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主题案例: **绿色酒店 GREEN HOTELS 4/6**

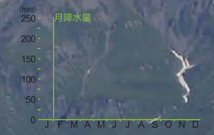
REFUGE DU GOÛTER, MONT-BLANC, FRANCE

法国勃朗峰古德登山旅社

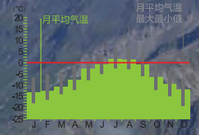
Design
Groupe-H, Deca-Laage
Material Courtesy of
Groupe-H, Deca-Laage,
Charpente Concept
Edited by
谢莹

地点 Location
法国勃朗峰古德登山道海拔 3835 **米处** Aiguille du Goûter, Mont-Blanc, Alt. 3835m, France
建筑面积 Gross area
720 m ^{2}
造价 Cost
7 000 000 EUR
完成时间 Completed
2012
年能源使用量 Annual purchased energy use
43.6 kWh/m ^{2}
年碳足迹 Annual carbon footprint (equivalent)
568 8 kg CO_2
功能 Function
多人卧室，餐厅，公共休息室，厨房、衣帽间、大堂、储藏室、机房、环保卫生间 Cloakroom, kitchen, restaurant, caretakers apart, dormitories, wc
绿色认证 Certificate
法国绿色建筑体系认证 High Quality Environmental standard (HQE)

