It’s not what you might expect to see in a brand-new concert hall: ranks of exposed structural steel beams stretching upwards, echoing the heavy timber construction of a barn’s gambrel roof, stark against the warm glow of a rich cherry interior. But that’s only one of many distinguishing features of the Bella Concert Hall, the crown jewel in Mount Royal University’s many-faceted music conservatory, the Taylor Centre for the Performing Arts, in Calgary.

Completed in August 2015 at a cost of $90 million, The Taylor Centre comprises the 773-seat Bella (named after Mary Bella “Bella” Taylor, the matriarch of the major donor’s family); the Transalta Pavilion, an ensemble studio large enough to hold a full orchestra for rehearsals; 43 private studios for individuals; six large ensemble studios; two percussion studios; and five master class studios.

The 93,000-sq.-ft. facility serves the university’s music, theatre, and speech programs and includes a wing dedicated to an early childhood program instructional suite. The instructional spaces surround and embrace the public performance components of the building, providing a direct correlation between the learning and performance of music. Each room and venue is individually isolated acoustically, allowing all of them to be used simultaneously; they are also interconnected on a Dante audio network.

The Bella’s design is a modern deconstruction of a rural barn, reflecting Alberta’s prairie heritage and landscape. “A contemporary interpretation of the rural barn on the expansive prairie of Alberta inspired our choices in materials, structure, and color throughout the project,” says architect Bill Murray, principal with Pfeiffer Partners, Inc. of Los Angeles, who led the design team in association with locally-based Sahuri + Partners Architecture, Inc. “The inside of the concert hall is really taken from looking at the old prairie—barns, how barns were constructed, the Indian tents, and what those looked like when they were illuminated.

“The inspiration for the outside of this building, and the inside, is derived from our studies of the prairie and...
Canadian Rockies,” Murray continues. “The outside is full of ledges and nooks and crannies, different massing changes that occur on the building, and that language translates into the inside of the hall into the lobby. Materials are metals and stone and other things that help reinforce this architectural language. The inspiration for the lobby continues that language of the architectural materials and architectural development of the outside coming in, so the volume of the concert hall, which as an exterior element is shaped as a barn asymmetrically, the material of that barn comes in as the major focal wall of the lobby.

Seating in the Bella is a custom design by Pfeiffer Partners, executed by Canadian seating manufacturer Ducharme. The seating is distributed between the parterre, a balcony, 10 theatre boxes, and an 89-seat choir loft. To achieve the graceful curves of the aisles, as well as to maximize patron sightlines, Howard B. Glickman, project manager for theatre consultants Auerbach Pollock Friedlander, specified four different seat widths, ranging from 20” to 23”, in order to stagger the seats and ensure that each person has a clear view of the stage between the guests seated in front of them. “We also specified different seat pitches in the orchestra and balcony to ensure proper viewing angles and better comfort for the audience,” Glickman says.

Acoustics
The hall’s intermediate seating capacity belies a relatively large volume of some 500,000-cu.-ft. “Unlike most acousticians, we don’t design the volume of the room based on the audience capacity,” says the acoustician Rick Talaske, of Chicago-based Talaske Group, Inc. “We design the acoustic volume of a concert hall based on the size of the stage and the associated expected ensemble size; we need to ensure that the room has sufficient volume so that an overly loud condition isn’t realized when you fill the stage with musicians. The volume at the Bella is keyed back to the number of musicians that are anticipated to be onstage, which is 85 – 90.”

“The EDT metric, by definition, looks at the decay by the direct sound, and they are necessary for clarity of sound. The EDT metric also includes sound reflections occurring that arrive within 30, 40, and sometimes 45ms after the direct sound. We feel that this is a more important metric than reverberation time (RT60), because when a person is forming a subjective impression of a room—which is what room acoustics is all about—the hearing system typically is gathering information for about a quarter or a third of a second before it starts to overload, at which point the impression is formed,” he says.

“Yes, we are concerned about reverberation time, and the numbers at Bella are textbook you might say, but we also are more concerned about the sound reflection pattern that’s occurring as the sound travels for up to 300’ before it reaches a patron’s ear,” Talaske notes. “That feature, which we call running liveliness—the ability to hear the reverberance as the music is ongoing—is strongly dependent on the shape of the room and on the ability of the room to create a multiplicity of fairly strong sound reflections after two or three bounces off walls, ceiling, and other surfaces.”

