



New cinema from old

by
**Wavetrain
Cinemas**

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This custom home cinema from Wavetrain Cinemas replaced a previous home cinema in the same space. You might think that would simplify things considerably, compared with converting a basement room or starting from scratch with a concrete shell. But as Wavetrain's David Moseley explains, that would depend on the quality of the original cinema design.

"The cinema as it was had significant issues to overcome," he tells *Sound+Image*. "The client's inspiration for the new design was a previous 'Art Nouveau' cinema we had created — but that had been a room with 3.2-metre ceilings. Here the ceiling height to the cinema was 2.4 metres and below that there were existing concrete

Out with the old, in with this new reference-level home cinema wrapped in glorious Art Nouveau trimmings.

beams and a 70mm drop in the slab at the screen end of the room. That previous cinema design would never work with these room proportions."

The ceiling was not the only issue requiring careful forethought. There was no air-conditioning to the room, only an exhaust fan ducted to the outside which was, says David Moseley, "incredibly noisy". In addition to better air-con, there was a need to deliver a high level of sound isolation. As for the system itself, the client wanted a "reference" AV system, with seating for eight people and a good-sized screen for the viewing distance. And there was one more thing...

"The project was located two-and-a-half hours from our main office," explains David Moseley. "This required us to be very organised, and rather than lose all that time commuting we actually hired a house nearby, where staff and various trades could stay as required. The clients were happy with us working unusual hours, so we were working much later than normal to maximise our time on site."

Room design

But before the construction period came the conceptual and interior design.

"We are a complete turnkey cinema company," notes David. "So we produce all of the architectural drawings for the project, the mechanical and acoustic engineering, and also the interior design. While the ceiling issues prevented us duplicating the cinema which the client had taken as a reference, we were able to go in a slightly different direction and used the Art Deco/Art Nouveau set designs from 'Superman Returns' as an inspiration, then overlaid that with opulent materials such as the aged bronze metal finishes, velvet curtains and art-silk carpet. It really lifted the room."

Meanwhile there were those fundamentals to be addressed.

"Normally we would have a rear seating platform of 350mm to deliver the sightlines required to see the screen," says David. "But here we had the low ceiling height, a 70mm dropdown over the screen, and we needed to

create a bulkhead at the front, for the Atmos speakers and to hide the curtain track and lighting. So the screen in this cinema is lower than usual, with the screen image 540mm off the floor. We also needed to create a bulkhead at the rear, for the Atmos speakers and the ducted air-con system. To get sufficient room height as you step up, the seating platform could go no higher than 225mm, and that was a potential problem for sightlines."

The solution was for Wavetrain to custom-build special daybeds, matching the rest of the seating while allowing the front row to lie down. The sightlines to the screen were then clear from the rear row.

Another major issue was a curved staircase that entered the room. Rather miraculously, there's no sign of this in the final cinema.

"If we created the platform with the staircase inside the room, it would have been illegal anyway," notes David Moseley. "We did however need to create space for the AC to enter the room, and also needed space for the bar the client wanted. All of this required that we build out the cinema on one side of the room sufficiently to make it all work and still keep space for eight cinema seats. The ceiling bulkhead covers most of the concrete staircase protrusion, so that only a small part of the concrete is visible and we disguised this to look like part of the ceiling pattern."

Isolation and air

Sound isolation was a priority for the client, who wanted to use the cinema without affecting the lifestyle of the rest of the home.

"Luckily the room was literally a concrete shell," notes David, "so we at least had mass on our side for dealing with airborne sound. Structural transmission was going to be the main issue."

Without the room height to allow for a floating floor or isolated ceiling to be used, some innovative thinking was required. The floor-mounted front subwoofers were installed on their own little floating platform, while the walls were built with a cavity and double-layer construction, including Green Glue noise-proofing compound to further attenuate sound getting into the structure.

"With the front speakers and subwoofers resilient-mounted, and the furring channel system we designed for the walls, it means that the bulk of the energy in the room simply can't transmit to the structure. Then we've provided a quiet air-conditioning system that introduced fresh air without compromising this sound isolation. We manufacture a range of AC products specifically for cinemas that are built into the structure to attenuate sound escaping the room, and slow air velocity to eliminate air turbulence, and ensure that the system can never rattle. We also manufactured the custom sound isolation door to the cinema. The entry to the cinema already had a door to the staircase and we designed this area to act as an air-lock."

With the platform height too low for normal ducting, Wavetrain "treated the cinema like a yacht", and formed the ducting within the timber structure itself. The ducts were then lined and covered with the flooring.



“We didn’t have the space for an AC fan coil inside the cinema,” says David, “but we were able to take what was a work-bench area in the garage behind the cinema and then custom-design joinery to accommodate the fan coil, equipment rack and projector hushbox. Given we couldn’t take fresh air from a garage that could have carbon monoxide in the air, we reversed the existing exhaust fan and added on to the ducting, taking a fresh air intake from a shaded area under the eaves into the front of the cinema and on to the rear.”

