

## Architecture A main factor of development and protection of the mountain environment

Estelle Lépine

### Abstract

The objective of this contribution is to show architecture as a major factor of development of the mountain environment against both environmental and human risks caused by the severe overcrowding of the routes leading to the main Alpine summits.

The choice between new buildings and the rehabilitation of existing refuges is currently a subject of debate in the Alps. The conference will focus on the Mont-Blanc area. Empirical *in situ* observations and confrontation between architectural and environmental considerations have raised specific issues. Nevertheless, this approach is applicable to other summits.

In a theoretical contribution, architecture will be put forward as a main factor in the development of the mountain environment. The definitions of walking, landscape and territorial scale will be seen as an integral part of the architectural project, contributing to the choice of the site, shape and integration. In order to consider the design of the spaces, we will look into the right level of comfort, appropriate materials and atmosphere, and the human and environmental risks at high altitude and in extreme environments.

Particular attention will be given to the Aiguille du Goûter refuge as a case study. As the overcrowding of the Mont-Blanc has considerable consequences on the environment and on human health, the architectural reflexions are aimed at answering the issue of environmental protection. The conclusion will evoke the limits of the project.

The originality and interest of this contribution is to use architecture (implementation, typology and material) to address these issues and to examine site-specific solutions in order to protect a given environment.

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### Keywords

Refuges, Alpine Architecture, Landscape, Risks, Comfort, Mont-Blanc, Alpinism, Walking

### Introduction

The human impact in the Alps is still developing; the major part of the summits is suffering from an overcrowding that has environmental and human consequences. The extreme conditions of the high altitude threaten mountaineers by natural risks, which are easily hidden behind the mass of people. On the other hand, the popularity of the Alps increases the menace of pollution and alteration of the landscape. Nowadays, most of the refuges need to be replaced or renovated, which is why the research was aimed at finding the capabilities of architecture to take part in the protection of the mountain area. The Mont-Blanc could be considered as one of the most visited summits of the Alps. In order to propose a new academic project to replace the Goûter refuge, which has been obsolete for years, this example is a suitable case study to illustrate our hypothesis. The refuge is now condemned to disappear given the fact that the French Alpine Club has built new accommodation a few meters away. Voluntarily, the new proposition won't be discussed because this study took place at the same time as the design process.

### Method

In order to analyse the particular case of the Aiguille du Goûter refuge, two scales were confronted. The first analysed scale was that of *territory* considered through the process of walking. It allows for the interpretation of the ascent as one route from the valley to the mountaintop with all its mutual risks both for the environment as for the mountaineers. The tools that we used were mainly the map at a 1/25 000 scale (source: IGN 3531 ET, St-Gervais-les-Bains, Massif du Mont-Blanc) and a virtual section of the climbing process to the summit (source: Estelle Lépine). The second scale was that of the *building*, considering different concepts in relation to landscape, shape and space, in order to determine the definition of the refuge. We used mainly architectural plans, primary literature sources and personal drawings of architectural surveys.

Finally, a refuge has been designed by the present author, presented with models and drawings (source: Estelle Lépine), in order to illustrate both approaches to scale and to provide theoretical answers applicable to summits suffering from similar dilemmas.

## Results

Rebecca Solnit defines high mountains as the environment above the forest level generated by natural forces and characterized by a harsh and freezing climate, where life does not exist anymore or is reduced to a minimum (SOLNIT 2002). Ice and glaciers are omnipresent and impose significant challenges to human beings who want to venture into those conditions. Special equipment and techniques are required to go up and appreciate silence and peace. However, hidden dangers lie under the beauty of the icy whiteness. The sound of falling ice keeps mountaineers alert to the reality of the surroundings and leads them to behave carefully.

