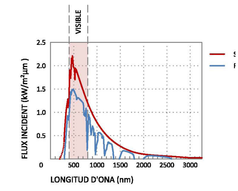
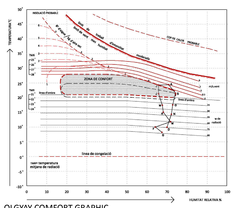
CONDITIONING AND SERVICES I



SPECTRUM DISTRIBUTION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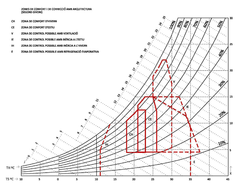
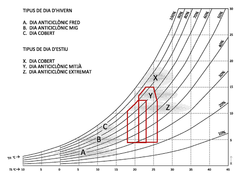
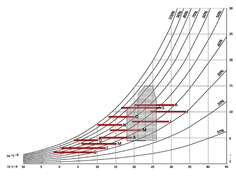
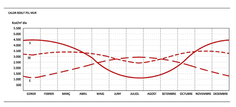
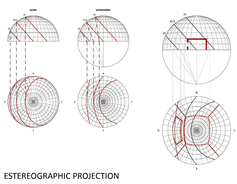

PSYCHROMETRIC CHART GIVONI



PSYCHROMETRIC CHART DAILY OSCILATION


PSYCHROMETRIC CHART MONTHLY OSCILATION


RADIATION OVER VERTICAL WALL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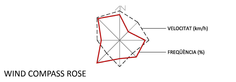
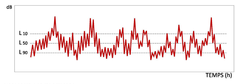
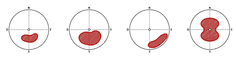
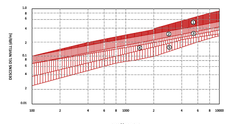


WIND COMPASS ROSE

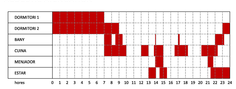


SOUND VARIATION

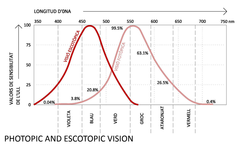

LOCATION DEPENDING ON THE CLIMATIC ZONE



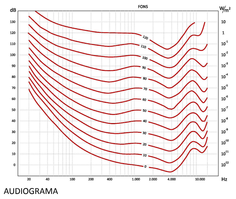
ACOUSTIC ATENUATION



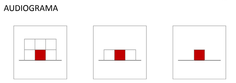
SPACE CONNECTION

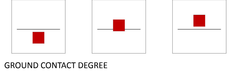


PHOTOPIC AND ESCOTOPIC VISION



AUDIOGRAMA


ATTACHMENT DEGREE


GROUND CONTACT DEGREE


PERFORATION DEGREE


SMOOTHNESS DEGREE

INTRODUCTION

This course studies the physical, physiological and psychological principles of environmental conditioning. The behaviour of the building in relation to the light, thermal and acoustical environment is presented: general aspects, systems, and evaluation parameters.

OBJECTIVES

Condicionament I Serveis I **(Environmental Conditioning and Services Equipment)** deals with the study of natural means, as well as the introduction of artificial means for environmental control and building services. The purpose is to provide the students with the knowledge and abilities needed to assess and plan architecture based on energy**.**

To attain this goal, the knowledge of the basic physical, physiological and psychological principles that regulate energy and environmental processes is needed. Some of the principles have already been introduced in other courses, be it in basic, intermediate education or at university (*Física II* and *Bases per a la tècnica*). Others have not been previously studied and can be new concepts for the students. In any case, a structured conceptualization becomes necessary, regarding the acoustic, light and climatic issues in architecture, whether in the natural or the artificial scope. This is the purpose of the first part of the course.

In the second part, with an already acquired basis and language, the course will deal with the historical and cultural background on the topic, through the comprehension of the environmental phenomena that shape the architectural environment.

The third part comprises the environmental control techniques applied into architecture. The different techniques will be studied, from the more general, including those previous to the design of the building - such as the site - to the specific natural systems to solve and improve certain aspects of its environmental behaviour. This part is considered the core of the learning process, which allows the student to acquire the needed ability to address an architectural project from an energetic point of view.

COURSE DEVELOPMENT

Teaching will be theoretical and practical. Along the course, one theoretical test and two practical projects will be performed.

Project 1. Critical analysis of building facilities in a residential building in Barcelona or surroundings. It will be performed in groups of two students. At the beginning of the course, the buildings to assess will be proposed. Teacher's approval, through signature, will be needed to proceed.

1. Diagrams and comments on building facilities
(geometry, operation, etc.)
2. Diagrams of transportation, space occupation and building facilities with their aesthetic repercussion.

Project 2. Design of the climatic, light and acoustic natural aspects of an individual space for a hypothetical user that carries out a specific task. The work will be developed in three main parts. The first one will be centred in the initial implantation study: pre-existences and micro climate study, location and surroundings correction. The second one is focused on the development of the architectural solution. The third one involves a revision of the proposed design considering the lighting, acoustic and climatic evaluation. At the end of the course, the student will handle a simplified version of the project together with the calculus of the energetic functioning results.

Project phases

1st phase: Definition of the relations between the exterior pre-existent microclimate and the project's disposition, regarding its location, orientation and building or spatial typology. A detailed study of every pre-existence that supports the decision of the location will be carried out. In addition, the corrections of the surroundings needed will be implemented in order to maximize the appropriate energetic performance.

2nd phase: The student will introduce the modifications suggested on the feed-back with the professors and he will develop the shapes and components of the project. The natural conditioning elements (skin, protections, special systems, vegetation...) that suit better the user's needed environmental conditions will be implemented in the design. In this phase, the project will be detailed, considering dimensions, materials, colours, exterior and interior finishing, etc. The result will be studied in floorplan, section and diagrams of the seasonal energetic functioning.

3rd phase: In this third part, the student will develop climatic, lighting and acoustic calculus in order to optimize the adopted solution. Corrections on the design – such as shape, measures or materials - depending on the results of the calculations will be carried out.

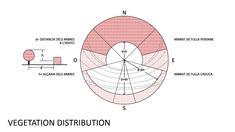
COURSE STRUCTURE

INTRODUCTION.
Environmental conditioning and service building equipment

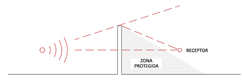
1st PART. ENERGETIC ENVIRONMENT IN ARCHITECTURE
- Introduction to the environment knowledge
- Physical definition of environment
- Physiological definition of environment
- Psychological definition of environment
- The environmental language

2nd PART. THE ENVIRONMENTAL CONTROL IN TIME AND SPACE
- The climate and other environmental pre-existing elements
- Climate and popular architecture
- The history of environmental control in architecture

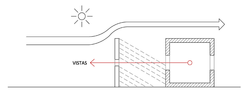
3rd PART. NATURAL MEANS OF ENVIRONMENTAL CONTROL
- General project characteristics
- Location choice
- Correction of the surroundings
- The general shape of the building
- Skin characteristics
- The building interior
- Special systems of natural conditioning
- Solar gain based systems
- Inertia based systems. Interior and peripheral
- Ventilation systems and air treatment
- Solar radiation protection systems
- Special systems of natural lighting
- Lighting conduction components
- Treshold components
- Control elements
- Special acoustic systems
- Acoustic correction and protection
- Natural lighting evaluation
- Locals' acoustic evaluation
- Climatic building's evaluation



