



RETROFIT/RENOVATION
CATEGORY A
LESS THAN \$500,000

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Here's the Book on Design/Build

by Ron Rajcecki, senior editor

It might be said that the best Design/Build contractors can read their customers' needs like a book, and provide cover-to-cover service, with the bookends being innovative design and ongoing maintenance.

That's certainly the case at Boston, MA-based L.C. Anderson, which took top honors in this year's Category A (retrofit/renovation less than \$500,000) for its outstanding work at the Congregational Library of the American Congregational Association, in Boston.

The American Congregational Association was founded in 1853 to "promote the traditions and common interests of the Congregational Way by supporting the well-being, education, ministry and spiritual growth of individuals, congregations and related institutions."

After having several locations in Boston from 1853 to 1898, the association decided that it needed to construct a suitable building to house its operations. The prestigious Boston architectural firm of Shepley, Rutan and Coolidge designed a fitting eight-story location atop Boston's historic Bea-

con Hill. The association still occupies the building, along with several other not-for-profit organizations.

One of the primary functions of the association is its library. The Congregational Library was founded in 1853 "to

maintain, in the city of Boston, a Congregational House to care for and perpetuate a library of books, pamphlets, and manuscripts, and a collection of portraits and relics from the past; to promote friendly intercourse and cooperation



Two classics meet on Boston's Beacon Hill: The Congregational Library of the American Congregational Association (built in 1898), and L.C. Anderson, Inc. (established in 1947).

among Congregational ministers and churches, and with other denominations; and to do whatever else . . . shall serve to illustrate Congregational history and promote the general interests of the Congregational tradition."

The library is located in three stack levels, which are integrated into the second and third floors of the building. The stacks represent approximately 80,000 cubic feet of volume. They have been in this location since the construction was completed in 1898. In addition to the stacks, the library maintains a rare books room (to house extremely rare and his-

L.C. Anderson, Inc.
Boston, MA
 The Congregational Library of the
 American Congregational Association

toric artifacts), a large reading room, a meeting room, and the librarians' offices. Some of the artifacts in the collection include a 17th century John Eliot Bible in Algonquin (Indian) dialect, the Cambridge Platform of Church Discipline (1648), and the original records from the General Council of Congregational Christian Churches.

A Truly Irreplaceable Collection

"The library is the oldest and most fabled part of our whole operation," says Dr. Harold F. Worthley, who has served as CEO and librarian of the American Congregational Association since 1977. "The rare books in our archives are truly irreplaceable."

Yet this very special place had a problem: the only climate control in the library was the building's original steam heating system. A primitive air conditioning system installed in the late 1950s had long sat inoperational. Over time, the association's library committee became aware that the continual change in temperature and humidity with the change of seasons was causing the collection to deteriorate. It was decided in 1987

that the library needed a suitable environmental control system.

The association had several consulting engineers study the project over the years. Due to the library's location on the middle floors of the building, many of the consultants were devising systems that would take a significant amount of usable space. Due to the continual growth of its collection, the library was not willing to give up any significant space. In stepped L.C. Anderson, Inc.

In the 1960s, Boston-based L.C. Anderson had installed the water-cooled air conditioning systems that serve the association's offices and meeting rooms on the building's first floor. Despite solid ongoing maintenance, it was agreed in 1999 that L.C. Anderson would replace the old water-cooled systems with new, higher efficiency air-cooled systems.

The new systems were designed and installed under the watchful eye of Dr. Worthley, and the librarian was quite impressed with the quality and professionalism of L.C. Anderson's engineering and installation personnel. Upon completion, he asked the company if it would be interested in taking on the challenge of air conditioning the library.



Unobtrusive grilles blend into the décor in the Congregational Library's historic reading room.

L.C. Anderson accepted, and began to study the existing conditions and needs of the library in depth.

