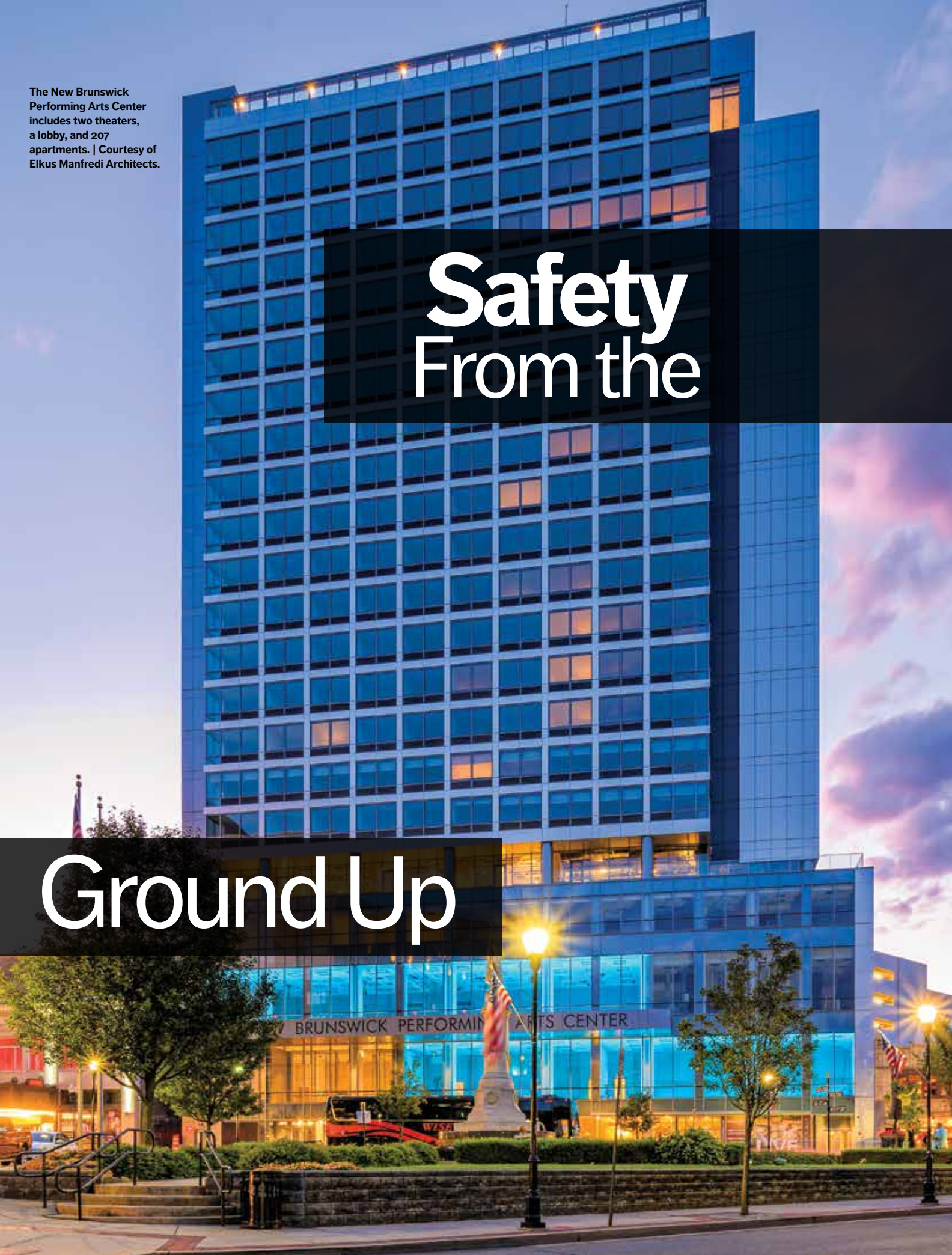


The New Brunswick  
Performing Arts Center  
includes two theaters,  
a lobby, and 207  
apartments. | Courtesy of  
Elkus Manfredi Architects.

# Safety From the

# Ground Up







# New Brunswick Performing Arts Center leverages the latest technology to create a safe space for all—theatregoers, performers, artists, professionals, and residences of the shared 23-story building

BY THOMAS RENNER

**A**s theatre owners and producers push the performance envelope to create the most entertaining show possible, building architects and construction teams struggle to meet those demands while also keeping performers, audiences, and theatre employees as safe as possible.

