



ENTE PER LE NUOVE TECNOLOGIE L'ENERGIA E L'AMBIENTE

Thermal bridges in the EBPD context: overview on MS approaches in regulations

MCitterio
ENEA

"An effective handling of thermal bridges in the EPBD context"



Introduction

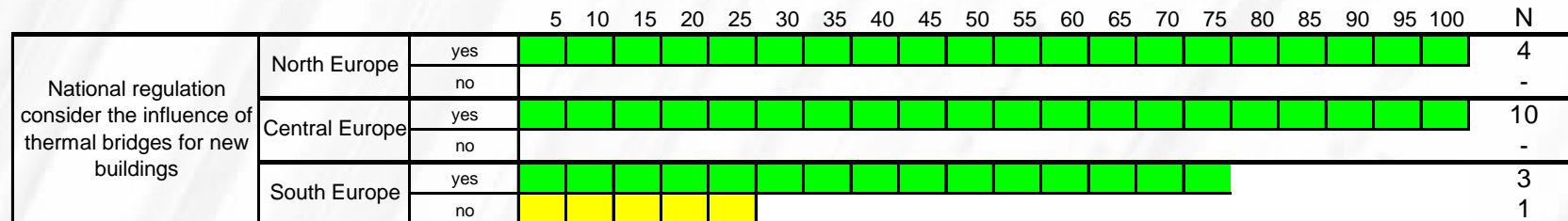
- Almost all MS building energy performance regulations deal with thermal bridges, but the approaches and, especially, minimum requirements may considerably differ
- This presentation summarizes the requisites and calculation procedures in the MS participating in ASIEPI at the **end of 2007**.
- In this presentation the situation in some Countries (**HU, LT, IR, UK, RO**) non participating in ASIEPI is also reported

Geographic areas

- The overview is split per geographical and climatic area: Northern, Central and Southern Europe (18 countries).
 - North (4):
 - Finland, Norway, Denmark, **Lithuania**
 - Central (10):
 - Germany, France, The Netherland, Belgium, The Czech Republic, Poland, **UK, Ireland, Hungary, Romania**
 - South (4)
 - Spain, Portugal, Italy, Greece

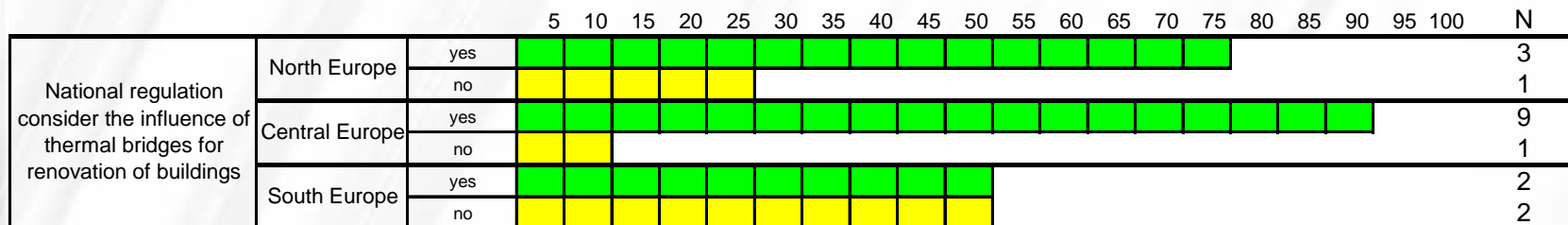
Thermal Bridges in New Buildings

All countries regulations in Northern and Central Europe are dealing with thermal bridges as far as **new constructions** are concerned. In Greece regulation is still pending.



Thermal bridges in Renovated Buildings

This is not the case for **renovation** projects: in Finland, Netherlands and Italy new building only are considered.



Simplified approach

- Simplified approach is most used, adopting a correction factor of U_{value} calculation.
- **Finland** applies special assessment methods (dependent on the λ -ratio: the highest divided by the lowest thermal conductivity of two adjacent layers respectively).
- **Belgium**, in case thermal bridge effect is not taken into account, applies a penalising default value of 10K-points (typical Belgian overall transmission heat loss indicator for the building envelope). 10K-points corresponds to more than 20% of the present requirements for new constructions.

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Explicit calculation or a simplified approach for new buildings	North Europe	expl.		■	■	■	■	■	■	■	■	■	■												2	
		simpl.		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	3
	Central Europe	expl.		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	10
		simpl.		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	8
	South Europe	expl.		■	■	■	■	■	■	■	■	■	■	■												2
		simpl.		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	3

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Explicit calculation or a simplified approach for renovation of buildings	North Europe	expl.		■	■	■	■	■	■	■	■	■	■												2	
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		simpl.		■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	7
	South Europe	expl.		■	■	■	■	■	■																	1
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Correction of the Uvalue: examples