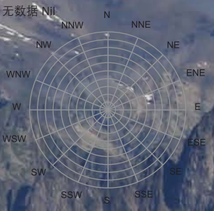
降水Precipitation/毫米mm
无数据 Nil



气温Temperatures/摄氏C°

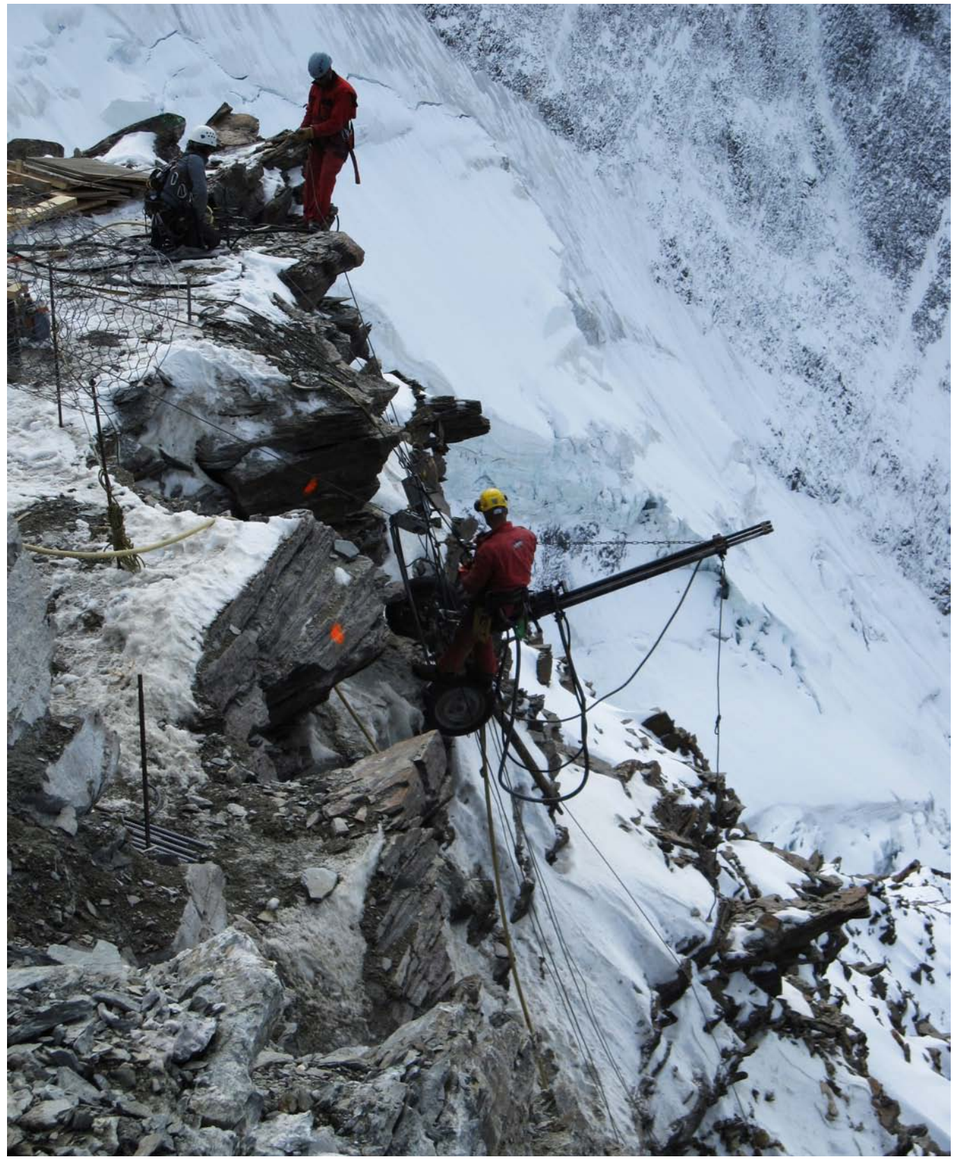


风向Wind rose
无数据 Nil



位于海拔 3 835 米悬崖峭壁之上的古德登山旅社是登山者挑战勃朗峰顶前最后的歇息之处。建筑将可再生能源技术与充满未来感的外形相结合，在极端环境中创造了一座在很大程度上可以自给自足的绿色旅社

LOCATED ON A CLIFF EDGE 3,835M ABOVE SEA LEVEL, REFUGE DU GOÛTER IS THE LAST PLACE FOR RECHARGE BEFORE MOUNTAIN CLIMBING ENTHUSIASTS REACH FOR THE SUMMIT. THE BUILDING COMBINES ADVANCED TECHNOLOGY WITH FUTURIST DESIGN, CREATING A COMFORTABLE GREEN ARCHITECTURE THAT IS LARGELY SELF-SUFFICIENT



本页及对页：建筑的设计基于对场地气候的分析、建造的可行性以及对雪山环境的影响。整个建造过程都面临了很大挑战，不仅因为需要把重型机械和全部材料运到海拔将近四千米的悬崖峭壁，更因为建造每年仅能在夏天温度适宜的大约五、六个月中进行。项目成为了在极端气候条件下利用绿色资源建造稳固轻体结构的范例。

This page and opposite page: the building form is based on the climate analysis of the site, the feasibility of construction and the influence on the environment. The construction of the building is one of the biggest challenges, and the building is regarded as an exemplary project of light-weight structure built in extreme climate conditions using green resources.

在法国勃朗峰海拔3 835米的一座悬崖边缘上，伫立着新近建成的古德登山旅社。建筑独特的结构形态和充满未来感的金属外观使其成为攀崖路途中最为令人瞩目的标志，即使在山下的村庄中它也清晰可见。极端的基地环境使建筑必须做到最大化的自给自足，在严峻的气候中将建造、运营甚至未来拆毁过程的碳排放量降至最低，以最为绿色的方式提供登山者舒适而难忘的体验。

勃朗峰是阿尔卑斯山的最高峰，位于法国的上萨瓦省和意大利的瓦莱达奥斯塔的交界处，海拔为4 810.45米，是西欧及欧盟地区的最高雪山山峰。勃朗峰拥有典型的高山气候，山势险峻，山顶终年积雪，成为了世界各地登山和滑雪爱好者的目的地，每年大约有17 000登山客尝试攀登顶峰。不过由于温室效应，千年冰川上遍布裂缝，导致山顶落石频繁，登山事故时有发生。古德登山道是到达勃朗峰顶端的主要路线，夏天夜晚有时会多达300人在古德道上留宿，准备第二天一早向顶峰冲刺。1960年，古德道上建立了一座古德登山旅社，成为人们抵达顶峰之前的落脚点。但是现在老旅社年久失修、配置落后，已经无法满足人们的住宿、卫生和环境的要求，而且所有的废水都被直接排到山中，造成直接的环境污染。2005年，法国阿尔卑斯山俱乐部（FFCAM）决定新建一座现代化的古德登山旅社。设计要求在风速高达300kph、条件严酷资源缺乏的高山位置利用科技手段，建造一座利用再生能源运营并且自给自足的绿色旅社。最后，建筑设计由瑞士公司Group H以及法国DécaLaage事务所协作完成。

