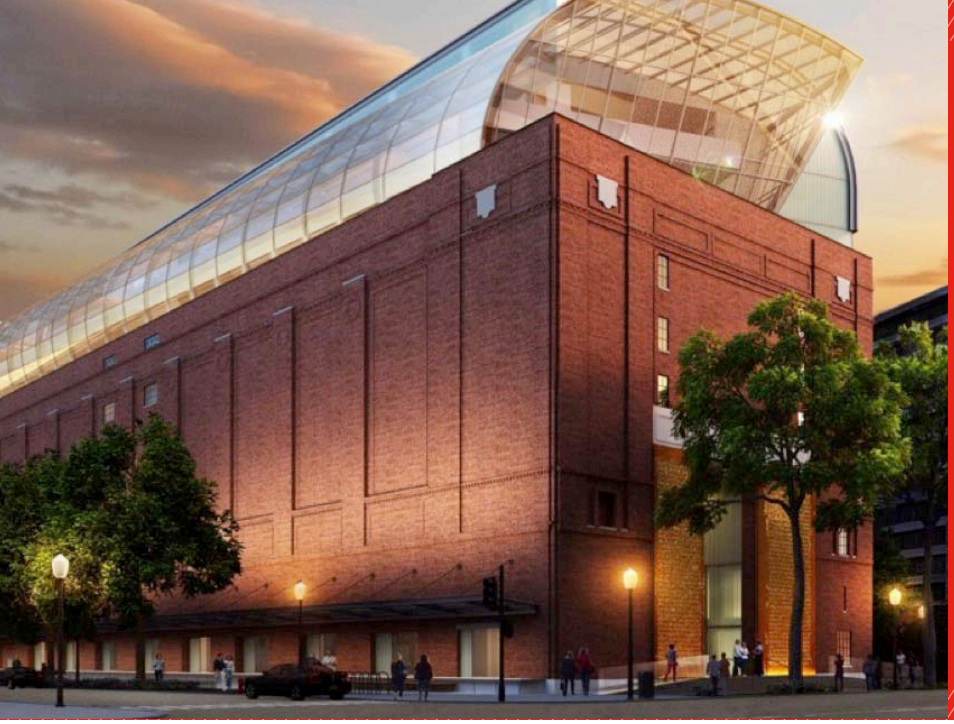


SUPERIOR ESSEX

CASE STUDY

By combining one of the most important books in the world with future-forward communications technology, Museum of the Bible in Washington, D.C., has created a multi-cultural experience of immersive environments, interactive exhibits and rare artifacts. And to keep it all connected, they trusted Superior Essex to deliver numerous high-quality, reliable cabling solutions for voice, data, Power-over-Ethernet (PoE) and complex A/V applications – all working together to captivate generations for decades to come.

museum of the Bible

THE BIBLE MEETS MODERN COMMUNICATIONS

HOW MUSEUM OF THE BIBLE UTILIZED UNIQUE CABLING DESIGNS AND TECHNOLOGIES FROM SUPERIOR ESSEX TO CREATE AN EPIC ATTENDEE EXPERIENCE

FROM DEFUNCT WAREHOUSE TO HIGH-TECH MUSEUM

Located just three blocks from the United States Capitol in the heart of Washington, D.C., and surrounded by the city's numerous downtown attractions, the new 430,000 sq. ft. Museum of the Bible is a miracle onto itself. Five years in the making from initial design work to its grand opening in November 2017, the museum was originally constructed in 1922 as a refrigerated warehouse. But the museum's leadership and partners – including Superior Essex and Legrand – have repurposed the old, eight-story, brick building and transformed it into a technological spectacle that encompasses high-tech displays, theme park-style interactive exhibits, expansive theaters, thousands of artifacts and gorgeous event spaces. And all of these work together to attract visitors – believer and secular alike – from across different countries and cultures to experience the Bible's impact on the modern world.

In total, the museum represents a massive investment of over $500 million and includes such technology as: interactive touch screens; LED video walls; a 360° panoramic theater with seating for 472 visitors, along with other smaller theaters; a simulated "Disney-style" virtual ride through D.C.; unique exhibits displaying hundreds of artifacts; a proprietary, personalized, indoor digital navigation system; a gaming system; a virtual reality experience of 25 sites in the Holy Land; and a rooftop restaurant.

