NZEB Design Strategies For Residential Buildings in Mediterranean Regions

DESIGN GUIDELINE Part-1

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Content

1. Introduction
2. Challenges to face in a Mediterranean climate
3. NZEB
4. General Design Strategies
- Building Envelope Solutions and Technologies
- Opaque Building Envelope
- Transparent Building Envelope
- Shading
- The solutions for opaque components
- Ventilation

5. Cost effectiveness – optimality

APPENDİX - A
APPENDİX - B
APPENDİX - C
References

Aim

- The aim of this guidebook is to develop a basic framework of a design guideline to deliver the most appropriate and cost-effective solutions for NZEB in Mediterranean climates.
- This guidebook (Part 1) represents specific conditions of Mediterranean climate, aspects related to theoretical background and building envelope design.
- Additionally, case studies and a database are described.
- **Residential buildings are mainly considered in this guide book.**

Basics

1. Climate is the main factor affecting a building and its HVAC system design. Design strategies should be different for cold climates and hot climates.
2. In the Mediterranean region the climate is different and new strategies need developing.
3. In hot climate conditions, cooling is the principal energy consuming process.

Basics

4) Utilizing natural forces has considerable benefits in decreasing cooling loads.

5) Case studies may guide further actions by demonstrating suitable strategies that may be applied.

6) Heat losses and/or gains through the envelope are the main elements of the total load for residential buildings.

7) Due to the large daily swing in climatic variables in the Mediterranean region, building envelope dynamic responses are particularly important.

Building Envelope Solutions and Technologies

- In an case study for a residential building in Mediterranean climate, cooling energy demand is approximately 6 times larger than heating.
- The annual cooling energy demand is higher for higher insulation thickness.
- Increasing thermal insulation thickness is not a good strategy to reduce the cooling energy demand in the Mediterranean climate.

Transparent Building Envelope

- In the Mediterranean region, to reduce cooling energy costs it is necessary to invest in appropriate windows.

Window Frames

- Window frames play an important role in reducing the window heat loads.

Shading

- Shading strategies are particularly important in the Mediterranean climate.

The solutions for opaque components

- Living wall
- Green roof and cool roof
- Radiant barriers
- Ventilated roof

Thermal Mass of Opaque Components

Thick stone walls in a hot-dry climate zone perform better than the insulated walls.

Phase Change Materials

- Phase Changing Materials (PCM) can also be used for providing thermal storage in the contemporary design of buildings.

Evaporative cooling of the envelope

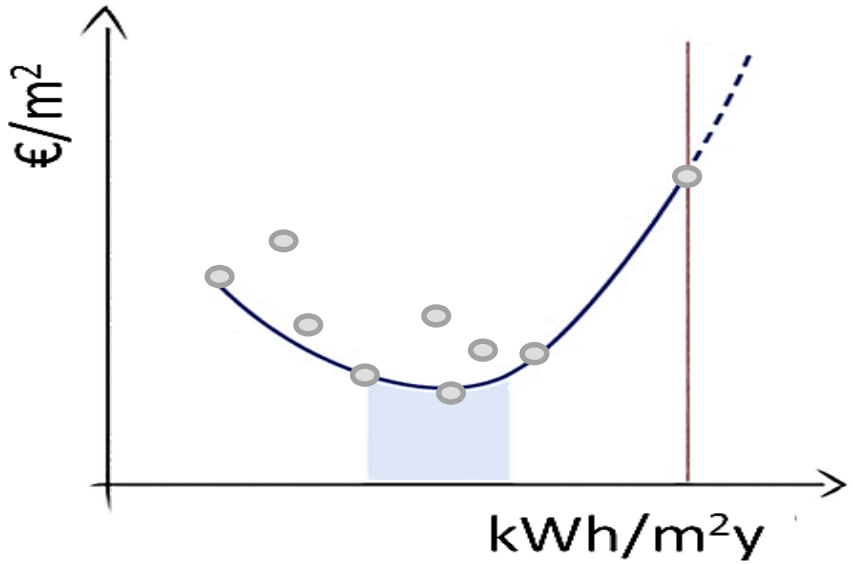
- Evaporatively cooled surfaces can be applied with different building envelope components at the outer skin of the buildings

Natural Ventilation

- Ventilation may help to cool buildings passively.
- the climate is very important to passively cool the space by natural ventilation

Cost effectiveness - optimality

- Based on the calculations of primary energy use and total costs associated with the different packages/variants of measures assessed for the defined Reference Building, the cost-optimal graphs can be drawn



Appendix – A: Building energy evaluation tools

- In order to properly develop building energy design related to NZEBs, a suitable building energy performance simulation tool is necessary.

Appendix - B: Case studies

From the existing NZEB examples available in Mediterranean zones, a brief survey of the main case studies, that included their key energy features, is provided in **Table B1.**

Appendix – C: A harmonized database to share NZEBs good practice

- A current REHVA task force and, at the Italian level, an AiCARR team aim to design a guide for NZEBs at a European level based on real national experiences, creating a support.

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