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CONTEMPORARY PASSIVE SHELTERS: CHANGE OF PERSPECTIVE
Environmental Diversity And Contemporary Lifestyles

Fig. 01

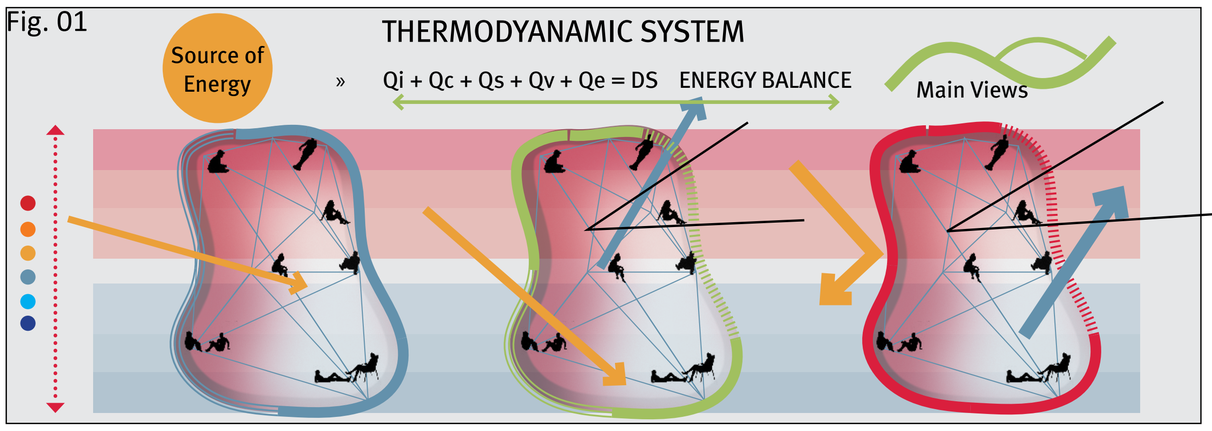


Fig. 02

