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THE GREEN LIBRARY

The challenge of environmental sustainability

DIE GRÜNE BIBLIOTHEK

Ökologische Nachhaltigkeit in der Praxis

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Green and growing

The impact of a LEED library on an organization's sustainable practices

**DE GRUYTER
SAUR**

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The impact of a LEED library on an organization's sustainable practices¹

Abstract: In 2009, the Church of Jesus Christ of Latter-day Saints opened a new library designed to meet the rigorous standards set by the U.S. Green Building Council for newly constructed facilities. The success of the project was officially recognized when the Church History Library received its Leadership in Energy and Environmental Design (LEED) certification. This paper will trace how building plans originally focused on preserving archival materials were expanded to address larger environmental concerns. Also explored will be the impact a single green facility can have on the sustainable practices of an entire organization. Topics covered will include the Church History Library, its mission and collections; the Leadership in Energy and Environmental Design programme; special environmental design characteristics of the Church History Library building; data on recycling efforts in the library and its parent organization; organizational impact of constructing a LEED-certified facility.

Zusammenfassung: Im Jahr 2009 eröffnete die Church of Jesus Christ of Latter-day Saints eine neue Bibliothek, deren Entwurf den strengen Standards des U.S. Green Building Council für neu errichtete Gebäude entsprach. Der Erfolg des Projektes wurde in der Öffentlichkeit wahrgenommen, als die Church History Library ihr Zertifikat Leadership in Energy and Environmental Design (LEED) erhielt. Dieser Beitrag zeichnet nach, wie Neubaupläne, die ursprünglich auf die Erhaltung von Archivmaterialien abzielten, erweitert wurden, um weiterreichende, umweltbezogene Anliegen einzubeziehen. Es wird ferner der Einfluss untersucht, den ein einzelnes grünes Gebäude auf die nachhaltigen Praktiken der ganzen Trägerorganisation haben kann. Behandelt werden der Auftrag und die Sammlungen der Church History Library, das Leadership in Energy and Environmental Design Programm, die auf Nachhaltigkeit bezogenen Spezifika im Entwurf für das Church History Library Gebäude, Daten zu den Recyclingmaßnahmen in der Bibliothek und ihrer Trägerorganisation sowie die Auswirkungen des Baus eines LEED zertifizierten Gebäudes auf die Trägerorganisation.

¹ This paper is an updated version of the authors' presentation at the 77th IFLA Conference in San Juan, Puerto Rico, 13–18 Aug 2011. <http://conference.ifla.org/past/ifla77/109-olsen-en.pdf>. Accessed on 16 January 2013.

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1 Introduction

Is there anything as contagious as the common cold? In our opinion, the answer is yes. Good ideas are just as contagious. At least that has been our experience working in research libraries for a combined 58 years. Recently, we observed again how good ideas could spread through an organization by observing changes originating from Church History Library in Salt Lake City.

In 2009, the Library moved into a new 230,000 sq.ft. facility with environmentally controlled storage vaults and spacious, well-equipped reading rooms. Conspicuous throughout the library were recycling containers for different types of waste. Over time, we became more and more impressed with how much effort had gone into creating a facility that was good for books, good for people, and good for the environment.

Through discussions with colleagues who described the planning of the Library, we were struck by the organic nature of the process. It seemed that good ideas for preserving documents had led to consequential decisions on environmental controls, which fostered an organizational commitment to rigorous international construction standards for green buildings. As library professionals, we felt that this story was worth sharing in the professional literature as one way of encouraging planners to listen to, and promote good ideas on, sustainable practices.

2 Background: The Church History Library

The Church History Library serves as the corporate library for the Church of Jesus Christ of Latter-day Saints (LDS Church), but it also has a broad mandate to collect, preserve, and share a record of the LDS, sometimes called Mormon, people. This mandate stretches back to the founding of the Church on 1 April 1830 when one of the first six members, Oliver Cowdery, began keeping records of Church meetings and activities. From that date until now, the history of the Church has been meticulously kept in everything from handwritten pioneer journals to video recordings of semi-annual Church conferences.



Fig. 15: The Church History Library building, Salt Lake City. © R. J. Olsen, C. McAfee.

Today, the Library holds a book collection of just under 300,000 volumes. While not impressive in terms of size compared to other research institutions, it is remarkably comprehensive in its coverage of everything having to do with the LDS Church. The majority of the Library's holdings are in manuscript form with over 150,000 collections of journals, diaries, and papers. This remarkable archive is continually expanding as Church members donate records of their ancestors or their own personal papers. In addition, the Library collects oral histories of prominent individuals, with over 5,000 in its holdings today.

