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SOUND & COMMUNICATIONS

AV FOR SYSTEMS INTEGRATORS, CONTRACTORS AND CONSULTANTS

'THE RAPID'S' NEW TECHNOLOGY

AV UPDATES CENTRAL STATION'S PLATFORMS, BOARDROOM.

AV PROVIDES FLEXIBILITY

BOSTON UNIVERSITY TIES ITS EAC EIGHTH, NINTH FLOORS TOGETHER.

KAYYE'S KRYSTAL BALL: 2005 TECHNOLOGY FORECAST

THE NEW TECHNOLOGY OF *THE RAPID*

Looking through the transfer platform toward the center kiosk.

Grand Rapids Central Station applies AV technology to its platforms and boardroom.

BY BRET W. EMERSON, RCDD/NTS, CNE

A new term is being coined in our industry: technology designer or communications engineer. Many of the people who do the consulting and design associated with communications systems are not professional engineers but perform the same functions as their counterparts in the electrical, mechanical and structural disciplines.

A communications engineer uses his or her knowledge and accepted industry practices to provide the best solution to match the owner's communications requirements to today's technical possibilities. These communications systems encompass telephone systems, data networking, access control, video security, control systems, Cat6 cabling, wide-area connectivity, digital signage, master clocks and audio/video systems.

Here is an installation that illustrates how the communications engineer, in this case working for an architecture and engineering firm, can play an important role.

When you think of a new downtown bus transfer station, the first thing that comes to your mind is almost certainly not "technology," but that is exactly what greets riders and visitors to the new Grand Rapids Central Station.

The bus system in Grand Rapids MI, better known as The Rapid, had been utilizing a small downtown surface lot for transferring passengers

Bret Emerson, director of communications engineering for Progressive AE, Grand Rapids MI, has been engineering communications systems for 10 years. Armed with a degree in Communications System Management from Ohio University, Bret's first working day was spent installing fiber cable above a Northern Ohio steel plant's blast furnace. Learning communications systems from the ground up allowed him to begin working with a consulting and integration firm that was at the forefront of the communications engineering movement. Today he works directly with architects and owners to make sure that all aspects of the building technology are included in the design process.

between different bus routes. With the growth in ridership over the past decade, it was apparent that the existing lot would not meet the expanding needs of the bus system. It was time to build a new complex that would consist of an open-air transfer platform and a multi-use building that would serve as the vendor area, ticket booth, waiting area, meeting rooms and eventual office space for the staff of the Interurban Transit Partnership (ITP), which is the governing body of The Rapid. Together with the existing administrative office building next door, these structures would be referred to as the Central Station.

ITP Chooses Design Partner

In choosing its design partner, ITP CEO Peter Varga noted, "We knew that we had the opportunity to build a facility that would serve Grand Rapids into the next century. We also knew that we needed a partner that could help us achieve that goal, and we chose Progressive AE as the design architect and engineer."

Progressive AE has been working in Grand Rapids for more than 40 years and has a reputation as an innovator in design. By combining architectural, electrical, mechanical, civil and structural disciplines under one roof, Progressive provides each client with a complete range of services. Progressive had recently taken the larger step of adding Communications Engineering to its list of services. With the explosion of technology in buildings and the changes to the CSI specification format, Progressive knew that the only way to keep providing the breadth of services that its clients had come to expect was to integrate this specialty into the engineering side of the company.

Design Process, New Buildings

At the beginning of the design process, the main focus is on the buildings and how they will look and function: where they will be located on the site, what they will be made of and how can they best be designed to serve the riders, employees and the general public. Through site surveys and meetings with the owner, riders and general public, the architects at Progressive designed complementary structures that would prove to be a beacon for downtown Grand Rapids.

The concept designed the transfer platform to be an open-air steel structure measuring 560 feet by 100 feet, completely covered by a long-life, translucent tensioned fabric membrane canopy. It would accommodate 17 buses parked around its perimeter and serve as the main transfer point for all city buses. In addition, the Central Station building would be a multi-floor, multi-use facility that would serve the needs of riders of the city buses while also containing the downtown Greyhound station.

Aerial view of the Central Station, which shows the Central Station multi-use building, Central Station transfer platform and the administration building.

The core of the building would be a large open space that would contain a waiting area, a vendor space, a ticket booth for local bus passes, and a separate Greyhound waiting area and ticket area. The upper floors would contain future office space, restrooms and a large community room that would be used as a meeting room for the ITP board as well as rental space for groups for their meetings or gatherings.