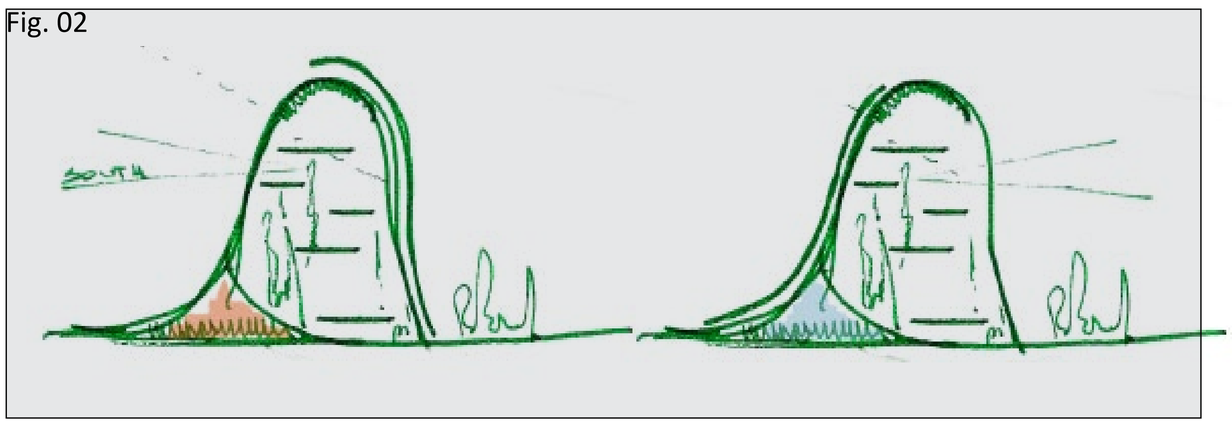
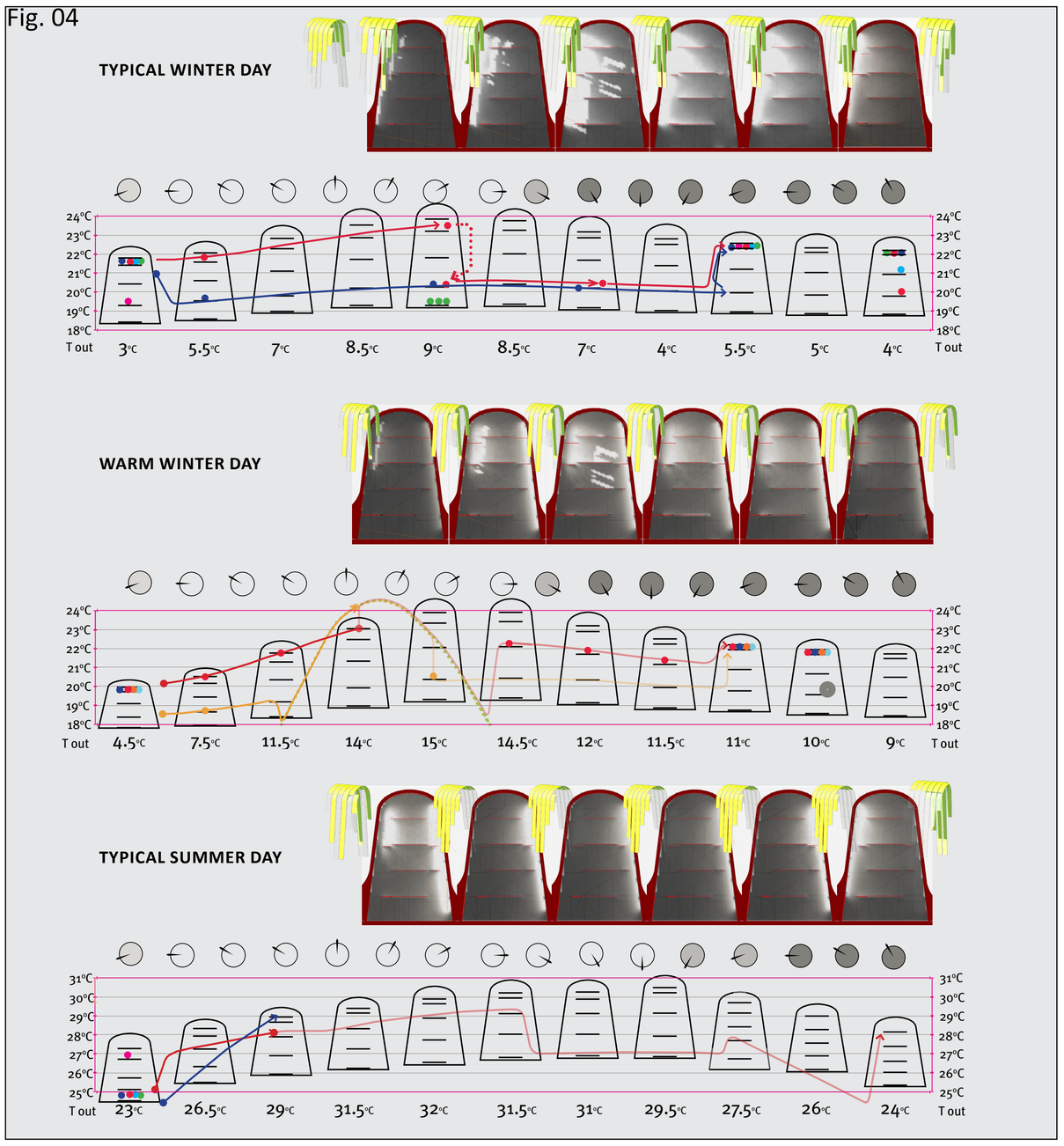


Fig. 03

Fig. 04



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DEVELOPMENT OF NEW BUILDING AND URBAN TYPOLOGIES
VERNACULAR INNOVATION
BUILDING FOR ADAPTIVE COMFORT

