

HLJÓMAHÖLLIN – A RENOVATED HALL AND A NEW MUSIC SCHOOL

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INTRODUCTION

In the town of Reykjanesbaer (close to the Keflavik airport) a “Music House” is being built. Here an old music hall is rebuilt and beside it a new music school is built with two smaller halls and besides that a Museum for Popular Music. The old hall will be a multi-purpose hall for all kinds of music: Classical, pop, rock and also musicals, theatre etc. Acoustic consultants are the Icelandic firm VST-Rafteikning hf.

Because the volume of the hall is too small for classical music, and also because of the demand for high flexibility, it was decided to install an electronic “help-acoustic” system. A system designed and installed by the Norwegian firm Panpot was chosen for the hall.

The music school is in two levels with music practice rooms in both levels, and also some larger rooms. A recording studio is located in the center of the music house, consisting of two control rooms. The recording studio is also a part of the music school studio and will be used a lot for teaching purposes.



Figure 1 *The Music House in Reykjanesbaer (Keflavik)*

The two new halls are called the chamber music hall and the rehearsal hall respectively. They are separated from each other and from the rest of the building in order to get a good sound insulation. Above the rehearsal hall and next to the chamber music hall there is a technical room, which is a “box-in-box” construction to minimize disturbance from it to the two halls.

The rooms of the music school are classed in 4 categories: A, B, C, D - with different demands on sound insulation. The highest demands, category A apply to the percussion room, the recording studio and the two new halls.

1. THE CONCERT HALL

The concert hall is intended to be used as a multi-purpose hall that will host a wide range of activities from lectures and conferences to concert with amplified rhythmic or non-amplified classical music. To compensate for the wide range of acoustical requirements the hall will be equipped with a variable room acoustic system, RAES.

The hall is 13 m wide and 32 m long and its volume is approximately 2200 m³. The audience area is about 200 m² which should give about 340 seats corresponding to 6-7 m³ for each listener. The size of the stage is about 140 m² which is sufficiently large to accommodate a symphonic orchestra with 70 – 80 members. The size can be varied by building the stage a little bit out into the hall, and by using stage reflectors the space for the performers on stage can be varied greatly.

The reverberation time for the hall was aimed for approx. 1.2 sec in the mid-frequency region. This was achieved with sound absorption, additional to the absorption of the audience, distributed in the ceiling. The ceiling above the stage has about 70 % of its area with sound absorption, the ceiling above the main audience area has about 50 % of its area with sound absorption and the ceiling above the balcony seats has about 30 % of its area covered with sound absorption. The material used sound for absorption is 200 mm thick mineral wool, acting also as thermal insulation. Sound reflective part of the ceiling is made of gypsum boards. The ceiling under the balconies is covered with sound absorptive material. The visible part of the ceiling in the hall will be made of stretch-metal which is acoustically transparent.

Most of the side walls are double layered gypsum wall. The walls around the stage are made of concrete.

There are several sound reflectors distributed throughout the hall. There are 16 reflectors on the side walls, each one approximately 1.5 x 1.5 m in size. They are all curved with a radius of 4 m. All of the wall reflectors are rotated towards the stage by 6° along the height axis. Some of them are also rotated down by 6° along the longitudinal axis. Above the stage are 3 sound reflectors. Two of them are identical and are located over the inner part of the stage. These are mainly intended to give stage support to the musicians performing. Their width is close to the width of the hall and they are both curved with a radius of 3.5 meters.

The third reflector above the stage forms a mouth over the stage opening, curved with a radius of 8 m. The front side of the balcony will also be angled downwards. If this is not done it will reflect unwanted sound from the loudspeaker system (located above the stage) toward the stage and the first rows of the audience area. These reflections will arrive too late to be useful. Some 14 moveable sound reflectors will be located on the stage (1.5 m wide and 3.2 m high). They will be used to adjust the stage to orchestra size acoustically and visually.