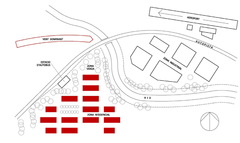
VEGETATION DISTRIBUTION

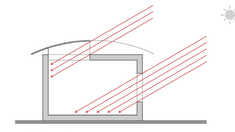


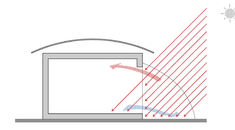
ACOUSTIC BARRIER

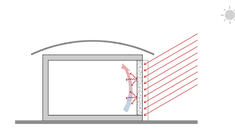


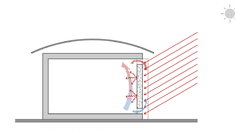
VISUAL BARRIER

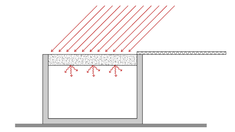

ACOUSTIC PLANIFICATION

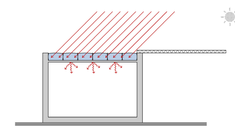

DIRECT SOLAR GAIN

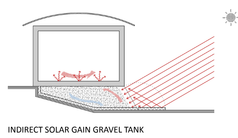

SEMI DIRECT SOLAR GAIN. SUNSPACE

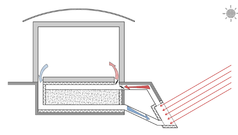

INDIRECT SOLAR GAIN IN WALL

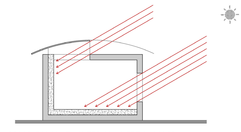

INDIRECT SOLAR GAIN TROMBE WALL

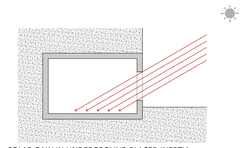

INDIRECT SOLAR GAIN WITH ROOF PLACED INERTIA

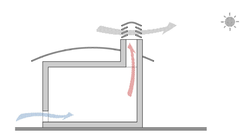

INDIRECT SOLAR GAIN IN ROOF POND

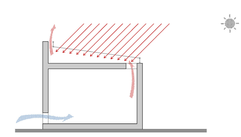

INDIRECT SOLAR GAIN GRAVEL TANK