BUILDING

CHANGES IN LIFESTYLES AND PEOPLE NEEDS
CHANGES IN HOUSEHOLD CONFIGURATION
ENERGY AND WATER EXPENDITURES

Currently, buildings use large amounts of their operational energy to counteract the impact of the external environment on their inhabitants. Recent years have seen a progressive attention on these themes due to the great energy saving potential of the sector, moving towards an integrated design approach between the building and its plants. Nevertheless buildings, although more efficient, are still conceived as containers of mechanically controlled microclimates. However, today, technology and new theories of comfort allow a radical rethinking of how buildings are conceived, designed and inhabited.
This paper reports on a design research that investigates alternative models of habitable environments, proposing an original concept and role for buildings. The research aims to contribute to the discourse on new highly efficient buildings showing how an innovative design process based on the integration of adaptive comfort theory, building physics and thermodynamic principles, passive strategies and centrality of the user, can not only deliver less energy intensive and more comfortable buildings but also enhance the generative potentials of new forms and spaces towards a more contemporary and sustainable built environment.

Design process
Preliminary studies and analysis on climate, comfort and site investigated the building as a passive system and showed that: 1. the principal views are towards the north -where there are hills and a natural park; 2. a south orientation to maximize passive solar gains is needed in winter; 3. a modulation of the energy flows during warm winter days and mid seasons is requested to avoid overheating; 4. the unit must be protected from direct solar gains in summer.
In order to gather these requirements together with the Reflections on predicted future lifestyles and about new living environments (dynamic, movable and temporary), adaptive comfort and spatial diversity, the concept of 'change of perspective' was developed *(Fig. 1)*. The concept's name recalls the changes in mindset that should be made when designing contemporary sustainable buildings but also the emotional complexity that the unit will provide in this specific case by modulating the energy flows in order to balance the equation between heat losses (conduction and ventilation) and heat gains (internal and external). Doing so, the perspective on and from the inside space will dynamically change during the days and seasons .

The described concept has been then developed and tested adopting an evidence based approach and creating a constant dialogue between design and performance analysis (performed through specialist software such as dynamic thermal modelling and simulation, EDSL TAS, and daylighting software, Radiance). The spatial diversity was obtained along the height of the unit based on the thermodynamic principle that warmer air raises and tend to stratifies. But, in order to enhance this diversity, also for the daylight, the geometry of the openings, insulation and thermal mass were distributed according to the simulation's results. The outputs from the performance analysis became the inputs for the architectural design *(Fig. 2)*.

Living the diversity
The design outcome provides diverse environmental combinations of light, temperature, privacy and views. Occupants can then choose the environmental conditions they prefer, following indoor migration patterns, ranging from close visual and acoustic contact with other spaces to high levels of privacy. The user personalizes the spaces, giving them temporarily the function related to the activity carried out. The richness and complexity of the user's experience within this space, enriched by thermal and daylight diversity, has been visualised supposing possible patterns during typical days *(Fig4)*.

Conclusions
The study reports on the generative process followed to design a contemporary unit that provides the range of thermal and visual adaptive comfort throughout the year by passive means extending the user's enjoyment of the space and reducing the energy demand for comfort. This research offers hints for reflection on the contemporary way of conceiving sustainable buildings based on an integrated process that leads to the building-plants systems, claiming that today's technology, simulations and the technological state of the art allow architects to make a further steps towards innovative sustainable buildings: in fact it is possible to design buildings that work in synergy with the surrounding and the user in order to offer more sustainable, comfortable and contemporary environments (Schiano-Phan, Weber, Santamouris, 2015). The outcome of this research, yet experimental, can be applied to different typologies of buildings in order to really make a shift in the way buildings are conceived, built and lived towards more sustainable built environment and users. In fact, studies suggest that changes in the built environment can strongly influence behavioural choices (Wilhite, 2009) and this correlation, if exploited, can potentially minimise one of the main barriers towards building sustainability that is the cultural and behavioural barrier.

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