



A Concert Hall of One's Own

Orchestre Symphonique de Montréal finds a home at last

by Alan Hardiman

Montréal's new Maison Symphonique opened September 7 to tumultuous acclaim from patrons and press alike. The crowning jewel on the city's famed Place des Arts, in the heart of downtown, it is Québec's first public-private partnership in arts and culture.

The 1,900-seat concert hall will serve as the new home of the Orchestre Symphonique de Montréal, which will have exclusive occupancy rights for 240 days each year, well above the 100 days it was formerly granted in Salle Wilfred Pelletier, the 2,990-seat multipurpose centerpiece of Place des Arts, which opened in 1963. This will permit the orchestra the rare luxury of rehearsing in its performance space, something it was unable to do in its old digs. The remaining 125 days each year will be programmed mainly by the Orchestre Métropolitain, Les Violons du Roy (an early-music ensemble), and the McGill Chamber Orchestra.

Acoustics and architecture

From the beginning, the Québec government's Ministry of Culture, Communications, and the Status of Women took responsibility for the acoustics, retaining Artec Consultants Inc. as its acoustical and theatre consultant. Tateo Nakajima led the Artec team, developing the concept for the acoustical design under the leadership of Artec's founder, the late Russell Johnson.

Designed by Diamond and Schmitt Architects and Aedifica, with artistic acoustics by Sound Space Design (developed within guidelines formulated by Artec), the project was helmed by multinational engineering and construction giant SNC-Lavalin through its wholly owned subsidiary, Groupe immobilier Ovation, for \$266 million, a price tag that includes the cost of financing, design, building, operation, and maintenance for the next 27 years.

Acoustician Bob Essert, of Sound Space Design, was brought in at the specific request of lead architect Jack Diamond and guided the design team on every detail.

The resulting artistic acoustical design is nothing short of majestic, breathing new life into the sound of the OSM, reinvigorating the performers, and inspiring Montréal audiences while satisfying the requirements that Artec developed for the ministry.

The auditorium is a classic shoebox design in that "it's narrow and tall, but it's not a box—it's curvilinear," said Diamond, referring to the striking convex arcs and gently sweeping curves that characterize the walls, balcony fronts, and boxes.

"There's a language of architecture here which is consistent, and that's the curvilinear form," said Diamond. "These convex forms send the music out in many directions to get that blend that you're looking for. The low, medium, and high frequencies are diffracted by different shapes at different scales: You've got big movement in the



Opposite: The view of the auditorium from the stage.
Above: The lobby.

walls and some big movement in the balconies, but some wood panels are smooth and some have a slightly rough sandpaper finish, which gives different reflections and refractions. When Handel played in Covent Garden, he wouldn't let them dust the walls, because the dust was that sandpaper finish. So we've got a permanent dust, as it were, in the hall to give you that wonderful blend of the high-frequency components."

Regarding the rough surface of some panels, Essert said, "It's a very fine texture. It's rough by human standards, but, for the sound, it's very fine. It's actually grabbing a bit of the high-frequency sound and softening it a little bit, so it's not glassy-sounding. A very smooth, glassy, or polished, finish makes a harsh sound, and a little bit of roughness takes that edge off."

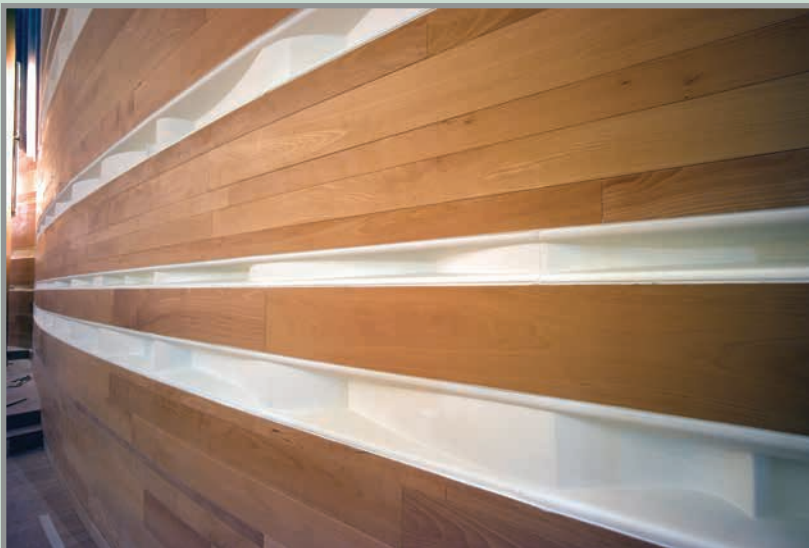
Seating in the orchestra is supplemented by three balconies that flow out into narrow galleries along the side walls, flanking and almost surrounding the performers. While most of the seats face the front of the stage, the acoustical design assumes that the audience will occasionally occupy the chorus seating behind the orchestra, which increases capacity to 2,120 seats.

