

STAVANGER CONCERT HALL: WORLD CLASS ACOUSTICS

Tor Halmrast, Statsbygg

Many concert hall projects seek "world class acoustics", but how is this achieved? Stavanger decided very early to build two separate halls: One hall dedicated to acoustic concerts, and one flexible hall. Through history many multipurpose halls have been built that "can be used for everything, but is not really good for anything". Of course modern stage technology and acoustic solutions have made many multipurpose halls reasonably good, but if one really wants to join the top league, one cannot go into (many) compromises. Stavanger clearly stated that the concert hall should be used solely for acoustic concerts and concerts with light amplification, like a jazz trio. That makes it more likely that the users and the audience will be satisfied also during a "heavy" concert in the same hall, compared to if one had started with the assumption that the concert hall shall "function for every possible use!"

The main issue for a good concert hall for acoustic music and organ is easy to state, but expensive: ROOM VOLUME. The next is ROOM SHAPE. For Stavanger, both these issues were decided long time before the architectural competition. The necessary room height was stated, and a "conservative" shoe-box shape was decided, in order to "surround" the listener with sideways/lateral reflections.

The world is full of good architects, but very few of them have practical experience in drawing good concert halls. Thus, it was made clear to the participants in the architectural competition that they were not supposed to put too much weight on the details of the concert hall, but secure volume, shape, access, communication lines etc. On the other side: There are few acousticians in the world, and very few of them have designed good concert halls. Therefore, Stavanger decided to have a special competition for acoustic adviser, starting after the big architectural competition was finished. A team with the best opportunities was chosen: Kahle from Brussels with his experience from the highly ranked concert hall in Lucerne, Akukon from Finland with their experience from flexible halls for rock etc. In addition, the client stated that the acousticians should have "experience with Norwegian build custom", and this was interpreted in the best possible way, as Sinus from Stavanger took care of the acoustics in general areas, sound insulation etc, and extremely tight and close inspections of the building site. The team of acoustics advisers had a very resonating collaboration with Ratio Architects.

Since the Fartein Valen Hall was dedicated primarily to acoustic concerts, a long reverberation time was chosen. This might be dangerous, as the sound might be too "muddy". Therefore, a very important issue for the acousticians was to secure that sufficient surfaces give reflections arriving shortly after the direct sound, to secure clarity. On the other hand, the reflections from the rear of the audience area should not be so distinct as to give clear echoes back to the stage. The project took advantage of Kahle's practical experience as a viola player regarding the seating of the musicians and details like needs for reflecting/vibrating surfaces close to the double basses, but absorbing surfaces behind percussion. The most innovating part of the design in Fartein Valen is the free hanging balconies. This solution gives the opportunity to activate this volume, or to dampen it with curtains between the balconies and the walls. The free hanging balconies had to be studied carefully in acoustic models, because we at the same time need the reflections we would normally achieve when balconies are positioned close to walls. Therefore, vertical "down-stands" under the balconies is included in order to secure close reflections.

A soloist or a string quartet might want long reverberation, almost like a big orchestra, but do not provide the same sound effect. Therefore the heights of the ceiling elements are adjustable, in order to reduce the volume so that also quieter ensembles "fill the hall". A soloist, for instance a classical guitarist, might still feel "acoustically lonesome" on stage, so it is also possible to lower the reflecting canopy ("clouds") over the stage. Careful adjustments of all the flexible acoustic elements (curtains, flexible ceiling elements, reflectors/canopy over the podium) demand experience and skill.

Comprehensive room acoustic measurements have been executed in Fartein Valen, to secure that the criteria in the brief are met, and for experience to new projects. Often such measurements are “forgotten” at the end of projects (and money), but Stavanger put weight on such detailed adjustments and measurements. Fartein Valen rigged for full symphony orchestra with the ceiling in a high position has a reverberation time for mid-frequencies of almost 2.6 seconds without audience, and 2.2 s fully occupied. The last is actually over the very strong criteria of minimum 2.1 s given in the brief, and this puts the hall amongst the very best reference halls like Musikverein in Vienna, Concertgebouw in Amsterdam, Lucerne etc. (adjusted for audience number). Intentionally there was not a demand that the hall shall have the same reverberation time empty and occupied, because, by experience, that might lead to too short reverberation time fully occupied, but there is a possibility to lower a “rehearsal curtain” for rehearsals in empty hall and recording sessions. This curtain reduces the reverberation time to 2.1 s (unoccupied). Side curtains can be drawn for concerts with amplification, speech and brass bands etc. Then the reverberation time is reduced some 0.7 s (for empty hall without rehearsal curtain).

The measurements in Stavanger included an important parameter that is not always included in the measurements of all concert halls: Strength or Gain, G. This parameter is of course dependent on the setting of the flexible acoustic treatments, but the G values measured in Fartein Valen are very reasonable, and they vary very little over the audience seats. (Reference halls like Musikverein actually have too high G values for full orchestra, so Stavanger is reasonably somewhat lower than this). Clarity for music, C80, compares the sound energy arriving before/after 80 milliseconds. The measured values for C80 lie between the somewhat (too) low values typical for reference halls built in the late part of the 1800’s, and the (too) high values for some modern halls. It is remarkable that Stavanger has achieved such good clarity in a hall combined with such long reverberation time!

Humans have two ears, and in order to measure “surround” and sideways/lateral sound information in the hall, correlation measurements between the two ears of a “dummy head” was performed. The measurements show very good results compared to reference halls. The podium acoustics was measured using the parameter Support, ST, and the high values indicate that the musicians have better listening conditions on stage than in most reference halls.

The Zetlitz Hall has so many flexible possibilities that we cannot mention all: From rock concerts on a flat floor open all the way into the foyer, to chamber opera with audience seated in amphip. In practice, the flexible amphip is the adjustment that gives the biggest changes of the acoustics.

The acoustic measurements show that the acoustical criteria are more than fulfilled, and with the user’s still growing experience with their new “instruments”, we can hear that Stavanger Concert hall truly fulfils the statements of “world class acoustics”!

Tor Halmrast
th@statsbygg.no