As the corporate library for the Church of Jesus Christ of Latter-day Saints, the Library also collects histories of local ecclesiastical units all over the world and operates a records-management programme for the Church Headquarters in Salt Lake City. Corporate records include audio and video recordings of Church conferences and other events, with over 23,000 preserved recordings. The Library's photograph collection numbers more than 2.5 million images including the entire archive of the *Deseret News*, a local Salt Lake City newspaper that began publication in 1850. Lastly, the Library holds over 20,000 rolls of microfilm stored in vaults as preservation masters of important documents.

In 1856, the Library, housed in the LDS Church Historian's Office in Salt Lake City, was just a small collection of books and manuscripts. By 1917 the collection had grown to the point that it had to be relocated to an administration building and from there it was moved in 1972 to occupy an entire wing of a newly constructed Church Office Building. While that facility provided adequate space for the Library's collections, the environment it provided was that of an office building and not an archive. With no specialized temperature or humidity controls, an inadequate fire suppression system, seismic concerns, and floors loaded to or beyond capacity, it was only a matter of time before a new library would have to

be constructed. By 2003, LDS Church administrators authorized planning a new facility.

3 The building plan

In 2004, *Omni Group, Inc.* was engaged to assist with planning a new Church History Library facility and given a charge to “define [library] space and facility requirements which will support anticipated collection, service, and operational needs over the upcoming three decades” (Building program update 2004). The impressive plan drafted by Omni Group detailed the usual library-design features and code requirements but also explored the possibility of creating optimum environmental storage conditions for different document formats.

For example, the plan noted that the rate of deterioration for paper-based materials could be cut in half for every 18°F reduction in temperature. The plan also pointed out that controlling humidity was even more important than managing temperature and offered recommendations for temperature and humidity control for different document types and in different areas of the building. The recommendations, as summarized in an appendix to the plan, were as shown in Table 15.1 (Building program update 2004, 7.6–7.7).

Table 15.1: Recommendations on temperature and humidity control.

Format Type/Storage Location	Recommendation
Paper based/open stacks	72°F ± 4° and 30% ± 5% RH
Paper based/closed stacks	60°F ± 4° and 40% ± 5% RH
Paper based, rare/closed stacks	35°F ± 2° and 40% ± 3% RH
Photographs and film (black and white)/closed stacks	35°F ± 2° and 30% ± 3% RH
Photographs and film (color), nitrate, acetate film/closed stacks	25°F ± 2° and 30% ± 3% RH
Sound and video recordings (magnetic)/closed stacks	55°F ± 4° and 35% ± 5% RH

Recommendations for the closed stacks areas were later modified to provide increased protection from deterioration. The new recommendations specified 55°F and 35% RH for the paper and audio media in the collection with recommendations for photographic materials at –4°F and 30% RH.

With respect to minimizing deterioration from exposure to light, the plan recommended illuminating closed stack areas at only 10–30 foot-candles² and keeping the areas in the dark as much as possible. Consideration should even be given, according to the plan, to illuminating these areas with high-pressure sodium/high-density discharge fixtures configured to provide indirect lighting. The plan suggested that office and public areas be illuminated to 60–75 foot-candles but low-UV fluorescent tubes with screening sleeves should be installed.

A separate appendix to the plan was devoted to recommendations for protecting materials against airborne pollutants. Drawing on data from the *2003 ASHRAE Handbook* (2003),³ the plan specifically recommended filtering out six pollutants that may cause irreversible chemical damage to materials. The pollutants to be eliminated were acetic acid, hydrogen sulphide, nitrogen dioxide, ozone, sulphur dioxide, and PM2.5 fine particles. The goal set was to filter the pollutants so that the maximum average concentration of these damaging chemicals would not be realized for at least 100 years.

In considering filtration possibilities it was noted that a filtration system that allows recirculation of indoor air could reduce overall building operation costs. The proposed system was to use a potassium permanganate tube through which outside air could be filtered. The air would then pass through a final filter to remove any potassium permanganate dust before being recirculated as indoor air.