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The reflectors seen above serve to distribute sound energy down to the stage and throughout the audience.



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continued. "They're not uniform, for acoustical reasons. When you have that diversity, you need some unifying force, and we have chosen wood as the unifying component. It holds the hall together, as it were.

Architecturally, it's really all one material. It's not true that wood is a better acoustic material than plaster—that's nonsense. But wood has a wonderful feeling to it; it has softness. This Québec beech, which has a lovely warm honey color to it, gives a sense of enclosure and a *bonne humeur*, a good feeling, to the hall. That's important."

A decorative asymmetrical array of gleaming faux organ pipes adorning the front wall of the hall serves as a placeholder for an organ designed by Québec's renowned Casavant Frères, in collaboration with Diamond and Schmitt and Aedifica, which is scheduled for delivery in 2014.

The seats, provided by Ducharme Seating, of Montréal, come in three widths, arranged seemingly at random throughout the auditorium. Aside from accommodating patrons of different widths, however, they have been distributed so that everyone has a clear sightline to the stage, a necessity given the shallow rake that, Essert said, "is much better for acoustics."



The left and center speaker clusters.

Top photo: Tom Arban; Bottom left photo: Orchestre Symphonique due Montréal; Bottom right photo: Etienne Lechuga

“I played Mozart and Haydn regularly in Salle Wilfred Pelletier, with the full knowledge that only a few rows in the hall could hear it, because I didn’t want to play Haydn with 16 first violins. Now, the public’s experience will be very different from any they’ve had before.” — Nagano

In addition, each seat has its own air-conditioning supply in the pedestal, ensuring optimal comfort for all audience members while generating no noise or air movement that might affect sound quality in the hall.

The auditorium’s N1 acoustic rating was achieved in part by creating a box-within-a-box, where the hall is structurally separated from everything around it and sits on rubber and steel pads that impede the transmission of vibration and sound from the outside.

The stage, loading dock, orchestra seating, lobby, and outdoor plaza are all at grade, providing straightforward access for the public and ease of operations for stagehands. However, this natural sequence was initially assumed to be impossible, since placing the stage at grade meant the concert hall would be very close to the noise of the subway, parking lot, and street.

“Believing that all the criteria could be met without sacrificing important architectural relationships, Diamond and Schmitt Architects, accompanied by their acoustic consultant Sound Space Design Ltd. and Fisher Dachs Associates, under the supervision of Artec Consultants Inc., in collaboration with SNC-Lavalin, led a detailed acoustical study to prove the noise isolation was attainable with careful design,” said a spokesman for the OSM, illustrating the labyrinthine relationships that existed among the members of the construction consortium.

The N1 rating has a huge impact on the orchestra. “We’re getting used to playing in a hall where we can really play the extreme range of the dynamics,” explained Kent Nagano, its artistic director. “In Salle Wilfred Pelletier, for example, because of the seating capacity, the generic acoustics, and the very loud air-conditioning unit, we could never play *piano*. For us, playing piano meant that we were at least playing *mezzo-piano* and sometimes even *mezzo-forte*, depending on how much air-conditioning was on. On the other hand, we had to be very careful in the old hall, because if we would play too aggressively, it would completely change the aesthetic coming to the hall. It would become two-dimensional—very hard and very brittle. We’re learning quickly that this new hall is a great hall.”

Nagano expressed his vision for the new hall very early in the design process, in consultation with Tateo Nakajima, whose 10 years as a consultant and designer were preceded by a professional career as a violinist and conductor, a background particularly pertinent to his work with artists in the planning and design of Artec’s next generation of performing arts venues.

“We sat down with Maestro Nagano and had a conver-

sation about what sort of sound, what sort of hall, what sort of vision he had for the hall, its role in the community and the sound of the orchestra,” Nakajima recalled. “What he asked for was definitely the foundation of the work we did in developing the concept. Our goal for the architect and acoustician was to create as intimate a room as possible. The basic design that we created from our side—and I think it has certainly informed the architectural design process subsequent to that—has been driven by his vision from an artistic point of view. He asked for a more classical hall, one not so contemporary that you couldn’t comfortably play the entire range of repertoire.” This is an allusion to the OSM’s aversion to performing smaller and more subtle musical works in the difficult acoustical environment of its former performance space.

