



# A Night at the Opera

Setting the stage in Scandinavia

The once 'opera-less' Oslo now boasts one of the finest opera houses in the world, literally rising – almost iceberg-like – from the Norwegian capital's Bjørvika waterfront. JONATHAN MILLER marvels at its impressive sights and awesome sounds in the capable company of pivotal personnel from audio equipment installer Benum siv. ing AV.

With its extensive North Atlantic coastline peppered by its famous fjords – that rugged coastline stretching over 83,000km, Norway is an impressive country by any standard. Equally economically rich, Norwegians enjoy the second-highest gross domestic product (GDP) per capita after Luxembourg, and the third-highest GDP per capita in the world.

It is, therefore, fitting that no expense was spared in constructing and equipping the new state-of-the-art opera house that dominates the Bjørvika waterfront, an amazing architectural feat of eye-catching La Facciata (white Italian Carrara marble) and Norwegian 'Ice Green' granite (from Sør-Trøndelag) that rises out of the fjord like a giant ice floe, where it is perfectly positioned to serve around 500,000 residents – roughly one-tenth of the country's population. That's what a generous NOK 4.4 billion (approximately £430 million) building budget can create. The government footed the entire bill for the nine-year project, which actually finished ahead of schedule and under budget.

## Outside In

Norwegian architects Snøhetta's design is certainly beautiful, yet it's what's on the inside that really counts. Here its vital statistics make for impressive isolated reading: 38,500m<sup>2</sup> gross floor area (divided into 1,100 rooms), of which 11,200m<sup>2</sup> is dedicated to three audience areas – the 1,364-seat self-explanatory Main Hall (Store Sal), 440-seat so-called Scene 2 or Little Hall (Lille Sal), plus a 200-audience capacity Rehearsal Stage; stage areas totalling 8,300m<sup>2</sup> – including one of the most advanced opera stages in the world with a 16m x 16m main stage supported by side stages, back stages, and an under-stage allowing 9m-high scenery to be prepared under the main stage and elevated during performances; while a generous 19,100m<sup>2</sup> is turned over to rehearsal, administration, and workshop duties.

Remaining inside, Snøhetta turned to the combined talents of London-based Theatre Projects Consultants – 'Theatre Designers to the World' – and acoustic

designers BrekkeStrandArup, a joint venture between local consultants Brekke & Strand Akustikk and global consultants Arup Acoustics, also responsible for the Copenhagen Opera House. According to Rob Harris, director of Arup's global performing arts business, "Many old opera houses have short reverberation times, making the words sound clear, but the orchestra sounds dry, while modern opera houses tend to have a longer reverberation time to produce a more concert-like orchestral sound. The design brief in Oslo followed this trend, so our challenge was to provide the right balance between the two. It was a pleasure to experience the acoustic first hand at the opening event, and to witness the audience's appreciation for what we have achieved."

Yet construction and acoustics working together in harmony are not the whole story. The Benum Group – more specifically its Oslo-based Norwegian division, Benum siv. ing. AS – were invited to compete for a lucrative sound tender for the Oslo Opera House that was originally drawn up back in 2000. In reality, the latter's Peder Krohn (Project Manager), Ronald Hernes (Sales Manager), Egil Eide (Product Manager Audio), and Sverre Jøssund (Product Manager Audio) spent three months – and many sleepless nights – at the tail end of 2005 writing and delivering the winning tender, following a protracted pre-qualification round that itself took six months to negotiate.

An animated Hernes remembers receiving the good news in true Scandinavian style: "I was standing on a mountain, and Peder called me: 'Ronald; we got the deal!'" Given that the deal involved installing around \$10- to \$12-million of audio equipment, Hernes was understandably elated: "I went inside, drank a big beer, and then back out again: 'Yes!' It was fantastic."

Krohn: "I don't know if it's common or not, but one interesting thing is that we actually supplied the majority of the equipment, because most of the equipment is represented by Benum in Norway. We didn't have to shop around."

► Standing on the spacious main stage, looking out onto the beautifully finished Main Hall – whose inner and outer walls, balcony fronts, and circular ceiling element are clad in oak (to match the high, wave-curved wall separating the foyer and auditoriums), Eide embellishes the success story further still, adding, “Before we started doing the tender, we asked if we could get inside the building, but they said no because it was quite early on in the construction process,” says Hernes. “So the first time we got in was after we got the contract, because then it was possible – though not for visitors – to walk around. Below the stage it goes down 16m to accommodate the big rotating stage.