新建的古德登山旅社位于古德道海拔3 835米处悬崖的一角，是一座面积为720m²的四层木结构建筑，平面呈椭圆形，外覆不锈钢表皮、太阳能光伏系统和总共55个屋顶天窗，其颇为科幻的外形在皑皑白雪中异常瞩目。建筑内部容纳多人卧室、一个拥有户外全景景观的餐厅、公共休息室、厨房、衣帽间、大堂、储藏室、机房以及六个环保卫生间。旅社外部面向悬崖的半面连接一个供直升机降落及观景的平台，后面则设有溶雪设备。

设计基于对场地气候的分析、建造的可行性以及对雪山环境的影响。建筑师最初想要采纳模块式方块体量，如LEGO般在山崖上堆积出旅舍小屋。然而，方形体量产生的空气阻力较大。而后建筑师开始尝试圆形，但是圆形的设计也有牺牲可利用空间面积等弊端。最后，建筑采用了椭圆形平面构成具有弧度的圆柱体量，并且根据风向选址，从而将风阻力最小化，使屋顶积雪也不易堆积。结构还将减少了建筑表皮面积，以降低内部空间的热损耗，同时为室内引入自然光和户外观景，例如，将公共餐厅和安全平台放置在悬崖的方向。

建筑的外形设计也为项目利用可再生资源提供了解决方案。项目的挑战之一即为在高山上通过融雪得到足够净水满足做饭及盥洗的需求。“建筑朝向主导风向，从而产生风淌流，把在建筑外表皮上的积雪引导至一个太阳能板，水被热能融化然后聚集在水缸中。”Group H的主持建筑师Dessimoz解释道。每次收集的雪水可供旅舍使用大约16天的时间。[1]

古德登山旅社的建造方法是项目的另一特点，成为极端气候条件下利用绿色资源建造稳固轻体结构的范例。整个建筑采用预制的木质梁板结构建造，材料采用周边地区的云杉、落叶松和白冷杉。因为木材需要通过直升机被运至到山顶，而直升机的载重限额为550公斤，因此，预制结构配合运输要求定制并将建造方法最简化。这些可灵活拆卸的预制板材运到基地候不用改变尺寸，为了方便安装，很多连接部位利用了特殊的环氧树脂胶粘接。梁结构采用了胶合木板，节省了60%的原木。为了确保木材厚度的一致性，所有材料都通过超声波系统筛检。为了将整体结

1
http://www.theguardian.com/world/2012/sep/18/mont-blanc-mountain-climbing-refuge

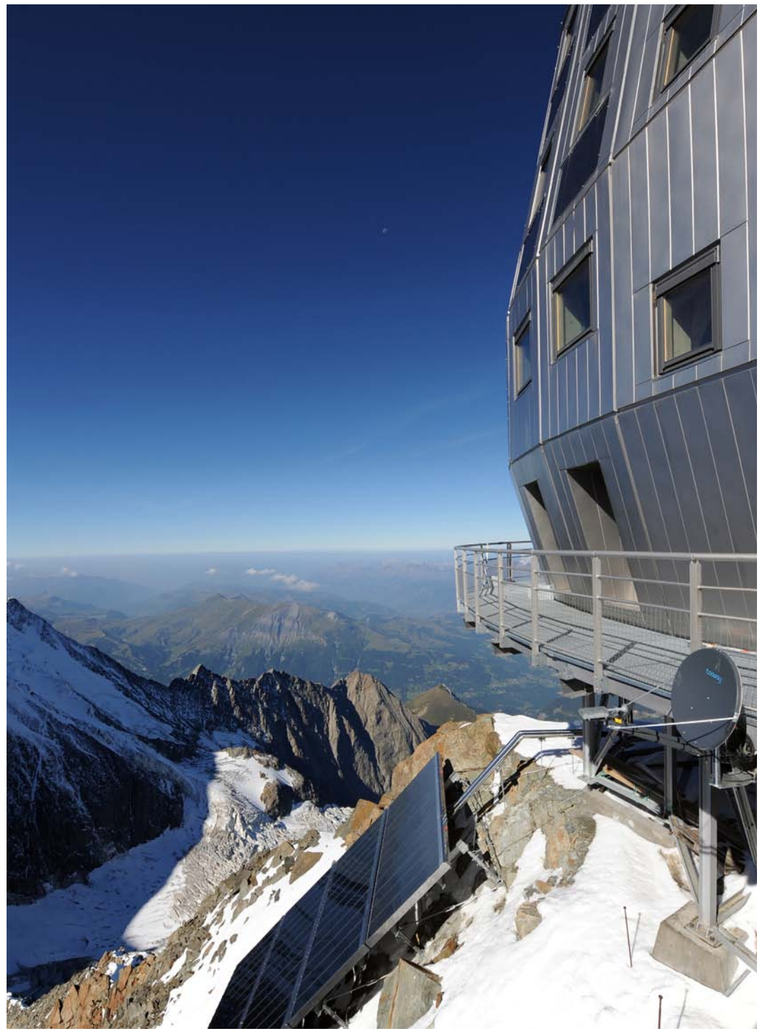
2
http://www.detail-online.com/architecture/news/energy-efficiency-before-the-summit-019625.htm