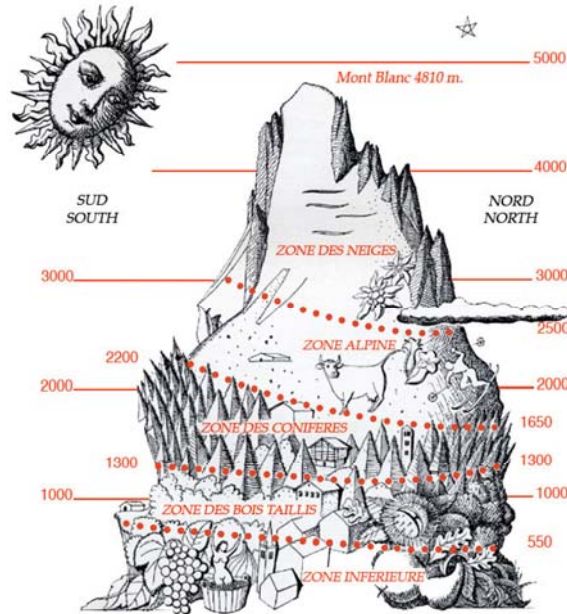


Image n°1: Source : Cereghini, M. 1956. Costruire in Montana. Milano

At high altitude, mountaineers are vulnerable to risks. The key issue is to characterize and understand the effects that this exposure has on them. *“Le risque est le dommage dont on peut évaluer la probabilité d’occurrence”* (PERRETI-WATTEL 2000). In other words, it is a notion of consequence multiplied by a presumption. Risk depends on hazards. It is not danger but it forestalls it. It is a paradox because it is real and unreal at the same time. It is objective and rational as a probability can be numbered. Simultaneously, risk is also subjective. The perception depends on the personality, the situation and the context. Anyone who is exposed to danger will react differently. In any situation, if the reason of danger is known, to be removed from it will reduce risk. On the other hand, it becomes much more complicated to avoid multiple sources of danger, as is the case in a mountain environment. As a result, it can be stated that zero risk does not exist, especially in alpinism (PERRETI-WATTEL 2000).

Risk perception has changed throughout the evolution of society; priorities are no longer the same (Anthony GIDDENS 1994). Education teaches us to respect science and technology without questioning daily life evidence. Complications emerge only when we enter into science ourselves. In fact, we learned to put our trust in expert systems or specialists. We believe in the functioning of our equipment more than the equipment itself. Trust and risk cannot be separated, because faith represents a conscious act of the human being in the unknown. Human mass, for instance, is a factor of trust, increasing with the number. That amount hides the truth and, sometimes, distorts the perception. Mountaineers progress in a reinforced safe feeling. Thus generalizing access to summits and refuges decreases limits of risk acceptance and perception, making an extreme environment accessible for all. If risks are visible within architecture, can we think that it will make the extreme environment more evident and that it will lead to more responsible behaviour towards the mountains? The approach chosen by the architects Devanthery and Lamunière in their project “Alpine Ensemble” incorporates a protection against avalanches in the renovation of a small woodhouse. From the outside, the presence of the concrete wall appears to be omnipresent, reminding us of the presence of danger. It highlights the issue of the risks to which we are exposed (LAMUNIÈRE 2006).

At high altitude, alpinism is not a common experience. It requires physical investment. Rebecca Solnit relates it to pilgrimage, *“le voyage sans point de destination aurait quelque chose d’aussi inachevé que l’arrivée non précédée d’un voyage”* (SOLNIT 2002). Summit glory and ascension seem inseparable; they are both important. Walking is the most appropriate way to feel and appreciate the mountains. It is a mechanical process based on the personal and physical abilities of the body. Connecting *space* and *time*, it opens the mind to the path followed and the exercise provided (SOLNIT 2002). Architects have already been confronted with these issues (REICHLIN 1998). Eduard Krüger, for example, designed a refuge of commemoration “Schliffkopfs Haus”. Along the walk through the forest, the building is visible through the treetops and is regarded as an objective. Added to the meaning of the construction, the spirit of the site highlights the importance of reaching the refuge towards the place of memory. Eduard Krüger emphasized the effect through the shape and implantation of the refuge which induce an ongoing movement from the outside to the inside memorial room, demonstrating the possibilities of integrating walking

within architectural projects. This suggests that the approach to a refuge is important, but nevertheless that the position could be even more significant for an ascent.