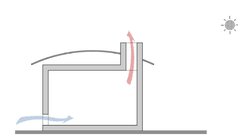

INDEPENDENT SOLAR GAIN


SOLAR GAIN WITH INTERNAL INERTIAL MASS


SOLAR GAIN IN UNDERGROUND PLACED INERTIA


VENTILATION BY STATIC ASPIRATOR


VENTILATION BY SOLAR CHAMBER


VENTILATION BY CHIMNEY EFFECT

PROJECT 2. STUDIO FOR A USER IN A SPECIFIC CLIMATE AND LOCATION. THREE EXAMPLES OF SIMILAR CLIMATES AND USERS

STUDIO FOR JOAN MIRÓ

CONTINENTAL MEDITERRANEAN CLIMATE

SOUND: Aerial noise of 70 dB(A)
VEGETATION: Perennial forest
LANDSCAPE: Pleasant views at the South-West

STUDIO FOR VASILY KANDINSKI

NORTHERN LITORAL MEDITERRANEAN CLIMATE

SOUND: Noise at the East of 90dB at 100m
VEGETATION: Deciduous trees forest
LANDSCAPE: Pleasant views at the East

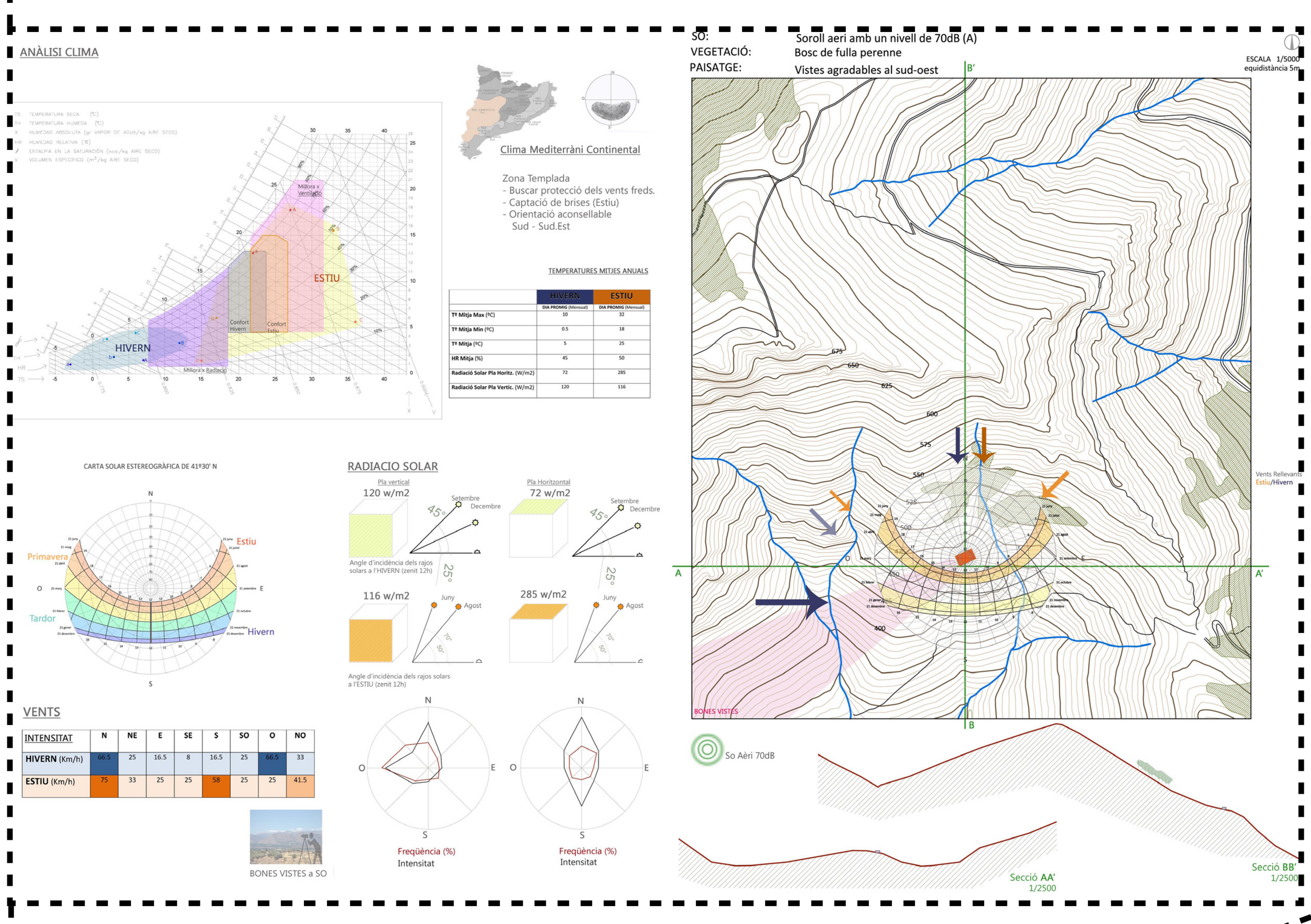
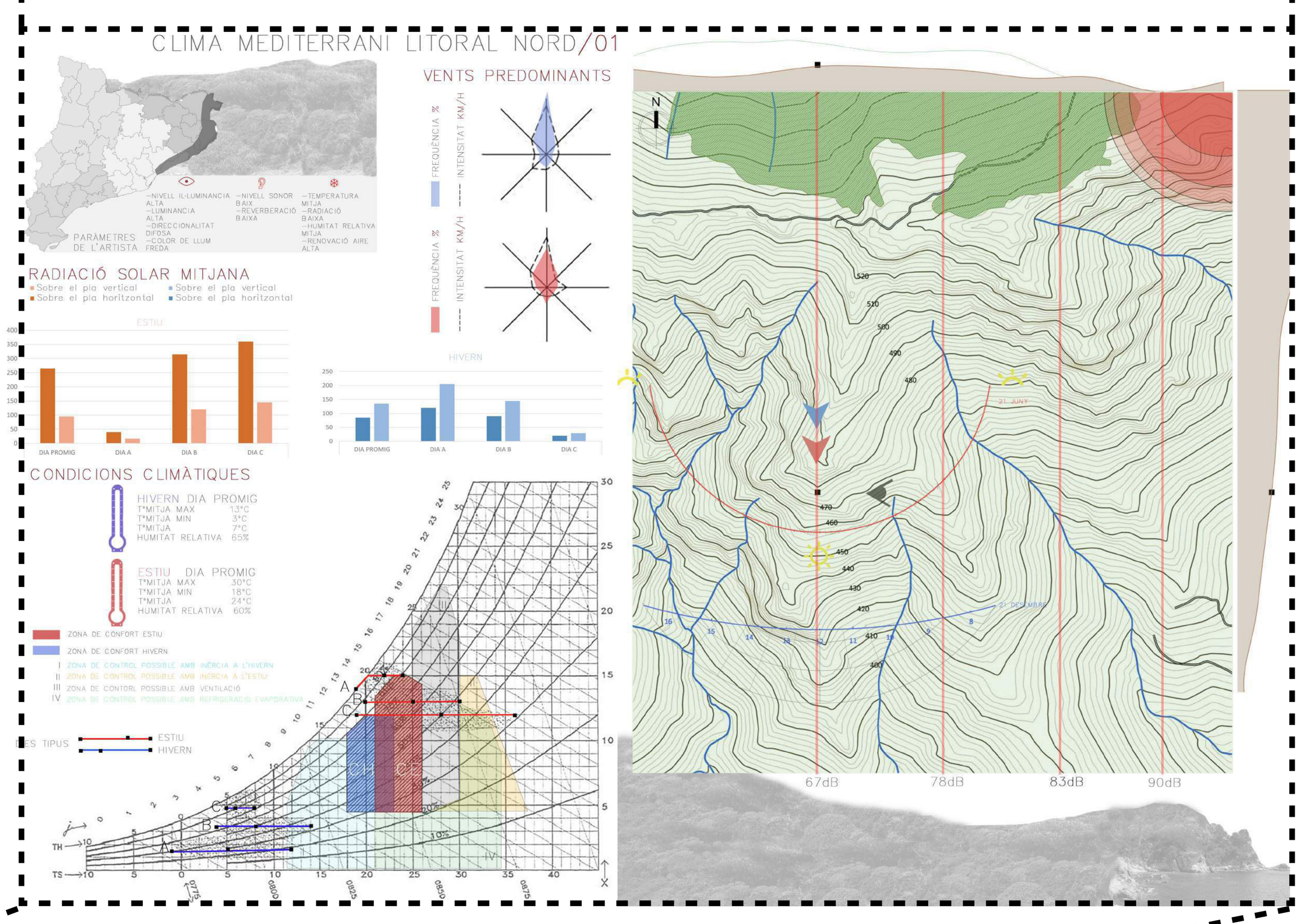
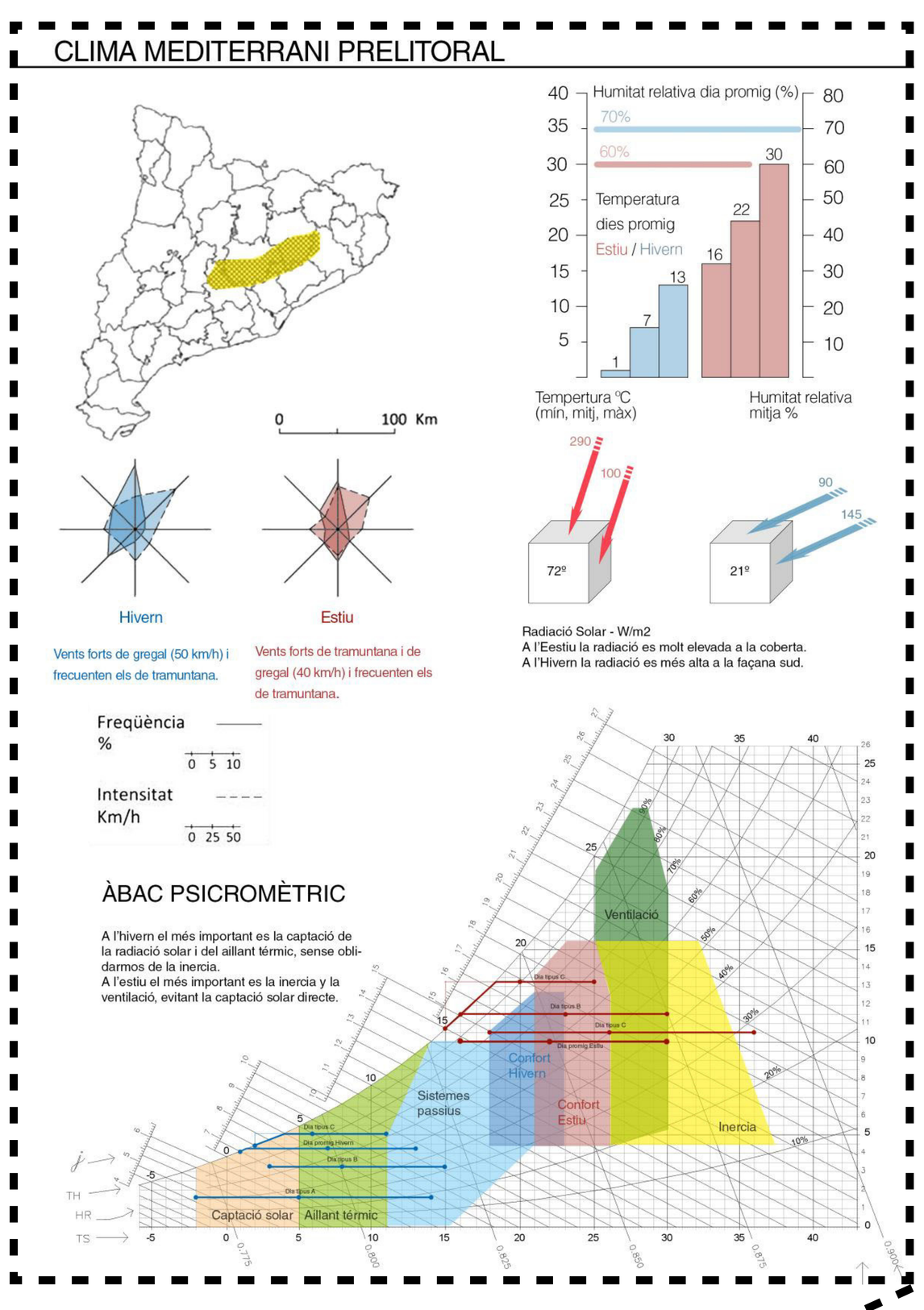
STUDIO FOR MAITENA