法国勃朗峰古德登山旅社
Refuge Du Goûter, Mont-Blanc, France

业主 Client
French Federation of Alpine and Mountain Clubs (FFCAM)
建筑师 Architect
Groupe-H, Deca-Laage
结构设计 Structural design
Charpente Concept
建造监理 Construction manager
Groupe-H, Deca-Laage, Charpente Concept, Betech, Cabinet Strem, Albedo, Cabinet Denizou
承包商 Contractor
Labat&Serra/B3D, Dasta, Cart, GGM, Gaubicher, JP Maintenance, Solaravis, BDF, Domancy-Elec, Durr Equip, ERG, Aubonnet, CBA Montagne, CMBH

本页及对页：新建的古德登山旅社位于古德道海拔3 835米处悬崖的一角，是一座面积为720m²的四层木结构建筑，平面呈椭圆形，外覆不锈钢表皮、太阳能光伏系统和总共55个屋顶天窗，其颇为科幻的外形在皑皑白雪中异常瞩目。

This page and opposite page: nestled on a corner of cliff on Aiguille du Goûter at 3,835m above the sea level, the new Refuge du Goûter is a four-storey wooden structure of 720 m^2. Elliptical in plan, it is equipped with stainless steel skin, solar photovoltaic system and a total of 55 roof windows. Its sci-fi look in the snow is very outstanding.



构固定在悬崖上，建筑的钢结构地基为共69个N80石油套管，被插入至地下平均12米处。这些不能利用直升机运输的材料利用一座18米的伸缩式起重机进行搬运。整个建造过程都面临了很大挑战，不仅因为需要把重型机械和全部材料运到海拔将近四千米的悬崖峭壁，更因为建造每年仅能在夏天温度适宜的大约五、六个月中进行，这使得整个项目的建造时间超过了两年。

因为地理位置的险峻和资源的缺乏，能够利用可再生能源对于古德登山旅社的运营来说至关重要。建筑安装了面积共为97m²的太阳能光伏发电系统提供电能，在用电高峰期该系统还有一个利用菜籽油驱动的燃气热气机发电机组进行支持。因此，除了厨房做饭的燃气之外，其能源都可以自给自足。热能方面，建筑表面共为54m²的太阳能板足以融雪，而被融化的雪水被收集到体积为18立方米、位于旅舍下方集水装置后亦成为了建筑的热能缓冲结构的一部分。

为了减少水资源的浪费，古德登山旅社拥有六个节水卫生间，内部利用飞机真空厕所的工作原理，排出的废弃物都会经过一个小型的污水处理系统，将废物转换成高度压缩的污泥，集中处理，已经过滤的净水会被重新利用冲刷卫生间或是排到山中。

建筑自身结构全部采用三层玻璃，外加8毫米厚的面板以确保其保温效果。这些玻璃被运至基地一周后才“适应”高山气候，得以安装。保温层同样采用木质纤维材料，使得室内温度能够保持在18至22摄氏度。

整个旅社的建造、使用以及未来的拆毁过程碳排放量将达到534吨，而其中有440吨的碳排放都源于直升机运输，仅有约20%的碳排放来自于建筑，与传统建造和能源使用方式相比节省43%的碳排放量，可见建筑的轻体结构和可再生能源对降低碳排放量的重要性。[2]

古德登山旅社自2013年6月开放以来，已经运营了几个月的时间，非凡设计理念成为勃朗峰一道特别的风景。建筑也吸引了世界的目光，并且获得了包括2012-2013年亚欧设计大奖，2012年法国-瑞典工商业协会评委特殊奖等多个奖项。

Refuge du Goûter is located 3, 835 meters above sea level on Mont Blanc in France. The building's unique structure and futuristic metal look make it one of the most impressive landmarks on Mont Blanc, and it even can be seen from the villages at the foot of the mountains. The building is largely self-sufficient in extreme environment and designed to minimize carbon emissions during the process of construction, operation and even future demolition, providing mountain climbing enthusiasts with a comfortable and memorable experience in the most sustainable way.

