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APRIL 14, 2010 | In-Depth Technology for Radio Engineers | $2.50 | RADIOWORLD.COM

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Sustainable Facilities and LEED Certification: A Broadcaster's Guide

Green Design Principles Form The Core of Rating System and Offer Long-Term Benefits

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"How will green and sustainable building construction requirements affect my facility development plans?"

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This is a question all broadcasters should be asking themselves right now. There exists an amalgam of codes and regulations that have been separately administered by a variety of governmental agencies, which address energy efficiency, water conservation, toxic materials, transportation, waste management and even historical/cultural factors.

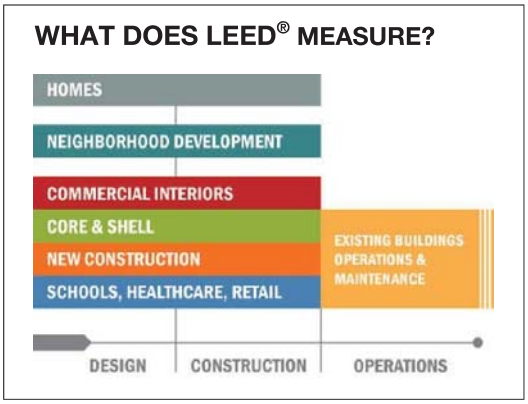

Fig. 1: LEED Systems and Areas of Measurement

Sustainable Design has emerged as a cohesive strategy and a unifying concept for all of the above. The trend is toward a mandated solution under the umbrella of Sustainability, bundling the environmental, energy and occupant regulations under it.

Today the evolution of Sustainable Design has matured to the point of codification. States, municipalities and government agencies are mandating a standard of "Green" design for the construction projects in their jurisdictions. Legislative bodies have been busy at all governmental levels framing this type of legislation.

While many of the drivers are of a sociopolitical nature, Sustainability has behind it an unprecedented economic force. The economic drivers of energy savings are obvious: at the individual consumer/user level, lowering consumption provides a direct benefit — lower cost. Sustainable design focuses,

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Modern VHF Signal Measurement Techniques At NPR Labs

BY JOHN KEAN

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Field strength measurements are almost as old as radio itself, as engineers have endeavored to test and

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improve their RF transmission systems. Despite generations of advancement in radio, however, the principles applied to field strength measurement for broadcast have not changed much.

Today's requirements of receiving antennas, detection and filtering, recording and statistical analysis have their basis in principles developed almost three quarters of a century ago. This article discusses some techniques developed by NPR Labs to make FM broadcast field measurements faster, easier and potentially more accurate.

VHF field strength measurements were commonplace at the dawn of television: Every new TV station had to conduct "license proof of performance"

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additionally, on the economies of the region, highlighting the impact of individuals' planning on the overall building environment, especially in areas of high municipal costs of infrastructure and energy generation.

As we look at the move toward a cohesive — and mandatory — degree of Sustainable Design compliance for projects, it is less important for broadcasters to know the ever-evolving details and more important that they concentrate on the concepts driving the requirements.

So as we begin this road to codification of what have been separate requirements by various agencies, what can we expect?

We can expect requirements that are very similar to what LEED certification entails. Unlike building and zoning codes, which painstakingly spell out what you may or may not do, Sustainability will have a few obligatory requirements and then a broad range of choices in a few environmental categories with very specific requirements to achieve certification for each.

"Various LEED initiatives — including legislation, executive orders, resolutions, ordinances, policies and incentives — are found in 45 states, including 201 localities (137 cities, 36 counties and 28 towns), 34 state governments, 14 federal agencies or departments, 17 public school jurisdictions and 41 institutions of higher education across the United States." [Ref. 1]

WHAT IS LEED?

*"**LEED** green building certification program is a voluntary, consensus-based national rating system for buildings designed, constructed and operated for improved environmental and human health performance."* [Ref. 2]

This is the definition provided by U. S. Green Building Council, a non-profit organization comprising 18,000 organizations from all aspects of the building industry.