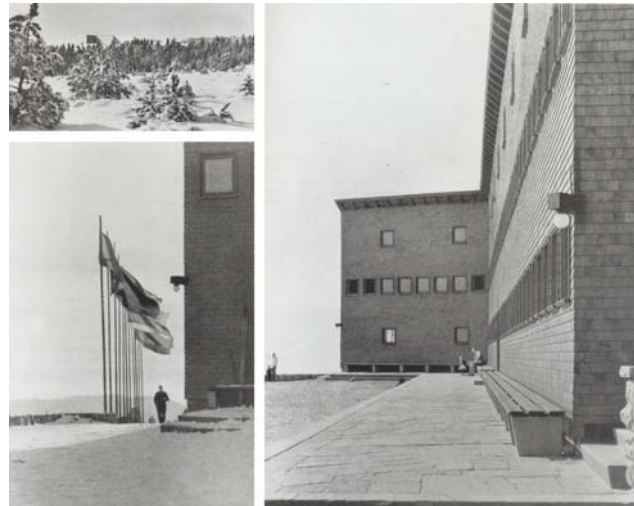


Image n°2: Source : Mayr Fingerle, C. (dir.) 1996. Neues Bauen in den Alpen: Architekturpreis. Basel.

Modernists have studied the qualities of the mountains through the relationship between site, scenery and nature. Regarding different examples, we can define three ways of questioning the parallel between landscape and architecture.

*Discretion* in architecture is explained by Theodor Fisher not as a work of contrast but as a harmony with nature. Everything must be valued (REICHLIN 1998). The qualities of the surroundings remain untouched despite the intervention. As for the extension of the wood house Truog "Gugalun", Peter Zumthor modified everything but at the same time he respected the original context (MAYR FINGERLE 1996). In that case, time is a consequential factor of success (REICHLIN 1998).

*Mimetism* is modeling nature through shapes and materials. Inspired by the form and inclination of ridges, slopes or summits, the works of Franz Baumann or Hans Leuzinger are typical. Their projects integrate the surrounding within the building through the choice of dimensions, shapes and materials (REICHLIN 1998). More recently, the main façade of the Monte Rosa Hütte project coincides with the summits in the background (ETH ZÜRICH 2010).

The geography and scenery of a site can also be integrated within a project as a tool of *composition*. Places can inspire the program because of their outstanding features. A number of architects use it as a conception tool. Lois Welzenbacher studied the relation between architecture, landscape and mountains for every mountain house he designed (REICHLIN 1998). Landscape is a physical site element (REICHLIN 1998). The entire architectural project is based on physical evolution influencing implantation and form. The Böhler house of Heinrich Tessenow demonstrates the possibility of composing the plan through the movement from the access road to the main terrace (BOESCH 2008). Adding section dimensions by height variations underlines the close relationship between the interior and the exterior. He emphasized the connection with the surroundings.



P. Zumthor  
Haus Truog «Gugalun»



H. Leuzinger  
Planurahütte



L. Welzenbacher  
Haus Buchroithner

Image n°3: Source : Mayr Fingerle, C. (dir.) 1996. Neues Bauen in den Alpen: Architekturpreis. Basel.

Specifically thinking of refuges, the work of Jakob Eschenmoser (1908-1993) is difficult to avoid. He conceived several projects, offering a maximum of efficiency for the interior spaces while proposing a minimal façade. He considered the latter as the weakness of any building because of the extreme climatic conditions in mountain environment. To address these conditions, he succeeded in reducing the external surfaces by studying the dimensions of the fundamental component of the refuge: the bed. Taking human proportions as a base, he optimized the size of a mattress, reducing mostly the width at the foot end. In consequence, he obtained a trapezoid plan and a multiplication of the sloped roof. He used that shape as an opportunity to integrate the constructions in harmony

with the surroundings in response to the difficult conditions (FLÜCKIGER-SEILER 2009; ESCHENMOSER 1973). His reflections have had an impact on the morphological evolution of Alpine refuges. The choice of separating the sleeping and common rooms was the first step in the direction of space efficiency and modern comfort.