“It’s not everyday that we do an installation while wearing a helmet and steel toe-capped shoes! And with a lot of dust – too much dust!”

### Sounds Like A Million NOK!

The Oslo Opera House’s extensive (and expensive) audio system was designed and specified by Swedish (Gothenburg-based) consultants Artifon AB in collaboration with Norway’s own Oslo-based COWI AS – the former’s Alf Bernston being responsible for both halls, plus their complex, custom-designed Stage Management System, while the latter’s Frode Bye was closely involved in signal distribution. For their not inconsiderable part in the (initially) dusty proceedings, those hard-working Benum boys provided over 200 SMRT audio distribution boxes, multiple Renkus-Heinz loudspeakers, Stage Tec consoles, Clear Com wireless and wired comms, Medialon-distributed paging for the orchestra, and much more besides. “One of the good things about this project has been how well we’ve been able to work with the consultants – and the users,” notes Hernes. Yet it should perhaps come as little surprise that Renkus-Heinz and Stage Tec ended up being so central to the resulting installation bearing in mind that Benum distributes both product lines in Norway. Declares Jøssund: “We decided that was the equipment that should be in here – simple as that...” To which Krohn light-heartedly interjects, “...and the one-million NOK you paid them!”

“We know that Renkus can do the job, and also, of course, the Stage Tec system – at least with the fibre optic system that covers the whole building,” continues Jøssund.

Eide: “I remember reading the specification; it was very clear that it was very close to Stage Tec, because they needed two consoles in this Main Hall that should be able to work in parallel, plus another console in the Small Hall, and a fourth console in the recording studio – all working on the same network. That was one part of it – making some effects in the studio, which could then be taken up to here, mixer to mixer, or whatever. So I think that flexibility and the fact that they have a very good reputation around Europe for opera houses and theatres was quite important.

“Of course, it’s expensive, but it’s very reliable, and it has very few critical cards.”

Here Eide is referring to the AURUS, Stage Tec’s delightful digital so-called Direct-Access Console, a 40 channel strip version of which resides in the separate control room located at the back of the Large Hall, working in parallel with a smaller



one (24 channel strip) sited in the Main Hall itself.

Nothing unusual about that, one might well assume, except that the smaller AURUS sits on a platform that cleverly lowers below the floor level, James Bond-style, allowing more seats to take its place.

“As I understand it, there’s always a big fight with the management, because they want to sell those seats, so their feeling is that the console should be raised during rehearsals, but lowered during performances, with the mix being done on the bigger console in the back room,” Eide maintains. “Once they have got used to sitting out in the Big Hall eventually they will be able to cope quite well from within the back room. After a year or two, let’s say, they will have great fun sitting with the windows closed!”

Hernes: “One funny question from the management before they moved in here was, ‘Do you know which seat numbers cover the console?’ Because they can’t sell a yearly subscription for that area, so they actually called us to ask... We had no idea – the seats weren’t in!”

Back to the amazing disappearing console though, Eide explains, “It’s a track system – like a train track, so you can slide the platform one way, then the console comes up. That’s the theory; in reality, it’s quite a heavy construction, because the console weighs about 70 to 80 kilos, but this is probably built for a locomotive of several-hundred tonnes! There must have been a big misunderstanding, because this is really over-engineered.”

The system is a step above what they’ve been used to working with before,” Eide notes, “but now that they have started to understand the routing, they’re very happy with it.”

Recalls Hernes: “When Sverre was installing the speakers suddenly some music came from somewhere; one of the users sitting in the sound studio downstairs had routed something wrong, so it came out of the Main Hall’s speakers! Training is quite important.” Indeed it is...

### Speakeasy

Of course, those flexible, reliable, and expensive Stage Tec AURUS consoles and their attendant NEXUS-STAR audio-router systems – designed by Stage Tec specifically to handle the most extensive routing requirements of broadcast centres, large production companies, and even truly 21st Century opera houses – would be

of little use if the resultant resplendent audio could not be heard – accidentally, or otherwise, and for that the Oslo Opera House largely relies on Renkus-Heinz, thanks, in part to Jøssund’s tenacity. “The consultants had thought long and hard about what they wanted,” he posits. “They had specifications on every speaker, and every speaker had to be inside this specification, so we had to find speakers that matched that, and we found that with Renkus-Heinz.” Suitably hooked, electro-acoustic evaluation for loudspeaker system design purposes was carried out by Jøssund – together with Renkus-Heinz’s Vice President of R&D, Ralph Heinz; Robert Nilsson, Project Leader of Swedish design and installation company DAT AB; and Artifon AB’s aforementioned Alf Bernston – using Ahnert Feister Media Group’s EASE (Enhanced Acoustic Simulator for Engineers) and EASERA (Electronic and Acoustic System Evaluation and Response Analysis) tools alongside Norsonic’s Nor118 sound level meter. Yet, amazingly, according to Eide, “The only time we’ve actually heard the speakers was during the tests!”

