

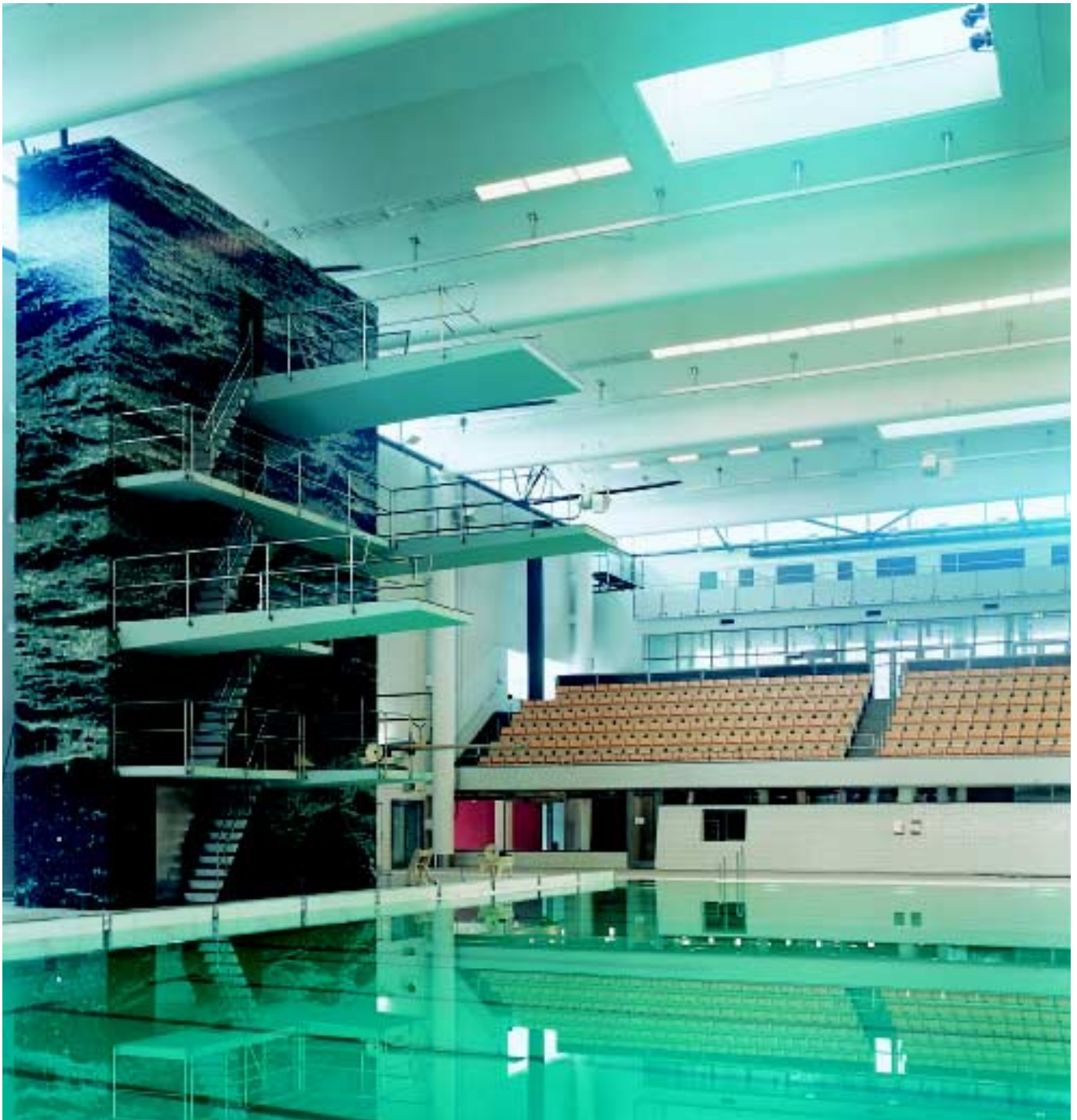
Eriksdal escaped audible belly flops in the public swimming baths

The new Eriksdalsbadet public swimming baths in Stockholm were built with the help of optical path calculations and auralisation. Methods that have previously only been used in the construction of concert halls.

But in this case they made it possible to avoid the traditional belly flops associated with public swimming bath acoustics.

Music in public swimming baths is normally confined to cheerleader ditties and whistle signals from trainers and swimming instructors. In general, public swimming baths do not have a lot in common with concert halls. Unless you are talking about the new Eriksdalsbadet in Stockholm. Here, for the first

Foto: Åke E:son Lindman



time ever in public swimming baths, optical path calculations and auralisation were used to create the best possible acoustics. And concerts have actually been held here.

When inviting tenders, the client, the city of Stockholm, had strict requirements concerning acoustics. The reverberation time in the competition pool must not exceed 1.8 seconds with no spectators. The sound had to be diffuse and free of echo.

One of the country's biggest indoor arenas

Eriksdalsbadet is a much longed-for facility for swimming in Stockholm. The city's school classes, hobby and competition swimmers and everybody else have finally got a modern and functional facility.