This myriad of applications converging onto a common network required a technological infrastructure that could deliver both data and power throughout this facility to create a truly integrated smart building. To accomplish this, the museum partnered with systems integrator S2N Technology Group, LLC, to review the technology requirements and then design the application of low-voltage cabling for each exhibit, communications cable manufacturer Superior Essex to deliver the fiber and copper cabling solutions and Legrand to supply the cable management and connectivity in the telecom and A/V equipment rooms.

In the Courageous Pages Children's Experience, kids read, hear and experience Bible stories about courage in the face of fear. Fun and interactive games give kids the chance to be strong like Samson, walk on water and more.

museum of the Bible

SUPERIOR ESSEX

DESIGNING A SMART BUILDING FOR "THE GREATEST STORY EVER TOLD"

Smart buildings, supported by an intelligent infrastructure solution, ultimately reduce operational costs, enhance performance and allow for future adaptability. And with the hundreds of different applications and devices, miles of various cable runs and the vast array of digital equipment required to make these complex integrations and sophisticated controls systems possible – as well as run on a single, converged network – creating a smart building of this capacity required a comprehensive plan.

The numerous museum's exhibits, each meant to communicate aspects of biblical history and stories in assorted media such as A/V projections and interactive applications, were created by four different exhibit designers. Furthermore, "All of the exhibits' designs for low-voltage applications, including the ceiling pathways and massive media walls, were not included in the base design of the building," explained Ian Mitchell, RCDD, RTPM, LEED AP, the Senior Project Manager for Systems Integration at S2N. "So, we had to coordinate with the specific application vendors and museum designers to review any constraints and come up with solutions."

A 1611 first edition of the King James Bible is displayed inside a glass case in one of the exhibits.

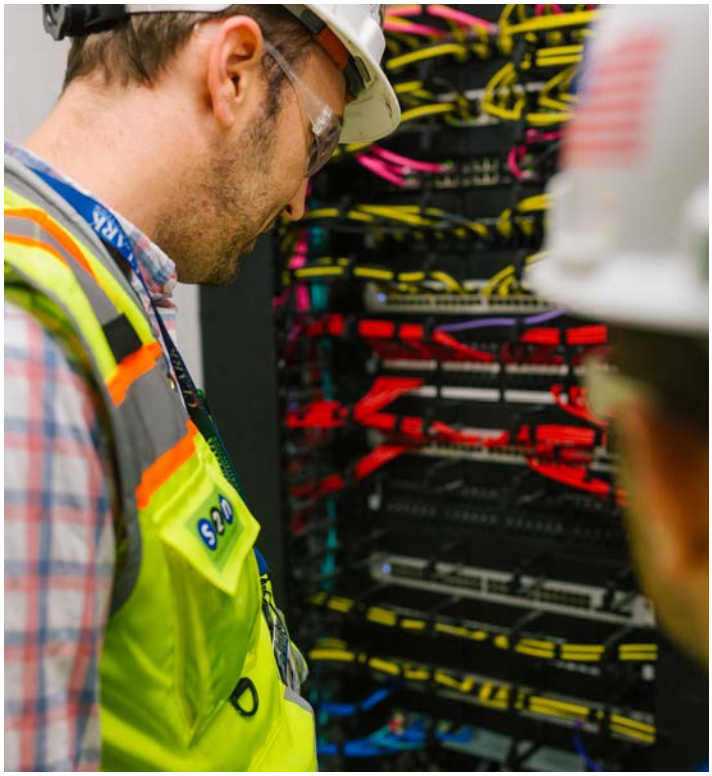
26,000
HOURS INSTALLING LOW-VOLTAGE CABLING

2,200
DEVICES CONNECTED

735,000
FEET OF SUPERIOR ESSEX CABLE

6
TYPES OF SUPERIOR ESSEX FIBER & COPPER CABLES

Part of the Hebrew Bible walkthrough includes this immersive scene of crossing through the Red Sea when the Israelites escaped from the Egyptians in the story of Exodus.



Ian Mitchell, RCDD, RTPM, LEED AP, Senior Project Manager for Systems Integration at S2N Technology Group, inspects the terminated Superior Essex category cable in one of the A/V rooms. The cable is color-coded for the different applications.