So, what’s where and why? Where to start, even? The Main Hall’s expansive (and expensive) stage seems sensible, since that’s where we’re still standing. Here two Renkus-Heinz ST4/4-2T self-powered PowerNet Reference Point Arrays are positioned in moveable loudspeaker towers hidden behind specially tested acoustically transparent cloths either side of the stage, together with another pair of centrally-flown ST4/4-2Ts to form the main Left-Centre-Right (L-C-R) system, augmented by four DR18-2 self-powered dual 18-inch subwoofers, plus four PN61 PowerNet self-powered loudspeakers providing front fill.

All are controlled by Renkus-Heinz’s proprietary R-Control network, interfaced with a Yamaha DME64 Digital Mix Engine, in turn connected to the above-mentioned networked Stage Tec NEXUS-STAR audio-router systems via AES/EBU. Krohn: “The ST Series cabinets were selected for their very low distortion and colouration, combined with compact dimensions relative to their maximum output level. The latter was important, because of the need for the complete system to be aesthetically unobtrusive, yet able to deliver very high SPLs, when required, for jazz and rock performances, as well as very pure vocals and solo instrumentalists.”



► To that end, the Main Hall's loudspeaker system is specified to handle anything up to and including full rock concerts, providing four individually selectable modes, electronically configurable via the Yamaha DME64 Digital Mix Engine's 64-way output matrix, allowing



instrumental and vocal signals to be routed to different loudspeaker combinations to suit the performance in question: Mode 1 ('Song System') configures the main proscenium system as L-C-R, plus fill; Mode 2 ('Instrument System') is configured as Left-Right, plus fill; Mode 3 is designated as Source-Oriented Reinforcement ('SOR'); and Mode 4 provides 5.1 surround sound. "That's not our decision; that was asked for in the tender," states Jøssund, most matter-of-factly. Meanwhile, under-balcony fills are handled by passive Renkus-Heinz PNX81/9 and PNX61 loudspeakers powered by QSC CX501 and CX1102 2-Channel Series amplifiers housed within dedicated temperature-controlled machine rooms (alongside an array of additional rack-mounted equipment, including a 48-channel Digidesign Pro Tools recording system and associated Studio Network Solutions server, multiple TC Electronic System 6000s, and much more besides), while no fewer than 52 additional QSC-driven PNX61s handle surround and delay fill duties when called upon to do so. Finally, four more PNX81/9s and PNX61s are flown from the circular lighting bridge – more commonly called 'The Doughnut' – suspended some 30m above the stalls. For the sake of continuity, Renkus-Heinz is also out in force in the adjacent Little Hall, where a mobile, fully self-powered stage monitor system comprises nine PN81/9s, 10 PN121Ms, eight PN61s, plus DR18-2 subs (elsewhere, the venue also boasts another mobile sound reinforcement system comprising

four Renkus-Heinz PN82/9s and two PN112-SUBs, controlled by a Yamaha LS9-16 digital mixing console). "Both halls sound beautiful," concludes a justifiably satisfied Eide. "They have very good acoustics, and the response from various critics has been fantastic." Hernes concurs: "For us, it was fantastic when they opened Scene 2, and at its premiere journalists wrote that it was heavenly! The sound engineer did a very good job, also; it almost sounded acoustic when coming from the speakers, so it sounded right."

### Curtain Call

And on that uplifting note, who better to bring our enjoyable evening visit to Oslo's latest landmark building project to a fitting close than the tolerant man charged with overseeing the long-winded installation of all that wonderful-sounding audio equipment? Peder Krohn kindly offers up the following summation on behalf of his hard-working colleagues from Benum siving. AS: "We are extremely proud; we are also humbled by the task and the consultants that we have been working together with, as well as the users. It's been a hard but fantastic journey. We'd like to do it again."

Anyone visiting the memorable Oslo Opera House will want to do so again. In the opening words of King Harald himself, "Here we may experience ourselves and the world we live in. Our challenge will be to make this available to all." **AM**



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