Christ Church

THE QUEST FOR INVISIBLE SOUND

Christ Church Deer Park, Anglican is situated on Yonge Street in the heart of Toronto, ON, two blocks north of St. Clair Avenue. The church is very active with numerous services, weddings and funerals. They have an extensive music program which typically sees a sung Eucharist and an organ recital each week, as well as Choral Mattins, Advent and Christmas Lessons and Carol services. The altar is centered in an open chancel and can be rolled aside to allow for the staging of music events by outside groups. The acoustics of the building make it the site of numerous concert performances and recordings as well as their own Jazz Vespers series.

The church was finding that their existing sound system lacked clarity and they were getting a number of complaints, particularly from seniors. This was apparent not only acoustically in the church but also in their hearing assist system and on the recordings that are made for their outreach program to shut-ins or any others who could not attend the services.

In first trying to determine how they would go about rectifying the situation the Rector, Reverend Canon Judy Rois and a committee of church wardens visited a number of churches including Timothy Eaton Church, St. Andrew's on King Street and York, where they thought the sound was well done, in order to establish a benchmark reference for themselves. They felt it was absolutely critical that they get advice not only on the equipment component of the sound system but that there also needed to be a clear understanding of all the needs of the congregation and the many users of the church as well as an awareness of the architecture and the aesthetics of the building. They also knew that they had many volunteers as operators, so a user-friendly, simple to operate system was very important. This led them to contact Engineering Harmonics of Toronto where Paul Alegado is a Project Manager and Designer. He first met with the committee in the summer of 2005 to determine the church's various uses and establish a wish list. He put together a needs analysis and an operational requirements report, including a cost estimate.

The church thought their sound system needs and uses seemed fairly straight forward, but they were very concerned about the visual element. Clarity and speech intelligibility were absolutely critical, particularly given the aging constituency of the congregation but they did not want the sound system to intrude on the architecture or acoustics of the building or the visual elements of the chancel and surrounding area.

Dave Clark is the Director at Engineering Harmonics: "Church committees are invariably comprised of people with very strong personalities and often conflicting views. They have do or die expectations and are always very budget conscious."

This congregation had very high standards for sound quality, but were also adamant that the acoustics of the building could not be altered and that the visual elements of the church should not be interfered with. They were also of a very frugal mind.

Every aspect of the visual landscape of the dais, the pulpit and lectern, the communion rail, and the altar itself had been donated and dedicated to the memory of a loved one. They are all precious monuments to the past. Mounting speakers or running cable almost anywhere was going to be extremely problematic.

Even the existing control console at the side of the church was a piece of carpentry that had been hand-made by a parishioner and was to remain intact.

How to Hide Sound Systems in Acoustical Environments:

The cross at Christ Church Deer Park is very much a visual focus. It is a large wooden sculpture with detailed painting that is prominently suspended in mid-

BY DON BARBER • PHOTOS BY JEFF MACKAY

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air over the altar in the centre of the chancel. Because of the highly reverberant space Engineering Harmonics determined that the only acceptable speaker position was going to be in the centre suspended very high up out of the sightlines with the cross. They were going to need very good directivity, which typically requires large horns to maintain pattern control within the voice range. Any standard sort of speaker cluster was still going to be far too obtrusive.

Dave turned to a recent development from Renkus-Heinz called Iconyx.

Iconyx is designed to:

"Resolve architectural and acoustic conflicts. It is a family of digitally controlled column speakers employing multiple 8-channel class D, 50 watt amplifiers, controlled by powerful DSP engines that allows the shape and aiming of the vertical beam to be defined from a remote location and deliver constant SPL over large distances. At only 6" wide, the iconyx 'thin stick' vertical profile blends easily with both classical and contemporary architecture."

The CCDP system employs two of the Iconyx IC16/8 columns vertically stacked. Each column has 16 co-axial transducers, 2 per amp channel. Frequency response is from 120 Hz to 18 KHz with a 120-degree horizontal and 20-degree vertical dispersion.

The church operates in many different configurations with readings from several locations including right in the pews. It was absolutely critical that there be a stable sound field with consistent coverage over the entire seating area. Dave had previously auditioned the Iconyx at the Mississauga Living Arts Centre and was impressed with its pattern control, steerability and overall sound quality. Often the coherence of line arrays over distance causes strong reflections off the back wall that becomes echoes, which are very distracting to people on stage. Christ Church Deer Park is proportioned so that the high centre position works

Christ Church Deer Park

to their advantage; the tight vertical pattern of the Iconyx allows it to be tilted down to cover the seating area without having any energy bouncing off the back wall. The wide vertical coverage pattern coming from a point source means that any energy bouncing off the side walls will form coherent reflections that do not impair intelligibility.