The audio system

With the client after a cinema that could match commercial cinema performance, Wavetrain proceeded from its usual starting point of placing seats into positions where they share common issues, then positioning the speakers and subwoofers to eliminate the worst problems in the room, while using an acoustic treatment system designed to improve imaging and tighten voices. Bass traps were built into the seating platform and the front corners of the cinema.

“If that’s all done correctly, the final tuning of the system mainly comprises cutting some bass power in the room,” says David Moseley. “Tuning a cinema is the last step, a fine tuning of the system — it shouldn’t be a fix for all the unresolved problems in a room. Good rooms

and correctly engineered systems produce great results.”

The goal was for the system to be able to play at a continuous 105dB, giving 3dB of headroom so that even at reference level, the system is never strained. Wavetrain specified Elementi Audio’s digital active speakers for the front LCRs, a new brand (see opposite) which positions dedicated amplifier modules close to the speakers, both eliminating long runs of speaker cable and keeping the main equipment rack significantly less populated with heat-producing electronics. Meanwhile the crossover duties are executed in the digital domain, each loudspeaker driver then given its own dedicated channel of amplification.

“Using a digital active system ensures that when the bass drivers are being pushed hard, that strain does not show up in the tweeters,” says David. “The result is effortless power that is incredibly detailed.”

The Elementi speakers used for the front LCR here are the Sirocco model from the ‘Air’ range, with pleated diaphragm tweeters rather than the compression drivers of the Fire range.

“Sirocco is a very unusual speaker in that the waveguide changes based on the speaker use,” says David Moseley. “The left and right speakers toe the sound in 10 degrees to deliver more energy to the seating area and reduce boundary reflections. The centre channel is

uniform in its dispersion pattern. This means that the Siroccos don’t need to be physically toed in, while with a 100-degree horizontal dispersion, the coverage across the seats is exceptional.”

The surround speakers were positioned with the tweeters on the top, placing them above ear height. Meanwhile the balanced signals to the 17 speakers and subwoofers in the system are supplied from a 16-channel Acurus Muse processor.

“With the room being long we needed to create a wider image down the side walls, a better link between front and rears,” says David. “We did this by adding in an extra set of side surrounds connected to the same signal and then levelled and time aligned separately to ensure they were acting in unison. We didn’t have the budget for a processor with a higher channel count.”

Indeed the budget had been significantly reduced by the client after the design stage was completed.

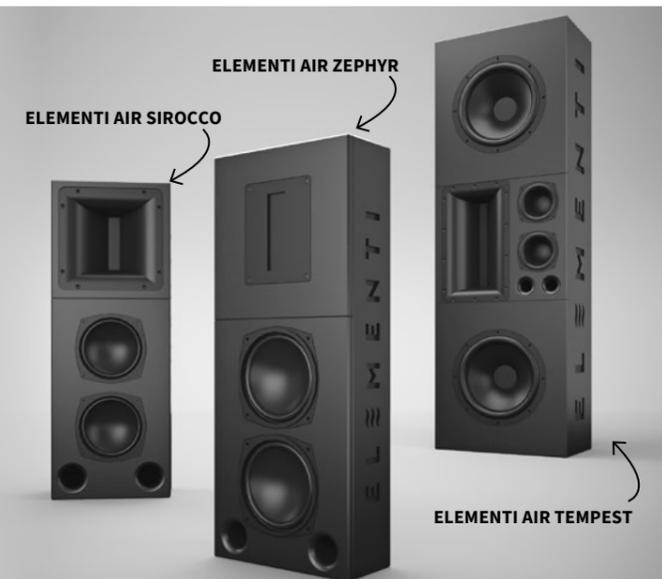
“We managed that by eliminating the bar, having the chairs built here in Australia, and respecifying some of the materials chosen”, he says. “We installed the cinema in such a way that the bar can slip in at a later date. We also went from using Elementi all round the cinema to a simpler design using some Triad speakers and the Muse processor.”

ELEMENTI AIR

The digital active speakers used in this system are from Elementi Audio’s Air range, similar in size to the Fire models which featured in the Wavetrain installation featured last issue, but instead of the compression drivers they incorporate a pleated diaphragm ‘tweeter’ along the lines of Oskar Hail’s air motion transformer. These pleated diaphragm tweeters in Elementi’s Air speakers provide high sensitivity, a low crossover frequency and high power handling, while the sound in the horizontal plane is the opposite of a compression driver, extremely even through all frequencies, yet still capable of delivering big cinema sound. It’s an interesting alternative to the more traditional cinematic sound of the Elementi Fire range. “Compression drivers tend to be the default for high SPL and dynamics,” says Elementi. “But just because things have always been done a certain way doesn’t mean they should *always* be done that way!”