“For the public not to have access to entire areas of repertoire meant that we were not fulfilling our role as a symphonic institution,” Nagano said. “I played Mozart and Haydn regularly in Salle Wilfred Pelletier, with the full knowledge that only a few rows in the hall could hear it, because I didn’t want to play Haydn with 16 first violins. Now, the public’s experience will be very different from any they’ve had before. Large areas of the classical repertoire will come to the fore in the form of cycles. We’ll be able to have different textures and colors with the size of an orchestra that will be historically appropriate.” He added that, based on his experience thus far, the Maison Symphonique “is an exceptional concert hall.” After a full day of rehearsal, concertmaster Richard Roberts called it “one of the greatest halls I’ve ever played in.”

Variable acoustics and adjustable systems

Among the more striking features of the hall is a series of nine retractable ceiling panels. These motorized reflectors, constructed of plywood and weighing between two and 25 tons each, are arrayed over the performance and orchestra seating areas to allow adjustment of the acoustic environment to suit the scale and nature of the performance. The reflectors serve to distribute sound energy down to the stage and throughout the audience, and to control the acoustic coupling between the volumes below and above the reflectors.

Chamber music, for example, will benefit from a lower deployment of the panels, whereas a very large orchestra, or an orchestra with choir, will dictate their retraction up toward the structural ceiling.

In addition, a system of motorized sound-absorptive



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fabric curtains covering most of the wall surfaces allows the acoustic environment to be adjusted both for the unamplified music repertoire, as well as for amplified music, by reducing the reverberation time of the hall. The complete retraction of the motorized reflectors and deployment of the acoustic curtains are most appropriate for amplified concerts, where higher sound pressure levels are the norm, and, consequently, a shorter reverberation time is required. Gerriets International supplied 2,500' of TRUMPF 95 track and 56 FRICTION-DRIVE motors for the variable acoustical draperies throughout the hall; the drapes were supplied by Lesna, Inc., of Montréal.

While the generous stage area will accommodate 120 performers, a forestage extension lift allows for the performance area to be increased when necessary to accommodate even larger ensembles. When the extension is not in use and remains at audience floor level, three rows of audience seating on mobile wagons can be brought onto the lift so that the capacity of the hall can be maximized. The lift can also be used as an orchestra pit.

In addition, a mobile chorus/audience seating wagon is located at the rear of the stage. This wagon can be pushed back under the permanent choral seating area when extra orchestra performance area without chorus is required. These were supplied by Gala Theatrical Equipment.

The performance sound system

Since the hall is designed primarily for unreinforced orchestral performances, a retractable performance sound system was specified. Designed by Artec principal consultant Geoff Zink, who served as sound and communications system designer, the system was installed by integrator Solotech under the direction of project manager Étienne Lechuga. When not in use, the main left, right, and center loudspeaker arrays retract into “doghouses” in the technical attic through motorized doors in the ceiling canopies.

“We designed an LCR system primarily because we want the center to be able to support vocals,” said Zink. “The vocals coming from that center element can mix acoustically with the instrumentation, which is ideally reinforced with the left and right elements of the system. That’s more natural, and it increases intelligibility. We worked with Alignment & Design’s Bob McCarthy in using Meyer’s new JM-1P loudspeaker. The advantage that we saw with this box is that it has a very wide vertical dispersion pattern, something like 60°, which allows us to have much shorter arrays physically, because you have a box that can cover a lot of vertical distance.”

The JM-1Ps are arrayed, four units over five units, to cover the majority of the main audience area, with a single UPA-1P providing downfill for the audience area closest to the stage. The remaining UPA-1Ps and UPQ-1P provide coverage to the side balconies and the chorus seating area.

“Halls such as the Maison Symphonique are extremely challenging to do from the center, because of the fact that you have 360° of coverage, but it’s a real funny 360°,” said McCarthy, who aided Zink in the selection, placement, aiming, and tuning of the loudspeakers.

“It’s long to the balconies, and then it’s very short on the sides, and then it goes half-long again at the back to the chorus seating,” he continued. “It’s challenging, because you don’t want to throw a lot of energy to hit the side walls—they are only one row deep. Everything is scaled: The biggest throw is handled by the biggest loudspeakers, the JM-1Ps; then the short throw on each side is handed off to the UPAs and the medium throw on the back is handled by the UPQ. The JM-1Ps allow us to control the horizontal coverage precisely, and give us a controlled edge on the side, which is necessary, given the very lively side walls. They cover just to the edge, where we could intersect with a single UPA to cover each side and a single UPQ to cover the rear. They all fit together like really nice little pieces of a puzzle.” He added that he was able to achieve the same sound pressure level all the way around the cluster.