Saving energy costs and minimizing other future operational expenses had been raised elsewhere in the plan as well. For example, the section on planning and design guidelines included the following stipulation:

“The new facility ... should be designed and engineered with the goal of minimizing the total consumption of all forms of energy. As a means of achieving energy conservation objectives, architectural analyses should be conducted with regard to passive conservation methods (i. e. exterior wall and roof systems, glazing and weatherproofing, etc.); as well as direct methods related to lighting and power consumption and efficiencies of the HVAC systems of the facility.” (*Building program update 2004*, 76)

Later, as the plan considered interior furnishing, it argued for selecting materials that are non-toxic and require minimal maintenance. The plan stated:

“The determination of the interior décor of the new facility during the detailed building design process will be a matter of aesthetics, function and cost. Another factor that should

² Foot-candle: “A unit of light measurement – the amount of light produced by a one-candela light source at a distance from the source of one foot. It’s sort of an odd unit, as it combines metric and imperial units. One foot-candle is equivalent to 10.76 lux.” From: <http://photonotes.org/cgi-bin/entry.pl?id=Footcandle>. Accessed on 19 February 2013.

³ American Society of Heating, Refrigerating, and Air-Conditioning Engineers.

be given equal attention is the durability and resistance to wear of the specified interior materials and finishes. Products should be selected with the need for minimal maintenance as a high concern. Maintenance is an expensive and continuing budgetary item in any building, and therefore all reasonable means of reducing long-term maintenance costs should be pursued.”

“A further concern in the selection of interior finishes and materials bears upon the avoidance of toxic products detrimental to the occupants of the facility, as well as to the preservation of the holdings stored within. Careful research must be undertaken during the detailed building design process to assure a healthy environment for people and materials.” (*Building program update 2004*, 7.7)

Assuring a healthy environment for people and materials became a larger and larger part of facility planning as the project progressed. Linking environmental concerns to cost avoidance made the argument even more compelling. The search was on for building design solutions that were good for books, good for the environment, and good in terms of long-term cost savings for the organization.

4 LEED certification

Ground breaking for the new Church History Library was held in October 2005 but planning for the facility did not stop with the turn of ceremonial shovels. The project was pursued as a design/build effort, meaning that innumerable design decisions were being made even as the facility was under construction. Two of the decisions reached had a major impact on environmental features of the building and its future operations. The first of these, made mid-way through construction, was to seek LEED certification for the new Library making it the first building constructed by the LDS Church to be officially recognized as “green”.

LEED is an acronym for “Leadership in Energy and Environmental Design”. Launched in 1998 by the U.S. Green Building Council (USGBC), the LEED certification programme has become an internationally accepted method for verifying that buildings are planned and operated according to rigorous environmental standards. The stated goal of the LEED programme according to the USGBC website is to encourage “global adoption of sustainable green building and development practices through a suite of rating systems that recognize projects that implement strategies for better environmental and health performance”.⁴

4 www.usgbc.org/DisplayPage.aspx?CMSPageID=1750. Accessed on 20 January 2013.

At the time the Church History Library decided to seek LEED certification there were 69 points possible in the rating system.⁵ Points were awarded in six categories:

1. sustainable sites;
2. water efficiency;
3. energy and atmosphere;
4. materials and resources;
5. indoor environmental quality;
6. innovation and design processes.

To be LEED certified, a building project had to earn a minimum of 26 points. Facilities that were awarded 33–39 points were recognized as “Silver” buildings, with those scoring “39–51” ranked as Gold, and those over 52 as “Platinum”.

The choice to seek LEED certification influenced many design decisions made from that point forward. While it would be impossible to identify all of the decisions made with LEED certification in mind, Jonathan Dazley from MHTN Architects,⁶ one of the architects on the project, remembers efforts to ensure that the building’s envelope would be as tight as possible, that the HVAC system would include heat recovery, and that all mechanical systems would operate as efficiently as practical. These design features would eventually earn the Church History Library LEED points in the “energy and atmosphere” category and in addition, save the LDS Church money.

How much money would be saved was estimated by *Enermodal Engineering Inc.*,⁷ an independent firm hired by the LDS Church to perform a LEED energy analysis of the revised Library plan.⁸ Enermodal concluded that changes made to the original building plan would save over \$60,000 annually or approximately 33% in energy costs. The energy analysis developed by Enermodal was then submitted to LEED.

When the LEED evaluation of the Church History Library was performed in 2009 the building scored 36 points, enough to merit recognition as a Silver facility (see Table 15.2).⁹ The highest number of points awarded was in the “Indoor Environmental Quality” category, reflecting the Library’s sophisticated systems

⁵ Today there are 100 points possible in the rating system but the points are spread over the same categories.