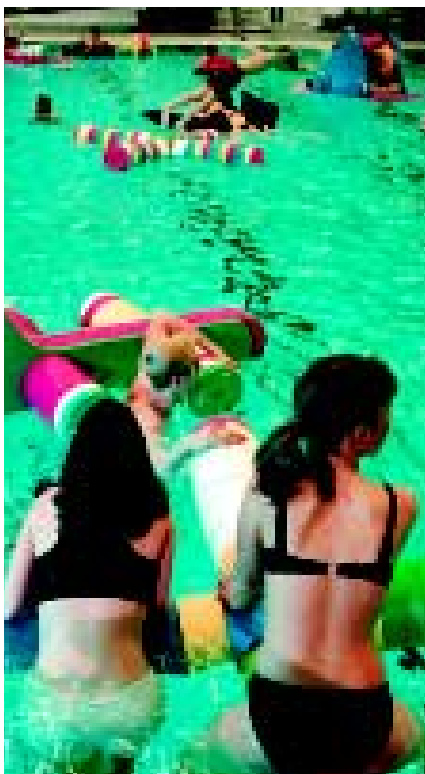
The new baths complex, replacing the fine old facility of the same name, has an area of 27 500 square metres. The competition pool area can house 1 500 spectators. In all room can be found for 4 000 onlookers by moving some walls and erecting temporary stands. This makes the facility one of the biggest of its kind in the world.

The competition pool alone has a volume of 60 000 cubic metres, making it one of Sweden's biggest indoor arenas.

Staff at risk

Public swimming baths are rarely known for their good acoustics. A volume as large as

Foto: Eriksdalsbadet



Fun for the children, but what do the staff think? The hubbub at the swimming baths can soon be a work environment problem, with risks that include stress and hearing damage.

the one at the Eriksdalsbadet is hardly likely to improve the chances. And, moreover, Eriksdalsbadet also has an adventure pool, with water chutes and simulated rapids. In places like this the sound level often gets unbearably high with all the splashing and shrieking. It's possible to put up with this occasionally if you are there bathing, having fun, and spending part of the time under the water. But for the staff, who have the swimming baths as their place of work and have to be constantly on the watch to supervise everything taking place in the water, then there's a great likelihood of noise injuries and stress-related symptoms.

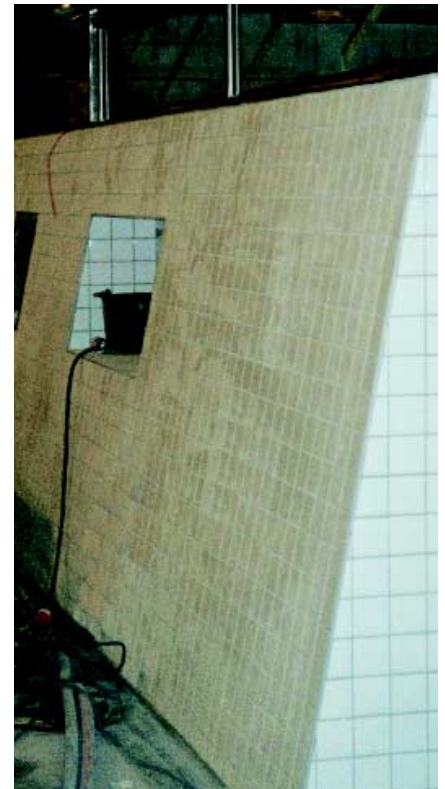
To pre-test the acoustics at the project development stage a method called optical ray measurement was used. This is normally used when concert halls and opera houses are built. Here, it meant from the outset they were able to calculate reverberation time and echo effects in the premises. The method takes into account factors such as the absorption properties of the materials used and diffusion elements that affect sound reflection.

Bathing children in the computer

Taking as a starting point the optical ray measurements, auralisation was carried out. Basically, this involves making expected sound experiences possible already at the project development stage. When auralisation was used in the design of the adventure pool, the sound of children bathing outdoors was recorded (to eliminate echo effects). With the help of the computer, the recorded and computer processed sounds from the children could convey a realistic impression of how the sound environment would be in the adventure pool. Thanks to the auralisation the test groups could listen to the simulated noise and experience the effects of the surfaces being covered with (computer simulated) absorbers. It was discovered, for example, that a tile-clad wall around the bottom of the pool created disturbing echoes. Since these surfaces have to be resistant to water and wear, using sound absorbers was out of the question. Instead, the walls were slanted, directing the sound reflections upward in the swimming baths towards surfaces that are more sound-absorbing.

Large open spaces mean great potential acoustic problems. The reverberation time is connected to the size of the sound-absorbing surfaces. With increasing size, the volume, relatively speaking, increases more than the total surface of walls, ceiling and floor. In Eriksdalsbadet, therefore, it was decided to place sound absorbers on substantial parts of walls and ceilings, even on the underside of the stands' tip-up seats. In the cylindrically formed hall for diving training the risk of poor acoustics was naturally considerable. Here the walls were designed to be maximally sound absorbing.

The new Eriksdalsbadet's wave and vault-



By constructing the tiled walls at an angle to the sound-absorbing ceiling, a large part of the sound waves from the activities in the baths is absorbed, and noise is reduced.

formed ceiling also contributes to a good sound environment.

An environment that, incidentally, is so good that a string quartet performed a concert of classical music in the part containing the 25-metre pool. With great success, according to the management of the facility.

Modern eco-minded building

In places that are not rectangularly box-shaped, there is basically only one way of avoiding acoustic belly flops, and that is with the help of optical path measurements and auralisation. The new Eriksdalsbadet is a modern building from other environmental aspects too. Here, for example, oak was chosen instead of teak for fittings, the pools are cleansed almost completely without the use of chlorine and PVC is a forbidden material in the swimming baths.

Ecophon at Eriksdalsbadet

- Master C/alpha 1800x600 (on the walls, in the blue baths with the diving tower).
- Master D/alpha 1800x600 (for the ceiling of the swimming baths).
- Focus C 1200x1200 (the ceiling of the section with the diving tower).
- The acoustic ceiling's suspension grid is protected from corrosion.

Because of all the hard surfaces, it was important to choose a satisfactory absorber, of absorption class A, which Master alpha is.