"One of the most unique aspects of working at the Congregational Library had nothing to do with the technical aspects of the job," says Karl R. Hudson, L.C. Anderson's vice president of construction services. "It's simply rare to

CATEGORY A

Retrofit/Renovation less than \$500,000

WINNER AT A GLANCE

COMPANY:

L.C. Anderson, Inc., Boston, MA

PROJECT NAME/LOCATION:

The Congregational Library of the American Congregational Association, Boston, MA

TOTAL COST: **\$303,000**

KEY CUSTOMER CONTACT:

Dr. Harold F. Worthley, CEO and librarian, American Congregational Association

NOMINATION SUBMITTED BY:

Karl R. Hudson, VP, construction services, L.C. Anderson, Inc.

THE PROJECT TEAM:

At L.C. Anderson:

■ Karl R. Hudson, design engineer/project manager

■ Bill Enders, field installation/controls supervisor

At the Congregational Library:

■ Dr. Harold F. Worthley

■ Margulies & Associates, architects

work with people who have such a long-term vision for their building. The association has been in that building for more than 100 years, and they plan to stay for another 100."

Old Building, New Era

L.C. Anderson's first significant challenge was to figure out how to provide adequate air conditioning to an 80,000 cubic foot space that was built in an era in which no one could even conceive of such a system, without taking away any of the owner's valuable space. The stacks are 22½ ft, high (continuous) with two intermediate floors of heavy plate glass that allow access to the books. There is virtually no floor space on the intermediate floors. There is 18 inches above the stacks on the top level, but some of this space had been used for a sprinkler system.

The next step was to determine the exact requirements of the space. This would help L.C. Anderson's efforts to find a home for the equipment.

"We used the weight of the building structure as well as the large thermal mass of the books to our advantage," Hudson explains. "A large thermal mass reduces the overall load, and in this case allowed us to reduce the required refrigeration capacity to approximately half of

CATEGORY A: PROJECT-AT-A-GLANCE

Retrofit/Renovation less than \$500,000



SYSTEM DESCRIPTION:

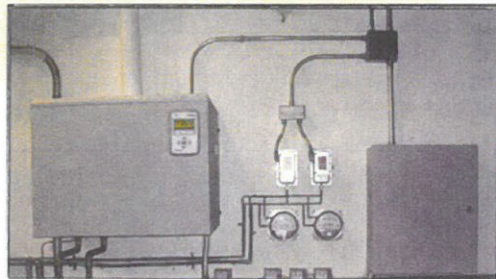
For Boston-based **L.C. Anderson, Inc.**, the **Congregational Library of the American Congregational Association** represented a very challenging project. The association has occupied its historic building since it was built in 1898. While it was unique working with an owner who had such long-term occupancy at and vision for a building, that also made the owner's requirements quite demanding. Design and installation were difficult due to the age and configuration of the building, and good results were vital due to the irreplaceable nature of much of the building's contents.

- A thorough engineering analysis of the spaces to be conditioned was the first step. These spaces included two floors of library stacks 22 ft. high, with each floor further divided by intermediate glass floors at seven and 14 ft.; a rare books room filled with irreplaceable artifacts; and offices.
- With only 18 inches above the stacks to work with, L.C. Anderson planned and installed a system that delivers air from above the stacks, with a central return below them. This brings conditioned air down through the stacks without the need for equipment on the intermediate glass floors. Two stages of gas heat, duct-mounted humidifiers, electric reheat coils, and a sophisticated controls system meet the varying challenges of New England's climate.
- The rare books room received a commercial grade air handling unit with two independent condensing units for redundancy, as well as humidification and enhanced filtration.
- A ducted split system was chosen for the historic reading room, and two ductless split systems serve the librarians' offices.
- Great care was taken to make the system operate as quietly as possible, and to install the equipment with minimal disruption to the library's operations.
- All of the engineering, design, drafting, and installation were performed by L.C. Anderson personnel. The sheet metal, carpentry, and asbestos abatement work were subcontracted. The owner's electrician performed the electrical work.

