

## The Green Building Reference Guide

### Executive Summary

The Green Building Reference Guide is a website created to address the issues and requirements associated with green building projects. It is designed to assist construction professionals by organizing resources and information pertinent to a sustainable / LEED rated project's management and successful completion. These goals are accomplished through its simple navigation format and targeted content.

While a multitude of available resources on sustainable / LEED buildings exists, the majority of this information is geared towards design professionals rather than construction professionals. Given this condition, research and surveys were conducted, indicating that a comprehensive database of resources would be a valuable tool for the industry.

Based on research results, and through consultations with construction professionals, the GBRG was divided into five main topics: Material Procurement, Site Management, Waste Management, Indoor Environmental Quality, and Commissioning. Each main topic was further divided into subtopics which contain individual links to online resources. Rather than containing information within itself, the website is essentially a database of links to other sustainable and LEED rated construction websites.

While the guide was designed to address the needs of general contractors, project managers, and other professionals, it is not intended to be exclusive to these groups. The guide can be of benefit to both builders and designers alike.

Considering the potential benefits, initial user feedback was obtained to test the viability of the website. The overall positive response indicated that the website could indeed benefit the industry.

By making the GBRG available online with routine maintenance, it has the ability of becoming a valuable reference tool in the expanding world of green construction.

## Research & Analysis Introduction

### *Overview:*

As The Navy League will be Arlington's first LEED rated office building, sustainable design components and methods are a clear choice for research. To achieve its 'Silver' LEED rating, the project must be carefully planned not only in terms of design features and components, but also the acquisition of these components and their use.

Considering that higher costs and more detailed planning may be associated with sustainable LEED construction, research questions can be developed using The Navy League Building as a basis for information. The underlying issue to address is the burden of sustainable design and LEED ratings on projects. Specifically, how can general contractors, construction managers, and other building professionals working on sustainable / LEED rated projects avoid unnecessary costs and delays through proper planning tools?

To address their difficulties and management questions, a reference guide was created in the form of a website (HTML document). The content and functionality of the website was determined through in depth research on the materials and management processes used on sustainable / LEED projects.

### *Analysis Outline:*

The basic steps of the website's creation are outlined below:

- Conducted preliminary research into LEED point system using text and internet-based sources
- Created and distributed surveys to industry professionals, building owners, and faculty among others
- Compiled, summarized, and organized resources into a logical graphic format for use online

### *Goal:*

The overall goal of creating a reference guide is to provide an up-to-date list of reference sources in a straightforward and easily accessible format. While there exists a multitude of available resources on sustainable / LEED buildings, the majority of this information is geared towards design professionals rather than construction professionals. The website created from the research will be dedicated to assisting construction professionals. The more information available to builders of sustainable projects, the better the chances for their success.

## Sustainable & LEED Construction Survey

### Overview

To assist in the development of the reference guide, a sustainable design and LEED rated construction survey was distributed to industry professionals. The survey (found in the appendix on page 69) asked participants to describe some of the challenges they faced and list potential risks of green building projects. Participants were also asked their opinions on the usefulness of a reference guide specifically designed to assist the construction industry.

In general, this survey data was intended to make the reference guide as practical and useful to builders as possible.

### Survey Results

Survey results were obtained from individuals working for the general contractor and subcontractors on the Navy League Building. In total, six survey forms were completed and returned. While the amount of collected data is limited, the survey did provide some direction towards development of the reference guide. A selected question and a few of the responses are listed below.

**Survey Question:** Do you believe a reference tool or guide outlining the potential cost, schedule, coordination, and other construction management issues in relation to sustainable / LEED design would be of benefit to construction professionals?

**Responses:** “Yes, (a guide) may give owners a real view of what its all about”  
– M.E.P. design professional

“Yes, any type of system that outlines potential risks is beneficial”  
– General contractor

“Yes, the knowledge is still limited in the field. This would help new people catch up faster”  
– General contractor

### Applications of Survey

If nothing else, the survey results proved that creation of an online reference guide would be of benefit to green construction professionals. With proper development, the guide can become an outlet for industry resources and assist individuals unfamiliar with sustainable / LEED construction practices.

## Reference Guide Development

### Form

The internet has revolutionized the industrial world with its communication and information network capabilities. Given this easily accessible platform, the Green Building Reference Guide (GBRG) is designed in HTML (Hypertext Markup Language) format in order to be made available online for use by any building professional. Unlike printed material, the reference guide is intended to be free, updated regularly, and readily available to anyone with a computer and internet connection.