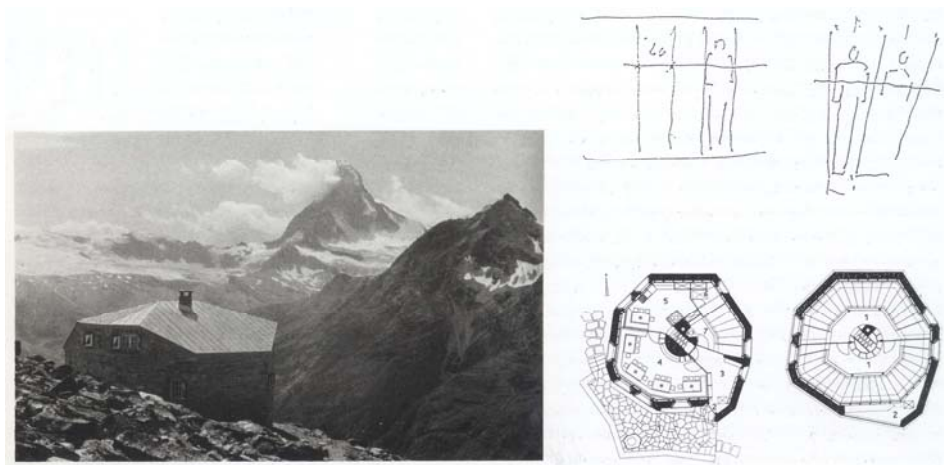


Image n°4: Source : Mayr Fingerle, C. (dir.) 1996. Neues Bauen in den Alpen: Architekturpreis. Basel.

Nowadays, comfort has evolved and is defined as the appreciation of the relationship between one's body and its physical environment in terms of space, temperature, light and sound (CROWLEY 1999). Elizabeth Shove gives us three different definitions (SHOVE 2003). "State of mind" qualifies the desire of access to social recognition. "Attribute" means a standard fixed by the close relationship between scientists and producers. Finally, "achievement" is a concept reached through the self-will of the one who wants it. The last one seems more accurate for comfort at high altitudes, following the reflections of Elisabeth Shove when she points out the strangeness of making effort to control nature instead of constructing the best conditions for the natural needs of the human body (SHOVE 2003). Affording technical supplies is an evident source of difficulties in extreme environments. As users are supposed to wear adequate equipment, we could question the level of comfort currently offered in a refuge. Gaston Bachelard stated that we feel the warmth inside because of the cold outside (BACHELARD 1957). The idea that feeling comfortable comes from the contrast between two opposed situations can be easily experienced in the project of a refuge especially when the purpose of the building is to open the mind to the surroundings.

With these theoretical contributions and studies on both scales, the next objective of the author was to illustrate, through an academic project, what could be the architectural answer to the issues encountered on the particular case of the Mont-Blanc.

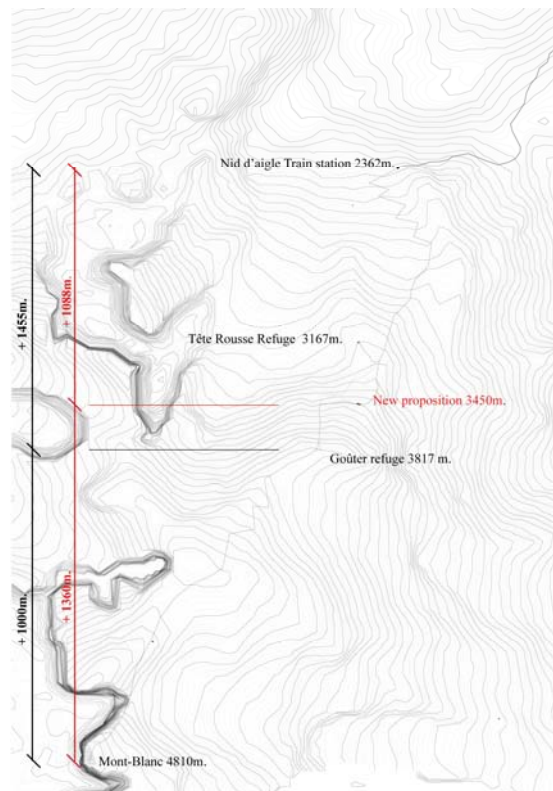


Image n°5: © Estelle Lépine



First of all, the concentration has been put on the choice of the site implantation. The preference was given to a lower position, compared to the ancient existing building and the new project now realized, in order to increase the difficulties on the way up. On the contrary of what happens now with an ascent divided into two equal parts, most of the climb would have to be done on the second day. The intention is to induce a selection of who is capable of making that sort of effort with a potential reduction of mountaineers. In a secured area from falling rocks at the foot of the face, the refuge is not a simple place to sleep anymore. It acquires higher status as a threshold to the highest European summit, a special symbolic meaning. Whilst maintaining the goal of testing the surroundings in order to stimulate the sensations of the climbers, it gives the opportunity to play with the different scales between the refuge and the terrain along the approach. The ubiquity of the steep face will erase any human reference. The last steps, under the building, make its dimension even more difficult to define. And when our vision and footsteps reach the door, it will look appealing because of its protective appearance. The need and definition of a refuge grow obvious in the mind.