PRELITORAL MEDITERRANEAN CLIMATE

SOUND: Noise at the East of 80dB at 75m
VEGETATION: Deciduous trees forest
LANDSCAPE: Pleasant views at the South-East

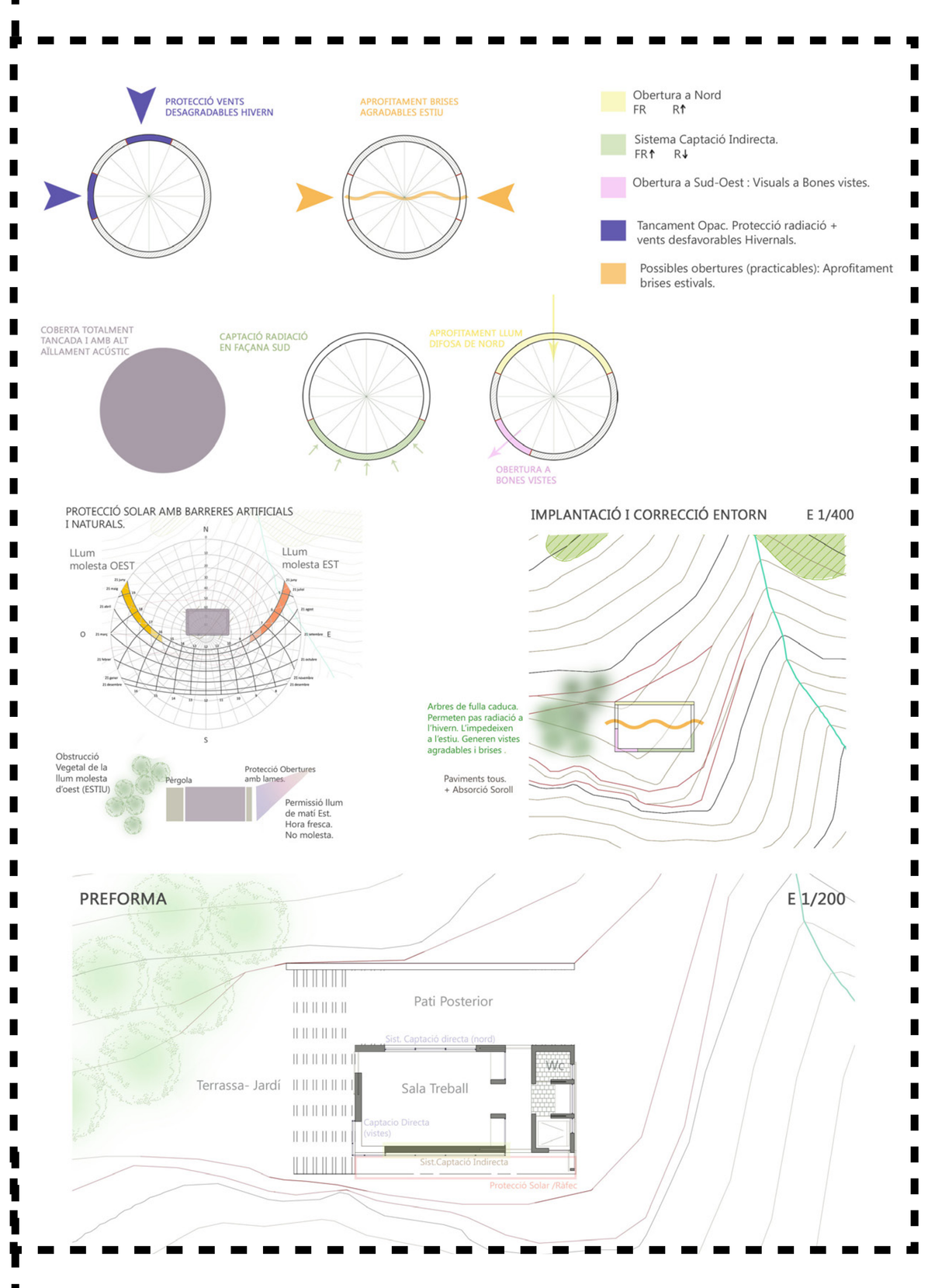
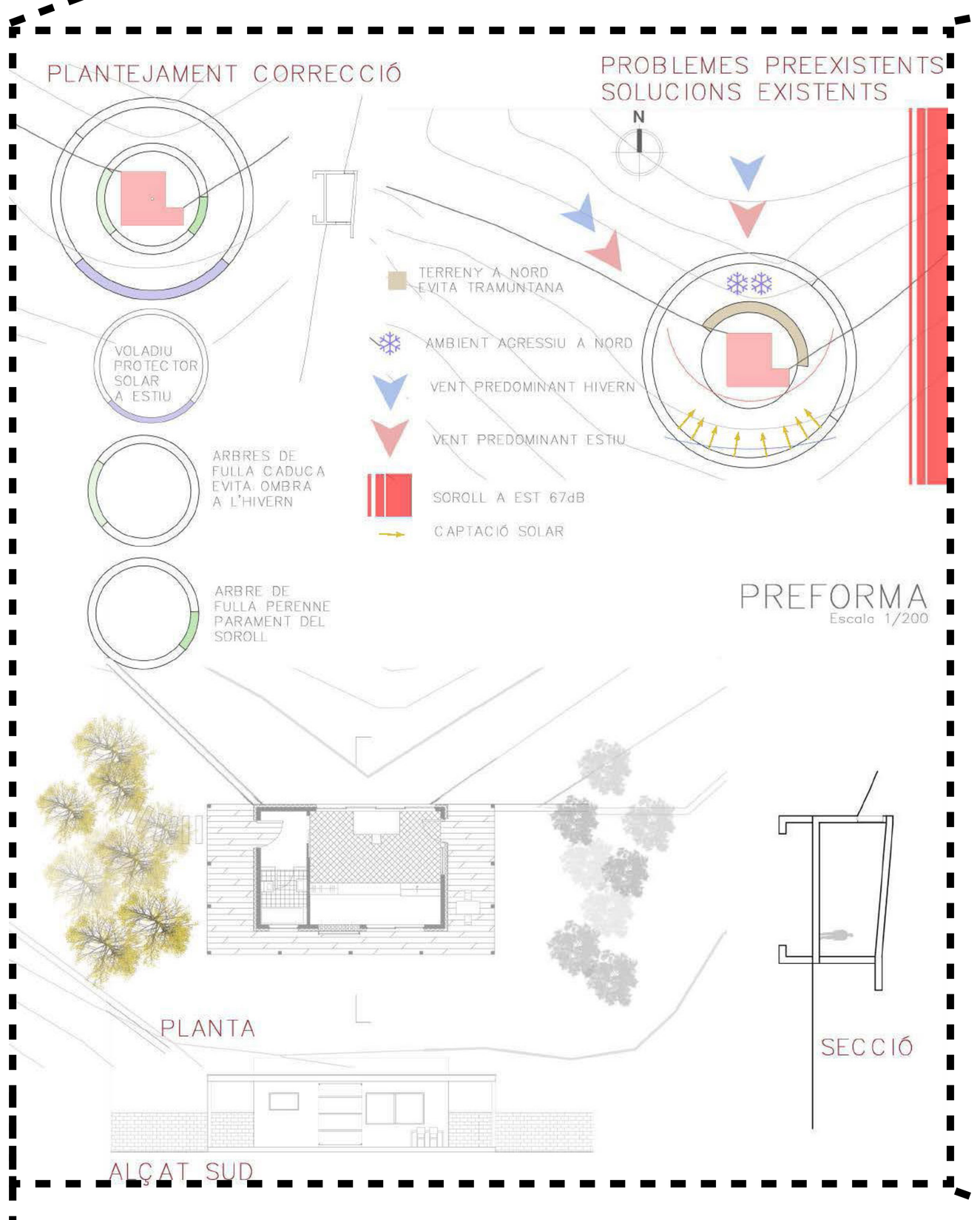
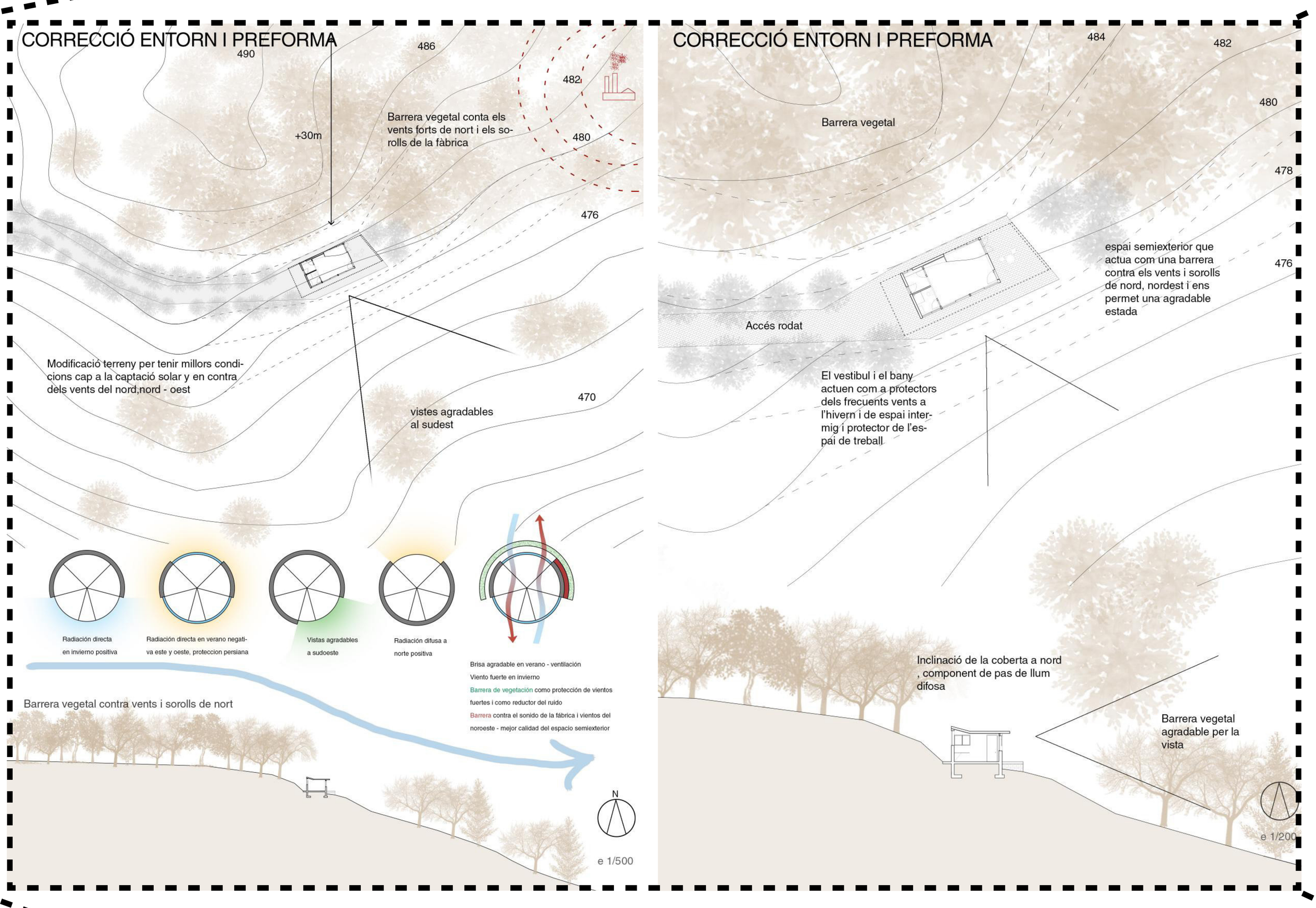
1. ANALYSIS OF THE PRE-EXISTING