In general, the GBRG is designed to assist construction professionals by organizing resources and information pertinent to the management and successful completion of green building projects. Rather than containing information within itself, the website is essentially a database of links to other sustainable and LEED rated construction websites.

The difference between the GBRG and other sites is though its targeted organization and direct format. The GBRG is divided into five main topics: Material Procurement, Site Management, Waste Management, Indoor Environmental Quality, and Commissioning. Each main topic is further divided into subtopics which contain individual links to online resources. Main topics and subtopics were selected based on research and through consultations with construction professionals.

Specifically, the website provides links to a variety of information such as moisture intrusion, waste avoidance, and commissioning practices among others. The common theme between the topics is that project managers may be required to use the information on sustainable and LEED rated construction projects. By using the GBRG, construction professionals can quickly and easily find desired topics rather than wading through a plethora of unrelated information and search results.

### Function

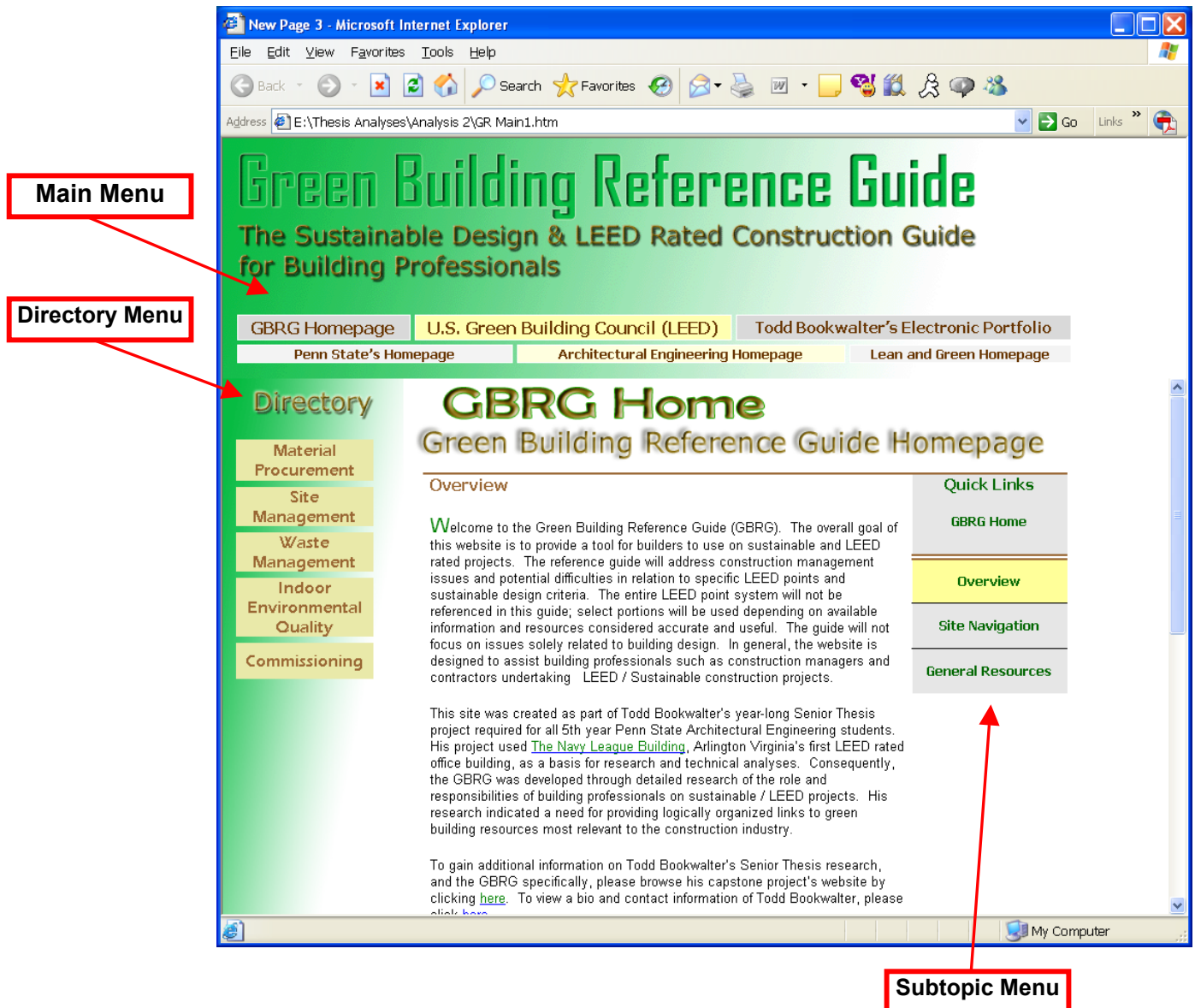
The GBRG appears and functions similar to many websites, but with little fanfare. The main page is divided into separate frames featuring navigation menus and the content page window. As seen in the image on the following page, a header and navigation bar contains links to A.E. Senior Thesis related sites as well as the GBRG homepage. The homepage provides viewers with a brief introduction to the guide, its navigation techniques, and a list of comprehensive resources on sustainable and LEED construction.