The New Brunswick Performing Arts Center (NBPAC) in New Jersey, which opened in September 2019, added another dynamic to theatre safety: It shares a 23-story building with 207 upscale apartments. The \$172 million high-rise is located about 40 miles south of Manhattan and will soon host a variety of performances. According to NBPAC, “The state-of-the-art center will immediately take its rightful place as one of the Northeast’s premier venues for musical, dance, and theatrical performances.”

The team at Elkus Manfredi Architects, which designed the building, reported that meeting demands for residential and commercial codes, style preferences, energy performance, and numerous other design goals was like designing a monolithic jigsaw puzzle and then putting it together. As is the case with every building, the first priority for the NBPAC was to guarantee its structural stability. Architectural elements for fire safety are only one of the many precautions needed for residents, performers, audiences, and employees. The many other architectural elements, either for safety, aesthetics, or building functionality, must also be chosen with attention to detail. It can be complicated, costly, and time-consuming.

“The project was conceived architecturally as a single structure containing un-separated mixed uses such as assembly

(theatres, rehearsal spaces, and lobbies), residential (apartments), storage (back-of-house spaces), and business (offices),” says Andrew Goetze, project manager for Elkus Manfredi. “The building construction type was selected based on the need for the floor and vertical support assemblies to provide the required fire resistance assembly for each of the uses.”

The New Brunswick Development Corp., which spearheaded the project, started to obtain funding in 2010 and construction began in 2017. Christopher Paladino, the corporation’s president, estimates the facility will create about \$20 million for the local economy.

## Fire Safety

While all buildings must meet fire codes established by the National Fire Protection Association and the International Building Code, both organizations have additional requirements that are specific to theatres and other places of assembly. Since the early 1900s, building and fire codes have required ventilation over stages. The vents draw smoke, heat, and other combustible elements from a fire away from the audience. The NBPAC project includes eight acoustically rated BILCO Company smoke vents, which guard against noise intrusion while providing the security of automatic smoke venting from the stage houses in the two theatres. “We were familiar with the manufacturer from previous projects and they offered the most advantageous sizes,” Goetze says. “The fire code stipulates that a certain percentage of the stage area needs to be properly vented, and BILCO had sizes that fit the bill.”

The number of smoke vents used in any application varies based on the size



The New Brunswick Performing Arts Center, a 23-story building that includes apartments and two theatres, opened in September 2019 in New Jersey. | Courtesy of Elkus Manfredi Architects.

activity, as well as an approach to Newark International Airport.

The vents chosen for NBPAC are designed to counteract the external soundscape that surrounds the facility. BILCO's new 2020 vent model has an STC-50 rating and an OITC-50 rating. STC measures the extent to which sound is prevented from being transferred from one area to another. OITC rates the transmission sound between outdoor spaces and indoor spaces in a structure. "OITC is the preferred rating when addressing sound insulation from exterior noise—especially when transportation noise sources are impacting a building facade with significant low-frequency (bass) sound," says Harold Merck, principal and acoustician for Merck & Hill Consultants of Atlanta. "While STC ratings may be fine for typical interior noise sources such as voices, STC does not adequately address

of the building. A stage area with more than 1,000 square feet requires smoke vents. This area measurement includes all of the wings, forestage, and any other areas not separated from the stage by minimum one-hour fire-rated construction components. Smoke vents open automatically via a positive hold/release mechanism that ensures reliable operation if a fire occurs. It also automatically releases vent covers upon the melting of a 165° F (74° C) fusible link, or activation of a heat detector interfaced with the building fire alarm system. Smoke vents equipped with motors can be easily opened and closed from the floor by a switch. According to BILCO, its vents "can be supplied with an electric Thermolatch to allow the vents to be operated by a smoke detector or fire alarm control panel."

Acoustical smoke vents work in the same way but add an element to protect against noise intrusion. They are installed in theatres, music halls, and other interior applications that require limited noise from the outside. At the Hale Centre Theatre in Utah, 20 acoustical smoke vents were installed in an \$80 million project that stretched across 130,000 square feet. The venue is located directly in line of the flight path to and from a nearby heavily trafficked airport and is adjacent to busy roadways. Similarly, the NBPAC also sits in the middle of a city rife with vehicular



The rehearsal hall allows performers to practice shows within the building, facilitating quick turnarounds and less theatre downtime. | Courtesy of Elkus Manfredi Architects.



the extended low-frequency noise contribution of aircraft, traffic, or even large roof-top equipment. The OITC better addresses low-frequency noise impacts and is the more applicable sound rating for roof-mounted automatic smoke vents,” he explained.