PRODUCTS KEY TO SUCCESS

- Carrier model 48TFE014-5 packaged gas/electric rooftop unit (stacks)
- Carrier model 39LD06 central station air handling unit (rare books room)
- Two Carrier model 38CKC060-5 air-cooled condensing units (rare books room)
- Two Mitsubishi room fan coil units, models PKH24FK1 and PKH18FK1 (offices)
- Two Mitsubishi air-cooled condensing units, models PUH24EK and PUH18EK (offices)
- Two Dri-Steem Ultra Sorb LV duct-mounted humidifiers (stacks, rare books room)
- Two BTU Electric Heaters duct-mounted electric reheat coils, models MR-1638 and MR-1220 (stacks, rare books room)
- Flanders pre/final/carbon filtration sections (rare books room)
- IAC model LFM stainless steel sound attenuators (stacks)
- Honeywell XL control system

A Dri-Steem humidifier (left), filter differential pressure switches and magnetohelics (center), and a Honeywell XL-15 control panel (right) all help preserve the rare books and materials housed in the Congregational Library.



what many of the other companies' consulting engineers had recommended. We were quite confident that the capacity we were recommending would be adequate to maintain the owner's desired temperature of 72F."

Once the required capacity was known, L.C. Anderson was able to move ahead with the *how* of conditioning the space. The company's engineers determined that if conditioned air was introduced at the top of the stacks, and return air was drawn through the bottom, the air would drop naturally through the stack levels. This would

completely eliminate the need to have equipment and ductwork on the intermediate levels.

Based on L.C. Anderson's calculations, one unit could be used to condition the entire library space in this manner. To locate the equipment, L.C. Anderson targeted a low roof at the building's second floor level. After working with the owner's structural engineer, it was determined that the roof could support a single rooftop unit.

With the unit on the lower roof, ductwork was brought outdoors up the side of the stacks and into the top level. Exten-

sive duct distribution was provided in the 18 inches above the stacks to equally distribute the air. One large return air grille was installed on the lower stack level, which forced all of the air to travel through the stacks before returning to the unit.

An Exercise in Drafting

"We went in and did an as-built on the 18 inches we had to work with above the stacks. Then we moved things around with our CAD system until we found a way to integrate our ductwork around the existing sprinkler system."

L.C. Anderson also incorporated two stages of gas heat into the unit to provide adequate comfort in the winter. Duct-mounted humidifiers and electric reheat coils with infinitely adjustable controllers allow the library to be cooled, heated, humidified, or dehumidified, depending on ambient conditions. Stainless steel sound attenuators were installed on the return duct, as the return air grille is immediately next to a librarian's desk.

A Honeywell XL control system is coupled with intermediate space temperature and humidity sensors on each stack level. The system maintains the temperature to $\pm 1F$ of setpoint (with a 1F temperature difference from the top to the bottom of the stacks), and the humidity to $\pm 3\%$.

In the rare books room, the broken-down, 50-year-old air conditioning system was replaced with a new commercial-grade air handling unit with two independent condensing units to provide redundancy. The system received the same humidification/dehumidification capabilities, electric reheat coils, and controls as the system in the main part of the library. This unit also received 30% pre-filters, 95% final filters, and carbon filtration.

The reading room was fitted with a ducted split system. Since this is an historic room, any work done needed to be reviewed by the Beacon Hill Architectural Commission. L.C. Anderson installed an air handling unit over the librarian's office, with a new drop ceiling below the unit. Two unobtru-

sive wall registers distribute air across the room. The return air grille is installed in the bookcase behind the librarian's desk. The Architectural Commission reviewed the proposed drawings and registers, and approved the changes to the room.

The two librarian's offices are served by dedicated ductless split system cooling units with local control in each office.

All of the systems, with the exception of the ductless splits, are controlled by the Honeywell control system. The Honeywell controls are tied in to L.C. Anderson's office via modem, allowing the company to monitor and control it remotely.

The Job Starts at the End

At L.C. Anderson, commissioning is viewed as the most important part of the project. The company assigns one field supervisor to each of its projects. The field supervisor is responsible for coordinating all of the fieldwork, including the subcontractors. On this project, field supervisor Bill Enders was responsible for everything from installation of L.C. Anderson's systems to asbestos abatement, carpentry, and electrical work.

