar Grini, National Office of Building Technology and Administration
Poland	Jerzy Sowa, Warsaw University of Technology
Portugal	Helder Gonçalves, INETI
Slovak Republic	Zuzana Sternova, VVÚPS-NOVA
Slovenia	Matjaz Prek, University of Ljubljana
Sweden	Hans-Olof Karlsson Hjorth, National Board of Housing, Building and Planning
UK: England and Wales	Roger Hitchin, BRE