



MEDIA RELEASE

Glass Meets Mountain

Challenges of using glass in the Alpine regions

High up in the Alps, the architecture is often characterized by a traditional method of construction that has few transparent surfaces and, in order to provide protection against the extreme weather conditions, tends to be of rather reserved nature. This is where contemporary façade glazing opens up new opportunities: The transparent material not only offers greater creative freedom but also enables designers to realise bright and inviting rooms which allow for far-reaching views of the mountains and create the optimum conditions for the successful use of the buildings from the tourism aspect. As a Swiss company, Glas Trösch has extensive experience in the use of glass at extreme altitudes and knows the special requirements demanded of the material at these exposed locations.

In addition to the special technical and aesthetic qualities of the glass, expert planning is also of utmost importance for the realisation of building structures in Alpine regions. It is here that Glas Trösch has demonstrated its expertise to comprehensive effect in recent years through a whole range of projects at altitudes around 2,000 metres above sea level: These include for example the new Monte Rosa Hut in the Valais Alps, the Rondorama mountain restaurant on the Stanserhorn, the Hoher Kasten revolving restaurant in the Appenzell Alps and the famous Piz Gloria panoramic restaurant on the Schilthorn. The most recent project – a mountain top restaurant on the Chäserrugg in the Canton of St. Gallen designed by Herzog & de Meuron – is an impressive, successful combination of traditional timber construction and modern design elements. Large window surfaces in this building provide for far-reaching views of the Appenzell mountains.

The right coating for the right location

Extreme cold in the winter, as well as a strong sunlight in the summer, are just a couple of the specific requirements which have to be taken into consideration in the choice of glass. Depending upon the geographic location of the structure and arrangement of the window surfaces, the material should adapt to the differing climatic conditions. For the mountain top restaurant on the Chäserrugg, maximum thermal insulation made particular sense because the south-facing window surfaces are protected by a wide, overhanging roof, avoiding the possibility of any direct sunlight. The up to six metre high glass panes on the sides of the



building are east or west-facing, so the façade glazing is only exposed to the rather weaker morning or evening sun. That's why a triple insulating glass with the SILVERSTAR ZERO Eplus coating was used for the mountain restaurant. The thermal insulating coating, with a U_g -value of $0.6 \text{ W/m}^2\text{K}$, provides maximum thermal insulation to ensure a pleasant room climate. At the same time, thanks to the use of EUROWHITE base glass, the insulating glass has a light transmittance of 74 percent and so allows plenty of natural light into the room.

By contrast, completely different demands were made on the façade glazing in the Rondorama restaurant on the Stanserhorn: Because extensive glass surfaces here are exposed to particularly strong sunlight, increased solar protection was required. The SILVERSTAR SUNSTOP Neutral 50 T glazing from Glas Trösch used in this building provides effective protection against the rooms overheating. There is however often also a need for the optimum possible balance between solar and thermal protection, as in the case of the Monte Rosa Hut: The glass surfaces here are restricted to narrow bands of windows and less exposed glass surfaces which do not need to either protect the rooms from extreme heat or provide increased thermal insulation. So-called COMBI glazing provides both efficient insulation as well as good heat protection.

Bending strength to combat pressure and tension

The temperature-related fluctuations in Alpine regions and the associated thermal stresses to which glass is exposed in the High Alps represent a severe test for the material. The bending strength can be increased through tempered glass, preventing a pressure build-up in the gap between the panes as well as deformation of the glass. The partially tempered safety glass SWISSDUREX was used for the architecture on the Chäserrugg.

Another challenge in the planning of glass façades in mountain regions is the difference in pressure resulting from the difference in altitude which affects the gases contained in the gap between the panes. In order to avoid the creation of excessive stresses during transportation, the pressure in the insulating glass should gradually be adjusted to the differing height conditions. For example, the insulating glass panes used for the Chäserrugg mountain restaurant were stored for several days at a stopover station half way up the mountain.

However, it is not only changes in temperature and the high air pressures that influence the technical demands on the glass but also the extreme wind stresses. To cope with this, the insulating glass panes used comprise several layers of laminated safety glass which can withstand the pressure and, in extreme cases, hold together the fragments through the splintering effect of the internal foil.



Extra-white glass and minimal reflection for a clear view

As a result of their exposed location, mountain-top buildings and mountain lodges offer breathtaking views of the mountain landscape – a not insignificant consideration when planning for this altitude. To ensure uninterrupted viewing, the façade glass should allow maximum clear vision. To this end, on the Chäserrugg the planners used the extra-white base glass EUROWHITE. It offers maximum transparency thanks to its extremely high light transmittance of 74 per cent in the triple-pane design and a very good colour reproduction index of 97. In addition, the low reflection of the glass helps ensure that visitors can also enjoy the mountains from inside the building. Externally, the minimal reflection of 14 percent also enhances protection for animals. Without any reflection of the surroundings, the birds recognize what's behind the glass and are not curious to take a closer look.

Complex logistics during the construction phase

In addition to the technical requirements demanded of the glass, the delivery of building materials must be viewed as one of the biggest challenges in building in Alpine regions. The materials have to be transported either by helicopter or cable car – this often requires a complex logistics chain which needs to be flexible due to the changeable weather conditions. The transportation of all the building materials to the Chäserrugg required approximately 1200 cable car rides, whilst the glazing for the isolated new Monte Rosa Hut was transported by helicopter and installed in a continuous rotation, each taking approx.10-15 minutes. An additional factor was the short time frame for the projects as wind and weather do not allow construction work to be carried out in extreme weather conditions.

Efficient planning and consulting for contemporary projects

Because of the increased requirements, detailed technical and logistical planning is essential for construction projects in mountain regions. Glas Trösch helps in the success of a project through its comprehensive experience, expert advice and efficient service: In cooperation with architects and planners, the glass manufacturer develops the optimum solution for each individual project, adapted to meet the specific technical, static and energy-related requirements.

Go to glastroesch.com and see the video on the Chäserrugg project to find out more about the impressive architecture of the mountain restaurant and the glass used.



The Chäserrugg mountain restaurant 2,262 metres above sea level in the canton of St. Gallen makes an impressive sight thanks to the successful combination of traditional timber construction and large glass elements. As a result of the low U_g value, the triple insulation glazing with SILVERSTAR ZERO Eplus thermal insulation coating maintains a pleasant room climate. (Photo: Juergen Pollak)



The high transparency and low reflection of the glass elements of the mountain restaurant on the Chäserrugg provide clarity for uninterrupted views of the mountains and allow the natural environment of the mountains to flow into the building interior. (Photo: Juergen Pollak)



The Rondorama restaurant on the Stanserhorn is located 1,900 metres above sea level and is exposed to extreme sunlight through the large glass façade areas. Here, the solar protection glass SILVERSTAR SUNSTOP Neutral 50 T prevents the rooms from overheating.



The new Monte Rosa Hut located 2,883 metres above sea level required detailed logistical planning. Due to the isolated location the transport of building materials had to be well planned and adapted to suit the changing weather conditions.



The insulated glass panes of the new Monte Rosa Hut are characterized by a combination of solar and thermal protection. The COMBI glass panes not only provide for effective basic solar protection but also create a cosy atmosphere inside the room by maintaining a low heat loss.

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