

At first glance, adopting a lighting strategy for the 2,000-pound Liberty Bell similar to the one used to illuminate a 90-pound ballerina seems incomprehensible. But, in truth, each is a performer, as lighting designers Daniel E. Edenbaum and Ray Grenald discovered when illuminating a new residence for an American icon that receives 1.6 million visitors per year.

The new \$12.6 million Liberty Bell Center, part of a \$300 million facelift for the Philadelphia Independence National Historic Park, opened October 9, 2003.

Designed by Architects Bohlin Cywinski Jackson, the 23,000 sq ft museum's grand finale is a 1700 sq ft glass Bell Chamber. The glass structure was thoughtfully placed so that Independence Hall

against the sky serves as a backdrop for the beloved Bell.

Work on the lighting designs began in March of 1999. For Grenald Waldron Associates, Ray Grenald was design principal and Daniel E. Edenbaum (now of Drago Illumination) was project designer and project manager. "When I first heard that there was going to be a new home for the Liberty Bell and that Grenald Waldron Associates was going to be part of the design team, I jumped at the opportunity to be involved. Having grown up in the suburbs of New Jersey I remember field trips to see the Liberty Bell in grade school," says Edenbaum.

The first task was to establish a series of written narratives describing three different design scenarios. These narratives were used to establish a set of

construction cost estimates from which the owner of the site, The National Park Service, and its representatives could assess various pros and cons of installation and operating costs. Since the Liberty Bell Center was one part of a comprehensive "Master Plan" for all of the Independence National Historic Park, encompassing a new Visitor Center, a museum dedicated to the U.S. Constitution (see *Scanning the Spectrum*, LD+A November 2003) and plans to rehabilitate the surrounding three block site, several coordination meetings between the design teams and concerned parties was required before moving forward with a final design.

An important part of the new Liberty Bell Center was a museum, the Exhibit Hall, which would display artifacts and memorabilia related to the Bell,

should feel like you were stepping on 'sacred or hallowed ground.' Figuratively, 'you should drop to one knee and pray to whatever God you pray to.' The image of the Bell should be that powerful."

The architectural design of the new center does just that, and more. The appearance of the Bell in its new symmetrical chamber is a very powerful image. (The Liberty Bell weighs 2080 pounds). This image is accentuated by the design of the queuing area for the Bell Chamber, an architectural aspect that Cywinski and Grenald collaborated on. In order to achieve this, the ceiling of the queue area was deliberately made relatively low, the finishes are mostly dark grays, and the materials are all hard. Two simple slots in the ceiling provide the only light. It is a noisy, dim, depressing space. Such subtleties of design are generally not even realized by most people. Yet the overall impact is unmistakable.

To help determine the best way to illuminate the Liberty Bell itself, before the initial design process, Grenald and Edenbaum agreed a mockup of the actual Liberty Bell was going to be necessary to ensure that what they were designing would turn out as expected. The Liberty Bell is a very dark bronze, so a physical evaluation was going to be critical in order to strike the right balance of light qualitatively, quantitatively and chromatically.

The lighting design had a couple of other daunting challenges. To keep the Bell Chamber ceiling as clean as possible, plans called for recessing the lights in the ceiling 30 ft above the Bell. For dramatic impact, the light beams had to be tight and well controlled, capable of accenting a three by four ft object from 30 ft in the air with little spill light. Long life sources to reduce maintenance costs had to be factored into the design as well.

The entire south wall of the Bell Chamber is a glass curtain wall. This allows visitors viewing the

Ring In The New



Close-up of the Bell with Independence Hall and evening sky as backdrop.

PHOTOS: DANIEL E. EDENBAUM

THERE WAS NOTHING ORDINARY ABOUT LIGHTING A NEW HOME FOR THE LIBERTY BELL. PASSIONS RAN HIGH, AND EVEN VETERAN DESIGNERS WERE IN AWE OF THE TASK AT HAND

and allow for interpretation of the Bell's long history as an icon for freedom and liberty.

A low-voltage cable system was used for the Exhibit Hall portion of the Center. This allowed the flexibility needed to illuminate the exhibits no matter where they wound up being located, as well as highlighting certain architectural features and elements. This included a meandering granite wall that leads visitors through the exhibits to the queue for the Bell Chamber. The low voltage cable system was a natural extension of the building's exposed structure and it blends in seamlessly. According to Edenbaum, "The cables and light fixture of the system were located so that the first view of the building, when you enter the Exhibit Hall, is absolutely clean; one can't see a single light fixture."

To achieve such a high level of integration required close collaboration with the project architect throughout the design and construction process. From architects Bohlin Cywinski Jackson, Bernard Cywinski was design principal, Ken Mitchell was project architect and Jeffrey Lew was project manager.

The Vision

In an early meeting, Cywinski, gave the design team its focus and inspiration, "When you approach the Bell it should be almost a 'holy experience,' you



Low voltage cable system dramatically lights the meandering granite wall through exhibits.



Northern view of Bell from outside, opposite walkway on Chestnut Street.