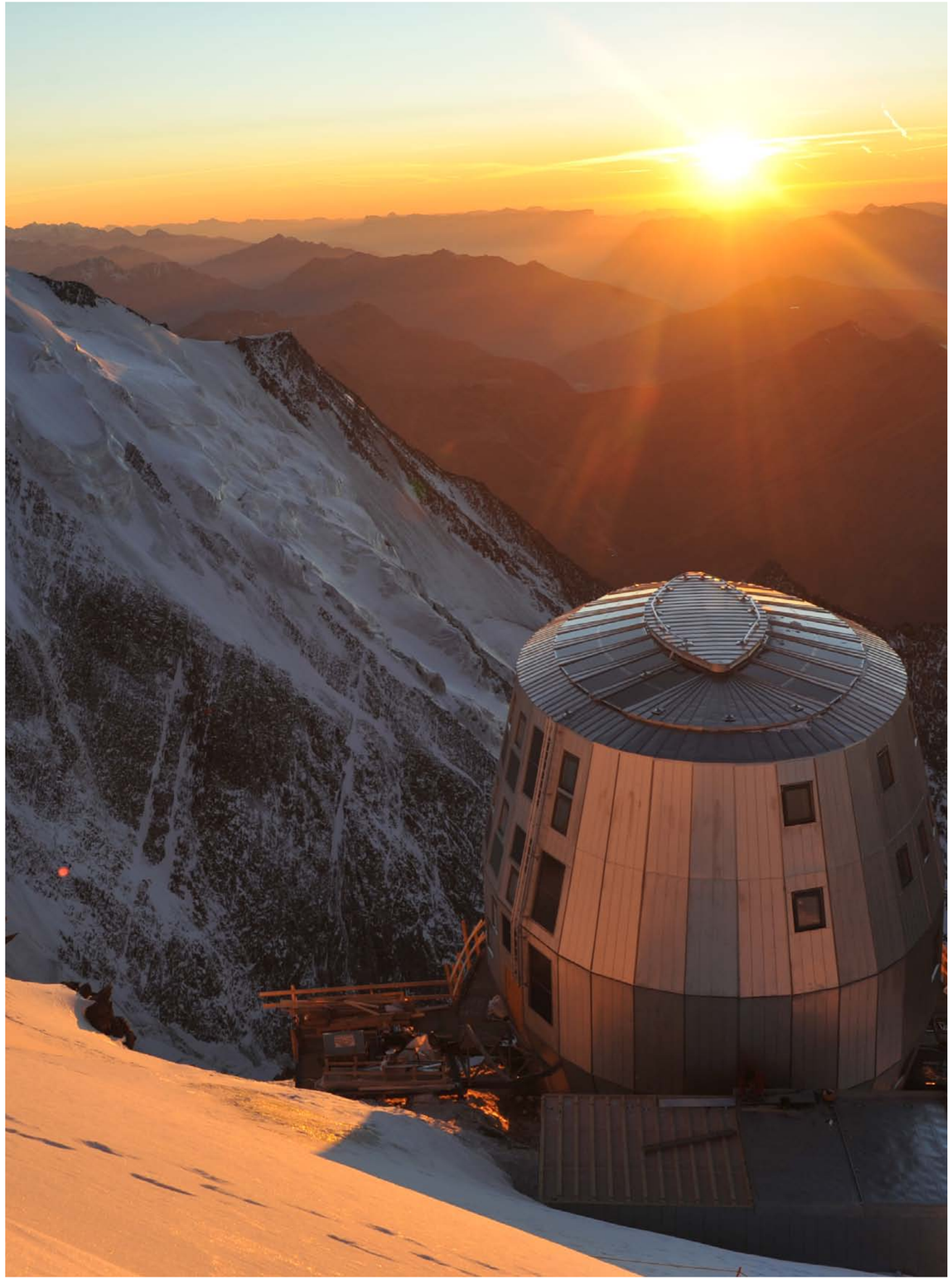
Mont Blanc is the highest peak in the Alps, between the regions of Aosta Valley, Italy, and Haute-Savoie, France, and also known as the highest peak in Western Europe and the European Union. It is 4,810.45 meters above the sea level. Mont Blanc is steep and covered by snow all year round, known as a popular destination for mountain climbing. Every year, about 17,000 climbers attempt to reach the summit, taking the Couloir du Goûter route. In summer, sometimes as many as 300 climbers spend the night on the route, before making an early start on the final ascent. In 1960, a lodge was built on the mountain as the last stop for climbers to rest before making it to the summit. Since the old lodge was too small and outdated, it could not meet the accommodation, health and environmental requirements, for example waste water was directly charged into the mountains, causing environmental pollution. In 2005, the French Federation of Alpine and Mountain Clubs decided to build a new Refuge du Goûter lodge. The design aims to be a green and self-sufficient hotel using renewable energies, and able to withstand extreme environment where wind speed can exceed 300kph and resource is scarce. The design was completed by Swiss firm Group H in collaboration with French studio DécaLaage.