Design Process

The new transfer platform and multi-use building were to be built across the street from the existing administration building. The three-story administration building holds all the offices for the staff of The Rapid except the maintenance workers, who are housed three blocks away at the maintenance building. The administration and maintenance buildings are tied together via a redundant fiberoptic ring with separate building entrances for each leg of the fiber.

Most of the existing communications services such as the telephone system, data network and video system are fed out of the administration building and routed via the fiber to the maintenance building. By constructing the new transfer platform and multi-use building next door to the administration building, the existing services can be extended to serve the new buildings without the expense of starting from scratch.

As the owner and architects began to discuss these usage and building issues, communications and technology kept coming up. "We had numerous meetings where we went through the platform and the multi-use building and spaces and discussed their usage. One of the things we realized was that technology was required throughout the building and on the platform," noted Jim Vander Molen, Progressive

(Left) View of the transfer platform from the community room inside the multi-use/ Surface Transportation Center, with a closer view of the Transfer Platform.

AE project architect. "That was when we knew it was time to bring our communications engineers into the process."

The initial meeting with the communications engineer was an eye-opener for the client. During discussions with the engineer, they realized what a large part technology could play in the Central Station and how they could enhance each space by including the technology design alongside the architectural and electrical design.

"We wanted a first-class project and we knew that the technology wasn't something we could leave to vendors or the integrator to plan and design," Varga said. After that initial meeting, the technology design was a discussion topic in each planning meeting. The design would grow to include a telephone system, data networking, LED signage, security systems and audio/video systems.

As the meetings progressed, it became apparent that many of the technology approaches for the platform and the multi-use building were behind-the-scenes systems that just had to work; this included the telephones, data network, security and building cabling. Although extending these systems from the administration building to the new structures was important, the public would be most aware of the audio and video. These had to work and fit into the architecture of the buildings.

Progressive's communications engineers worked alongside the electrical engineers to design the underground conduits, manholes and above-ground

Equipment

Bus Transfer Platform Background Music, Paging Announcements

1 Biamp AudiaSOLO 8x8
1 Biamp Audia Volume 8 selectable volume control
2 Crown CTs 2000 power amps
1 Denon DN-H800 AM/FM 5-disc player
1 Denon RC-H800 IR remote control
22 Electro-Voice Evid 6.2tw 2-way speakers
4 Electro-Voice WP-300 ambient mics
1 Middle Atlantic custom panel
1 Neutrik NC3MX connector for talk mic
1 ProCo WP-1004 wall plate
1 Shure 550 L desk mic
West Penn wire

Community/Boardroom

1 AKG SA41/1 mic holder
1 Audio-Technica ES945W
1 Biamp AudiaFLEX CM audio mixer/processor
9 Biamp IP2 input cards
3 Biamp OP2 output cards
1 Comprehensive RGB to BNC breakout
1 Crestron CNSP-XX serial interface cable
4 Crestron CNXIRP IR interface
1 Crestron MP2E AV switcher/control system
1 Crestron STRFGWX 2-way gateway
1 Crestron STX-1700C wireless touchpanel
3 Crown CTS 600 2-channel 70V amps
1 Denon DN-H-800 tuner
1 Denon DVD-900P DVD player
10 Electro-Voice Evid C4.2 ceiling speakers Type 3
1 ETA PD11SS power sequencer
Extron break-out cable
1 Extron 60-373-03 RGB 460xi (white)
1 Great Lakes GL840E-2932L equipment cabinet
1 ProCo WP-1004 mic input plate #8
5 ProCo plates
1 Radio Shack FM antenna
1 Sanyo PLC-XT16 3000 lumen projector w/custom lens
9 Shure MX418D/C lectern mics
1 Shure UA500 half wave antenna kit
1 Shure UA845-UB antenna distribution
2 Shure UC14/83 lapel mic systems UB
1 Shure UC25/58 handheld mic system UB
1 Sony SLVN700 VCR
1 SVS Mini 4-3 projector lift
1 TASCAM MD-350mkII mini disc player
West Penn wire, coax cable

Common Areas (Atrium, Hallways,Offices)

35 Atlas Sound 81-8R ceiling bridges
5 Atlas Sound AT10 volume controls
35 Atlas Sound CS95-8 backboxes
2 Atlas Sound GA 15T paging horns
35 Atlas Sound SD-72W ceiling speakers
1 Crown CTS 4200 4-channel 70V amp
7 Electro-Voice EVID C8.2HC ceiling speakers (Type 2)
West Penn mic cable

List is edited from information supplied by Progressive AE.