The Iconyx speaker system was specifically chosen for its unique capabilities and visual discretion. When it came to the other elements of the system Engineering Harmonics specified performance requirements as opposed to specific brand names.

Dave Clark: "We try to work on a design/function philosophy. Often the choice of equipment is 'electro political' in that the client has certain brand name preferences; their confidence in the component equipment is actually very important to the ultimate technical performance of the system."

Testing 1, 2:

CCDP wanted to be able to try different options in determining specific equipment and brands. This was particularly true for microphones and wireless transmitters. PA Plus of Toronto was chosen as the systems contractor and they were able to facilitate this process due to their extensive available rental inventory. Rob Kennedy of PA Plus acted as Project Lead: "Because of our rentals, particularly to corporate clients, we have an extensive inventory of wireless and podium microphones that we were able to let the client try for several weeks at a time to evaluate the differences in performance and cost."

Judy Rois was very active in the process of determining many of the specifics, handing out questionnaires to the congregation asking them for their opinion on the sound, where they were seated and any aesthetic or other concerns they might have.

The client chose the Countryman Isomax IV podium microphone for the pulpit and lectern, which happens to be a PA Plus favourite as well. The sensitivity along with the Isomax IV's very tight focus and noise filters allows them to be positioned almost two feet away from the reader and still get lots of gain before feedback. This positioning means there is no visual obstruction for the reader or the congregation and the pick-up worked for anyone from four feet to over six feet tall. It also means that no one is going to grab the microphone to try and reposition it. In one of many efforts at attention to detail Rob developed a custom mounting assembly for the Isomax IVs using K&M parts. The combination of the mic's low profile, the ability to mount it at a distance and the custom mounting assembly means you can hardly see the mics from even the closest pews.

A very interesting choice was made when it came to the wireless microphones. Both Judy Rois and Reverend Dianne Mesh, the Associate Priest, picked the Countryman E6 Earset microphone. The E6 is not inexpensive, and not all ministers are comfortable wearing a microphone on their head, but they found that the sound quality was so good and the freedom of movement it allowed were very worthwhile.

The Countryman E6 is an:

"Ultra-miniature electret condenser element that is held close to the mouth by a thin boom and a comfortable ear clip. The entire assembly weighs less than one-tenth of an ounce and virtually disappears against the skin, so presenters forget they're even wearing a mic. The omnidirectional element is nearly immune to wind and breath pops even when used without a windscreen, while the boom keeps it very close to the mouth for excellent isolation."

(Note: My experience is that the boom arm is best placed along the shadow of the jaw line; it is more invisible than if it is along the cheek, and near the mouth it is susceptible to the breathing noise of the exhale stream from the nose.)

Above: The Countryman Isomax IV is set up at the podium.
Below: The Lectrosonics AM8 mixer and the Biamp matrix controller powered by QSC CX 404 amplifiers.

User Friendly:

Another interesting choice was that of the Electro-Voice RE1 wireless systems. There are other brand name wireless systems that are perhaps more commonly seen, but the choice of the RE1 systems other than the fact that they work very well and sound very good, came down to some very practical points.

There are a number of volunteers working as system operators; they are not experienced sound engineers, so keeping the system control as simple as possible was an important criterion. There are two body pack transmitters dedicated to the two priests, but a third one and a handheld transmitter are shared by a number of speakers in a number of locations in the church. The congregation specifically preferred the *over-moulded Warmgrip* of the Hand Held transmitter. Two other features of the EV system that made it specifically suitable were the capability of locking out the transmitters and receivers to prevent accidental channel changes and the cast magnesium case for durability vs. the more common plastic cases of other brands. The single most important feature however was the transmitter's ON/OFF switch for a simple and practical reason – most transmitters have a soft push-button switch for both on and off with an LED indicator for status; not all fingers can activate them easily. Also, you can't see the indicator when the transmitter is under clerical robes. The EV RE1 has a toggle switch that physically repositions so you can feel where the switch is and know when the pack is live or not.

Self Control:

The other elements of the system were determined in conjunction with Peter Lima, Senior Systems Integrator with PA Plus who supervised the supply and installation of the equipment. This included the choice of the Lectrosonics AM8 mixer, the Biamp Audia matrix controller and the EAW VR61 for fill and monitor speakers,

powered by QSC CX 404 amplifiers.

Peter says the Lectrosonic AM8 auto mixer is "amazing". It employs digitally controlled analog electronics. Rather than gated inputs, it provides variable independent front end gains using "really fast VCAs" and a patented gain sharing algorithm.

