

# Improving Acoustics of a Concert Hall

**National Arts Centre, Southam Hall  
Ottawa, Canada**

The National Arts Centre, situated in Canada's capital Ottawa, first opened its doors in 1969 and is one of the largest performing arts facilities in a the country. It is home to the National Arts Centre Orchestra that presents about 100 performances a year with internationally renowned artists, most in the Centre's Southam Hall.

## The rejuvenation project

2016 a project was started in which a series of renovations of the 2065 seat Southam hall took place. As part of these renovations, acoustical improvements were made, which included, new seating, changed flooring, a brand new and better positioned orchestra shell and a fully upgraded ACS-system. The 2018-2019 season started in a beautifully renovated hall with all improvements in place.

**“No other enhancement technology we are aware of is capable of this level of seamless integration with the natural acoustics.”**

*Scott Pfeiffer, Partner, Threshold Acoustics*

## The history of ACS at the National Arts Centre

ACS has long been a part of Southam hall, which was originally designed as a multipurpose space with tunable acoustics. The acoustics however proved to be difficult for instrumental music. The reverberation time fell short of desired levels in both strength and duration, the sound lacked

clarity and the communication between members of the orchestra was not sufficiently supported by the orchestra shell.

In 1998 Pinchas Zukerman became Music Director of Canada's National Arts Centre Orchestra and because of his wish for better acoustics he became the initiator behind the installation of ACS.

Plans to improve the acoustics were made by Kirkegaard and associates and in 1999 an ACS system was installed.

It used 18 microphones and 78 loudspeakers which were mounted in the hall, under the balconies and within the existing orchestra shell. It addressed all the issues described above which resulted in a major improvement of the acoustics.

## Successful years

Many years followed in which large number of world class musicians, - orchestras, - conductors performed in Southam hall, using ACS.

## Acoustic Control Systems at the National Arts Centre

- Increased levels of Early Reflections and Reverberation, to improved the clarity, spaciousness and presence of musical performances
- Acoustics enhancement since 1999
- Musicians, Conductors, ... Many hundreds of artists from all over the world have performed here with ACS
- Upgraded to the latest technical standards and again taking a prominent role after the acoustical improvements of 2017-2018
- Extended reverberation times when desirable for a performance
- Electronic architecture perceived as natural acoustics

## Acoustical upgrade

Around 2012 Threshold Acoustics became involved in the National Arts Centre's rejuvenation project. Improvements to the natural acoustics were proposed but because of the size, shape and materials used in the construction, it was clear that the hall would still benefit from electro-acoustical enhancement.

In 2015 Alexander Shelley succeeded Pinchas Zukerman as Music Director of Canada's National Arts Centre Orchestra and in 2016 the first improvements were made in Southam Hall.

For the National Arts Centre who had been a very satisfied user for over 16 years, it was not a difficult decision to select ACS for the electro-acoustic enhancement.

The ACS system was upgraded to the latest technical standards, where necessary the loudspeaker and microphone layout was adjusted. Microphones and loudspeakers were also integrated in the beautiful new orchestra enclosure. Although this enclosure provides very good communication between the musicians on stage, there was still a need for a higher level of reverberation on stage.

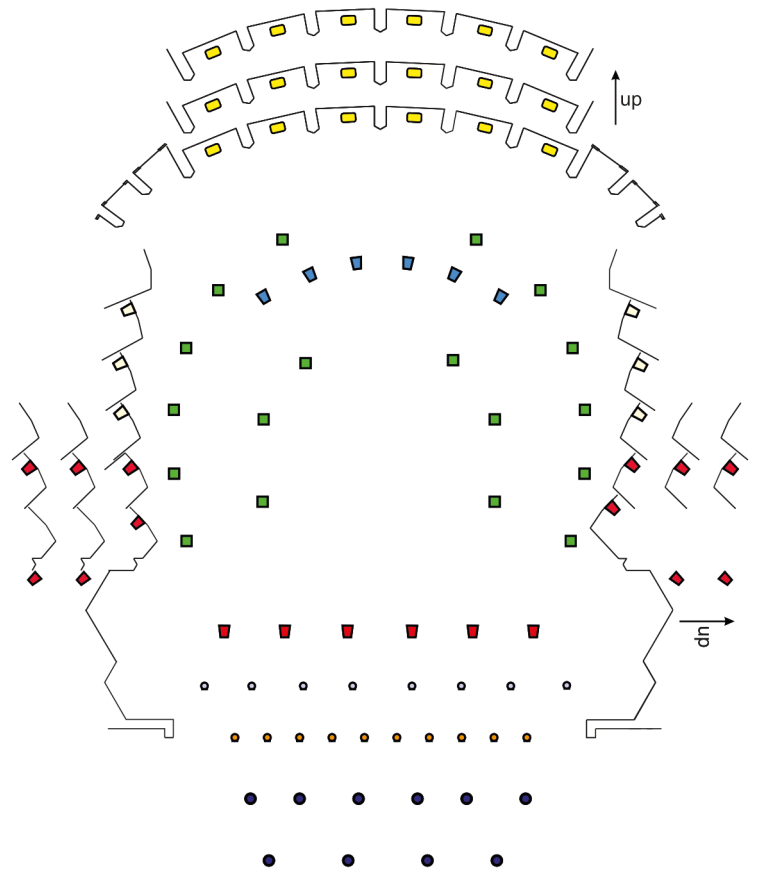


Scott Pfeiffer, Partner at Threshold acoustics and involved during the whole rejuvenation process tells this about ACS....

*"While ACS brought considerable improvements to the NAC in 1999, the digital upgrade in 2016 provided more transparency and control to the tuning process. Once we had the opportunity to reduce the absorption in the audience plane through improved auditorium seating and the removal of carpet in 2017, ACS was able to take a more prominent role, working with the natural acoustics of the room to lift the presence of early reflections and reverberation without any sense of awareness of listening to loudspeakers. With the addition of the new physical orchestra enclosure in 2018, the power and musical balance dramatically improved, allowing for an even more present enhancement of the missing aspects of the concert hall. No other enhancement technology we are aware of is capable of this level of seamless integration with the natural acoustics."*



The orchestra enclosure includes ACS microphones and Loudspeakers



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| • Microphones on reflector   | ◆ Loudspeakers aimed at upper balcony                        |
| • Microphones in orchestra enclosure A ceiling piece                             | ◇ Loudspeakers in lower boxes.                               |
| ■ Loudspeakers above the proscenium opening and at 3 levels in/next to the boxes | ▭ Loudspeakers, under each of the three balcony levels.      |
| ■ Loudspeakers under catwalks  | ● Loudspeakers in orchestra enclosure B and C ceiling pieces |

## Schematic Floor Plan

### ACS in brief:

- ACS AE-01 series processor with Early Reflection and Reverberation matrices as well as Orchestra/Foldback extension
- 18 microphones and 76 loudspeakers driven by 76 discrete processed outputs
- 12 presets available with optimized acoustics for orchestral performances, chamber music, choir, opera, ...