Underneath and to the left of the header, the directory menu contains links to the five main topics of the guide. Clicking on a box brings up the home page for the associated topic.

## Reference Guide Development (Continued)

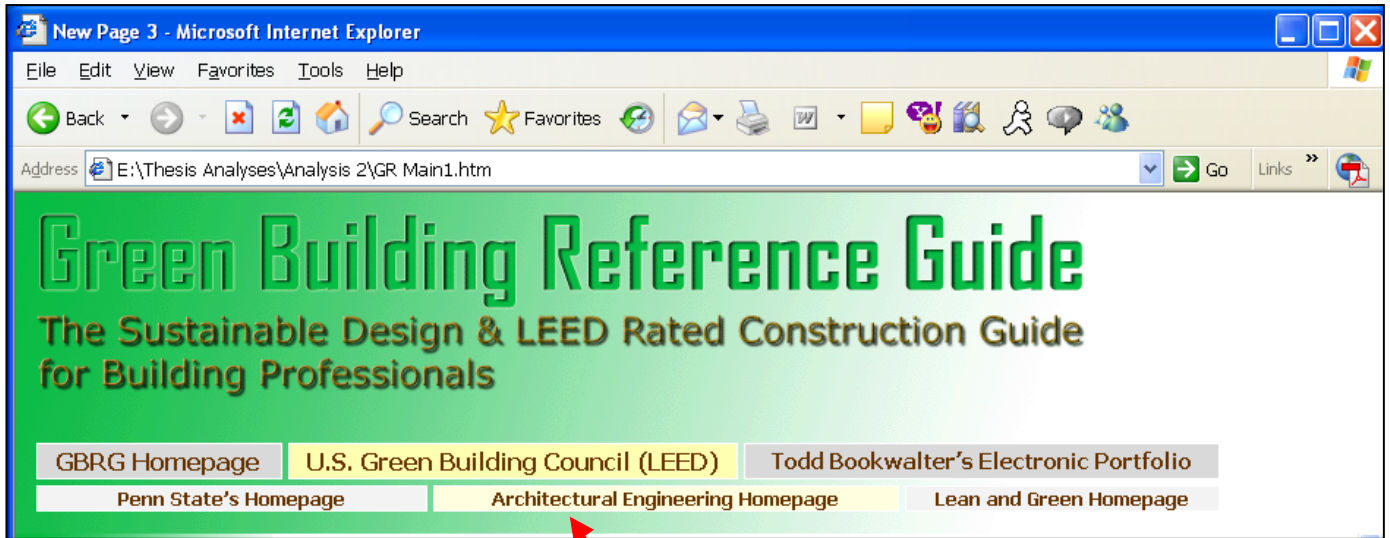
Each topic homepage contains a brief overview of the topic and its relevance to green building construction. To the right of the homepage, a smaller navigation menu features the subtopics and the links to their individual content pages. The subtopic navigation menu allows users to see which page they are viewing out of all available for that category. Both the main topic and subtopic menus allow quick access to alternate topics without going back through previously viewed pages.

Image of the Green Building Reference Guide Main Homepage



Reference Guide Development (Continued)