⁶ www.mhtn.com/. Accessed on 19 February 2013.

⁷ www.enermodal.com/. Accessed on 19 February 2013.

⁸ *Final LEED Energy Analysis, Church History Library*. Salt Lake City, Utah: Enermodal Engineering, Inc. 26 March 2007, p. 3.

⁹ US Green Building Council. *LEED™ Scorecard, LDS Church History Library*. May 2009.

for controlling temperature and airborne pollutants. These systems had primarily been designed to protect library materials but what is good for books can also be good for people and good for the environment, as the LEED scoring proved.

Table 15.2: LEED Scoring of LDS Church History Library.

LEED Category	Possible Points	Library Score
Sustainable Site	14	7
Water Efficiency	5	2
Energy & Atmosphere	17	6
Materials & Resources	13	6
Indoor Environmental Quality	15	10
Innovation and Design Process	5	5
Total	69	36

5 LEED and recycling

A second decision, which was influenced by LEED certification, had to do with recycling. Well towards the end of the design/build process, a high-volume paper shredder from *Ameri-Shred, Inc.*¹⁰ and a horizontal compactor from *MaxPak*¹¹ were added to the facility. This equipment had the capacity to manage all of the Library's waste paper plus all of that generated in over 50 other buildings located at LDS Church headquarters. In addition, the new shredding equipment could process document types that had previously been reduced to a wet pulp and hauled to the landfill. Where the LDS Church had once paid landfill fees, it would now derive a modest income stream from recycling. LEED awarded the Library two points in the "Materials and Resources" category for its recycling programme.

Reports from *Rocky Mountain Recycling*,¹² the firm that purchases shredded paper from the LDS Church, show just how successful the paper-recycling programme became. Between 2007 and 2009, the LDS Church shipped an average of 33.32 tons of shredded paper to Rocky Mountain Recycling annually. In 2011, after the recycling programme was in full operation, the Church shipped 79.85 tons of paper or over twice the previous average.

¹⁰ www.ameri-shred.com/. Accessed on 19 February 2013.

¹¹ www.maxpak.cc. Accessed on 19 February 2013.

¹² www.rockymountainrecycling.com/. Accessed on 20 January 2013.

Table 15.3: Rocky Mountain Recycling Data, tons of material received from the LDS Church.¹³

Category	2007–2009	2007–2009 Average/Year	2011
Aluminum	0.56	0.19	0.57
Cardboard	260.27	86.76	146.94
Office paper	99.97	33.32	79.85
Total	360.80	120.27	227.36

In fairness, it should be noted that the 2011 increase in recycling cannot be attributed solely to the Church History Library’s shredding/compacting equipment. Other factors, such as the number of workers employed by the Church and sustainable practices at a Church printing facility, also contributed to the more robust recycling programme. These other factors, however, suggest a growing commitment on the part of the LDS Church and its employees to sustainable practices, as evidenced by increased shipments of aluminium and cardboard to Rocky Mountain Recycling. Growth in recycling of these products was due to additional shredding and compacting equipment purchased after the Church History Library was completed. The success of the Library’s recycling programme undoubtedly encouraged further investment in sustainable practices by the LDS Church.

6 LEED and health

Another LEED-driven decision for the new library was related to the health of individuals and the environment. Bicycle racks and a locker room with showers were incorporated into the new building as a means of encouraging staff to ride their bikes to work. This feature not only contributed to employee health but also decreased the impact of commuter automobile emissions on the environment. Use of the locker room and bike racks steadily grew after the Library opened, and, since the facilities were made available to all Church campus employees, offer further evidence of how sustainable practices in the Library spread to the larger organization.

¹³ *Shipping Statement for Corp. of the Presiding Bishop, 01/01/2007 to 12/31/2009; Shipping Statement for Corp. of the Presiding Bishop, 01/01/2011 to 12/31/2011.* Rocky Mountain Recycling.

7 Expectations and reality

As with any large project, there have been unanticipated problems related to the Library's environmental design. For example, within the first year of the Library opening, stains appeared on the building's exterior stone. Later studies showed that this was caused by a combination of two things. Because the Library's interior humidity was higher than the external air, there was a "push" of humidity towards the outside of the building. As the humidity passed through the stone, iron particles within the stone oxidized and this caused rust stains to appear. To resolve this issue, the exterior of the building was cleaned and then coated with a sealant to prevent the stains from reappearing. The exterior of the building is now being monitored for reoccurrence of the stains.