Image n°6: © Estelle Lépine

Then the path doesn't stop but continues inside. The ascent remains the main source of imagination of the internal spatial composition. In fact, inside, the guests have to follow up the main staircase to the welcome desk and the common room. Every floor has been imagined as a step. Through the levels, limited size openings brighten up each landing and provide directed eye contact with the landscape. Going up means that the view will change along the floors. Beginning at the lower entrance, the link is assured with the immediate ground. Then one floor at a time, it will be lost because the last windows only open to the sky. This process is in order to rhythm and lead the move inside and to emphasize the main view from the common room where the apertures are wider and unrestricted to the magnificence of the full surroundings.



Image n°7: © Estelle Lépine

The main staircase is carved in the rock, a reminder of the Goûter face, to confront people with the hurdle that has to be overcome the next day. The same idea is for the dormitories. Hanging on to the rock to keep its presence stronger, they have been designed in wood. As a protective shell, the rooms have been developed to the exact dimension of the beds. Adding ten mattresses to each room (average number we consider acceptable for one room), we have obtained the dimension of one dormitory. It is mainly conceived for resting time, which is the basic offer of a refuge. It permits personal reflection, to have a moment to be conscious of where we are. The only extra space is for a minimum capacity for personal belongings storage. To preserve the sleeping areas from noise, the corridors have been specially measured to offer enough room for packing and preparing the equipment. Attention has been particularly given to the natural and artificial lighting and furniture convenience to facilitate movement and specific activities and equipment associated with alpinism, especially in the early hours.

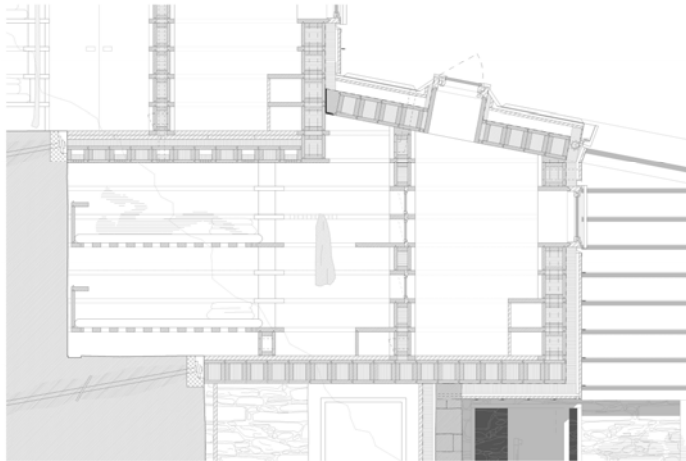


Image n°8: © Estelle Lépine

Thus, the reflection on level of comfort has been concentrated mainly on spatial considerations: space efficiency, material selection, dimensioning and best lighting and view. The consideration of the technical aspects (shower, heating and electricity) has been deliberately reduced to a minimum, refusing to offer guests sanitary standards equal in the valley. This is in order to have the smallest impact on the environment and minimize the effort to produce energy. Whilst keeping the purpose of designing the refuge to the context and as a sensitizer of the surroundings, comfort level is particularly adapted to reduce the consequences of human presence at high altitude.



Image n°9: © Estelle Lépine

Nowadays the new projects of refuge are designed to offer comfort as we can expect in any accommodation linked to infrastructures in the valley. In order to protect the Alps, we assume that architects and designers must question themselves to make sure that the refuge is not putting the environment at risk. Consequently, a clear position must be adopted in order to take decisions to influence the users and their behaviour. First of all, the *location* is very important because in some case it creates a natural barrier able to reduce the number of mountaineers. Then, the *integration* in the context is a source of awareness of the surroundings. And finally, the

*space* must be designed to give the right level of comfort in order not to erase or hide the presence of the extreme environment.

The reflections have been specifically made for the Mont-Blanc, however, they can be applied widely to the entire Alps area. They will be adapted to the new summit or context taken into consideration.

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