ASSIGNATION OF A CLIMATE AND LOCATION THAT DETERMINE INITIAL STRATEGIES

2. CORRECTION OF SURROUNDINGS + PRE-SHAPE

THE SURROUNDINGS ARE MODIFIED TO ADAPT TO THE PRE-EXISTENCES AND USERS' NEEDS

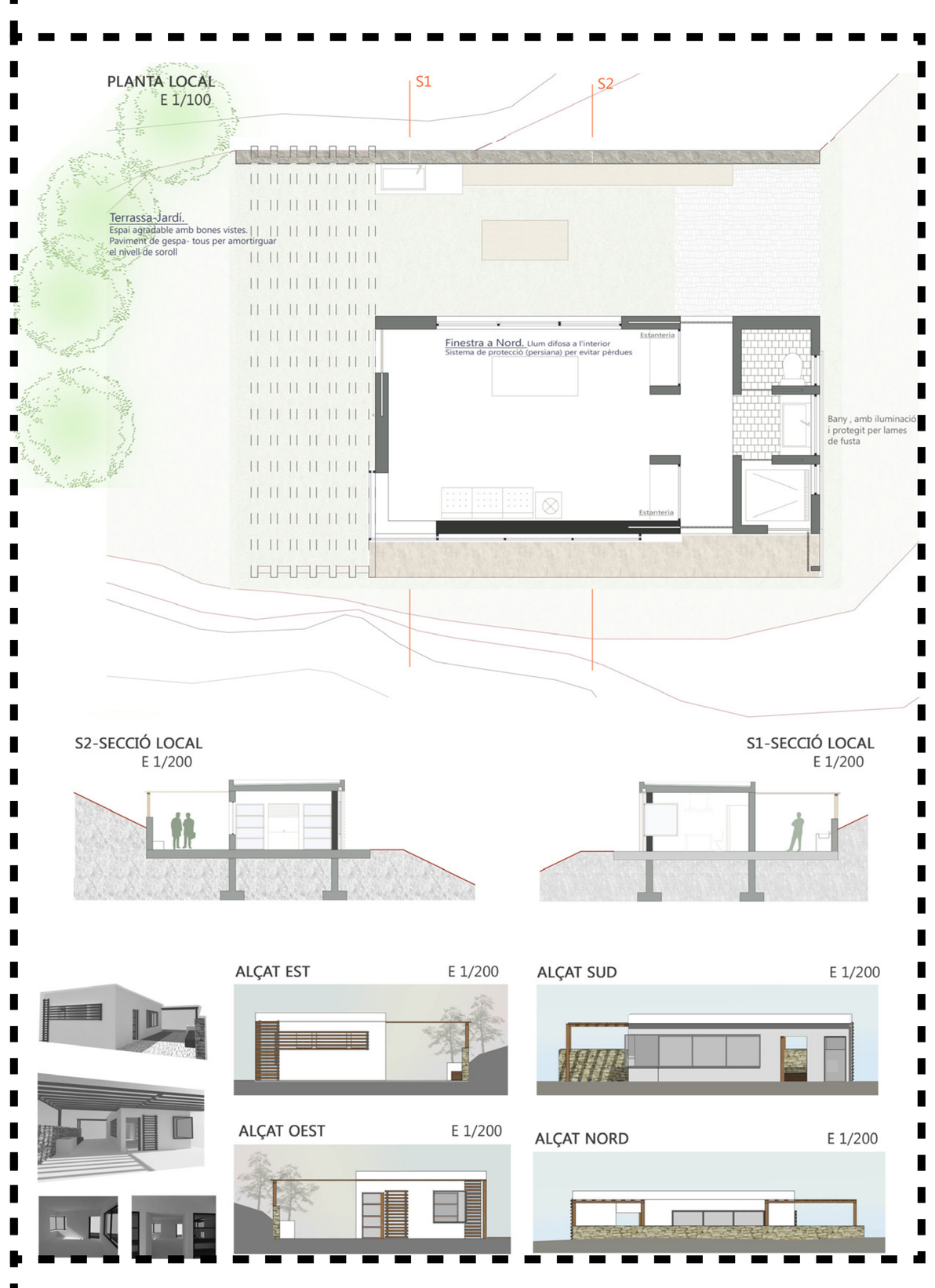
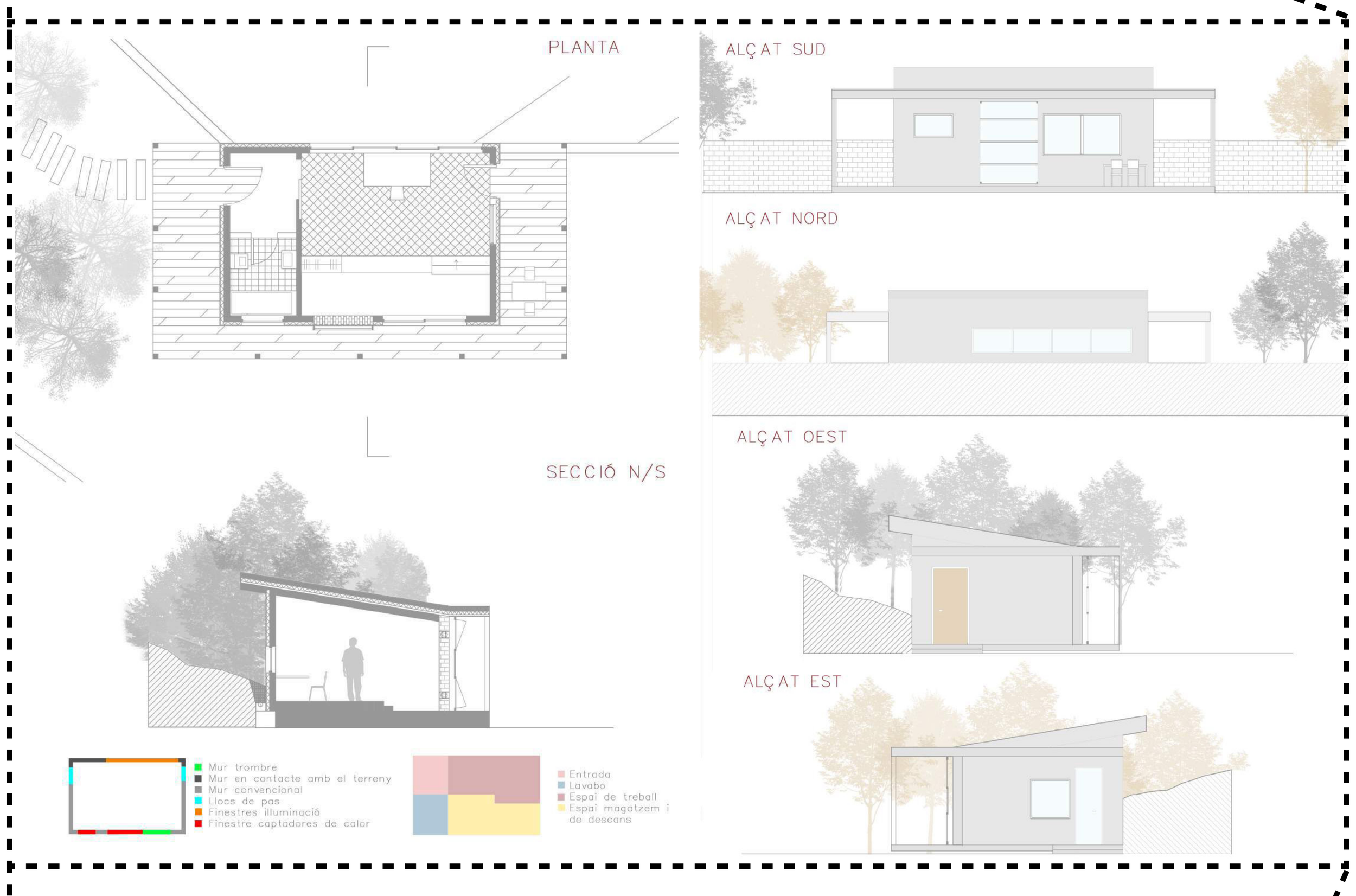
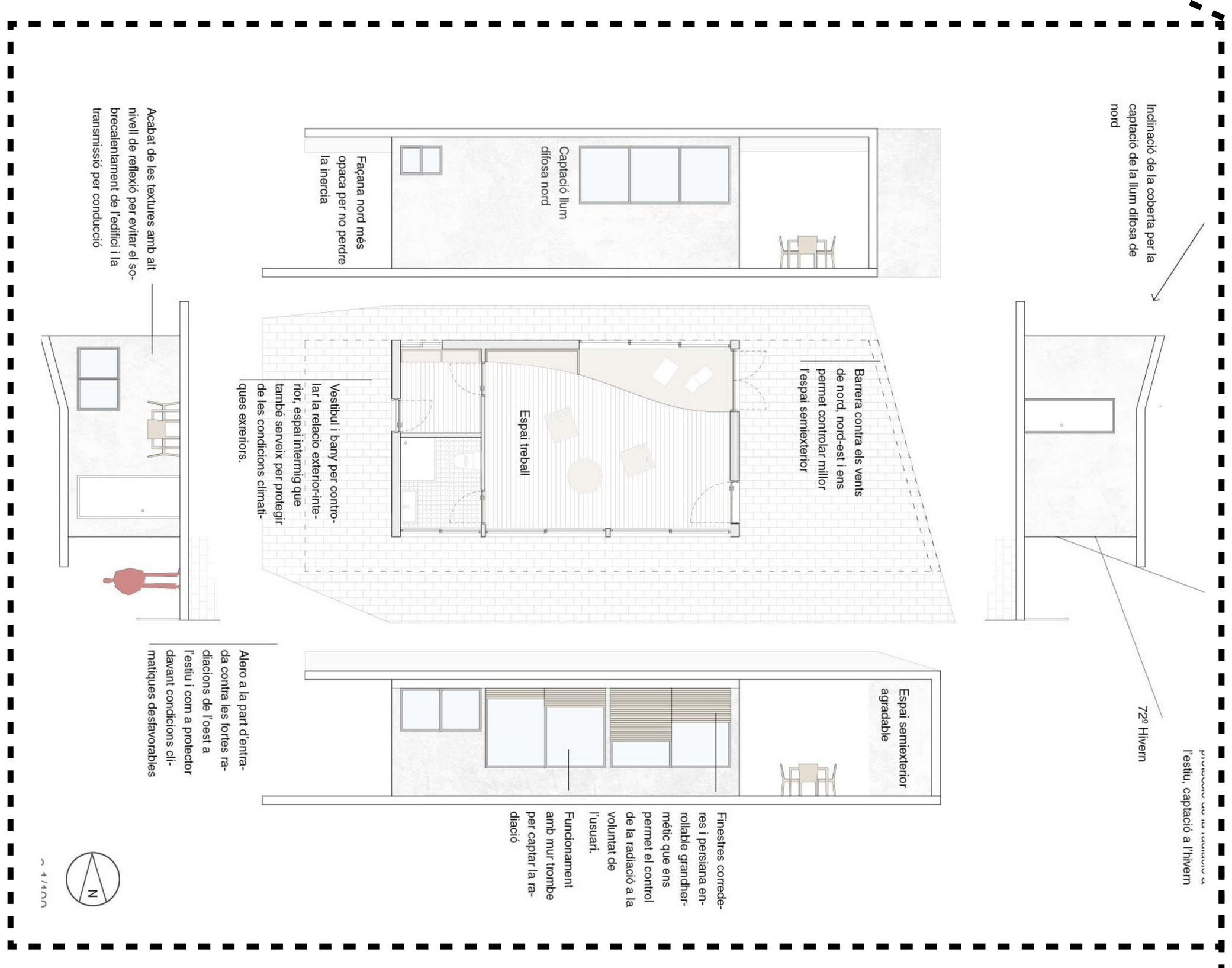
USERS