Nestled on a corner of cliff on Aiguille du Goûter at 3,835m above the sea level, the new Refuge du Goûter is a four-storey wooden structure of 720 m^2. Elliptical in plan, it is equipped with stainless steel skin, solar photovoltaic system and a total of 55 roof windows. Its sci-fi look in the snow is very outstanding. The building accommodates bedrooms, a restaurant with panoramic views, common room, kitchens, cloakrooms, lobby, storage room, computer room and six environmentally friendly toilets. There is a viewing platform attached to the side facing the cliff, on the other side behind the building there are snow melting equipments.

Based on the climate analysis of the site, the feasibility of construction and the influence on the environment, architects initially wanted to build modular blocks assembled like a game of Lego. However, the block shape is not the best shape to facilitate air flow. Then architects tried the circular shape, but it had the disadvantages of losing available area. Finally, the building used an elliptical plan and was positioned against the prevailing wind to minimize wind resistance, helping to boost melting of snow. The structure's oval shape also reduces the external skin area, thus the thermal loss of internal space. The design introduce natural light and outdoor views into the interior space, for example, the public restaurant and security platform were arranged in the direction facing the cliff.

The form design also provides solutions for using renewable resources. One of the design challenges was to provide the lodge with a self-sufficient water supply for cooking and washing. Its egg shape is part of the answer. "The building is pointed into the prevailing wind, causing turbulence, which makes the snow slide across the outer skin and accumulate on a solar panel. Heat from the solar panel melts the snow, which collects in huge tanks," says Dessimoz. It can operate for 16 days without fresh snow.[1]

The construction of the building is one of the biggest challenges, and the building is regarded as an exemplary project of light-weight structure built in extreme climate conditions using green resources. The whole structure was created by prefabricated wood structure and wood floors, made with spruce, larch and white fir from nearby forests. Those elements needed to be hoisted by helicopter with the maximum carrying capacity of about 550kg, so the method required the prefabricated elements to be specially-customized for easy assembly and were mounted using a special resin adhesive. Also, glued laminated timber beams were used, saving up to 60% of standard timber beams. In order to ensure the thickness consistency of the wood, all materials were processed by ultrasonic system. To stay above the sheer cliff, the steel structure has extremely strong foundations that comprise of 69 micropiles of N80 steel anchored into hard rock, with an average depth of 12m. These elements that could not be delivered by the helicopter were transported using a special 18m telescopic crane. The whole



本页：建筑内部容纳多人卧室、一个拥有户外全景景观的餐厅、公共休息室、厨房、衣帽间、大堂、储藏室、机房以及六个环保卫生间。

This page: the building accommodates bedrooms, a restaurant with panoramic views, common room, kitchens, cloakrooms, lobby, storage room, computer room and six environmentally friendly toilets.

construction process was challenging, because the heavy machinery and all materials must be transported on site at nearly 4,000 meters above sea level. What's more, building work was limited to five or six months in summer, which stretched the construction phase to over two years.

Due to the harsh geographical condition and limited resources, it is vital to maximize the use of available natural resources and self sufficiently. The electricity is generated by 97m^2 of photovoltaic solar panels installed on the facade and on the roof. During the peak season, a backup generator, running on rapeseed oil, produces electricity. Therefore, besides the gas for the kitchen, all other energies are self-sufficient. There is also an area of thermal solar panels of 54m^2 installed at the foot of the building, providing the heat to melt the snow. The water obtained is fed to the building by means of a water tank of 18m^3 located under the building, which becomes a part of thermal energy buffer system.