In the process, S2N collected all of the design information from each exhibitor and laid out the infrastructure design – which included mapping out the different pathways and choosing the backbone and horizontal cable, telecom room equipment and termination components. They also engaged with Network Products, Inc. (NPI), a manufacturer representative for both Superior Essex and Legrand, to specify and supply the cable necessary to connect these complex, networked A/V systems, including massive displays such as the 140-ft.-long screen of LED panels in the main lobby, an intricate digital mapping system and a complex acoustic enhancement system in the immense, 8,000 sq. ft. World Stage Theater with seating for 472 visitors. "We hosted the technology and network teams from S2N and Museum of the Bible at our showroom in Maryland to give them hands-on demonstrations of the products selected for the jobsite," shared Jon Mengenhauser, Owner of NPI.

Throughout the fast-tracked construction schedule of just under two years, S2N worked with Superior Essex and Legrand to design and equip more than 20 telecom and A/V rooms which housed all of the active equipment and termination components for every application connected by the structured cabling, as well as to each and every separate exhibit. When completed, Net100, Ltd., the selected low-voltage contractor, had spent more than 26,000 hours installing over 735,000 ft. of Superior Essex fiber and copper cables to provide data, voice, power (via Power-over-Ethernet) and A/V to more than 2,200 devices all over the museum.

The two-story, 8,000-square foot World Stage Theater has seating for 472 visitors.

THE CABLE THAT CONNECTS THE MASSES

With highly sophisticated technology spread throughout the museum and unique architectural forms on every floor and in every exhibit, the teams faced numerous, interesting challenges in getting it all connected.

CHALLENGES

Coordinating all of the different pathways for the horizontal cables to reach and serve all the various applications in each of their unique locations

The original building was constructed with brick, making it difficult to design the backbone cabling infrastructure from the telecom and A/V rooms, while also connecting it with the network of the performance hall, and tying it all back to the main demarcation point and server room located in the building's basement.

Many larger-than-life displays inside and outside of the museum required sophisticated pathways and cabling. Providing cables to those displays, especially to those located on the windows and ceilings, was a challenge, as not only was the ground very high, but the displays also sat on a stone floor.

SOLUTIONS

"There were lots of hard ceilings that were dry walled, which made it difficult for planning the cable runs," stated Matt Odell, Director of Technologies for S2N. "So, we creatively located pull boxes connected with 4-inch conduit pipe in those locations, mainly for A/V applications, and carefully planned these before the ceiling was closed," he adds.

On a couple of the exhibit floors, the ceilings were open air, so cable trays or J-hooks were installed. Where applicable, Net100, the installation team, ran horizontal cable through low-profile (2 in.) raised floors.

The selection of the backbone cable had to provide enough bandwidth for today's and tomorrow's communications needs, so Superior Essex provided 12 strands of both OM3 multi-mode and OS2 single-mode optical fiber cable as the backbone between floors and to the telecom and A/V rooms.

The fiber cable was mechanically spliced and terminated within Legrand MightyMo 20 fiber splice cabinets. Additionally, Superior Essex supplied the Category 3 cable required to create a copper backbone for analog phones.

The design for connectivity to the A/V displays went through several iterations, and the biggest challenge was creating the pathways from the telecom and A/V rooms to the individual LED panels. Because most of the ceilings were hard plastered, time was of the essence to run and terminate the cable before the ceilings were closed up.

To solve this, Net100 pulled Superior Essex OM3 6-strand plenum armored optical fiber cable through 4 in. conduits from A/V and IT rooms to accessible fiber boxes. They then terminated two strands of Superior Essex OM3 cable to each LED panel.

RESULTS

"Our infrastructure design reflects a concerted effort between S2N and our vendors," stated Odell, to which Mitchell added, "Working with Superior Essex, our project team was able to turn many cabling challenges into solutions."

"Although we had to be creative with the locations and varying capacities of the telecom and A/V rooms per floor, we set a standard for the copper and fiber cabling and termination products," explains Mitchell. "We wanted to be consistent with the design and the installed cabling products," he added.

As a result, all of these gorgeous displays and devices work seamlessly together since they are being supplied the data and power they require.

CHALLENGES

The building's complex Digital Mapping System provides personalized, indoor navigation that can track users within six inches of their physical location to guide them to their preset programmed schedule. A digital guide (handheld tablet) enables the step-by-step navigation system, but it needed to remain connected to the network at all times to operate properly.

SOLUTIONS

The system uses an ultra-wideband technology to detect the position of every digital guide holder. This is achieved through 600 anchor (location) points that are installed in the ceiling and throughout the exhibit spaces so that users can be in close proximity to each other and still not experience any cross-communication issues. Each anchor requires 900 MHz of data, and Superior Essex supplied the Category 6 cable to provide both PoE and data to every one of these anchors.