The Bella departs from the classic shoebox shape; the side walls are not parallel but are canted in several degrees toward the rear to achieve a reverse fan shape, in order to develop those strong reflections. The corners of the room have been designed to reflect sound to the far side wall, allowing for multiple long reflections that remain strong as they arrive at the listener’s ear. A cylindrical diffuser, high on the upstage wall, is shaped acoustically to serve several functions, Talaske says. “One being to provide sound projection of the chorus and another being cross-communication within the choral loft so that choristers can hear one another. A third feature is that the upstage corner is shaped in a way to take the sound from the woodwind section on stage and deliver that to the rear of the audience. Many halls suffer from woodwinds being not as loud as they could or should be. That’s particularly true when you have an orchestra that’s playing on the flat stage, without a fully developed orchestral riser system. That upstage area was shaped in a way to help deliver into the room some of that sound from musical sources located mid-stage.”

“There’s no question that Rick Talaske was very successful in doing that,” says Al Williams, the Bella’s resident house mixer for amplified performances, and a 40-year audio industry veteran. “We find that there’s a lot of energy in the low mid-frequency area coming off the deck. Musicians have commented that they’re able to hear themselves better in our hall than in others—in a lot of halls, you don’t get good left-right communication. The choirs have said the same thing.” He adds, joking, “The sopranos in the Calgary Philharmonic Chorus said that they heard the baritones, and they didn’t even know that they had baritones before!”

Perhaps the Bella’s most distinctive acoustical feature is a large circular reflector over the stage, shaped to evoke the province’s official floral emblem, the Alberta Rose. “The height of the hall’s structural ceiling meant that reflections
that occurred off the upper ceiling were too long delayed to facilitate sound clarity,” Talaske says. “Also, we wanted to keep the shape of the Alberta Rose in a natural circular form; however, that resulted in a sound reflection surface that ended a little bit too soon. We sought a projection of the sound-reflecting surface beyond the edge of the stage, and suggested that another way of doing this was to introduce some other petals in the hall to complement sound-reflecting surfaces over the stage.”

Two additional petals were installed over the audience area to complement sound surfaces over the stage and reflect sound to the patrons in the balcony. In order to confirm the accuracy of the angles of incidence and reflectance, Talaske asked the contractor to bounce a laser from the center of the stage off a piece of light-reflective material and will absorb low-pitched sound at about the pitch that you hear if you tap your fist on that wall.”

Given the wide range of programming the hall was designed to support—everything from choral and symphonic works to amplified hip-hop and pop concerts—Talaske’s design, realized in technical elements designed by Auerbach Pollock Friedlander, incorporates variable acoustics, with some 9,800 sq. ft. of retractable fabric banners at the side walls, telescoping panels in the walls and ceiling, and onstage draperies that can be deployed in locations.

In working with theatre acousticians and AV consultants, it’s a number one priority for us to integrate the AV theatrical systems into the architecture, and something that Pfeiffer Partners takes great pride in,” Murray says. “When these systems are on, we design them to integrate seamlessly with the architectural language of the room and the building as a whole.”

Above the Alberta Rose, a full working gridiron serves the technical requirements of speaker rigging, projection screen rigging, and a variety of portable hoists and stands. These meet the needs for business events on stage—a critical income stream—as well as pop concerts that might want to use their own lighting rigs. Overhead motor control cabinets located in three separate locations in the technical areas of the concert hall offer convenient control of a JR Clancy ScenaControl 5000 automation system via SC5200 touch-screen interfaces to actuate presets configured for different types of performances. The system controls 12 SEW Eurodrive 1000w automatic motors, ranging in size from 1/4hp to 3hp with encoder positioning for repetitive presets of the variable acoustics, including nine custom-fabricated hard-framed and fabric-wrapped telescoping panels weighing two tons each; twenty-four 2m-wide x 3.5m-high self-stacking, tracked rigid acrylic panels; and 39 acousRolli

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Sound M’elodie cabinets, 12 in each identical array. A pair of Meyer 500HP subs and one 700HP sub are permanently installed above the canopy.

The AV consultant, Rick Wells, of Los Angeles-based Multi-Media Consulting, Inc., specified a very long-line array in order to increase the directivity of low-frequency sound. “My goal is to put as much direct sound in the listening area, in the seating area, and keep as much energy off the walls as possible,” Wells says. “We knew we had more horsepower than we would ever use in that room.

“We specified the project three different ways, using Renkus-Heinz Varias, Meyer, and L-Acoustics arrays,” Wells says. “That was one of the interesting things about this project: Because loudspeaker technology has advanced so far, we were able to use products from three different acceptable manufacturers that would have performed equally well. At the end of the day, the university chose to continue with Meyer; they already had some Meyer loudspeakers in their gymnasium, so they had a leaning toward it from the beginning.”

Stage monitors are Meyer UM-1P wide-coverage wedges. Wells recommended that the variable acoustics include a significant amount of absorption on the upstage wall “so we wouldn’t get a lot of bounce back from the stage monitors.”