(Top) The communications rack inside the multi-use building incorporates the volume control and AM/FM tuner and CD player connected to the platform and whole building paging system. (Above) This audio-video cabinet is in the side room of the community room.

Progressive AE

Progressive AE is a 125-member architecture and engineering firm located in Grand Rapids M. Progressive has provided its clients with electrical, mechanical, structural and civil engineering for 40 years. Almost four years ago, Progressive added communications engineering to its list of services.

Management realized that, if they wanted to maintain the company's strength in the AE field, it needed to include communications engineering as part of its list of services. With the abundance of technology in each building and the changes coming to the CSI MasterFormat specifications, the inclusion of these systems into the design process was the only logical conclusion. Clients now appreciate and understand the need to plan these systems and include the planning into the overall building design process.

poles that would allow connectivity between all the buildings of the Central Station and the maintenance building. The electrical and communications engineers got together on a daily basis and discussed changes and possibilities in the underground and above-ground infrastructure. This might not have been possible if an integrator was completing the communications systems or the electrical and communications engineer worked for separate companies.

Technology Decisions

As the design team continued to meet and the discussions about technology progressed, the extension of the existing communications systems was completely detailed. The telephone system would be reused and extended to the new buildings from the administration building via a new copper cable.

One leg of the fiberoptic ring would be relocated to connect the maintenance building directly to the multi-use building. A new fiber would be routed between the multi-use building and the administration building to complete the ring. This cable would then facilitate the extension of the data network into the new buildings as well as be a path for connectivity of the new access control and video security system that would be located in the security office of the multi-use building.

These systems were important, but would be used mostly by staff and would not directly affect the general public. The systems that the public would see, those that would be an extension of the state-of-the-art Central Station, were the audio and video systems. Vander Molen said, "The client knew that the telephone system, data network and security system would serve their employees. They wanted the audio and video systems to stand out and *wow* the riders and general public."

Technology and Architecture Integration

In today's technology world, the systems that help us communicate have

Central Interconnect Inc.

Central Interconnect Inc. is a 35-employee integration firm that has been providing audio, video and telecom solutions for more than 20 years. Based in Grand Rapids MI, the firm provides systems to clients throughout the US. Central Interconnect specializes in the integration of high-end and architecturally unique AV systems. With a long history of success in the AV market, the company provides advanced systems that meet and exceed engineers' requirements. Where many integrators have a product they want to sell, Central Interconnect provides clients with a solution. By creating relationships with the architects and engineers on the project, they are able to provide a high level of service during the installation and beyond.

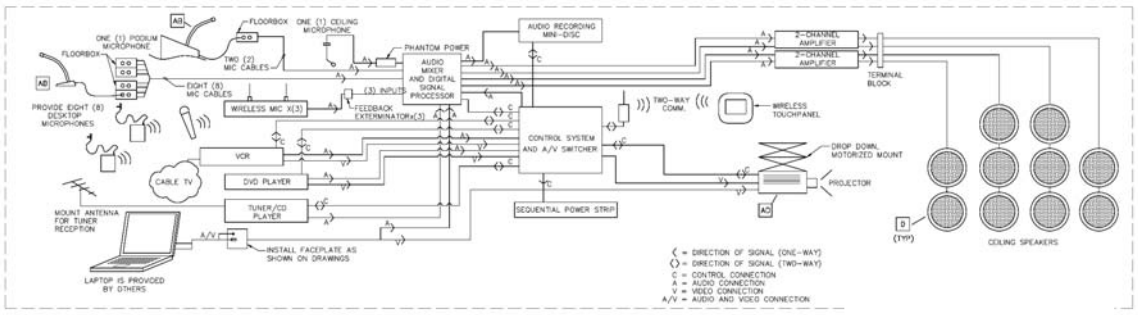
not only converged themselves but have converged with the building. This simple truth provides the opportunity to integrate the technology design alongside the architectural, structural and electrical systems.