USGBC developed the LEED rating system. It was introduced about 10 years ago, and its latest version, v3.0, was released in 2009. It is an evolving system based on feedback from implementation and refinement based on evolving technology and socioeconomic issues. It is the most popular and recognized rating system — up to the 2009 version 3.0, almost 28,000 projects totaling over 6 billion square feet of gross area had been registered. [Ref. 3] It is important to note that only a fraction of all those projects actually end up being certified (about 20 percent).

There are several versions of the LEED green building rating system according to building/project type. The three that are applicable to broadcasters are **New Construction** for new buildings and major renovations, **Existing Building, Operations & Maintenance** for certification of ongoing facilities providing entry level certification and **Commercial Interiors** for tenant-type work where the applicant does not control the whole building.

At its core, LEED measures performance, then rates it into four levels: **Certified**, 40–49 points; **Silver**, 50–59 points; **Gold**, 60–79 points; and **Platinum**, 80 points and above.

It is estimated that Americans spend about 90 percent of their day indoors, where adhesives, sealants and lack of fresh air conspire to create a toxic 'soup' that has been directly linked to absenteeism and other workplace maladies.

WHAT DOES LEED MEASURE?

Think of the LEED rating system as a label that immediately lets anyone know the "ingredients" that make up a building's or leasehold's content and its performance.

There are seven areas or categories that it measures, and within these there are a series of *credits,* which are awarded *points* according to success in fulfilling the requirements. Two categories are, in my mind, the underpinning of the five environmental categories.

The first, **Regional Priority**, is the newest category, and addresses issues that are most important locally for each region of the country as prioritized by USGBC chapters and members. Thinking locally is at the core of sensible building, and this category encourages that by providing up to 4 bonus points.

The second, **Innovation in Design**, provides up to 6 bonus points for projects that use creative technologies and strategies to provide performance solutions that are more than those required by other LEED credits or new strategy solutions not found elsewhere in LEED. This credit category also rewards projects for including a LEED Accredited Professional on the team to ensure a synergistic, integrated approach to the design and construction phase.

Fig. 2: LEED Categories

The five *environmental categories* are the core of the performance criteria, and like branches of a tree, different credits are closely related between the categories in such a way that gaining points in one credit will make a contribution towards another. There is a maximum total of 100 points, which can be achieved in the environmental categories. The breakdown per category varies slightly depending on the LEED system applied. For the sake of simplicity, the points per category provided are for the New Construction and Major Project (NC) system. Every LEED category credit is followed by a set of *options*; these provide great flexibility by allowing a variety of approaches to achieve the desired points for a credit.

Sustainable Sites (SS):

Choosing a broadcaster's building site — whether a new building, existing or a tenant space — is the first step toward a "green" project. The Sustainable Sites category discourages development on previously undeveloped land; minimizes a building's impact on ecosystems and waterways; encourages regionally appropriate landscaping; rewards smart transportation choices; controls storm water runoff; and reduces erosion, light pollution, heat island effect and construction related pollution. This category has a total of 26 points available. It is important to note that this category also applies for Commercial Interior (CI) LEED system candidates (21 possible points), and it both makes sense and is a simple and economical way to achieve points. All you have to do is make sure that the criteria for SS are part of your search for a new leasehold.

Water Efficiency (WE):

Buildings are major users of our potable water supply. Broadcast buildings face typical consumption issues, and can achieve water reduction through more efficient faucets, fixtures and fittings inside and water-wise landscaping outside. Additionally, many larger facilities have cooling towers for chilled water air conditioning systems, which consume proportionally more water than an office building occupancy. A system of reclaiming "grey" water to provide make-up water is a good example of how additional savings opportunities can be developed. This category has a total of 10 points available.

Energy and Atmosphere (EA):

Broadcasters, perhaps even more than general consumers, equate Sustainability with cutting back on energy consumption — and perhaps with good reason. Broadcast facilities are very dependent on power; whether it is for lighting a TV production studio, a room full of racks or a transmitter, you need power. Buildings use 39 percent of the energy and 74 percent of the electricity produced each year in the United States. [Ref. 4] This category encourages many varieties of energy strategies that will appeal to broadcasters: commissioning; energy use monitoring; efficient design

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and construction; efficient equipment, systems and lighting; the use of renewable and clean sources of energy, generated on-site or off-site; and other innovative strategies. We will come back to this category later on as it is very important; however, note that this category has 35 possible points — the most of any category — yet it's only about one-third of the possible points.