RESULTS

The cable provided the bandwidth needed for the anchor points, as well as a robust signal that can transmit through concrete walls.

The museum's 8,000 sq. ft. theater is an A/V wonder, and achieving this requires 17 floor-to-ceiling, high-output, 4K projectors that seamlessly weave together the digital 3D images and an acoustic enhancement sound system programmed to suit the nature of the event. And these devices all need to be interconnected to work flawlessly together.

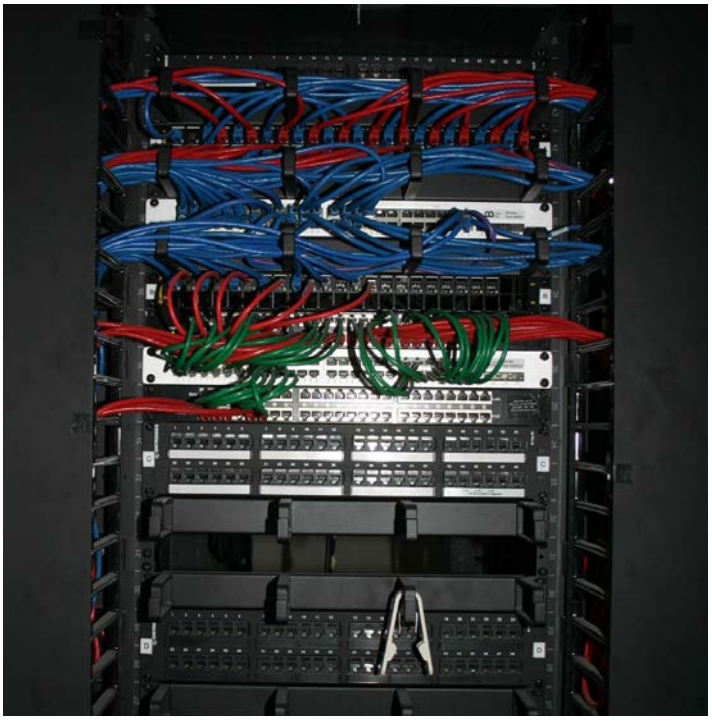
The cable pathways in the theater are a combination of free air and conduit from two dedicated telecom and A/V rooms serving this grand theater. Superior Essex provided the OM3 multi-mode fiber optic cable and the Category 6 copper cable to supply all of the 17 projectors and to connect each of the projector sensors.

With Superior Essex cables interconnecting the projectors, sensors and acoustic system, Museum of the Bible now features an incredibly immersive theater.

Ian Mitchell and Brody Pfeifer of S2N Technology Group inspect the cabling for the cellular distributed antenna system (DAS) and facility radio in the demarcation room.

In total, more than 140 miles of Superior Essex copper and fiber cable products now interconnect the various devices throughout Museum of the Bible. The six main cabling solutions included:

