



IEA SHC Task 40/ECBCS Annex 52

Towards Net Zero Energy Buildings

<http://www.iea-shc.org/task40/>

Analysis Matrix - Passive Approaches

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Scope of work (all) - Next 6 months:

- List within the Solution Set Categories a set of major headings from the text books (what we know)
- Write 2-3 pages maximum on the theoretical role of each heading within NZEBs
- Write a further 3-5 pages for each heading relating the case study buildings' solutions sets to the theory - ensure coverage of issues of: users / simulation / monitoring
- Identify for Colorado what are the follow up issues - the need for data from the case studies to complete the analysis of the case studies.

Scope of work - Following 6 months:

- Document according to the graphic standards the design approaches of ALL 50+ buildings - now with the work of the above analysis as a means of classifying the building solution sets
- Communicate with the country champions collating the information to assist the completion of the case study analyses

STC1 - Analysis matrix

STC1 A - Passive Approaches

Introduction

Passive heating of building is possible through direct heat gain and/or thermal storage methods [Givoni 1991], that is, using transparent surfaces to gain heat and wall to storage it, making it available for the night. Direct heat gain method is simple and inexpensive, but it depends on climatic loads swings, being the amplitude of the heat wave on the outer surface of the wall based on solar radiation and convection in between the outer surface of the wall and ambient air [Asan 1998], even if mass could possible attenuate the phenomena

Passive approaches sub headings

Passive solar energy approach constitutes one of most important issue in the matrix of solutions set of the Net Zero Energy Solar Buildings.

Passive solar energy concepts described in this chapter fall into three main categories depending of the solar energy exploitation and the relative solutions could be divided in four separate component sets, depending on the function (Fig.1).

MEANS OF USE	DIRECT		
	INDIRECT		
	ISOLATED		
HEATING	COOLING	LIGHTING	
PREVENTION		STRATEGIES OF USE	
MODULATION			
REJECTION/COLLECTION			
CONTROL			

What we have from Factsheets

STRATEGIES	HEATING	COOLING	LIGHTING
prevention	advanced thermal insulation	sunshading green roofs/façades	advanced daylight measures
modulation (store/distribute)	thermal mass-thermal storage heat buffer rooms heat recovery		
rejection/collection	maximization of the solar heat gain	thermal chimney natural cross ventilation evaporating cooling night cooling earth tube heat exchanger	
control			

Questions

- to have a **brief** or a **detailed** description of SS to each building?
- what kind of informations is need in order to make the description?