A Yamaha CLS digital mixing console, with 72 mono and eight stereo inputs, sits on the front-of-house mixing porch, a small area at the rear center of the hall.

Due to the relatively shallow depth of the hall, there was no requirement for delay loudspeakers. Four Meyer UPQ-1P wide-coverage loudspeakers are mounted in soffits in the rear corners of the paterns and balcony to provide rear-left and rear-right surround coverage as required. Five Meyer UP-4XP compact loudspeakers are installed behind grilles cloth in the stage lip to provide front-fill coverage for the first few rows. The choir loft above the upstage rear wall is served by eight Meyer MM-4XP miniature wide-range loudspeakers mounted in the fascia rails.

“AB Soundweb London BLU feeds a 16-output Meyer Galileo loudspeaker processor for the LCR line arrays and subwoofers,” says Wayne Rabidoux, project manager for system contractor Allstar Show Industries, Inc., of Edmonton. “The front fill, choir loft, surround loudspeakers, stage monitors, and Meyer UM-1P control room monitors are fed directly from dedicated BSS units. The signal is routed from the CLS via Dante to the BSS, and from the BSS it goes via AES to the Galileo, keeping the signal in the digital domain as long as possible, as designed by Rick Wells.”

One of Wells’ design goals was to introduce no intermediate digital-to-analog conversions or format conversions, aside from the Dante-to-AES conversion in the BSS Soundweb. “I even used Shure’s wireless ULX-D wireless microphone system, which has Dante outputs and sits on the Dante bus,” he says. The entire system will most likely be standardized at 48kHz, 24-bit, given that the Shure ULX-D system operates at that standard. Rabidoux adds, noting that final commissioning had not been scheduled as of press time.

Monitor mixing can be performed either at the front-of-house console or on a second CLS at the side of the stage when necessary. “For a recent Elvis and Roy Orbison tribute show with a nine-piece band, we had on the stage 10 Meyer UM-100Ps plus a sub on eight mixes,” Williams says. “We did that monitor mixing from the FOH position, because it was just the one band. If it had been two bands, we would have brought in our second CLS and located it stage left, perhaps behind a curtain—there are no wings.”

“For that show, we hit about 103dB at the console at the back of the hall. In the front seats, it would have been a lot hotter,” Williams continues. “When we first opened the hall, I was quite concerned that amplified sound would be a problem. It’s really good for choir. When we were...
Perhaps the Bella’s most distinctive acoustical feature is the large circular reflector over the stage, shaped to evoke the Alberta Rose, the province’s official floral emblem.

With a symphony orchestra, and even more so with a chamber orchestra, however, you have to deploy more of the acoustical absorption, because they need to have a little more direct sound and less reflected sound. We have had some performances that have been primarily choral in the first half and then primarily orchestral in the second half, and we have changed the deployment of acoustical panels during the intermission. Actually, during one performance, they finished a piece, and, during a little bit of chat before the next piece, I changed the acoustics for that piece. It takes about 20 minutes to deploy the complete system, but if you’re just changing the flavor for a little bit more articulation, you can bring in a couple of panels in just three or four minutes.”

The pre-programmed presets in the variable acoustics system allow for reverberation times in the range of 2.6 – 1.4 seconds. “In addition to the retractable rolling banners, and the panels that come down to reduce end-to-end reflections, we have nine panels up in the center of the ceiling,” Williams says. “When they are deployed from the center of the peaked ceiling where they reside, down toward the eaves, they effectively bring the ceiling down.”

Williams hasn’t yet mixed in surround or LCR; he generally likes to mix live sound “in dual mono, where I may pan a little tiny bit left to right,” he says. “We’ve done an L/R mix, and we’ve done a C mix, which is what we call a ‘chat’ position, to allow for a chat, for example, during a classical performance in which the sound system isn’t otherwise used. We’ll drop eight of the 12 boxes in from the center array for the chat.”

The 5.1 surround sound system is available for film showings in the hall, along with a 33,000-lumen NEC NC3240S-A 4K digital cinema projector and 33.5’-wide Stewart motorized screen that retracts up into the canopy when not in use.

While no dedicated facilities exist at present to accommodate recording or the needs of broadcast trucks, the theatre consultant made provisions for several sections of orchestra seating to be removable so that multiple camera positions could be set up for recording and broadcast.

“There are plugs on the cords of the aisle lights in these areas, with receptacles in the floor as well as inserts in the floor, to allow for easy removability of the chairs,” Glickman says.