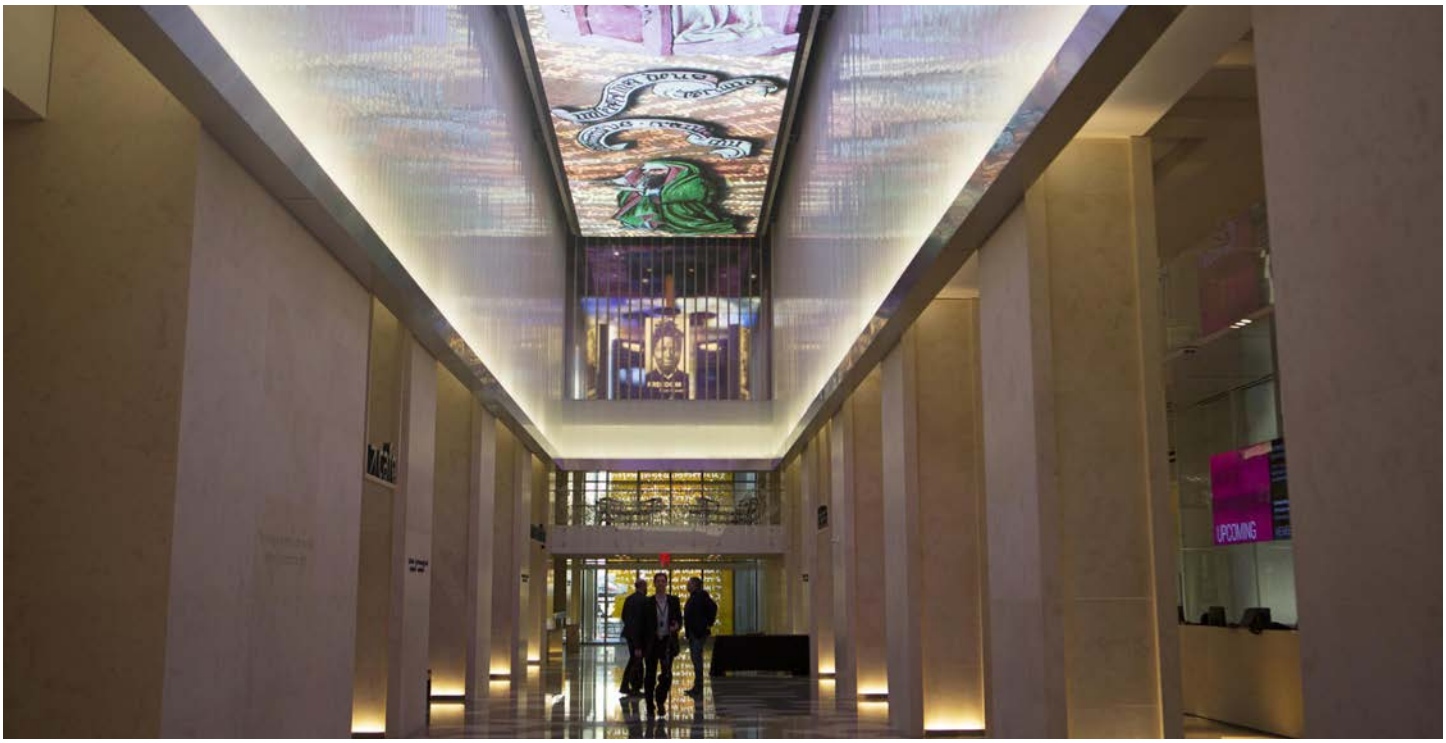
- 202,000 ft. of Superior Essex Multi-Mode 50-micron OM3 Fiber Optic Cables (2, 6, 12, 24, 48 strand; Plenum Armored and Interconnect)
- 15,360 ft. of Superior Essex Single-Mode Fiber Optic Cables (6, 12, 24 and 48 strand; Plenum Armored, Bend Insensitive)
- 166,000 ft. of Superior Essex Category 6A Cable (4-pair)
- 328,000 ft. of Superior Essex Category 6 Cable (4-pair)
- 6,650 ft. of Superior Essex Category 3 Cable (25-pair and 100-pair)
- 5,000 ft. of Superior Essex RG-G Coaxial Cable (Quad Shield, Plenum)



Superior Essex Category 6 and 6A cable is terminated into Ortronics Clarity® HDJ modular patch panels housed in Legrand MightyMo 20 cable management racks. The copper cables are color-coded: blue for standard data/voice, green for exhibitor data and red for IP security cameras.

"Working with Superior Essex, our project team was able to turn many cabling challenges into solutions."

// Ian Mitchell, RCDD, RTPM, LEED AP,
Senior Project Manager for Systems Integration,
S2N Technology Group



The 40 ft. tall lobby include LED panels measuring 140 ft. long by 14 ft. wide.

"We hosted the technology and network teams from S2N, Superior Essex and Museum of the Bible at our showroom in Maryland to give them hands-on demonstrations of the products selected for the jobsite."

// Jon Mengenhauser, Owner, Network Products, Inc.