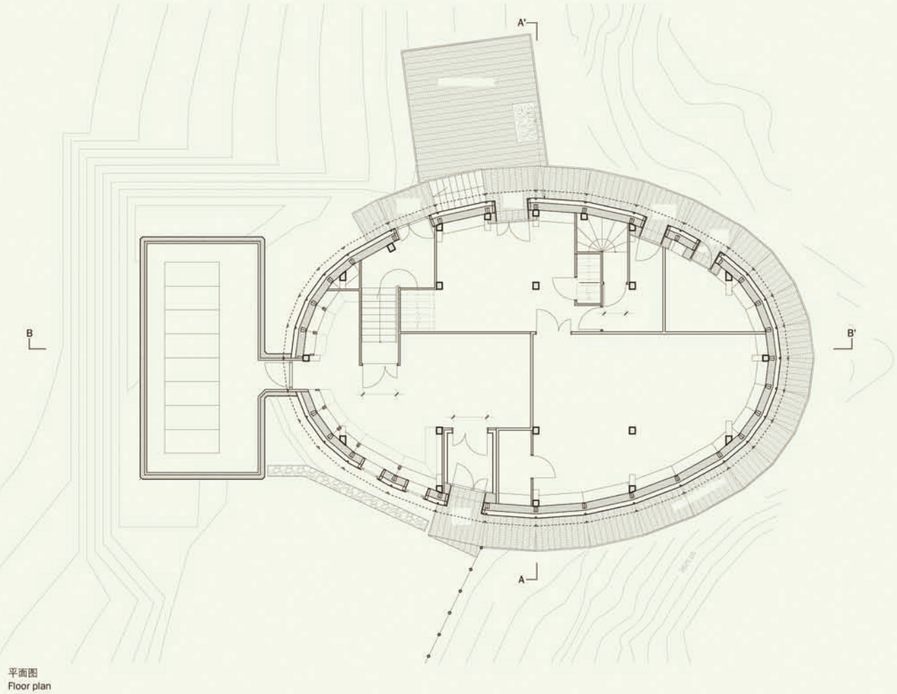
To reduce water consumption, the new lodge has six environmentally friendly toilets, the idea was borrowed from the vacuum-suction principle used in aircraft. A tiny sewage farm will process organic waste, outputting highly compacted sludge which can be heliported down to the valley for final disposal. Any water released into the mountain environment will be clean.

Triple-glazed windows were fitted with an additional 8-millimetre thick glass pane to provide extra protection from the harsh weather conditions. These glasses were installed in the building envelope after one week "adaptation" of alpine climate on site. Insulated by wood-fibre panels, the temperature indoors ranges from 18℃ to 22℃ .

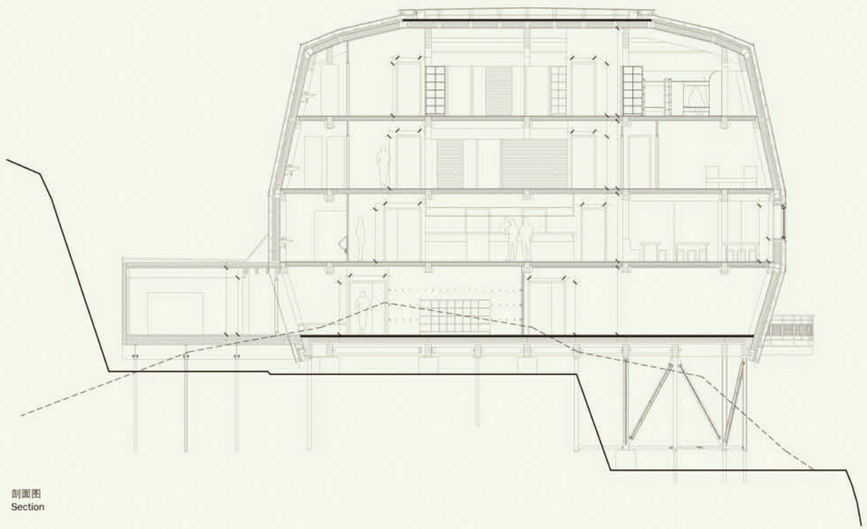
It is estimated that for the construction, utilization and later deconstruction of the building, a total CO_2 emission is about to be 534 tons, with 440 tons of these alone due to helicopter flights and only about 20% from constructing process. Compared with traditional ways of construction and energy using, the renewable energies alone allowed a 43% saving in CO_2 emissions. This figure illustrates why lightweight construction played such an important role in this project.[2]