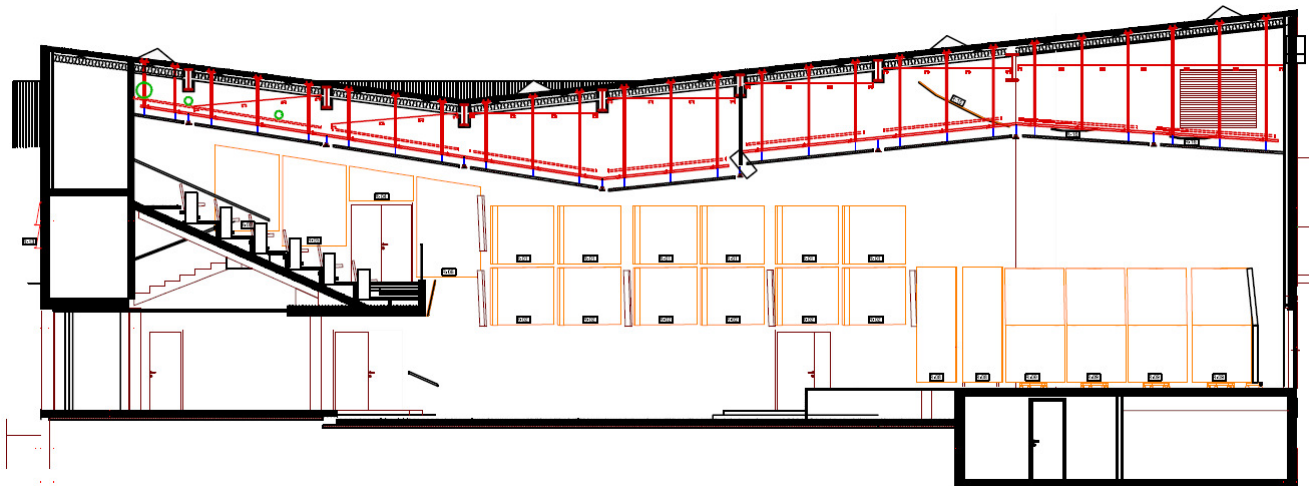


Figure 2 A section of the hall

The hall will be equipped with a RAES system (Room Acoustic Enhancement System). By the aid of the system the reverberation time can be extended, as well as the early reflections enhanced while maintaining the character of the hall. Over the audience area there will be 16 omni-directional microphones and 8 shotgun microphones pointed towards the stage. The loudspeakers in the auditorium will be 8 on the side walls for the early reflections. There will be 24 loudspeakers in the ceiling for reverberation sound, and finally there will be 8 subwoofers. The stage will be equipped with 4 loudspeakers for stage support. The core of the system will be a 24 channel DSP matrix.

A computer simulation of the hall was done in CATT-Acoustics and also in a ray-tracing program made by Akustikon ab in Sweden. Calculated echograms of the hall have been provided for the RAES team in order to help tuning the system. Example of an echogram is shown in figure 3.

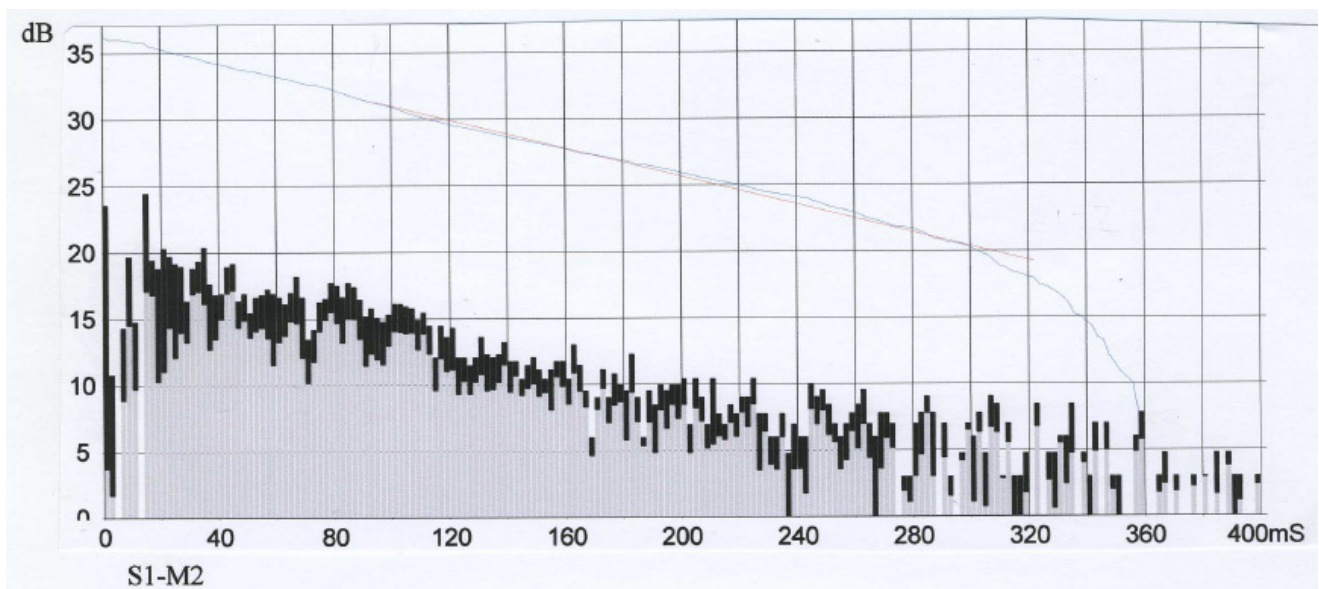


Figure 3 Calculated echogram from a computer model.