The users dependent characteristics are defined in order to adapt the project to their needs.

- The program. Use given to the space
- User's character and preferences
- Environmental volitions regarding the space structure, lighting, visual, acoustic and climatic parameters.

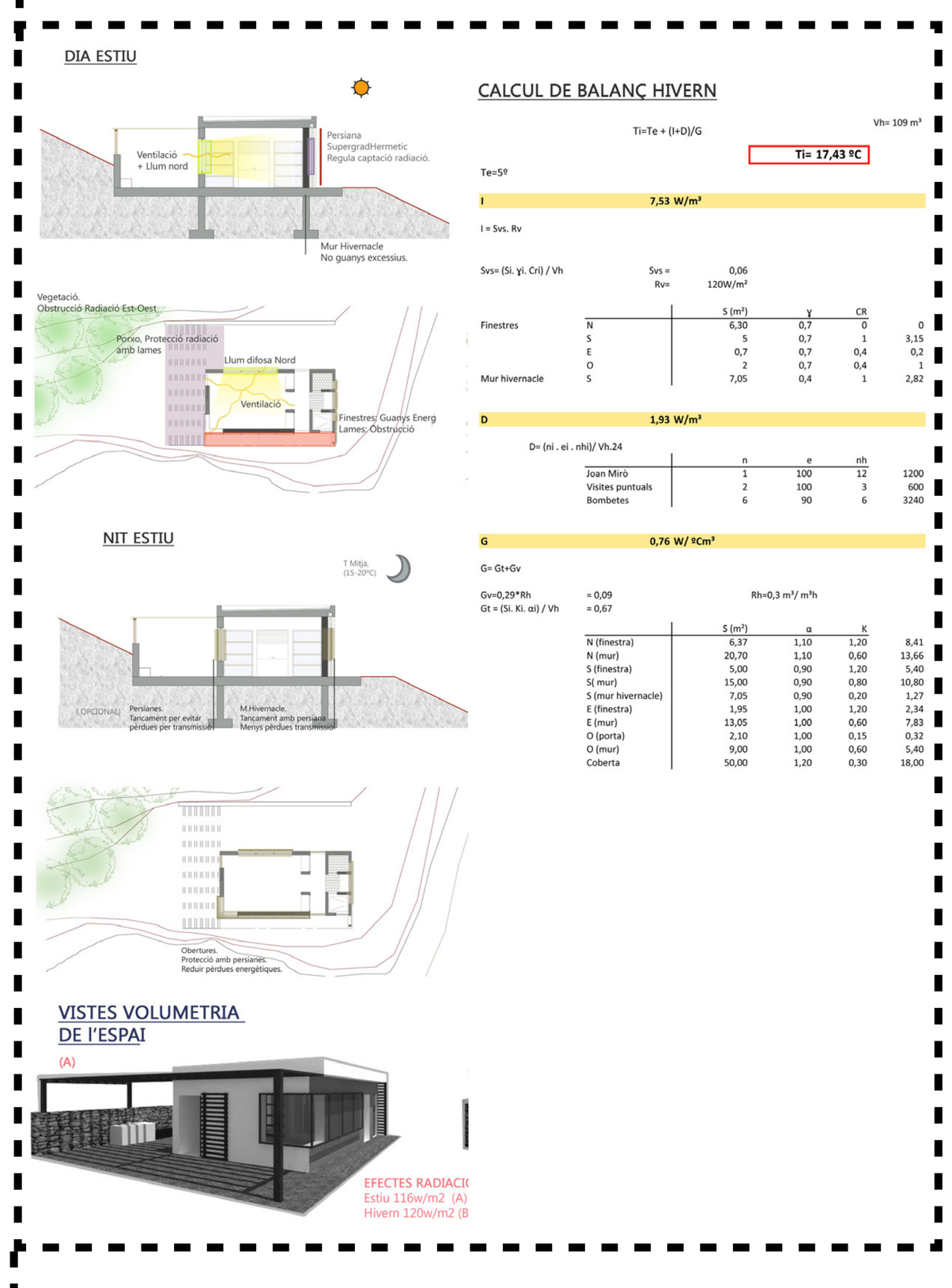
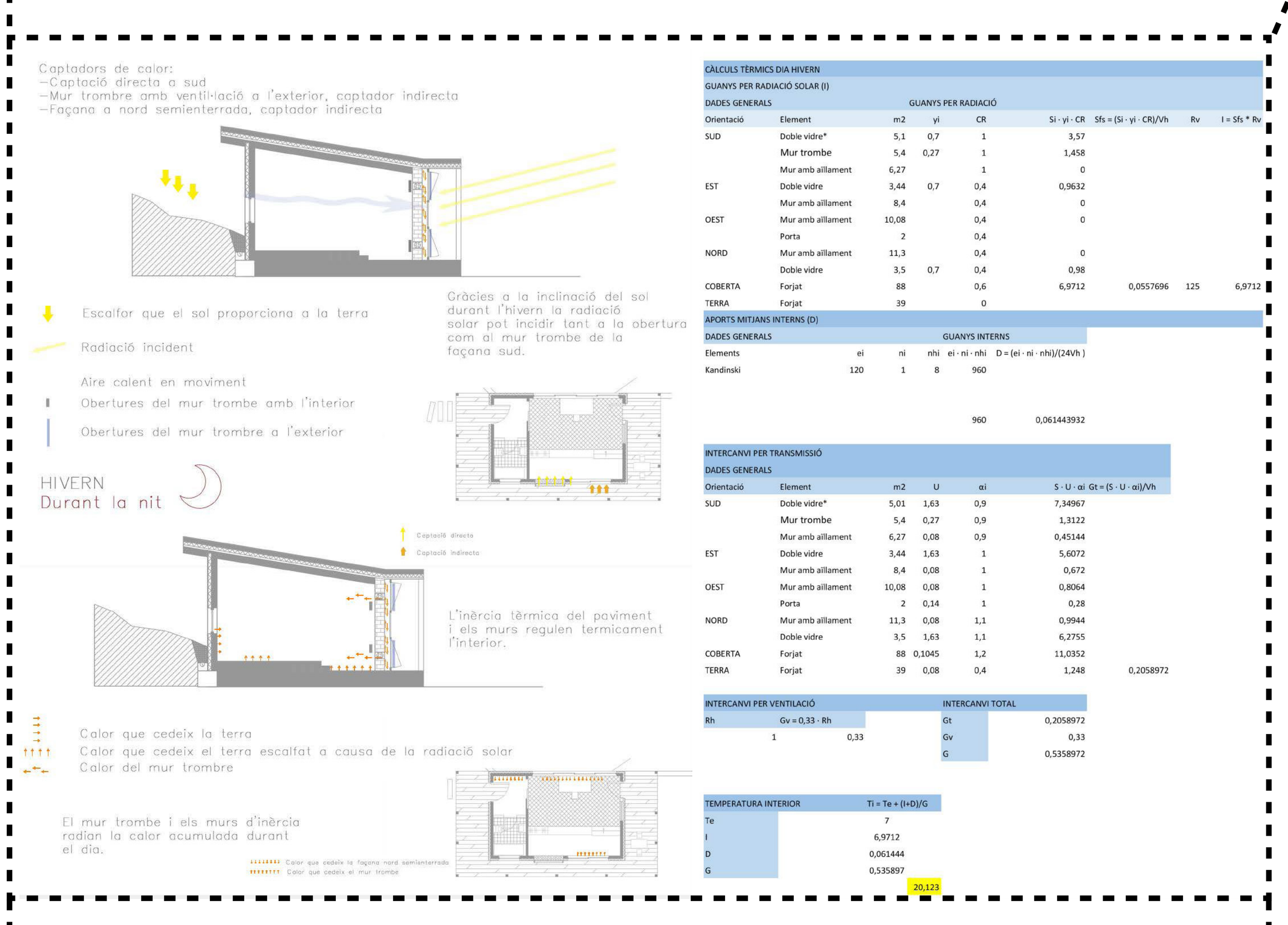
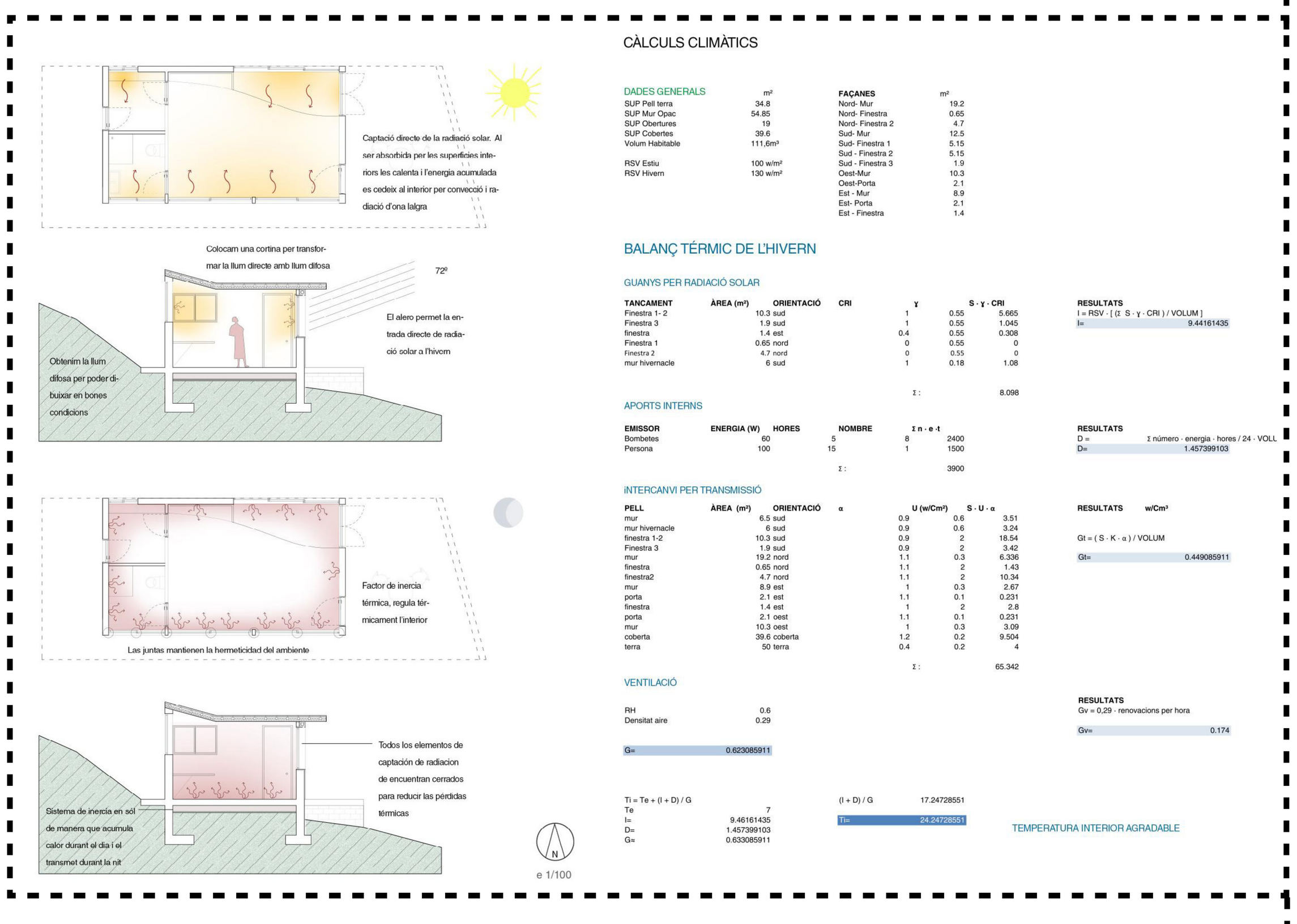
3. DEFINITION OF SHAPE, SKIN AND INTERIOR