One of the reasons the Elementi brand was chosen for this project — apart from the power and sound quality generally — is the brand’s concept for how a cinema should be wired. The Elementi amps are relatively shallow and modular units, designed to mount vertically against the cinema walls, hidden behind fabric or in joinery. Speaker cable signals suffer badly beyond three or four metres, but with this arrangement the audio signals can run over balanced analogue audio cables, and Elementi also plans to offer a digital option using Dante’s audio-over-IP system, digital right through the Elementi amps’ floating 32-point DSP processing, digital crossovers and FIR filters (with correction in both the frequency and time domains) to the DACs.

“Certainly for the front speakers here this is a significant gain in sound quality,” says David Moseley. “Meanwhile the rack has



a lot less cabling going to it, which simplifies installation, and a lot of the heat removed too. The next phase of this project is to redesign the butler’s pantry into a bar which will open to an outside entertaining area, and the rack will then go into a narrow cupboard. Getting rid of heat from the rack now will make a big difference later.”

Another advantage of active speaker designs also applies, with the amplification perfectly matched to the specific speakers and vice versa. More info: elementiaudio.com



Four subwoofers are used, acting as a single LFE channel and positioned at the quarter points across the width of the room, “all time-aligned and levelled to the middle of the room, then phase/level adjusted testing back at the seating positions for any gains in SPL and frequency response,” says David. Two of the subwoofers are Elementi’s 12-inch Basalt model (pictured), unusual in being a sealed-enclosure design, while all other Elementi subwoofers are ported.

“If you are chasing big SPL at low frequencies then ported designs have big advantages,” notes David Moseley, “though heat soak and the potential of resulting power compression can affect the ability to sustain that output. All Elementi subwoofers use neodymium drivers for that reason. However big subwoofers move a lot of air — fine if you’re not sitting near the subwoofer, but not so good for near-field positions. The sealed Basalt avoids that issue.”



The Elementi Basalt subwoofer still has a 12-inch driver, neodymium-backed for efficiency and power handling, and it described as being suitable as a primary subwoofer in smaller cinema rooms, or as an in-fill subwoofer to balance room standing waves or for bass steering, especially in room designs where a shallow subwoofer depth is helpful.

Video system

A BenQ X12000 projector with 2400 lumens light output is fitted with a Panamorph anamorphic lens to increase screen brightness, all mounted in a hush box and paired with a 158-inch 1.2x gain Severtson Cinema White microperforated screen.

“The BenQ provides a native DCI-P3 colour gamut, and has an RGB LED light source,” says David Moseley. “The increased colour saturation of an RGB LED light source is such that the brain is tricked into perceiving the brightness as being 25% higher. It also implements LED dynamic dimming, which further enhances its

on/off contrast.” Anamorphic changes and HDR conversion are made via a Lumagen Radiance Pro video processor, which can remap the video to any configuration, including the option to use Lumagen’s NLS (Non-Linear Stretch) to project a 16:9 image in the 2.35:1 frame without cropping.

Sources for the home cinema include a Panasonic UHD Blu-ray player and AppleTV 4K, with control of the system via RTI software running on an iPad Mini docked in an iPort case, with a wall-mount.

Looking forward

In addition to the plan for the bar to be added later, the client had become convinced of the merits of D-BOX, the system that moves your seat in time with the movie using carefully-designed cues created by the Canadian-based D-BOX team. So D-BOX-ready seating was installed on the entire rear row, with those potential future vibrations already ameliorated by additional damping installed through the seating platform using two layers of structural plywood and more Green Glue.

Meanwhile the home’s family now enjoys their stylish and powerful new movie palace.

“I am really glad that I found Wavetrain to design and build my home cinema: they are easy to deal with, and responsive,” the client tells *Sound+Image*. “Our Wavetrain cinema brings our family a totally different experience now when watching our favourite content.” —

EQUIPMENT & CONTACTS

EQUIPMENT

- Elementi** Air Sirocco speakers x 3 (LCR)
- Elementi** Tungsten amplifiers x 3 (LCR)
- Elementi** Basalt 12-inch subwoofers x 2
- Elementi** Tungsten dual-channel amplifier
- Theory Audio** SB-25 speakers x 6
- Theory Audio** SUB15 subwoofers x 2
- Theory Audio** ALC-1809 9 channel amplifier
- Triad** InCeiling Silver/6 SAT in-ceiling speakers x 4
- Triad** TS-PAMP1-200 2-channel power amplifier
- BenQ** X12000H projector
- Panamorph** Paladin anamorphic lens
- Lumagen** Radiance Pro 4242 video scaler/processor
- Severtson** 158-inch Cinema White Microperf screen
- Acurus** Muse 16-channel pre-amp processor
- Panasonic** DMP-UB820 UHD Blu-ray player
- Apple** TV 4K
- Sanus** equipment rack
- Furman** Elite power conditioning
- RTI** control with iPad support
- iPort** LuxePort Wallstation & Case
- Pakedge** data equipment
- Wavetrain** custom-made seating
- D-BOX**-ready chairs & actuators

PHOTOGRAPHY: Holly Muldrock

DESIGN & INSTALLATION

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