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Performance lighting

“The primary focus in the lighting system design is classical music, but we’re starting to build some palettes and looks, and finding out what we can do,” says theatre technician Owen Day. “There are definitely some toys in the equipment package that are going to let us do things that are closer in scale to a rock show. We’ve already had some pop acts come through who have wanted some flashier lights, so we’ve been able to play a little bit and do some stuff that’s a bit more fun than what you might do for a straight classical music concert.”

Thirty ETC Source Four LED Series 2 Lustr arrays are hung, singly and in pairs, from 22 Tbars that extend radially outward around the edge of the Alberta Rose canopy, and above the choir loft. Another thirty 750W Source Four Zooms are hung in six windows, three on each of the side walls, while nine more are hung high on the hall’s rear wall “with big, honking 5° or 10° barrels on them that add super-long-throw capability,” Day adds.

“They add punch and act as my main front wash.” Also hung on the canopy are six Clay Paky Alpha B-EYE K10 LED moving lights, which Day uses as “wash fixtures with some cool beam-shaping effects that look terrific through haze.” His arsenal also includes four Source Four LED Series 2 Tunngsten HD arrays, mounted on Apollo Design Right Arms, that can be panned and tilted remotely to act as podium specials, or to isolate a spot for a performer.

“In our followspot booth, we have two [Martin Professional] MAC III Performance moving heads that, with adequate notice, we can use as pseudo-followspots,” Day says. “They are pretty powerful fixtures that, fitted with an animation wheel and gobos, allow us to create some cool texture effects on the stage, the flash-and-trash stuff that the rock guys like. There are no permanently installed trusses in the hall, although we do have pick points where we can pick up trusses that might be brought in by a touring rock show.”

An ETCIon 2000 console, fitted with a 2 x 20 USB fader wing, touch screens, and radio remote focus unit, affords control of the theatrical lighting over ETC’s Net3 Ethernet-based network. For this the LEDs, the Net3 control terminates in a node up in the Alberta Rose canopy; for the incandescent lighting, the network terminates at the dimmer racks. The system features one ETC Sensor SRS-48 AF and one Sensor SRS-24 AF dimmer rack as well as two ETC SmartSwitch SS-48 relay panels. The dimmer racks use a combination of Thru-Power modules as well as D20 and ELV10 modules for architectural lighting.

Control is provided by an ETC Unison Paradigm architectural control system.

“The house lights, or ‘beehives’ as we call them due to their shape, are really nice incandescent fixtures that work really well for us,” Day says. “We glow them in a little bit during the show at a 10 or 20 percent level, and they look great as a complement to the production lighting.”

Facility interconnection

The Transalta Pavilion, also known as Ensemble F, is about the same size as the Bella’s stage, and is often used for recitals and as a rehearsal space. One wall consists of windows and can be covered with movable drapes, if necessary. “The drapes are remarkably effective in changing the sound in that room,” Williams says. “It’s a tall room and pretty live, considering the plan of the room. The RT60 is about 1.6 – 1.7 seconds with all the drapes out.”

The wall opposite the windows is wrinkled with floor-to-ceiling diffusion, and the ceiling is broken up into various “angular planes that eliminate flutter echoes between the ceiling and the floor. “In a multi-purpose rehearsal hall, it’s very important to have adjustable acoustics; it’s important to have acoustical shaping,” Murray says. “It’s a very elegant room, but it’s also a workspace room.”

A Dante network connects the concert hall with the other facilities in the Taylor Centre, so when Ensemble F is used for concert hall overflow or teaching, audio from the Bella is reproducible through an installed 5.1 sound system consisting of three Tannoy VXP 12 loudspeakers across the front, a pair of smaller VXP 8.2 surrounds, and a Renkus-Heinz DR18-1R subwoofer. HD video can be projected via a NEC NP-PH1400U 14,000-lumen DLP projector onto a 21’-wide Stewart screen.

All other ensemble studios and master class studios are equipped with Crestron control systems. Tannoy loudspeakers, and either NEC commercial displays or NEC projectors and Stewart screens.

“A Crestron DM-MD32x32 switcher has been installed with digital media cable run throughout the facility to provide high-definition video to displays throughout the lobby and public areas,” Rabidoux notes. Program video from a Sony SRC-H900 HD PTZ and two fixed cameras is also distributed to the backstage areas over coax, and to the Bella’s lobby for the benefit of latecomers.

“To me, the interesting part of this project is how it functions as a teaching environment that is all inclusive, from master class rooms and rehearsal spaces to smaller performance spaces and the concert hall,” Wells says. “There’s a lot of connectivity between each venue. It’s essentially one big giant system.”

“The end result of this project is one that I’m extremely pleased with; it’s better than I ever imagined,” says Murray. “This building is going to be a new symbol for all of Alberta, and, I hope, one of the richest concert halls in all of Canada.”