Bell to make a visual and symbolic connection to Independence Hall and its belfry, where the Bell once hung. Compensation for high levels of daylight on one side had to be factored into the lighting design.

For the mockup, the design team was allowed to bring an assortment of lighting instruments into the Old Pavilion to do some tests after hours one night in October 1999. Edenbaum recalls, "Although the

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building was closed to the public, all sorts of people were coming up and knocking on the door because they saw us inside. Pleasantries were exchanged, we explained what we were doing, then the visitor went through their saga about fulfilling a childhood dream to see the Bell, having made some long pilgrimage to get here and that this was their once in a life time opportunity to see it. The Park Ranger smiled, invited them in and said that this happened all of the time. This only heightened my enthusiasm to be involved with the lighting of the Bell's new home. For me this was a once in a lifetime opportunity to be involved with something only one other team has really done in the 250 year life of the Bell."

Through the mockup, it was determined a mixture of ceramic high pressure sodium and ceramic metal halide would provide the right mix of color to enrich the dark bronze while also provid-

ing the intensity needed to give the Bell highlights and luster.

The Bell as Ballerina

The stage was set, the lighting positions were picked. Grenald worked with Edenbaum to design a lighting and control system to make it all work. Since part of Edenbaum's educational background comes from the theater, which included many hours working on ballet productions, he took Grenald's cue to model the Bell much the same way he would model a ballerina on stage. The techniques applied are actually very basic. They used two distinct colors and intensities of ceramic high-pressure sodium and ceramic metal halide to help render, or model, the "shape" of The Bell. Using light as a modeling medium is basic theatrical lighting. By alternating the color and intensity of the light around the Bell, it is modeled more three dimensionally than if only a single color or intensity was used. The control system was also an important aspect to the overall design. Five separate subsystems were identified, which sometimes had to work independently and together.

Large expanses of glass windows along both the east and west sides of the building also allowed significant amounts of daylight into the Exhibit Hall. Photocells were incorporated into the control sys-

tem to allow for daylight harvesting. One photocell controls the Exhibit Hall, while a second one controls the Bell Chamber. At higher levels of daylight more accent lighting is needed to overcome sky brightness.

Because the Park Service operates its facilities with rotating staffs, the lighting system needed to be extremely simple to operate, yet flexible enough to be able to adapt to different or future programming needs. The control system was designed so that when the facility opens in the morning the park ranger has only to touch one button to position all of the sub-systems into a pre-determined "scene," which then activates daylight harvesting via the photocells. At night when the facility closes, the push of one button puts the Bell Chamber and Exhibit Hall into nighttime viewing scenes, and ensures that all other subsystems are turned off. A time clock controls activation of the exterior areas. In this manner the building really almost takes care of itself extending maintenance cycles while lowering operating cost.

Fast forward through three years of construction to the late summer of 2003. Logistical issues deemed it necessary to aim the lights for the Bell before it was actually secure in its new home. To facilitate this, the architect provided a scale foam core cut out of the Bell. The lights were aimed one

evening in September and everything looked good. The aiming for the Exhibit Hall was completed several weeks later, this time with the actual exhibits in place.

Home at Last

The last time the Liberty Bell was moved was on January 1, 1976 to mark the beginning of the celebration of America's Bicentennial. On October 9th, 2003 the Bell was successfully moved from its old pavilion to the new Liberty Bell Center amidst a full day of special events, festivities and ceremonies. "At the end of the dedication ceremony the Bell was unveiled and it looked stunning. The mix of ceramic high pressure sodium and ceramic metal halide lamps give the Bell a shining luster with pleasant highlights," according to Edenbaum.

For the first few weeks after the opening several of the design team members would occasionally visit the Bell at its new home. "After having to visualize how The Bell was going to look, after four years it was nice to see the final results. And the daylight in the building changes a lot during the course of the day, and will continually change during the course of the year as the angle of the sun changes." Edenbaum observed.

Edenbaum summed up his experience, "Knowing that I have worked on projects which affect shoppers, workers and tourists all over the world is very fulfilling, both personally and professionally. However, they all pale to being able to say 'I was part of the design team for the Liberty Bell Center'—a truly a once in a lifetime opportunity."

—Roslyn Lowe



Visitor viewing the exhibit in the Bell Center Museum.



Lighting designer: Ray Grenald, NCARB, FAIA, FIALD, LC, Fellow IESNA (1961) founded Grenald Waldron Associates, Narberth, PA in 1968. He is both chairman and director of design and as such is responsible for marketing for the firm. Grenald is a Fellow of the American Institute of Architects (FAIA), and past President and Fellow of the International

Association of Lighting Designers (FIALD). His honors include the Edison Award of Excellence, and IIDA Awards of Excellence and Waterbury, Special Citation. Notable projects include the White House, Oval Office and Roosevelt Room.



Lighting designer: Daniel E. Edenbaum, Member IESNA (1986), is president of Drago Illumination, Ardmore, PA, which he founded in 2003. Prior to this, he was a senior lighting designer for Grenald Waldron Associates. He received his BFA Technical Theater, from the University of Rhode Island in 1986, and his MFA Architectural Lighting Design, from Parsons School of Design in 1988.