Materials and Resources (MR):

The process of building and operating a building uses a lot of materials and resources, and it creates waste. This is something that is painfully obvious to broadcasters who have to upgrade facilities because of changes in technology and the evolution of the industry. At the same time, they have been pioneers in repurposing buildings to suit their needs. This credit category encourages the re-use of existing construction, selection of local materials, use of renewable materials and mandates collection of recyclables. It promotes the reduction of waste, and it takes into account the reduction of waste at a product's source. This category provides 14 possible points.

Indoor Environmental Quality (IEQ):

The quality of our indoor air is something that affects all of us across all occupancies and pay scales. It is estimated that Americans spend about 90 percent of their day indoors, [Ref. 5] where adhesives, sealants and lack of fresh air conspire to create a toxic "soup" that has been directly linked to absenteeism and other workplace maladies. Another part of IEQ has to do with thermal comfort and day lighting issues that, when solved correctly, have the potential to contribute toward energy savings. The Indoor Environmental Quality category promotes strategies that in general control every aspect of the interior environment. This category has 15 possible points (17 for the LEED System for Commercial Interiors).

WHAT DOES LEED DELIVER AND HOW?

Third-party certification through the Green Building Certification Institute is the result. GBCI is an independent party that guarantees, along with its ISO compliance certifying partners, that a rigorous process has been followed, ensuring the "consistency, capacity and integrity of the LEED certification process." [Ref. 6]

GBCI was specifically organized to provide ANSI/ISO/IEC 17024 in 2009, and is therefore a new development in the LEED process. Additionally it provides professional accreditation and manages the Credentialing Maintenance Program for professionals.

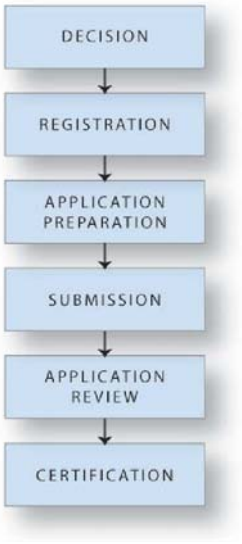

Fig. 3: LEED Process Overview

The procedure to achieve Project Certification is simple, easy to follow and heavily supported by online tools. The first step is to make sure your project meets the Minimum Program Requirements (MPR) for acceptance as a LEED project. This will become important as Sustainability grows into a coherent mandated set of requirements. Once certain of meeting the MPR, it is recommended that you carefully articulate the reasons (whether mandated or voluntary) why LEED certification is sought, first by the system type (New Construction, Commercial Interiors, etc.), and then initial performance level (Certified, Silver, Gold or Platinum).

LEED is definitely a team effort; it is a collaborative process, requiring the coordination of all the stakeholders in the project in order to reach the most preliminary LEED **Decision**.

Broadcasters as a user group have a unique advantage insofar as most of their significant projects require substantial collaboration teams. These teams include owners, designers and builders working together with well-defined success criteria and, many times, the experience of working together to deliver projects. This integration of needs and expertise, when led correctly, will yield a systems-oriented approach to design solutions that will capitalize on the synergies and improve the overall performance of the project.

The first tool the project team will use is the Credit Checklist, which is one of the tools provided for download as a preformatted spreadsheet (see sample in next page). This list provides three categories for each achievable point: "yes," "?" or "no." In the checklist of

LEED 2009 for New Construction and Major Renovation
Project Checklist
Project Name New Building Urban low-rise
Date: April 2010