measured

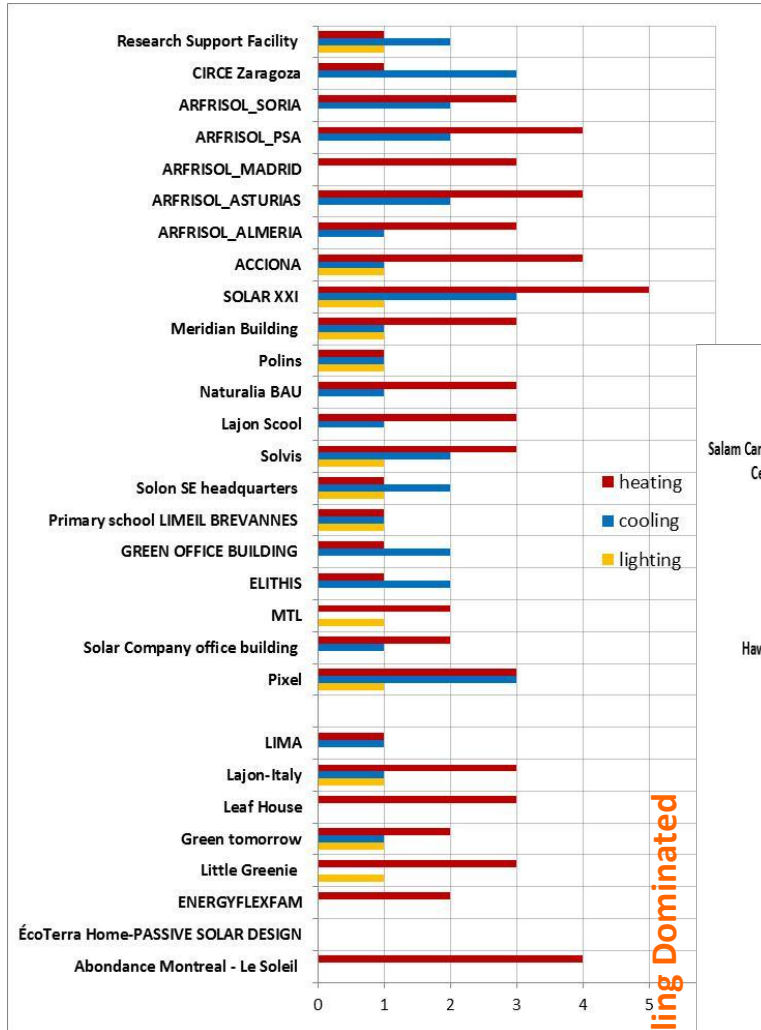
simulated

HCD Heating+cooling+lighting

CD Cooling+lighting

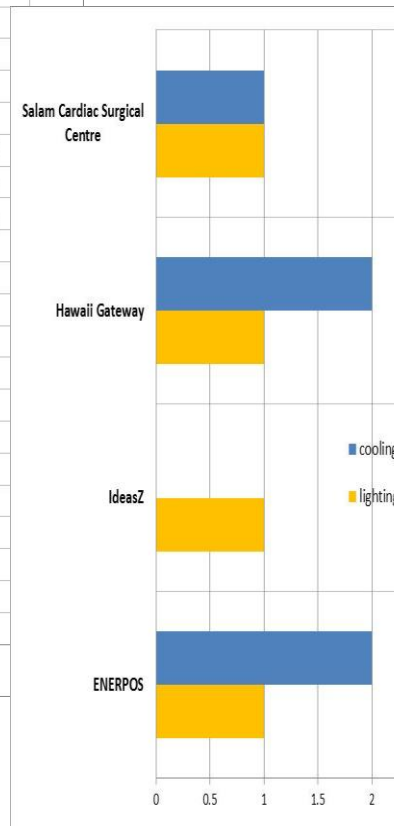
HD Heating+lighting

Passive approaches (heating/cooling/lighting) for each case study in CD