"The Adaptive Proportional Gain algorithm is a unique process that allocates the gain applied to each channel after comparing the individual channel level with an overall reference level. The reference level is a mix of all active channels, so it automatically adapts to varying background noise levels in the room. The channel with the most signal receives the most gain."

"I can be talking into a microphone and then shove it right in to the face of a speaker and it won't feed back because the mixer 'knows' that it is a different input source characteristic."

There are four EAW VR61 speakers on delays to fill in the very back corners of the church when it is completely full, which are otherwise turned off. The VR61 which is a 6 x 1" rotatable horn format specifically tuned for voice reproduction is also used to project into the side chapel and for monitors for the choir. Peter calls it "a great sounding little box for voice."

The original matrix control was specified as the Biamp Nexia, but for budget considerations this was changed to the simpler "incredibly well priced" Audia system using the EXPI-D module and the Volume/Select eight remote. It works very well in conjunction with the Lectrosonics mixer. There have been no DSP issues since there are no scene changes, other than to selectively mute the delay, monitor or chapel speakers and the feed to the lower level church school when not required.

"I was particularly pleased with the millwork and carpentry that was done by LMP. We had to retrofit everything into their existing control console which required some new millwork; LMP got the stain matched exactly – you can't tell the old from the new."

The new control system is very unobtrusive and ergonomic compared with the old console which had far too many things to adjust. Since they were not dealing with professional or experienced operators it was made as simple as possible to operate. There is a custom panel with eight volume controls for the input levels and the Biamp remote panel controls the outputs with master volume and mutes.

The settings are configured so that the gain change works within a pre-determined range so that nothing can go too loud or be turned too far down. It is also set to easily default to the original standard setting just in case someone gets a little lost or confused.

"We had a mandate to use as much of their existing equipment as possible. We weren't able to use much of the older hardware other than an amplifier for the 70 Volt program feed to the church school, but we were able to re-use some of the wiring infrastructure, this is a beautiful room, so it was nice that we could avoid drilling holes and running wires as well as save on some time and material costs."

They also used the existing Sennheiser infrared hearing assist system and associated mounts and wiring. The client had thought there was a problem with it for the longest time because it was never very clear and they found they were suffering from "listener fatigue", but now with a good clear input signal and the intelligent mix capability it's working very well.

Left and below: Renkus-Heinz Iconyx speakers provide a tight, vertical pattern to reach all the pews.

There are two AKG HM1000/CK31 mics centre hung in a stereo pattern for acoustic pickup that are combined through an ART 416 mixer with a bus feed from the Lectrosonic for recording to a TASCAM CC222 MKII machine and feeding the I/R system and program sound.

The (Almost) Final Result:

What started out as a seemingly simple requirement for a new sound system developed into an ever-expanding project. It is very difficult to resolve the client's desire for a fixed price and the natural requirement to try different options. CCDP is a very popular and busy church; Dave Clark characterizes the church's program as approaching the requirements of a small Broadway show. The congregation had a strong appreciation for acoustical quality and clarity and natural sound. As they came to understand their extended needs and became comfortable with the process of auditioning different solutions and the results of various adjustments some additional options have been introduced, with others being explored.

Getting the Iconyx into position was no simple task, requiring special scaffolding that could straddle the pews with no lower cross bracing, so a winch system was added to the Iconyx rigging to facilitate future servicing.

They are adding an antenna and power distribution system to the wireless, not because the reception was a problem, but to clean up the control area. The distro will eliminate the wall wart power supplies and allow them to use two antennas instead of eight. This in turn will allow them to lock the receivers away so there is no chance of accidental re-programming or setting changes.

Because it is so high up – almost 50 feet away from the mid seating area, the Iconyx required a fairly "radical" EQ boost of a 12dB per octave shelf above 2 KHz to compensate for high frequency loss over distance. This was accomplished with the on-board 5-band parametric EQ. Micro milliseconds of delay between component speakers are used to steer any lobes out of the coverage area. The result is smooth coverage and response over the entire seating area except for the back corners where the delays fill in, and a small dip in level in the centre seats where the two columns overlap. This is only noticeable when you walk through the pattern, which is virtually never the case since you only sit in one seat at a time. The other area is the first three rows of pews. In fact the sound there is fine since you are close to the acoustic source, but there is a delayed signal from the column high up above that is heard as an echo since the direct sound is closer than the amplified sound. It is not disturbing, but they are contemplating putting in some small front- or side-fill speakers to balance things out perfectly – they just have to determine where they'll fit.

Everything is working very well, and the church is very pleased with the results. Now it seems the only impediment to clear and intelligible speech is when the readers get nervous and speak too fast, so the church is offering some workshops to coach the lay readers on their presentation. At Christ Church Deer Park they're always busy with one thing or another. ●

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