At start-up, L.C. Anderson's technician completes a detailed start-up sheet for each piece of equipment. This sheet goes to both the installation manager and service manager. In addition, when the start-up technician starts the equipment, he puts a weatherproof service sticker on the side of the unit. This simple sticker gives the start-up technician personal ownership of the unit, and also serves as an on-site record of subsequent maintenance and repairs that are performed on the unit.

Once the system is up and running, all the equipment and systems are balanced. L.C. Anderson has its own balancing equipment and technicians in house.

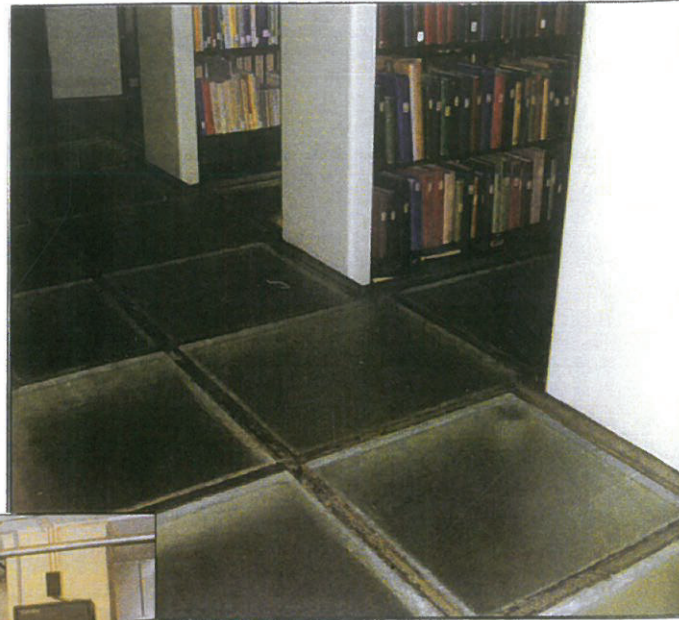
At time of commissioning, the owner receives:

- ▲ Training on the equipment and controls
- ▲ Warranty documentation

▲ Four sets of operation and maintenance manuals

▲ Four sets of as-built drawings.

Once an owner has been trained and receives the documentation, he or she signs a letter to that effect. This helps the owner understand that he or she now has ownership of the system. This owner-transitional time is critical. When done



Intermediate floors made of heavy panes of glass separate the stacks into three levels, and posed unique challenges for L.C. Anderson.



With only 18 inches to work with, L.C. Anderson designed a system that delivers air from above the book stacks, and allows it to drop down through the stacks to a central return.

properly, it eliminates the majority of nuisance callbacks.

One set of all of the above documentation is transmitted to the company's service manager so a maintenance agreement can be prepared. In true Design/Build/Maintain fashion, L.C. Anderson has the long-term maintenance contract for the new system at the Congregational Library, to keep the books and artifacts preserved in an appropriate indoor climate for future generations.

Well-earned Praise

For Hudson and his team at L.C. Anderson, the Congregational Library represented an interesting, challenging job that illustrates how the Design/Build delivery method can smoothly handle anything — even a century-old building filled with irreplaceable materials.

The company is enthusiastic that Contracting Business' judges rated their work as this year's top project in the always tough "Category A" of the Design/Build Awards. Yet the greatest reward came in a letter from Dr. Worthley shortly after the system was started up.

"The climate control system planned for and installed in the Congregational Library by L.C. Anderson has met every one of our expectations," Dr. Worthley wrote. "We knew that fitting all the elements of any such system into a cluttered space in a century old building without disrupting our operations was going to be a challenge. Yet your engineers and workmen managed the project neatly and efficiently, bringing it in on time and under budget, and at the same time taking care that no harm should come to our irreplaceable manuscripts, books, and artifacts.

"In sum, we are well satisfied with L.C. Anderson's work," Dr. Worthley concluded, "and thank you for a job well done."

Now that's a winner in anybody's book. ■

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