- **The Netherlands:** simplified method uses an addition to the U-value (with $\Delta U = 0.10 \text{ W/m}^2\text{K}$).
- **Germany:** Overall increase in the heat transfer of the building surface areas by $\Delta U_{\text{WB}} = 0.05 \dots 0.15 \text{ W/m}^2\text{K}$, according to DIN 4108 and DIN V 18599.
 - with:
 - $\Delta U_{\text{WB}} = 0.10 \text{ W/m}^2\text{K}$ as standard value for new constructions
 - $\Delta U_{\text{WB}} = 0.05 \text{ W/m}^2\text{K}$ if realised at least as good as example details national standards DIN4108
 - $\Delta U_{\text{WB}} = 0.15 \text{ W/m}^2\text{K}$ for existing buildings with internal insulation (DIN V 18599-2).
- **Poland:** A correction factor is added to the U-value:
 - exterior wall with openings for windows and doors: $\Delta U = 0,05 \text{ W/m}^2\text{K}$,
 - exterior walls with openings for windows and doors with balcony cantilever passing through the wall $\Delta U = 0,15 \text{ W/m}^2\text{K}$

Detailed approach

- In Northern Europe, Denmark and Norway adopt explicit detailed approach
- All central Europe countries adopt detailed calculation methods
- 2 out of 4 Southern countries adopt explicit detailed approach (Italy and Spain)

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Explicit calculation or a simplified approach for new buildings	North Europe	expl.	█	█	█	█	█	█	█	█	█	█	█											2	
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	Central Europe	expl.	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	10
		simpl.													█	█	█	█	█	█	█	█	█	█	8
	South Europe	expl.	█	█	█	█	█	█	█	█	█	█	█	█											2
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			5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	N		
Explicit calculation or a simplified approach for renovation of buildings	North Europe	expl.	█	█	█	█	█	█	█	█	█	█	█											2	
		simpl.													█	█	█	█	█	█	█	█	█	█	2
	Central Europe	expl.	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	█	9
		simpl.													█	█	█	█	█	█	█	█	█	█	7
	South Europe	expl.	█	█	█	█	█	█																	1
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Maximum values

- There are many methods to deal with the maximum value for thermal bridges in regulations:
 - in Germany the dimensionless temperature factor f_{Rsi} is used ($f_{Rsi} > 0.7$),
 - in Denmark and Czech Republic a ψ_{max} value is set depending on the type of join,
 - in France, **Lithuania and Ireland** the ψ_{max} depends on the type of building.
 - Norway distinguishes between large and small buildings

Maximum values: indirect ways of control

- In southern countries only Portugal gives explicit maximum value, but for areas and not for linear Thermal Bridges
- In Spain and Finland the risk of condensation is checked by means of the calculation of indoor surface temperature.
- In Finland, Italy, **Hungary, Romania** the effect of thermal bridges are limited indirectly: structures have to be designed so that the corrected thermal conductance of each component is less than the reference design conductance (tabulated U_{values} from the building code)

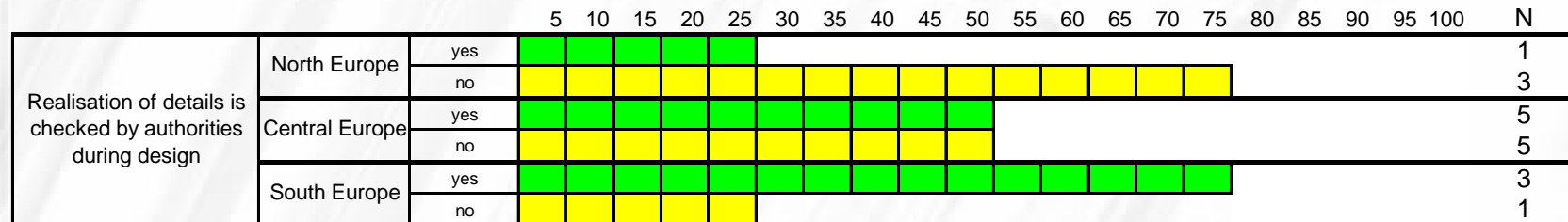
Maximum values: overview

- Countries that distinguish between building types accept higher values for NR buildings
- Countries that distinguish between building dimensions accept higher values for bigger buildings
- Same procedures adopted in countries where climate differs significantly

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Maximum value for thermal bridges is given in regulation	North Europe	yes	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■						3	
		no	■	■	■	■	■																		1
	Central Europe	yes	■	■	■	■	■	■	■	■	■	■	■												5
		no	■	■	■	■	■	■	■	■	■	■	■												5
	South Europe	yes	■	■	■	■	■	■	■	■	■	■	■												2
		no	■	■	■	■	■	■	■	■	■	■	■												2

Compliance and Control during design phase

- The realisation of details is checked during the design phase especially in Southern Europe. In Central Europe NL, PL, HU, RO and UK checks are done. In Northern countries only Denmark checks details during design phase.



Compliance and Control during realisation phase

- Authorities of **Lithuania** in the North, Poland and **UK** in the Central, Portugal in Southern Europe check during realisation phase the execution of construction details.
- In Czech Republic special cases can be checked by means of thermography
- In Italy one certification scheme (CasaClima) adopts protocol of inspections on construction sites.

			5	10	15	20	25	30	35	40	45	50	55	60	65	70	75	80	85	90	95	100	N		
Realisation of details is checked by authorities during realisation	North Europe	yes	■	■	■	■	■																	1	
		no	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	3
	Central Europe	yes	■	■	■	■	■																		2
		no	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	8
	South Europe	yes	■	■	■	■	■																		1
		no	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	■	3

Thanks for your attention

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