2. THE CHAMBER MUSIC HALL AND THE REHEARSAL HALL

Two small new halls will be built in the center of the music school. One is a multi-purpose hall, but designed primarily for chamber music acoustics, and the other is a rehearsal hall. They are 148 m² and 134 m² respectively. They are approximately 9 m wide and 16 m long, and the ceiling height in the chamber music hall is about 6.5 m, but it is only about 3.5 m in the rehearsal hall.

The chamber music hall has a volume of approximately 1000 m³, and seating for up to max. 150 persons. The basic reverberation time will be about 1.4 seconds. The side walls are fitted with curved reflectors giving vertical diffusion and the ceiling has some omni-directional diffusing elements. Along the upper parts of the walls rolling curtains will be installed with highly absorptive textiles to provide for shorter reverberation time intended for rhythmic music, lectures etc.

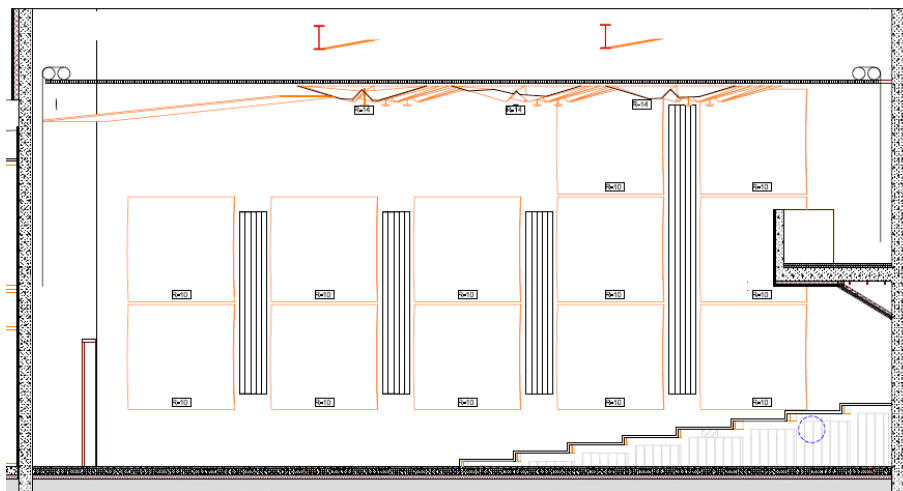


Figure 4 A section of the chamber music hall

The rehearsal hall on the other hand will have a flat floor, and here the ceiling will have medium absorption, corresponding to suspended perforated gypsum boards. The walls will have sound diffusing elements similar to those used in the music practice rooms, and there will also be a large area of sound absorbing textiles along the walls, which can be used to increase or decrease the acoustical damping of the room.

The two halls are structurally made as two separate concrete boxes, with a double concrete wall between the two halls, and the two boxes are structurally separated from the ground floor concrete slab. The roof gives some connections to the rest of the building, but even here the structures were separated as much as possible, but the stability of the building construction sets some limits here.

Above the rehearsal hall and also next to the chamber music hall there is a technical room, which is a “box-in-box” construction to minimize disturbance from it to the two halls.

3. THE MUSIC SCHOOL

The music school is on two floors and it has some 25 rooms for teaching and practicing. In the design of the complex all rooms were categorized according to their acoustical requirements (here mainly the sound insulation). The rooms were classed in 4 categories: A, B, C, D, where the highest demands, category A, apply to the percussion room, the recording studio and the two new halls. The normal music practice rooms are category B, and rooms with slightly less acoustical demands are category C, whereas rooms with very little acoustic demands are category D.

The sound insulation is designed primarily by using heavy floating floors. The walls are double gypsum walls with 2 or 3 layers of gypsum boards, and in some cases there are concrete walls which are then complimented with a single gypsum wall. The ceilings in the ground floor are concrete slabs with a lining of double gypsum boards, but the ceilings in the second floor are a lightweight roof construction with a lining of double gypsum boards.

The doors to rooms in class B are 35 dB doors, but rooms in class A have double 30 dB doors.

The music practice rooms are fitted with sound absorbing curtains in order to adjust the reverberation time as needed, and two of the walls have sound diffusing elements. These are made as specially designed shelves. These shelves can also be used for note pages as well as functioning as sound diffusers.

4. THE RECORDING STUDIO

A recording studio will be located in the center of the music school. It will consist of two control rooms, connected to all of the three halls, and several small rooms (practice rooms) within the music school. All rooms have their audio cables connected to a shared connection point so all spaces can be interconnected at will. The recording studio is a part of the music school and it will also be used a lot for teaching.

The control rooms consist of a small 16 m² tracking room and a larger 29 m² mixing room. Both rooms are symmetric with side walls tilted along the height axis to form a fan shape. The acoustics of the control rooms will be designed according to the Live End – Dead End principle.