The left and right loudspeaker arrays each contain one Meyer 700-HP subwoofer and six Meyer JM-1Ps. The JM-1Ps are arranged in two sets of three units per side: an upper set and a lower set. The upper set includes the subwoofer, and is designed to hang approximately 33' above

the stage. The lower set hangs about 16' above the stage.

"We didn't want to have a ground stack on the stage, due to space limitations," said Zink. "So the upper element addresses the upper part of the room, and the lower element addresses the lower part of the room. This also allows the imaging to be brought down a bit, so that it doesn't seem that the sound is coming from way up above. The left and right arrays do not address the sides and chorus. The chorus area is not always used for audience seating, but when it is, we use the smaller elements of the center cluster to hit the chorus area, and mix in the left and right signals as well, so that those areas are addressed by the small loudspeakers in the center cluster, in mono."

McCarthy added, "Each array is covering two stories of the building. If you were to do the traditional thing of bringing them together, moving one up and the other down so they meet, you would end up getting shadowing on the top level and on the bottom level."

Recognizing that the split configuration is not the norm in concert halls, McCarthy noted that "the place where there's the strongest interaction between the two arrays—which is the thing you're always concerned with—is right along the balcony face where nobody sits, all along the second level of the side walls, and the second balcony. That was the goal we shot for, and it worked out really well.

"In addition, the rear of each of the three balconies and orchestra seating is almost the same distance from the loudspeakers, and, since there are delay speakers covering the last few rows of the top balcony, we're essentially shooting to the same distance at the top as at the bottom of the balconies," McCarthy added. "The typical line array configuration favors a seating layout where the upper seats are significantly farther away than the lower seats. But, since the JM-1Ps have a lot of vertical dispersion and present a very flat face, they allowed us to hit that shape really nicely while controlling the sides."

The main loudspeaker arrays are supplemented by a number of front fill, over-balcony, and delay loudspeakers. Twenty-two d&b audiotechnik E3 loudspeakers are mounted in the stage lip and stage extension lip for front fill. Also, 59 QSC AD-CI52ST low-profile loudspeakers, powered by Lab.gruppen amplifiers, are used as ceiling-mounted underbalcony delays for each balcony tier. "Their shallow depth—less than 4"—makes it easier to coordinate with other services on the balconies, because typically you can't go too deep into the balcony without hitting another structural or electrical service," Zink said.

Four Meyer UPJ-1P loudspeakers, installed on a fixed acoustic ceiling piece, are used as delayed fill loudspeakers for the last four rows at the top of the third balcony. "The very top of the upper balcony needs a little



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The stage is filled at the opening performance on September 7.

bit of help once you get that far away from the main clusters,” Zink said. The hall measures 129’ from the stage lip to the rear of the upper balcony.

The performance sound system was designed for shows “on the full pop-singer level,” said McCarthy. “It’s not going to do for Metallica, but it would certainly be right for James Taylor. The system should be able to reach in the 115dB SPL peak range.”

During a pop concert featuring the rock group Simple Plan, backed by the OSM 10 days after the inaugural gala, Zink measured 101dB SPL (A-weighted) in the hall. “I don’t know that we’d want anything louder, even though we could achieve it,” he said. “The system has all the headroom in the world, but, in this type of hall, you can start to overload the room even with all the adjustable acoustic elements in place: The curtains were deployed, and we took all the acoustic canopies all the way out to the structural ceiling so that we didn’t have any coupling volume above the canopies to take any of the acoustic energy and process it up there and spit it back out.”

On that occasion, the orchestra was fully miked, “but it was definitely a challenge for the mixer to get a good balance between the band and the orchestra,” Zink added. “Drums, like any acoustic instruments on the stage, are by design projected out into the hall. Sound guys quickly realize that they don’t need to mic the drums, so the issue

is how to deal with the drums acoustically to allow the orchestra to be heard, even with the amplification. It was a challenge, but it sounded good and we were able to achieve pretty high sound levels.”

The main mixing console is a 48-input DiGiCo SD8 with one MaDiRack and one MiNi-DiGiRack. The MaDiRack can reside offstage or onstage for fiber connection with the control surface. The MiNi-DiGiRack resides in an amplifier rack room at the technical attic level, to allow conversion of microphone signals for recording as soon as possible.