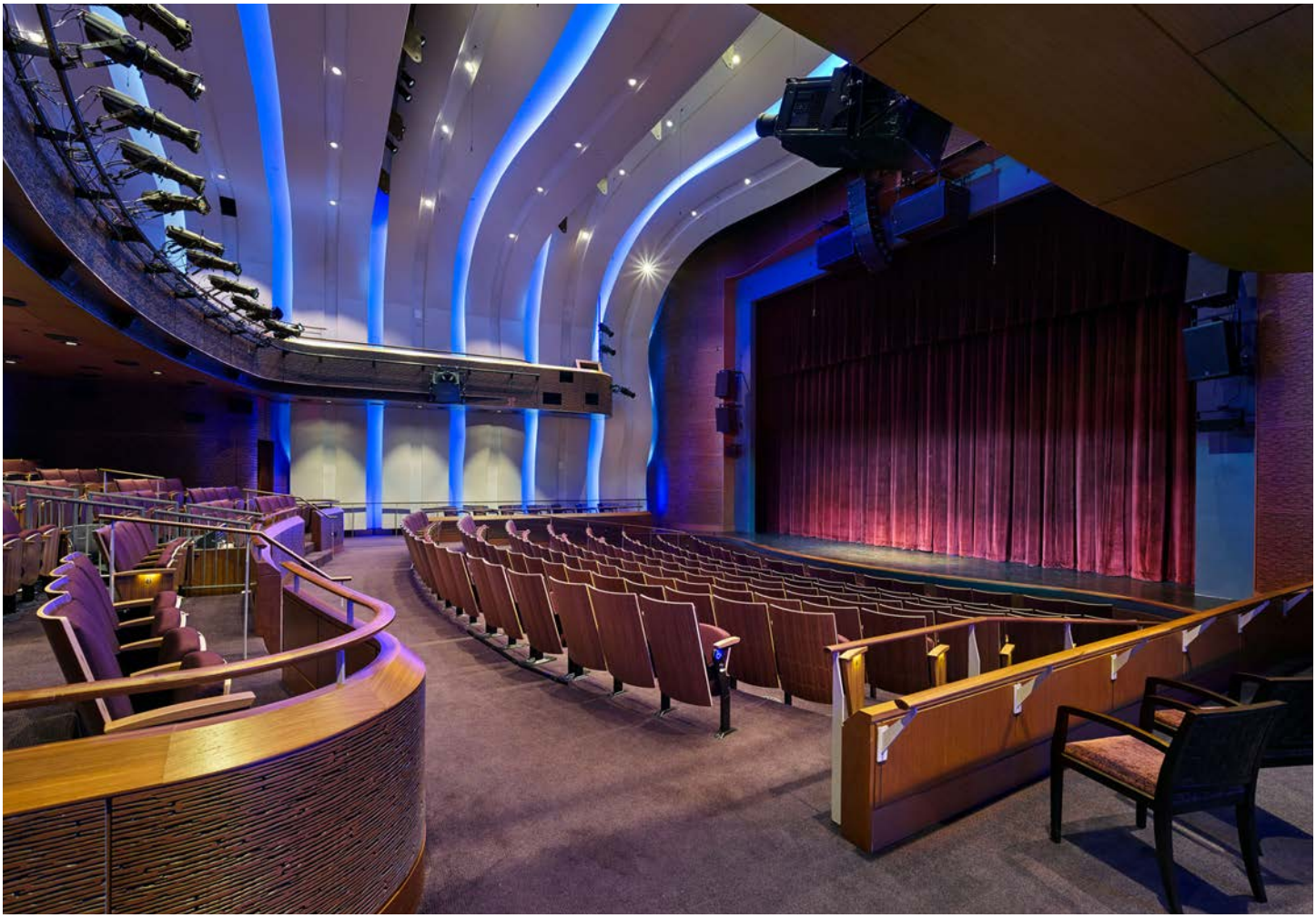
The museum provides visitors with a digital handheld guide which connects to the digital mapping system through 600 anchor points to provide personalized indoor navigation through the exhibits.

The History of the Bible Floor displays over 600 fascinating artifacts that trace the history of the Bible from handwritten scrolls to mobile devices.

BUILDING A MASTERPIECE FOR ALL TIME

Designed to constantly adjust to changes and incorporate future exhibits, whether through video or stationary presentations, Museum of the Bible is as adaptable as its network infrastructure. Everything in this museum strives to provide an immersive experience though the use of numerous, future-forward technologies. As a result, the museum's converged communications infrastructure consolidates all the data, power, A/V and media-storage traffic onto a single, high-performance, highly available network.

This common infrastructure, in turn, simplifies the installation path for adding any new applications. It acts as the unifier that ties all of the technology together to ensure an integrated performance that enables consistent, high-quality experiences for today, tomorrow and generations to come. And when the exhibits get changed out or updated, the future-forward cabling from Superior Essex is specifically designed to quietly withstand the tests of time from behind the walls, seamlessly providing application assurance and an unforgettable experience for the museum and every one of its visitors. //



The World Stage Theater uses a digital 3D-mapping technique to transform the theater into an immersive experience through seamlessly weaving digital images onto 17 floor-to-ceiling, high-output, 4K projectors, each connected with Superior Essex OM3 multimode fiber optic cable and Category 6 copper cable.