

## Cave of sound in the Oslo Fjord

A new opera house in Norway boasts a great deal in the way of acoustic sophistication – and architecture that considers itself a Nordic landscape.

When Rob Harris starts talking about concert halls and opera houses, about materials that reflect sound and about sound clarity in auditoriums, a great acoustic universe opens up. It is one the British engineer explains in anecdotes. As with the reverberation period in the new Oslo Opera House, for example. As is usual in Nordic countries, the period is an incredibly long 1.7 seconds – for one simple reason. Scandinavians attach more importance to the orchestral richness and overall musical experience than to the clarity of the sound of the vocals. As the audience does not speak Italian, nobody understands the libretto anyway. It is quite a different story in south European countries. The brief reverberation period of opera houses such as the Teatro La Fenice in Venice ensures a crisp, clear sound, with which the singer's tonal clarity asserts itself over the orchestra, so that every word sung can be understood.

Rob Harris is head of the Acoustics division at international engineering consultancy Ove Arup & Partners – the section is specialized in opera houses and concert halls, be they in Australia or Norway. Harris was called in together with the Norwegian studio Brekke Strand Akustikk to provide expert support right from the planning stage for the Oslo Opera House. Thus the architects from the Norwegian studio Snøhetta were able to arrange the volume and shape of the building's interior and its 1,371 seats to meet carefully defined acoustic parameters when still working on their initial design and then devised a spatial concept for the large auditorium that ensured it would produce optimum sound. Roughly one year after its inauguration, the Oslo Opera House has an established standing in the international music world and has made a name for itself as an acoustic cave of sound with very special qualities, namely, an ideal reverberation period, minimal echo and various zones either reflecting or absorbing sound and transporting it from the orchestra pit to the audience without distorting it. Thus it is a world of sound in which architecture and acoustics condense into an overall sensory experience.

### Iceberg and skating ramp

The marble slabs of the Opera House in the Oslo Fjord tower majestically into the sky like sheets of ice left behind by the cold Norwegian winter. Only a stone's throw from the train station, the resplendent white marble colossus is located at the heart of the Norwegian capital and in good weather becomes a viewing platform on which skaters and tourists throng to enjoy the view of Oslo. Heavy traffic crawls around the base of the white edifice. Built using 36,000 monolithic blocks of Carrara's best, the Opera House occupies an area the size of two soccer fields.

The € 550 million project has set records, yet despite its luxurious interior facilities and spectacular architecture (and no expense was spared), it aspires more to be an opera house for the people than a monumental music palace. Following the resolution by parliament to build a new opera house, King Harald V laid the foundation stone of the building designed by the Norwegian team of architects Snøhetta five years ago. They had in mind a block of ice made using 43,500 cubic meters of concrete and 2,300 tons of steel – and it rises up next to the container port in the fjord and in sheer size quite sidelines the international ferry that docks right next to the building. Now, roughly a year after it was opened, the Opera House has been embraced as a public urban space and cultural magnet. Inside this ice-house there is a main stage and two auxiliary stages, not to mention several rehearsal rooms, recording rooms, workshops and offices for around 600 permanent staff.



Photos: Héléne Binet





#### Monteverdi and German oak

Nature and the Nordic world of fjords are recurring themes that Snøhetta likes to reference in its architectural designs, thus melding public and private spaces, architecture and landscape into a single entity. And the Opera House in Oslo, part of which is built upon stilts in the fjord, is definitely no exception. Here, the approach culminates in a kind of non-building that functions both as a landscape and an interior consisting of various zones and areas in the 1,000 rooms of the Opera House. From the large foyer, which opens out behind a recess in the marble façade, we look out through high glass walls at the water outside. A curving wooden structure slides into the bright space like a ship's hull. Its oak beam cladding creates the necessary contrast to the white marble and actually has a sound-absorbing function. Elegant oak staircases and their balustrades swing down into the space. As we make our way into the auditorium, the cold glacier reveals itself to be a warm cave. While skaters perform their stunts on the roof of the Opera House, inside a colorful mix of people meet in the evenings to attend jazz concerts or Monteverdi operas, dance performances or Tchaikovsky renditions. The large auditorium is subdivided by the three tiers with their dynamic wooden balustrades that resemble gentle curves in the room, shaped according to acoustic considerations. Floors, walls and the balcony shine resplendent in their German oak cladding, creating a festive atmosphere. The rear walls fold back on each other like curtains whose lower edge is emphasized by a subtle band of light. In the Oslo Opera House, members of the Royal Family do not take their seats in a box, but in the middle of the audience. In egalitarian Norway, this almost goes without saying.

All the technical refinements that make the auditorium the perfect place to listen to music remain hidden from view. All the details of the well-conceived acoustic planning are integrated into the architecture. Every seat has a screen which, if desired, can show the libretto in one of seven different languages. The air and temperature are regulated in zones. The hall is humidified to a greater degree above the orchestra pit and on the stage than in the spectator area, in order to create a better atmosphere for soloists and instruments. A modern, circular chandelier consisting of 5,000 crystals spreads out under the high ceiling of the room. Based on the architects' design, this glittering circle of light assumes the function of an acoustic reflector that can be hung higher or lower depending on the volume of the sound coming from the stage. The stage curtain, by the American artist Pae White, is the pride and joy of the opera hall, whose seats covered in red velvet also have a role in determining the acoustics. The colorfulness of the spectator area is refracted and folded in the curtain's aluminum edges and becomes a single shimmering, animated image.

#### From drawing board to stage design

Acoustic models on a scale of 1:50 and life-sized were required to come up with as precise a sound for the main auditorium as possible. It is true that computer and scale models would limit potential surprises in the acoustics, so that the calculated scenarios could be closer to reality, says Rob Harris. However, unexpected things could still happen in the acoustic design that make it more or less impossible to calculate the effect of the stage: "The acoustics change for the spectator depending on how much material is used in the stage design of each production and corresponding act." Thus the acoustic design of such complex spaces as the Opera House in Oslo goes far beyond computer models and also passes on suggestions to stage designers regarding what they should ideally do and what they should avoid.

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