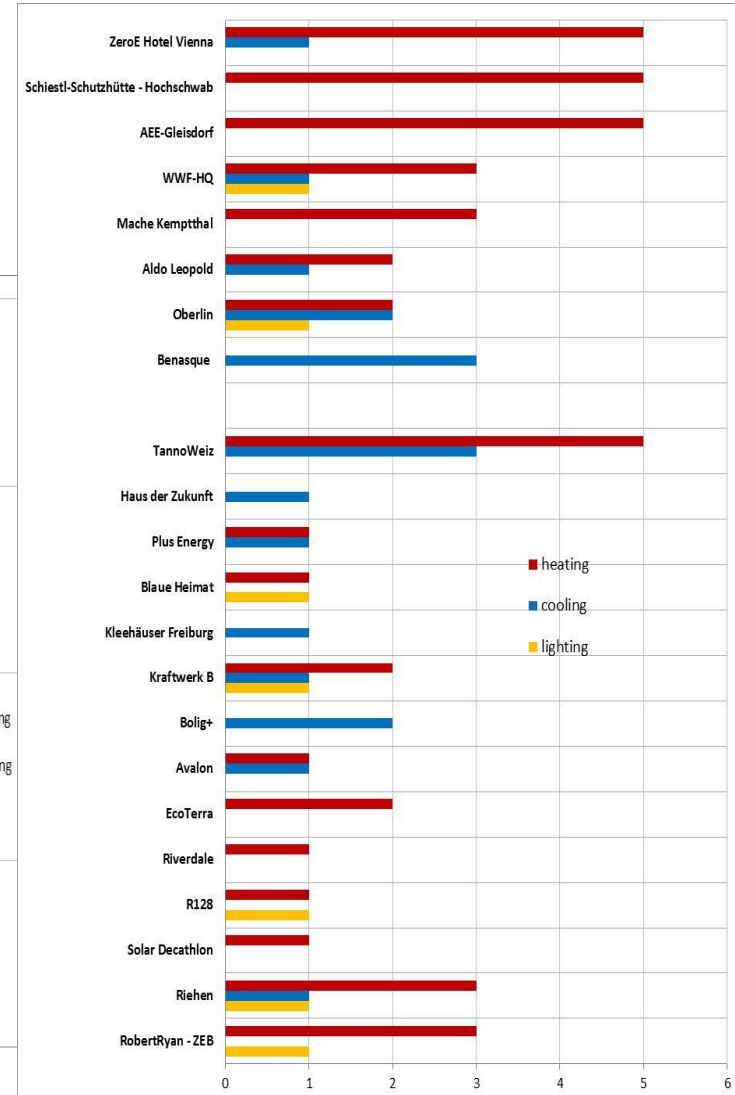


Heating Cooling Dominated

Cooling Dominated



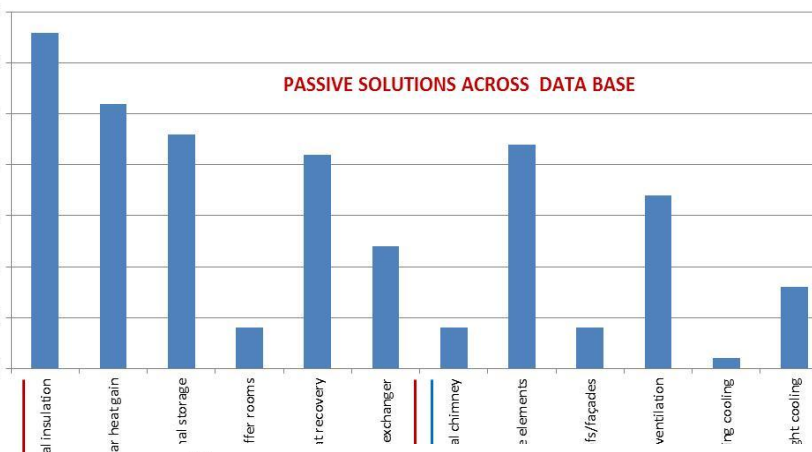
Heating Dominated



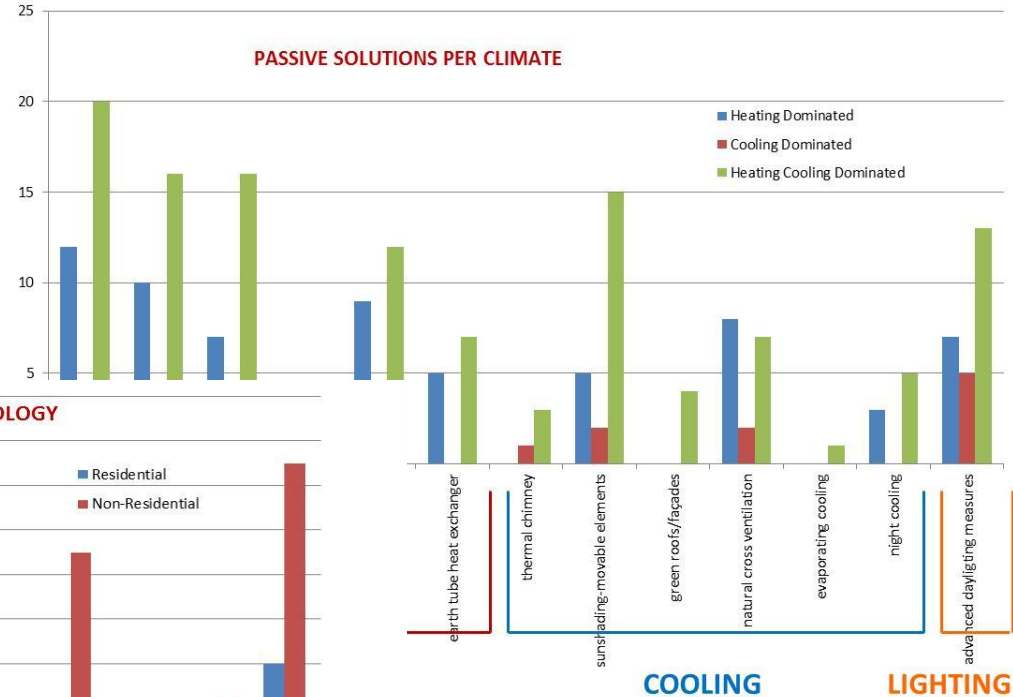
5th Experts Group Meeting, April 4 - 6, Colorado, USA