The oxidation problem was ultimately a symptom of an even larger problem. According to Charles Brown, the Library's Facilities Manager, the building's envelope did not provide an adequate vapour barrier between the interior and exterior walls. To eliminate this problem completely the building's envelope would have had to be upgraded, but that solution was cost-prohibitive. The facilities team worked hard to mitigate the issue by caulking and filling holes throughout the building to reduce air leakage. The leakage problem persisted for some time, however, making it difficult to control humidity, temperature, and pollutants. Fortunately, the facilities team eventually found a minimum level of positive air pressure that allowed for control of interior environments without losing too much air to the building's exterior.

Another setback in the Library's sustainable programme occurred when a rubberized belt in the building's paper shredder caught fire and smouldered. No smoke penetrated collection areas but this event brought to light two other concerns with the shredding process. Firstly, the shredder was designed to operate in a larger space than had been constructed. Secondly, the complete shredding operation was too large and sophisticated to be handled in the space allocated. In the end, the shredder was moved to different property owned by the Church in order to provide more space for the operation. The Library remains, however, the central point for gathering recyclables and the LDS Church's commitment to recycling was not diminished.

8 Conclusion

Despite some problems with its building design and recycling programme, the completed Church History Library is a remarkable facility. Preservation condi-

tions in its storage vaults actually exceed those recommended in its initial building plan. Ten vaults are maintained at 55°F and 35% RH with two other vaults kept at -4°F and 30% RH. The building's filtration system meets the requirements specified in the building plan, ensuring a healthy environment for books, employees, and library patrons. Lighting in office areas and storage rooms throughout the building are motion activated and window shades are computer controlled to manage heat gain and minimize UV damage. Landscaping around the facility utilizes xeriscaping to conserve water in Utah's desert climate. The new Library merits its LEED certification and deserves recognition as a superbly designed facility for long-term preservation of archival materials.

The success of the project can be partially attributed, we believe, to the phenomenon we noted at the outset of this paper. Good ideas spread as fast as the common cold. The first good idea that influenced the project was a fundamental commitment to conservation of resources. In the LDS Church, this commitment stretches back to its 19th-century founder, Joseph Smith, who reportedly instructed members, "... not to kill a serpent, a bird, or an animal of any kind ... unless it became necessary to preserve ourselves from hunger." (Roberts 1904, 72)

Ongoing commitment to environmentally responsible practices has been evident in LDS buildings for years. Jared Doxey, Director of Architecture, Engineering, and Construction for the LDS Church, estimates that Church buildings constructed prior to LEED probably still met 80% of the requirements for certification. Given this prior institutional commitment, it is easy to understand how good ideas for preserving documents sparked ambitious plans to meet LEED certification standards. The decision to pursue LEED certification was probably also influenced by local civic leaders.

In 2005, Salt Lake City mayor Rocky Anderson issued an executive order directing that all new or significantly remodelled municipal buildings meet LEED Silver certification standards (Snyder 2005a). Later that year, he challenged LDS Church leaders to adopt LEED standards for Church construction projects. (Snyder 2005b). Then in November 2006, the Salt Lake City Council passed an ordinance requiring that city-funded construction merit a "Certified" or "Silver" LEED designation.¹⁴

The "Salt Lake City Ordinance" and statements by the Mayor came just as construction on the Church History Library was getting underway. Since Library building plans already called for strict environmental controls and operational

¹⁴ Salt Lake City Ordinance No. 78 of 2006. An Ordinance Enacting Title 18, Chapter 25, Salt Lake City Code, Requiring LEED Certification for Certain City-Funded Construction. Passed by the City Council of Salt Lake City, Utah, 7 November 2006. www.usgbc.org/ShowFile.aspx?DocumentID=2266. Accessed on 25 March 2013.

efficiencies, embracing LEED was the next logical step for building planners and it was consistent with the LDS Church's commitment to being a responsible member of the local community.

Where will the good ideas lead next? The Church History Library is aggressively pursuing a digital preservation system to ensure the long-term survival of born-digital documents as well as digitized versions of rare, fragile and high-use materials. This effort may extend the life of the existing building by reducing the demand for additional storage space. In terms of LEED, the LDS Church is prototyping five new chapel designs that will probably be certified, with three of the designs being solar powered. The Church History Library may have been the first "green" building constructed by the LDS Church but it is likely that many more will now follow. The message to take away from this story for librarians and building planners should be, never underestimate how far a good idea can take you, particularly when it comes to sustainable practices.

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