Architects also had to be concerned with designing a building that kept residents safe. The safety of the occupants of the building’s Premiere Residences, located above the New Brunswick Performing Arts Center and including an impressive range of amenities—a rooftop pool, fitness center, demonstration kitchen, karaoke room, residents’ lounge and co-working, and private meeting rooms—was a critical consideration for the team. “DeSimone Engineering, the structural engineer on the project, designed transfer girders and thickened slabs in the concrete structure that redirected the



The project includes acoustical roof hatches manufactured by The BILCO Company, which limit noise intrusion while also allowing for the release of smoke, heat, and gases in a burning building. | Courtesy of Elkus Manfredi Architects.



#### PROJECT AT A GLANCE

**What and where:**

New Brunswick Performing Arts Center, New Brunswick, N.J.

**Project cost:** \$172 million

**Opened:** September 2019

**Architect:** Elkus Manfredi

**Check it out:** <https://nbpac.org/>

**The building:**

The 23-story building includes 207 apartments, two theaters that can accommodate a total of 715 guests, rehearsal spaces, expansive lobby, rehearsal rooms, and bar.

**Enjoy the show!**

Well, eventually. The COVID-19 pandemic caused the facility to cancel shows six months after it opened. Performances are expected to begin as soon as conditions permit.

tower loads,” Goetze says. “They also designed large transfer trusses for the steel structure to keep the audience spaces in the theatres column-free.”

“We weren’t breaking new ground,” Christopher Paladino, president of the New Brunswick Development Corp., which spearheaded the project, says about including residences over the theatres. He cited The Museum of Modern Art in New York and even Carnegie Hall, which also had resident apartments at one time. “Residential units ended up making the most sense from a design standpoint, because we built the tower over the lobby and the rehearsal spaces.”

### Rigging and Air Safety

The technological evolution in the theatre industry puts additional stress on architects to put all of the elements in place for a venue that is safe for everyone, including the lead clarinet, the elderly patron, the acclaimed performer, and everyone in between. The critical part is planning and accounting for all the tasks that will occur within the building.

While the smoke vents help protect the New Brunswick building, Goetze and his team also had to consider how to keep performers and patrons safe. “When you are designing a theatre, there are additional issues you have to take into consideration,” Goetze says. “You have to account for protection of the audience from stage and production areas



The Arthur Laurents Theater at the New Brunswick Performing Arts Center can seat up to 252 patrons for dramatic theatre, dance, lectures, musical events and more. | Courtesy of Elkus Manfredi Architects.

with smoke and fire separation and fall protection at orchestra pits. It is also necessary to protect technical personnel on catwalks, rigging galleries, tension wire grids, and gridirons.”

Scenery and costume shop areas need to provide dust and toxic vapor control as well. The New Brunswick project included a dust control system, as well as a spray booth with external venting. There is also special emphasis on the safety of a theatre’s rigging system. This includes the rope operating lines, wire rope lift-lines, blocks, counterweights, and related devices within a theatre that enable a stage crew to fly scenery, lighting, and other production elements quickly.

Increased use of automation and improved wireless technology capability will also help improve theatre safety in new facilities that have significant technological infrastructure. As an example, the Hale Centre Theatre, designed by Tait Towers, includes an automated stage with 11 lifts, a performer flying station, cranes, and rigging systems that move set elements on and off stage as directed by a computer. The center lift can change rotational axes, both counter-clockwise and clockwise, independent of all other lifts.

All of this equipment must be considered early in the design process to ensure proper installation, power, and space. “Planning for the routing of the

extensive power and control infrastructure early in the project is critical,” says Goetze. “These pathways require a significant amount of space for horizontal and vertical routing, and total distance from devices to final termination points must be limited to acceptable overall distances in order to ensure proper functionality.”

Turning stages, flying performers and complex sets add to audience satisfaction but may also endanger actors. One of the most recent and best-known examples is the Broadway musical *Spider-Man: Turn Off the Dark* where a series of injuries befell performers, including lead actor Christopher Tierney who suffered four broken ribs, a skull fracture, and broken bones as a result of a fall in 2010. His replacement, Richard Kobak, sued for \$6 million over a string of injuries, which he attributed to errors in the programming of the aerial rigging computer (*New York Post*, 2012). “Performers are tasked with executing extraordinary things onstage, night after night, often amid such occupational hazards as theatrical smoke and haze, raked stages, and loud noises—all while decked out in unwieldy costume pieces and towering wigs,” Allison Considine wrote in *American Theatre* (2019). “New theatre rigging systems, counterweight and motorized, are safer than many of the systems used in older theatres,” Goetze says. “In addition, low voltage LED lighting has allowed

illumination of technical support areas without interfering with the audience experience, which creates a safer environment for performers and for technical personnel.”