Since its opening in June, 2013, Refuge du Goûter has been greeting guests for a few months. As a unique scenery in Mont Blanc, its outstanding design has attracted people's attention all over the world. The project received awards such as Winner of Eurasian Prize 2012-2013, Special Jury Award of France-Switzerland Chamber for Trade and Industry (CFSCI) 2012 and so on.

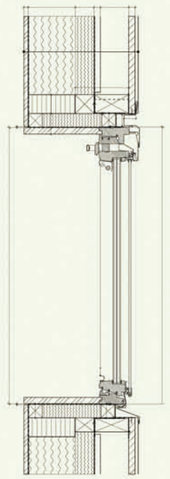
绿色分析 Green Analysis



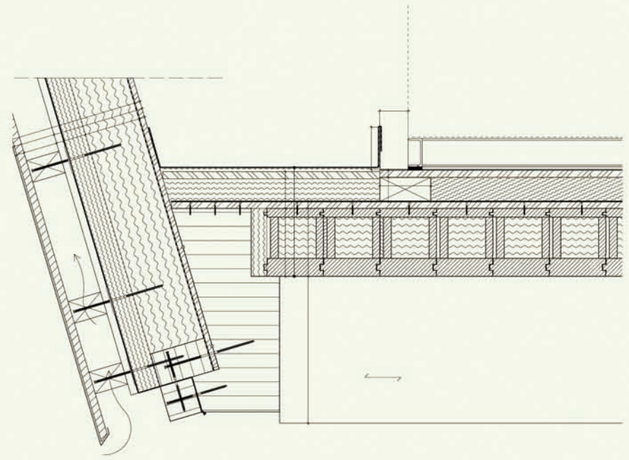
平面图
Floor plan



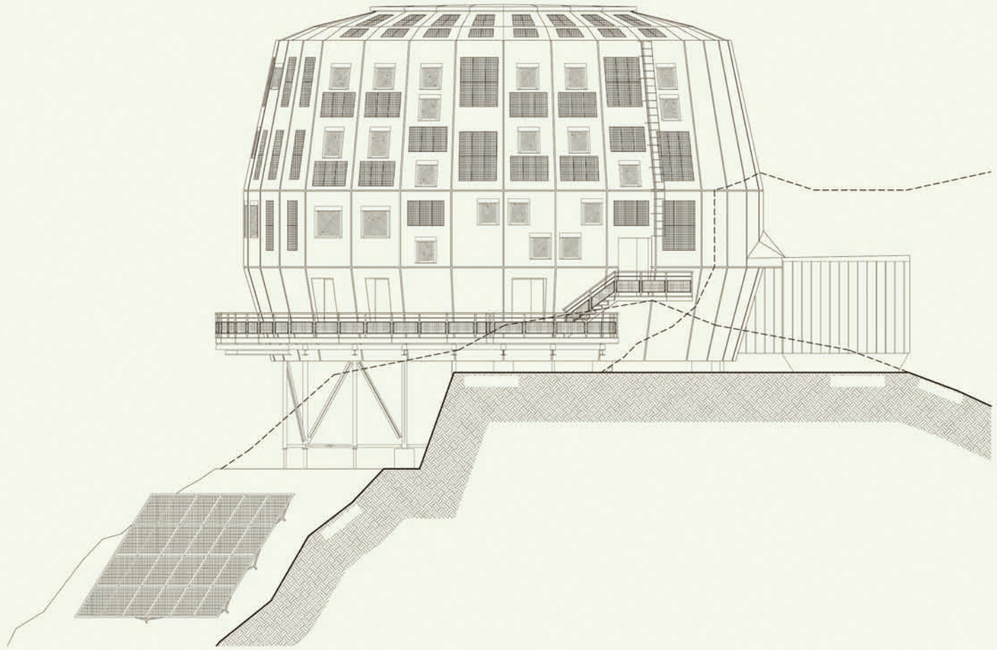
剖面图
Section



窗户细部
Window detail



楼板剖面详图
Floor section detail



立面图
Elevation