A ProTools HD2 ACCEL system with C24 control surface is provided for recording on up to 56 tracks, while a Yamaha LS9 console is available for smaller shows. Four Meyer Galileo processors handle loudspeaker DSP. All microphones are by Neumann and Sennheiser. A Listen Technologies infrared hearing assist system is comprised of an LT-82 stationary IR transmitter and six LA-140 stationary IR radiators.

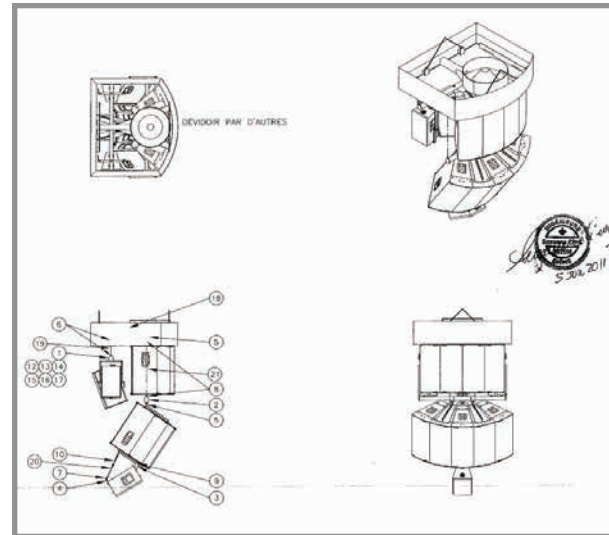
For occasions when deployment of the full performance sound system is not required, a concert announcement system is provided for announcements and narration, with two Renkus-Heinz ICONYX IC8 digitally steerable columnar arrays provided for the orchestra level, discreetly hidden in the front wall on either side of the stage. Two ICONYX IC16 columnar arrays, twice as long as the IC8, are used to address the multi-level chorus seating, since

two individual beams can be programmed—one directed downward and the other upward. These are supplemented by all the other installed elements—front-fill, balcony, and ceiling loudspeakers—to complete the concert announcement system.

A CCTV system is available, with one fixed and three mobile cameras, and the building is served by an MATV system broadcasting on five channels—two of them HD—to 47 monitors throughout the building, including a number of large-screen flat panel displays in the lobbies. A Symetrix SymNet system controls paging through 369 paging speakers powered by QSC amplifiers, with 55 volume controls throughout the facility. Communications are by Clear-Com.

Lighting

The hall is outfitted with a dimmer room and a lighting booth. The equipment complement includes: five ETC SR48+ racks installed, for a total of 480 dimmers, five ETC SmartSwitch 48 relay panels, two ETC transfer switch cabinets for emergency lighting, two ETC Paradigm processors for control of architectural and scenic lighting, and one ETC Eos 4000 console. ACN communication between the console, processor, and more than 120 lighting distribution boxes throughout the hall is assured by redundant fiber-optic and CAT6 networks, with conversion to DMX as necessary.



A schematic drawing of the center loudspeaker cluster.

management of cultural infrastructure in Québec. 3Ps in other sectors, such as construction and operation of roads and public utilities, have proven to be very efficient: For one thing, the government knows exactly what the project will cost before construction begins. In addition, strict controls are usually in place in 3Ps so there is no ballooning of costs, as was the case, for example, with Montréal's Olympic Stadium, a project fully funded from

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Sixty-six ETC Unison stations were installed to control the architectural lighting via touch screens and a cue light console. Twenty-nine cable reels power seven motorized lighting trusses via Solotech distribution boxes, with 250 ETC Source Four PAR lighting fixtures hung as the base lighting plot, along with eight ADB WARP/M motorized spotlights and three Robert Juliat Aramis followspots. Lighting was supplied by SNC-Lavalin.

The balcony faces are equipped with programmable LED light bars and LED light strips, linked to the Eos console via a DMX repeater to allow the operator to initiate one of eight pre-programmed presets.

The public-private partnership

The Maison Symphonique is unique in being the first public-private partnership (3P) in the construction and

the public purse that took 12 years to build, wasn't finished until long after the 1976 games for which it was intended, and wasn't finally paid off until November 2006.

With the arrival of the Maison Symphonique de Montréal, Place des Arts now stands complete as the pre-eminent center for cultural events and performances in French Canada's largest city, some 50 years after ground was first broken for Salle Wilfred Pelletier.

Looking further afield, Aedifica project architect Michel Languedoc said, “We have pushed our client, SNC-Lavalin and the Québec government, to support us in making this facility much richer, finished with all the amenities necessary to ensure that it will stand among the top ten concert halls in the world. But judging from the preliminary reactions of the musicians, I wouldn't be surprised if we were in the top five.”