THE PROJECT IS DEVELOPED TO ANSWER THE ENVIRONMENTAL AND USERS' NEEDS

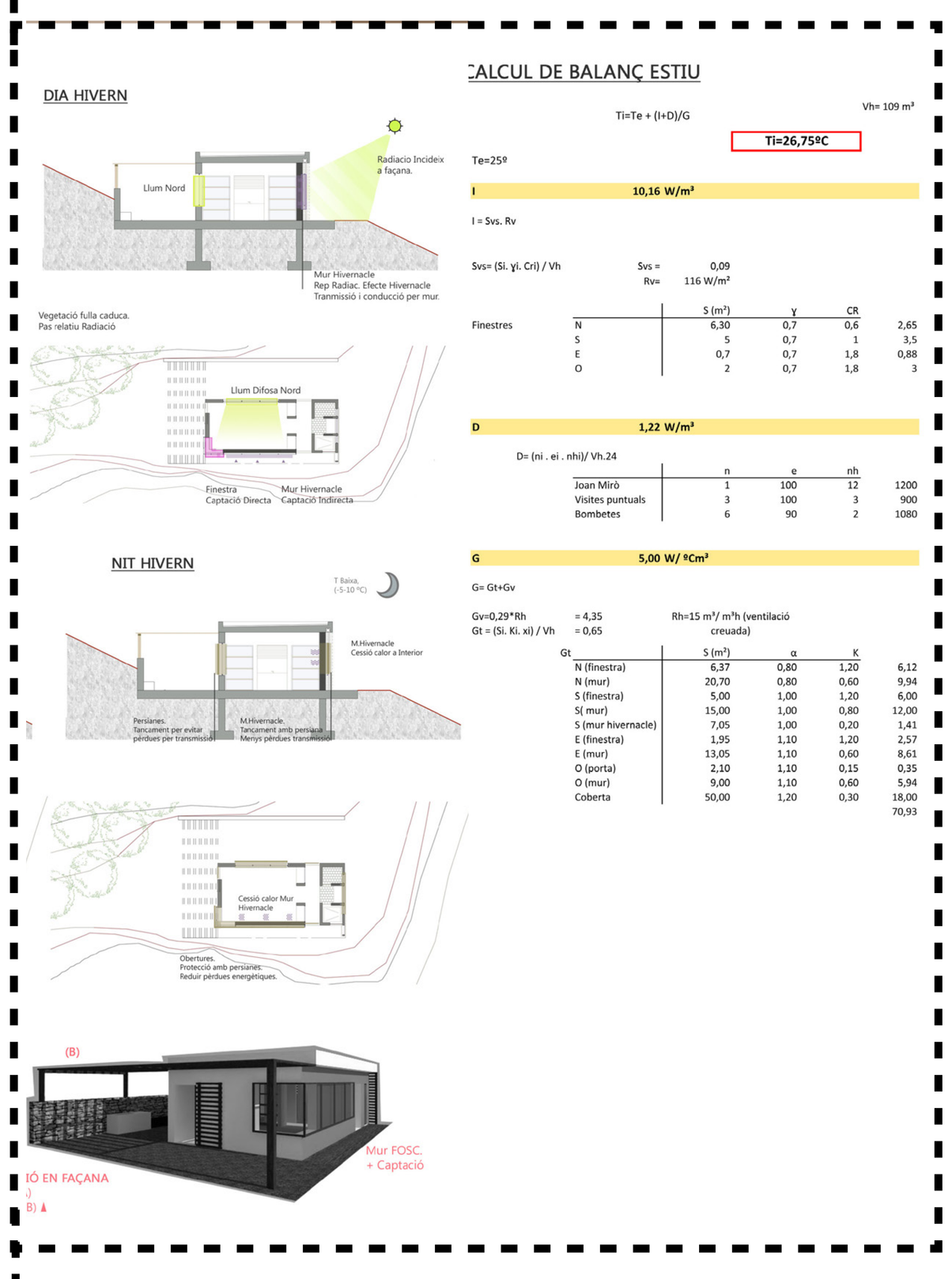
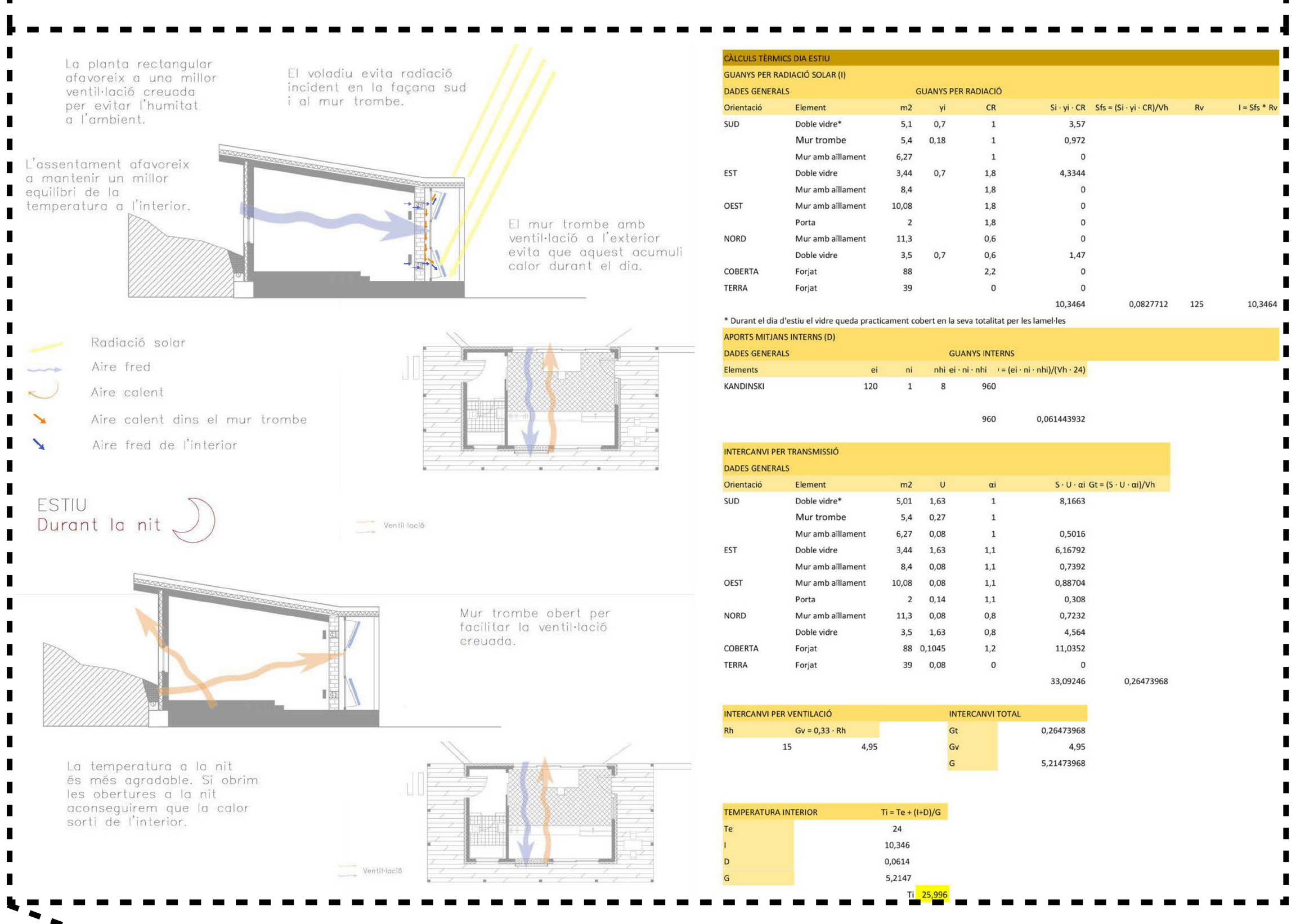
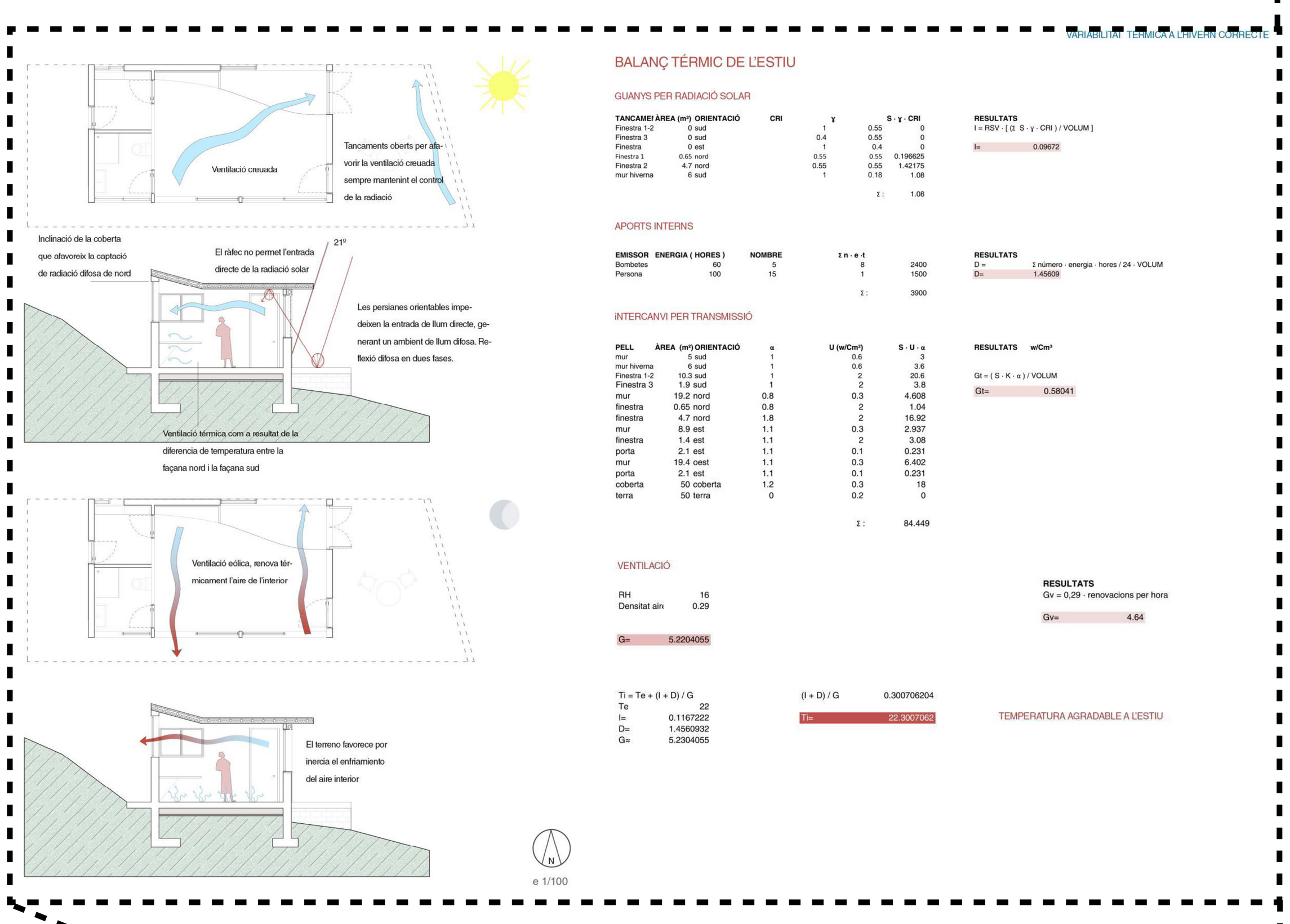
4. WINTER ENERGETIC BEHAVIOUR

THE ENERGETIC BEHAVIOUR IN WINTER IS CALCULATED USING BALANCE AND VARIABILITY ALGORITHMS

5. SUMMER ENERGETIC BEHAVIOUR

THE ENERGETIC BEHAVIOUR IN SUMMER IS CALCULATED USING BALANCE ALGORITHM

6. ACOUSTICS AND LIGHTING

THE ACOUSTICS AND LIGHTING FUNCTIONING ARE CHECKED THROUGH CALCULATIONS