The design meetings for the Central Station progressed from schematic design through final design, integrating all the technology and systems into the actual structure. Each technology system was detailed on the project drawings and in the CSI-based specifications that were released for bid, providing a complete building package that left nothing to be "field verified." This total package provided the customer with the knowledge that field changes would be kept to a minimum and that their technology systems would be as much a part of the structure as the walls themselves.

The communications package was released for bid and, after price comparison and integrator interviews, a communications integrator was chosen: Central Interconnect of Grand Rapids, an integrator with more than 20 years of experience installing systems throughout west Michigan. "Our firm appreciates bidding on projects that are fully laid out and designed such as the Central Station AV project," said Arlen Smith, Central Interconnect president. "With a clear delineation of the systems and equipment required, we can compete on a level playing field with other firms that may not normally propose the same quality level of equipment that we want to install."

Platform and Building Audio

The platform is the public face of the Central Station. This structure serves up to 17 buses loading and unloading passengers every 30 minutes, with people scrambling to get to their connecting bus and other people waiting on the platform for their spe-



Schematic of the audio and video connectivity in the community room.

cific bus to arrive. During the school year, the Grand Rapids Public Schools use The Rapid bus system as the primary transportation for their students. Each morning and afternoon the transfer platform is full of students traveling to school or back home.

Getting audio onto the platform was not just a good idea, but a requirement. With the sometimes rapid change in bus schedules and the number of people and students who might be on the platform at once, the audio system on the platform was designed to serve two purposes: announcements and background music. Because the platform was so tightly tied to the public waiting space in the multi-use building, it was decided that the audio system should cover not only the platform but also the public spaces inside the building.

Providing full-coverage audio on the platform presented a couple of issues: It is an outdoor venue with few places to install speakers so they fit into the structure, and there would be a potentially large disparity in the ambient noise level between the times there were no parked buses and when all the bus slips were full.

The engineers came up with a distributed system of speakers mounted

on alternating columns. Each column has four speakers, distributing audio to the center of the structure as well as out toward the buses. Due to the length of the platform, the speakers are connected in four distinct zones. Because the structure required a certain level of design precision, the architects wanted the speakers to "flow" with the columns and they wanted the speaker cables hidden wherever possible.

Environmentally Controlled Cabinet

The solution was to locate the audio amplifiers and other audio equipment in an environmentally controlled cabinet in the central mechanical kiosk on the platform. From this point, the cables would be routed underground through a series of manholes and underground conduits to eventually route up the structural columns and out to the speakers. This took coordination with the civil, structural and electrical engineers to get the raceways integrated with their work.

Once the cables were in the columns, they had to be attached to speakers that would be able to handle the weather and meet the architect's requirements to match the structure. The solution was to install Electro-Voice Evid 6.2TW speakers, which matched the color of the columns, are weather-resistant and have a shape fitting in with the structure of the platform.

To take care of the issue related to different ambient-noise levels, four plate microphones were installed and tied back to the mixer/processor of the audio system that serves the platform and the public spaces of the building. The processor, a Biamp Systems AudiaSOLO, takes inputs from a desktop microphone, a telephone line from the existing telephone switch, and a combination AM/FM tuner and five-disc CD player. The output of the system is routed through Crown amplifiers and then routed to the speakers on the platform.

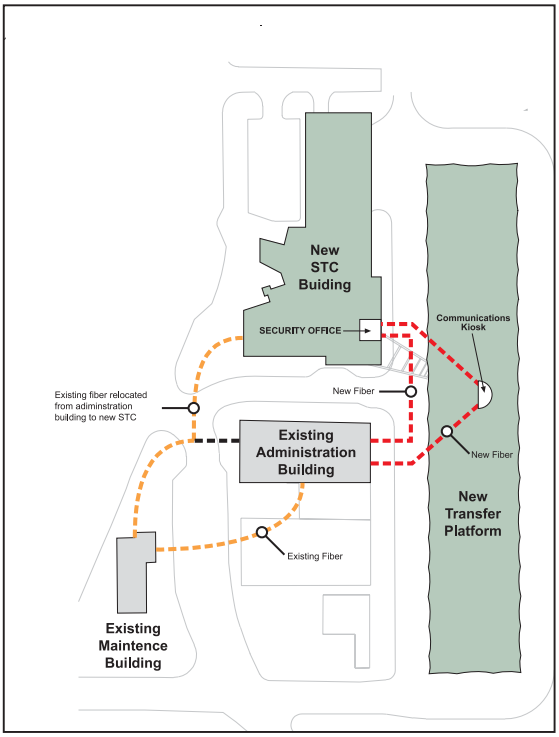
When buses are parked and idling at the platform, or when it is full of students waiting to transfer buses, the volume is raised automatically to provide headroom above the ambient noise.