Passive approaches (heating/cooling/lighting) for each case study in CD

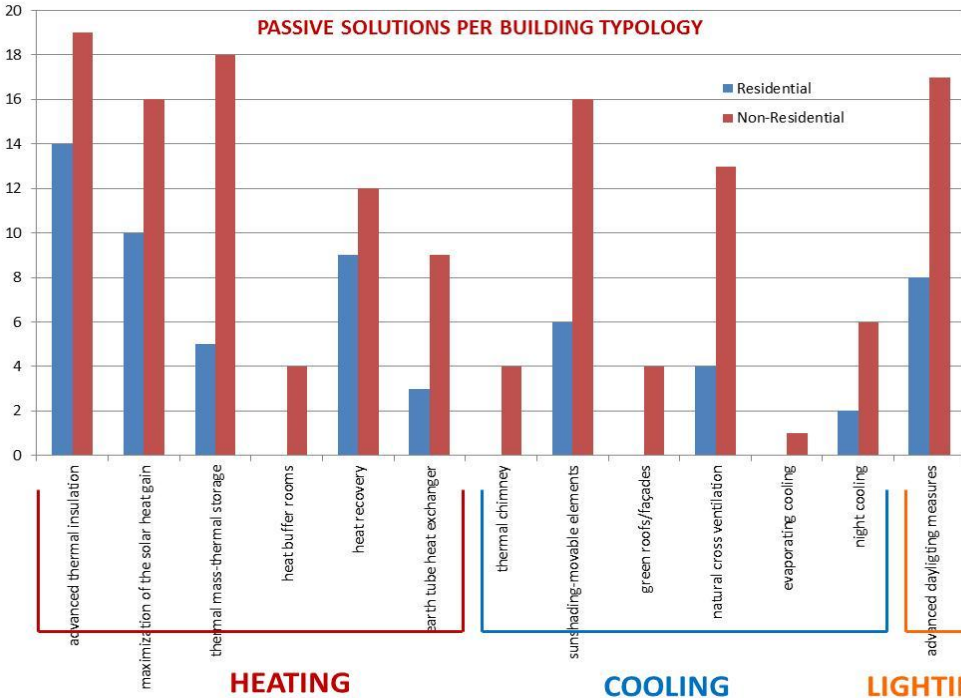
PASSIVE SOLUTIONS ACROSS DATA BASE



PASSIVE SOLUTIONS PER CLIMATE



PASSIVE SOLUTIONS PER BUILDING TYPOLOGY



HEATING

COOLING

LIGHTING

ISA

HEATING COOLING DOMINATED

- Monitoring data not yet available - still measuring
- Monitoring data available
- Building under construction
- Bills

Residential



Building	Monitoring	Sim.	User	Architecture	PA Components
Abundance Montreal- Le Soleil	Date collection plan produced (document available in French)	X			- GeoExchange system: In heating mode, the GeoExchange system collects energy in the ground - Heat recovery from shower drains using a sewewater heat recovery heat exchanger
Two units are occupied (July 2009 and May 2010)	Report available every month with data (until October 2012)				

HEATING DOMINATED

- Monitoring data not yet available - still measuring
- Monitoring data available
- Building under construction
- Bills

Residential

Building	Monitoring	Simul.	User	Architecture	PA Components
Plus energy houses "Weiz" commissioned	monthly basis	X		PV is integrated in the south facing Roof Area;	- Advanced Thermal Insulation - Maximization of Passive Solar Heat Gain - Thermal Mass - Heavy Weight Constr. - Natural Cross Ventilation / Night Cooling - Earth Tube Heat Exchanger - Low Embodied Energy / Eff. Disassembling & Recycling of Building Materials
Avalon Discovery III EQulibrium™ House	modelled, early results indicate somewhat less. Monthly data will be collected for at least one year on energy used (from gas heat, hot water, lights, etc.)	X	Manually operable external shades on all		- Very well insulated and airtight envelope - Manually operable external shades on all windows. Can prevent overheating by passive solar, and add approximately RSI-0.5 to windward window glazing.

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CASE STUDY BUILDINGS' SOLUTIONS SET TO THE THEORY PASSIVE APPROACHES

SOLAR XXI



Location, Climate

Solar XXI building is located in National Laboratory of Energy and Geology campus (Lisbon) about 10 km north-west of the Lisbon down town (38°46'N, 9°11'W). The Lisbon climate is generally warm and sunny with a heating period of 5.3 month and about 4 month cooling period. The monthly average temperature varies between 10.6°C (January) to 22.6°C (August). The average number of heating degree days (HDD) is 1190°C.days, with the average minimum temperature between 8 and 10°C. In summer time, the solar radiation can reach values of more than 6.5 kWh/m² per day and extreme temperature values of about 35°C or higher, however the maximum average air temperature in the summer is around 28°C.

Passive approaches

Passive Heating

Laion Schol - Italy



Location, Climate

The building is located in Laion-Navale at circa 750 m. The Laion Italian climate zone is F, that means full alpine climate, with no limitation on the heating plants use. The heating degree day value is 4186 DD. The Köppen classification for the Laion area is Dwb.

Passive approaches

Passive Heating

direct gain systems - collection, modulation (storage, distribution)

Large south and roof windows let in sun energy for the increasing of the deployment of the solar gains.

indirect gain systems - collection, modulation (storage, distribution)

A constructive solution maximizing the users' comfort and reducing energy consumption is given by a high thermal insulation of the external walls. These walls are entirely covered with 20 cm of mineral foam panels, except for the roof where 24 cm wood fibre panels have been used. The

Conclusions

- definition of types of climate HCD, CD, HD
- missing data (Canada, Germany, ...);
- additional information may be needed to complete the whole picture (simulations? when monitoring not available)
- once these issues are solved, the description of the buildings must move to a more advanced level (energy efficiency indicators and other issues)