Y	?	N				
17	4	0	**Sustainable Sites**	**Possible Points: 26**		**Comments**
Y			Prereq 1	Construction Activity Pollution Prevention		
1			Credit 1	Site Selection	1	It s an appropiate site by definition
5			Credit 2	Development Density and Community Connectivity	5	site meets Option 2 of Req.
	1		Credit 3	Brownfield Redevelopment	1	we will have to verify
6			Credit 4.1	Alternative Transportation - Public Transportation Access	6	we meet Option 2 for Bus stop proximity
	1		Credit 4.2	Alternative Transportation - Bicycle Storage and Changing Rooms	1	We may be able to work into plan
		0	Credit 4.3	Alternative Transportation - Low-Emitting and Fuel-Efficient Vehicles	3	Parking is problematic
2			Credit 4.4	Alternative Transportation - Parking Capacity	2	We meet this requirement because our parking is less than the minimum zoning allows
		0	Credit 5.1	Site Development - Protect or Restore Habitat	1	This will be very difficult at this location even with a green roof
	1		Credit 5.2	Site Development - Maximize Open Space	1	We may be able to achieve this by applying pedestrian oriented hardscape areas at 25%
1			Credit 6.1	Stormwater Design - Quantity Control	1	We can achieve this because the area had exisitng impervious greater than 50%
	1		Credit 6.2	Stormwater Design - Quality Control	1	Conduct cost benefit of treating run off for make up cooling tower water.
		0	Credit 7.1	Heat Island Effect - Non-roof	1	We will nor be able to achieve this
1			Credit 7.2	Heat Island Effect - Roof	1	Roofing material with SRI acceptable material
1			Credit 8	Light Pollution Reduction	1	We can fulfill requirement
6	0	0	**Water Efficiency**	**Possible Points: 10**		**Comments**
Y			Prereq 1	Water Use Reduction - 20% Reduction		
4			Credit 1	Water Efficient Landscaping	2 to 4	
				Reduce by 50%	2	
				x No Portable Water Use or Irrigation	4	We don't plan on irrigating

Fig. 4: Sample LEED Process Checklist

credits there will also be *Prerequisites* for each of the five environmental categories measured by LEED. These are all mandatory and must be complied with in order to obtain certification; failure to follow any one of them will exclude your project in its totality.

By environmental category the credits are:

1. Sustainable Sites
   a. Construction Activity Pollution Prevention

2. Water Efficiency
   a. Water Use Reduction

Energy and Atmosphere
   a. Fundamental Commissioning of Building Energy Systems
   b. Minimum Energy Performance
   c. Fundamental Refrigerant Management

Material and Resources
   a. Storage and Collection of Recyclables

Indoor Environmental Quality
   a. Minimum Indoor Air Quality Performance
   b. Environmental Tobacco Smoke Control

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The team will conduct an initial pass to identify the readily achievable (yes) and the maybe achievable (?) and the points that in their opinion are difficult for the project to achieve (no). Each point should have comments to clarify the reasons. The Project leader should organize a working meeting to discuss the Credit Checklist with the whole team and make final determinations on the achievability of a particular number of total certification points. These final recommendations for approval to ownership of the project should be conservative in the likelihood of achieving the necessary points and should be the result of the synergistic input of the whole team including Administrative, Design, Budgeting and Implementation.

Registration is the next step, and it is the process by which the project ownership officially requests certification and the team establishes contact with GBCI and receives access to the online tools. The project is registered by an individual who becomes the Project Administrator to GBCI. All other team members have access and can enter information; however, they are listed as users and their capacity to administer is limited. The Project Administrator can be changed at any time. To register the project, two fees must be paid up front. The fees are a Project Registration Fee (USGBC Members: $450; Non-Members: $600) and a Project Certification Fee. Preparing the Application involves providing basic project and team information.

Application includes the documentation required to fulfill the Prerequisites and each individual credit in the Project Checklist. As each of them is different, for the sake of this paper the important point is that there are many tools including templates, off-line calculators with formulas, forms and guidance to make the process efficient, standardized and simple. These documents are to be reviewed for completeness and are uploaded by team members.

Submission of the Application can only be done by the Project Administrator and requires payment of the Certification Review fees.

The Certification fees vary by the rating system and the size of the project. For example, for New Construction or Commercial Interiors, non-members pay $2,250 for projects under 50,000 square feet and ten times that for projects over 500,000 square feet, with projects in between paying $0.45 per square foot. We refer to them as fees (plural) because there is a Design Review fee and a Construction Review fee.

The **Review** process has two options: one whereby the Design Review and Construction Review are split and the other where they are combined. A split Design and Construction review allows for four review phases (a preliminary and a final for each). When they are combined, the review is done in two phases — one for Design and the other for Construction. Splitting the Design and Construction has the advantage that you get the value of preliminary feedback in the form of technical advice in a way that can be adjusted with the least amount of turbulence. The result of Preliminary Review is that each point submitted is evaluated and ruled as "anticipated," "pending" or "denied." Final reviews result in "awarded" or "denied," with only the Appeal Review process at the team's disposal — at $500 for each credit.