The processor provides an easy way to segment the audio on the platform from the audio in the public spaces of the multi-use building. The owner wanted the opportunity to make announcements just to the platform, just inside the building or both. With the processor's software configurations, any of these objectives can be reached.

The owner also wanted the ability to play background music on the platform and not inside the building, the idea being that playing mellow music may help keep the crowds on the platform equally mellow.

The mixer sits in the kiosk of the transfer platform and then one of the outputs is extended to more Crown amplifiers inside the building. These amplifiers provide power for ceiling speakers installed throughout the building. The speakers chosen for the high-ceiling waiting area of the multi-use building are Electro-Voice Evid C8.2HC high-ceiling speakers, which were mounted in the drop ceiling located 28 feet above the large waiting area.

Elsewhere throughout the building, the ceiling was a more normal 12 feet above the floor; in those locations, standard round ceiling speakers were installed with backboxes and tile bridges.



Site Plan for the Rapid Central Station.

It's All Signals

Whether you say technology, low-voltage systems or communications networks, it all leads back to the transmission of signals from one location to another. How we manage these signals and route them from point to point is the essence of what a communications engineer/technology designer does.

Many clients realize the value of technology in their buildings but historically have relied on integrators to tell them what they need and then to install it. This relationship has not been true for electrical, mechanical or structural services. Most companies realize the value in having a professional assist in the design and implementation of their plans. This is slowly but surely becoming a reality in the technology arena. More designers/consultants are becoming certified by industry stalwarts such as ICIA, NSCA and BICSI. As these communications engineers achieve success in their designs, customers will more often realize their value in the entire building process and include their work in the design process.

Because the paging system eventually would serve Greyhound as well as The Rapid, exterior paging horns were installed under the overhang where the Greyhound buses load and unload.

All the speakers and systems allow the people on the platform and in the waiting area of the building to listen to background music and hear announcements from the staff in the case of an emergency or change in bus routes. The processor allows music or announcements to be directed to the platform, the building or both. This engineered system provides the flexibility required of a dynamic public transportation center such as the Central Station.

Community Room Audio, Video

The new building at the Central Station was designed to provide space for any number of different groups. This includes riders waiting for their bus, Greyhound patrons, food vendors, ticket booth personnel, eventual office space for ITP staff and the general public. ITP wanted the building to have a community room that could be used for staff training, driver meetings, ITP board meetings and by various groups from around the area. The room had to be large, richly appointed and the technology had to match.

The external speakers on the transfer platform are mounted on the column.

What the architects came up with was a room that measures 45 feet wide by 60 feet long and includes special lighting, a multi-level metal drop ceiling and wood-grain walls The owner not only wanted this room to be richly appointed in the way of finishes, but wanted it to be set up technologically to provide audio and video presentation opportunities to every group that used it.

With that in mind, the engineer began designing the systems to provide multiple presentation options to any group while still being easy to use. A couple of issues that came up immediately were the floor-to-ceiling window that overlooks the transfer plat-

The community room is set up here for a board meeting that uses the desktop microphones and drop-down projector.

form and the ability to hide the video projector when not in use.

The window would serve as the backdrop for both the presenter and the video screen. With that much backlight, the video image would appear washed out. Because the interior designer and architects worked alongside the communications engineer, this issue was identified during design, not during construction. It was solved by installing motorized drapes that roll down from the soffit above. This allowed the installation of a high contrast, 3000 lumen Sanyo PLC-XT16 LCD projector that provides a clear and distinct image even during sunny days. An issue that might have gone unnoticed until construction and cost extra time and money was easily integrated into the drawing package.

The higher portion of the bi-level ceiling was in the center of the room; to project a full image onto the screen, which was mounted in the lower level of the ceiling, the projector required at least two feet below the ceiling level and had to be hidden completely in the ceiling when not in use. The engineered solution was to install an SVS projector lift and attach a pad from the drop ceiling to the bottom of the lift. "We wanted to make the community room a showplace and luckily we could fully plan all the technology so it would enhance the look of the room." said Vander Molen.

With those two solutions in place, the rest of the system was designed, installed and configured to provide ultimate flexibility for any group while also providing an intuitive Crestron touchpanel interface that could be picked up and used without the ITP staff being there to turn on and configure the system.