A number of significant improvements have advanced theatre safety. For example, smoke and fire detection systems have improved, allowing the use of detection devices that account for the special effects that may be used in productions. “Interior materials are improved in terms of flame resistance and reduced toxicity which improves indoor air quality,” Goetze adds. “Fire and smoke alarm and detection systems provide greater sensitivity and more effective response, which improves the safety of patrons and performers.”

Of course, the COVID-19 pandemic has raised a new red flag for theatre safety. Many theatres have not reopened, and how venues plan to keep actors and patrons safe is still being discussed, though USITT has released several guidelines, which are included in this issue. The few theatres that have reopened have been careful to meet or exceed guidelines established by the Centers for Disease Control and Prevention (CDC).

What is clear is that people are not ready to give up on theatre. “Why do we need live theatre?” Joanne Greco Rochman wrote in Connecticut’s *Republican-American* newspaper. “Because there’s nothing else like it in the world. This is where creativity reigns, where all the arts come together.”

## Stars of the Show

While the apartments are an important piece to the project, the distinct stars of the New Brunswick Performing Arts Center are the theatres. The Elizabeth Ross Johnson Theater is a 463-seat proscenium theatre designed to accommodate musical theatre, dance, opera, and dramatic theatre. The Arthur Laurents Theater can seat up to 252 patrons for dramatic theatre, dance, lectures, and community and musical events. The vibes are quite different—one grandiose and one intimate—but both are appealing to audiences.

“We pretty much did what everybody from the artistic side and theatre consultants recommended,” Paladino says. “We had some challenges, but in the end, we constructed the theatres that everybody wanted.”



Like most theatres in the United States, the NBPAC has endured difficult times in the wake of the COVID-19 pandemic. While not yet fully operational, the center does have spaces where people can maintain social distance. "We have a lot of opportunities to create social separation," Paladino says. "We will eventually get back our routine. But it is not like throwing a switch back on."

The Johnson Theater features continental seating. The orchestra pit, sized for up to 70 musicians, features a motorized lift. There is also a 75-foot fly space, which Goetze notes provides much-needed flexibility for space users: "The huge fly space allows you to have scenery that you can fly fully out. If you are not performing on a Monday night, you can fly out the scenery and do a comedy performance or something else. In theatres without a full fly system, you build a set on the stage and it's always there and you can't do anything else."

Architects designed the performance areas with optimum flexibility. At 5,400 square feet, the lobby provides ample area for guests to mingle before shows, and includes a bar that visitors can enjoy before and after shows. Three rehearsal rooms that replicate the stages of the two theatres add a unique element and give incoming productions a space where they can rehearse and move on quickly to the main stage. The spaces can also be used for general classes, workshops, and small public performances.

To maximize audience comfort, Barone Engineering, the HVAC engineer on the project, designed a displacement ventilation air conditioning system in which diffusers in the theatre floors provide conditioned air with the return duct work high above the audience. "The

equipment is much smaller and air is delivered at a lower velocity," Goetze says.

The Center is home to four member companies, including the Rutgers University Mason Gross School of the Arts. George Street Playhouse, another member company, is a nationally recognized professional producing theatre company. The American Repertory Ballet and Crossroads Theatre Company, the nation's premier African American theatre, also call the NBPAC home.

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The NBPAC gives patrons an experience they will not soon forget. The state-of-the-art venues, the residences, and the performances add a new dynamic to the cultural scene of New Brunswick. Just as important, the building is safe for residents, performers, audiences, employees, and all users of the building. From the smoke vents that sit atop the stage house to the window locks on the resident apartments, every detail has been scrutinized to ensure the facility meets

theatre and home safety demands. It is just a matter of time before audiences finally get to enjoy the facility to its full potential.

"The experienced theatre goers will see that the level of comfort, the sound, and the sightlines create an experience that is second to none," says Paladino. "The excitement the architecture creates on the street starts the experience. It is not unusual to walk past the building and see somebody rehearsing for a show. There's a genuine excitement to create a memorable experience."



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