The final step is **Certification**, and you will receive a certificate.

LEED FOR BROADCASTERS?

Broadcasters as a "use group" for a building use are much less definable than say Retail or Office uses. A broadcast use will be typically composed in varying proportions of three space types; **office**, **technical** and **content creation**. The proportions of which can vary wildly depending on the project, the media and even the business plan. While the LEED energy related points are about 1/3 of the total, their potential operational cost benefit is a big driver. LEED as a performance measuring tool is a great way to guarantee your project is built to a consistent yet flexible level across the board regardless of your mix or scale of project. It is also a safe bet that it will be performing at substantially higher level than a comparable building designed without LEED.

Broadcasters with projects involving **office** space should be implementing some of the tried and true solutions available, while at the same time making sure those solutions are in keeping with long terms goals and objectives. For example under-floor air distribution has been shown to cut down on cooling energy costs by 20 to 30 percent [Ref. 7], at the same time you are buying flexibility for future modification of a space. The cost delta between overhead air distribution and under-floor can vary by region, ratio of open to enclosed spaces and scale; however once you factor in all the costs including electrical distribution, it is very close. The first time you reconfigure the space it will be like cashing a check — and no sheet metal will go into a dumpster.

The **technical** space aspect of a broadcast operation is heavily dependent on good quality, reliable energy. Whether the area is a peopled tech space such as a control room or a largely unoccupied space as a rack room, it is a heavy consumer of power and therefore cooling — which requires power. As far as power is concerned, evaluation of project sustainability will be based on ANSI/ASHRAE/IESNA Standard 90.1-2007. The Prerequisite for Minimum Energy

Content capture spaces are unique to media facilities, and also play a substantial role in the energy profile for modeling.

Performance is best fulfilled by Broadcasters with *Option 1 — Whole Building Simulation* and you have to demonstrate that the building is 10 percent more efficient if new and 5 percent if existing. The baseline is the key in this comparison and as there is no ASHRAE defined "Broadcast Building" type, the baseline is a measurement of an existing facility or your own comparable occupancy. This measurement is done through energy modeling. It should be noted that, like broadcasters, occupancies such as data centers lack a defined LEED system; however in 2009 Citigroup inaugurated a "Platinum" rated data center facility. [Ref. 8]

Beyond the Prerequisite the largest single point amount is in the Optimize Energy Performance credit with up to 19 points, or about 20 percent of the credits. This is done by additional percentages of savings being matched proportionally with points.

Content capture spaces are unique to media facilities, and also play a substantial role in the energy profile for modeling. These types of spaces can vary greatly, from large TV Studios to Radio Studios. Yet they share a common factor; that the lighting generates either a significant or the most significant load. To achieve substantial savings, broadcasters will have to commit to modern lighting design solutions that lower the watts / sq. ft. for the space and therefore the dissipated heat load upon which the cooling will be based.

CONCEPTS VS. DETAILS

There is a substantial amount of detail involved in a broadcast project. Many will view participation in the design of Sustainable Facilities with trepidation — whether required by corporate or mandated by the state. It is unfamiliar and adds another layer of details to what is already a challenge. Sustainability, however, should be approached as a *concept* first, to which a variety of solutions can be applied to suit your project needs. Therefore "think," and Sustainable Design will be a process you will come to value.

Think *long-term:* Do cost benefit analysis, life cycle analysis.

Think *holistically:* Interdependency of systems is the key to success.

Think *collaborative:* Team solutions translate to better designed facilities.

Think *innovation:* Every project has it challenges — and opportunities.

Think *engineering:* Start with calculations such as dissipation and diversification of loads.

Think *economic:* The rebate incentives are very attractive beyond the mandated performance.

Think *innovatively*: Be guided by the "think" concepts above.

This paper was presented at the 2010 NAB Broadcast Engineering Conference by Antonio Argibay, AIA, LEED AP Meridian Design Associates, Architects, P.C.

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