The room primarily serves as the meeting room for the ITP governing board. To meet board members' needs, multiple microphones and connections throughout the space were required. The board requires eight microphones on the table at the front of the room, a handheld wireless microphone, two wireless lapel microphones, a lectern microphone for a presenter and a ceiling microphone designed to pick up audio from the audience.

Large Room

Because the room is so large, the board microphones have to be fed from floorboxes rather than the wall. The XLR connections are mounted in ProCo faceplates inserted into two boxes at either end of the board tables.

Desktop microphones provide a mute function to allow board members to converse privately without having their words picked up by the microphone. The ceiling microphone allows the audio system in the room to pick up ambient audio such as the voice of people who may be attending the public board meeting. The audio of each meeting is recorded and kept for reference purposes.

Alongside the presenter's microphone is an input for the audio and video from a PC. The distance from the presenter back to the AV cabinet was long enough that the PC video signal had to be amplified. An Extron wallplate with local buffered monitor output and the ability to send the signal to the switcher in the AV cabinet was installed in a double-gang wallplate directly behind the lectern location.

All of the microphone and video inputs route back to the AV cabinet, which is located in a small room directly accessible from the boardroom. The cabinet is hidden behind a door without hardware, providing the illusion that it is a wall. With a firm push on the door, it pops back out to reveal a seven-foot cabinet with a Plexiglas door full of audio and video equipment to serve the community room.

The heart of the audio and video is a Crestron control system and AV switcher. Every aspect of the audio and video in the community room is controlled through the wireless 5.7-inch touchpanel display that has been programmed to allow even the most inexperienced user to make a presentation.

Because the simple control was of paramount importance, Central Interconnect held meetings with the owner to review the programming and the look of the touchpanel control screens. The owner knew that it had to be set up so the users would feel comfortable with it and would not have to call the staff for assistance. To that end, whenever the panel is first touched, the person sees two large buttons: System ON and System OFF.

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THE RAPID

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Pushing "ON" does exactly what it says. The projector is lowered and turned on and all the components in the AV cabinet are turned on through the power sequencer.

The AV cabinet holds all the input, processing, switching and output electronics. The owner wanted options for almost any input to the system. Included in the cabinet are a VCR, DVD player and an AM/FM tuner/CD player. All the audio and video signals from these components route directly into the Crestron switcher. All audio signals then route out to one of the inputs on an AudiaFLEX CM processor, which is a PC-configurable audio mixer/DSP box that allows the integrator to choose the number of inputs and outputs based on the requirements of the project.

The community room required inputs from all the microphones and the audio output of the Crestron mixer. The outputs went to the audio amplifiers and a TASCAM mini-disc recorder, which was installed to match the system already in use in the old board room. After a transition period, ITP will most likely move to recording meetings on digital media for eventual archiving to a hard drive or data CD.

Because the room is set up with a definite presentation location at the front of the room, the ceiling speakers were designed to cover the rest of the potential audience space. Due to the length of the room and the owner's request for an advanced system, it was decided that the speakers would be installed in a series of four rows, each connected to a separate output from the AudiaFLEX. Each of the outputs is routed through one of two, two-channel Crown amplifiers.

By installing the speakers in rows extending back from the front of the room, the integrator was able to introduce delay for the microphone audio. This allows the speaker's actual voice and enhanced voice to reach the listener at the same time. Central Interconnect used the Haas effect to create source orientation and improve intelligibility. Although this delay was required for the presenter, the recorded and program audio did not require delay. Each configuration was a simple programming step.

ITP has been using its boardroom for meetings, and public groups have used it for gatherings and training. The system works as planned while allowing the non-technical user to feel comfortable at the touchpanel controls.

Fully Designed System

By introducing the design process to the technology and audio/video systems, the owner was able to eliminate many of the hassles that come with relying strictly on the integrator for design and installation. The owner was fully able to articulate what was wanted for the systems and the engineer was able to match the components and cabling to the unique architectural qualities of the platform and the community room.

With the expansion of the CSI MasterFormat specifications to include low-voltage systems, the advent of fully engineered systems is upon us. Architects and engineers are beginning to see the value of having a communications engineer working with them from the very beginning of the project. When every aspect of the building is designed, including the audio, video, data and security systems, their project looks better and provides a better overall environment for the client. ■