Enlarged Images of the GBRG Menus

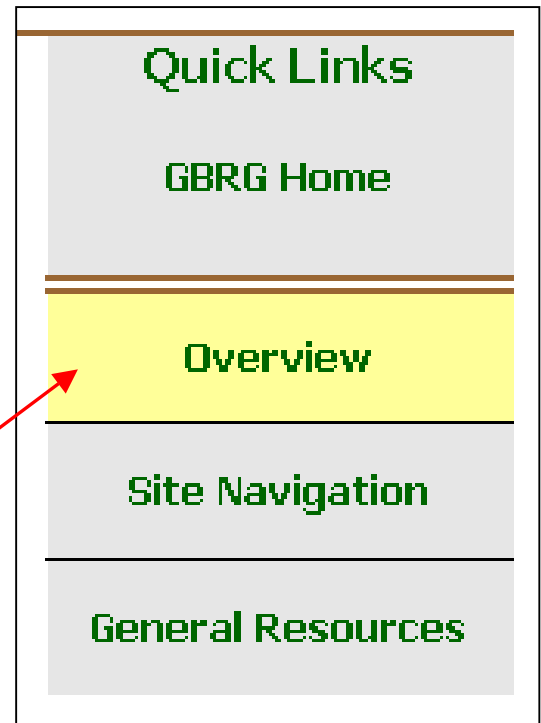


**Header and Main Menu**



**Directory Menu**  
Boxes are links

**Subtopic Menu**  
Subtopics highlighted in yellow corresponding to page on-screen



## Reference Guide Development (Continued)

With the straightforward menu system, users can access their desired content pages quickly and easily. Upon arriving at a content page, users find a simple list of resource links available for the subtopic. The title of each resource, containing the link itself, is provided along with the company or organization that maintains the website. To further enhance the ease of navigation, all resource links open in new browser windows so that users may reference back to the GBRG.

Image of the 'Recycling' Subtopic Content Page  
(under the Waste Management main topic)

The screenshot shows a web page titled "Green Building Reference Guide Waste Management". Under the "Recycling" subtopic, there is a section for "Online Information Sources". The first link is "Ways to [Make Your Recycling Program Successful](#), from the King County Solid Waste Division." The second link is "[Recycling Economics Sample Worksheet](#), Produced by Seattle / King County." The third link is "[Building Materials Reuse Association](#). As stated on the website, the Building Materials Reuse Association (BMRA) "is a non-profit, membership based organization that represents companies and organizations involved in the acquisition and / or redistribution of used building materials." The fourth link is "The [Construction Materials Recycling Association](#) is "first association devoted exclusively to the needs of the rapidly expanding North American construction waste & demolition debris processing and recycling industry". The fifth link is "The [Construction Waste Management Database](#), is a nationwide listing of companies that haul, process, and collect recyclable debris from construction sites." On the right side of the page, there is a vertical navigation menu with the following items: "Navigation", "Waste Management", "Overview", "Waste Avoidance", "Packaging Waste", "Waste Removal", and "Recycling". The "Recycling" item is highlighted in yellow. A red box highlights the link "The [Construction Waste Management Database](#)" in the text, with an arrow pointing to a red box at the bottom of the page.

**Resource Title and Link**  
Links open resource website in new browser window

## Reference Guide Development (Continued)

### Content

The intended benefit of the Green Building Reference Guide can be illustrated by the content contained within. The site was designed to be maintained on a regular basis and updated with new information. Each subtopic may be expanded with new resource websites as they are discovered and developed. Furthermore, new topics and subtopics can be created depending on industry trends as well user input. As stated on the homepage, the GBRG welcomes comments and improvement suggestions from users to make the guide a more helpful reference tool.

Each website linked in the guide was reviewed in terms of its information content and applicability to the subtopic. Websites focusing solely on design issues or providing limited information on the topic were not included in the resource lists. By containing filtered content, the GBRG will allow building professionals quick access to the most detailed resources and can decrease productivity losses from unnecessary searches.

The five main topics of the guide, **Material Procurement, Site Management, Waste Management, Indoor Environmental Quality, and Commissioning**, are essential issues to builders of sustainable and LEED rated projects. Considering time constraints and development of other Senior Thesis analysis topics, it was decided to narrow the scope of the GBRG's resource lists under these topics\*. Therefore, the main topics of Waste Management and Indoor Environmental Quality were researched and developed to provide a sample of the GBRG's content if it is ever made fully operational.

\*Note: A site map of the GBRG is located in Appendix C.

### *Waste Management:*

Waste management is a key issue to insure sustainable and LEED rated projects are successful. Careful planning of construction waste products and detailed documentation of how the waste is handled are of utmost importance. To address the multiple aspects of waste management, this section of the site is divided into the topics listed below:

- Waste Avoidance
- Packaging Waste
- Waste Removal
- Recycling

Waste avoidance measures can be an easily overlooked topic on construction sites. By implementing some simple guidelines and practices, project managers can reduce unnecessary waste from construction and demolition activities. This



## Reference Guide Development (Continued)

section contains links to resources such as a list of guidelines for the proper handling and storage of gypsum wallboard, and “Building Savings: Strategies for Waste Reduction of Debris from Buildings” by the U.S. Environmental Protection Agency.

The section entitled ‘Packaging Waste’ is another topic to be considered by construction professionals. In many instances, excessive construction wastes can be reduced through efficient packaging of products and materials. Builder’s have the option of either selecting manufacturers and suppliers already using efficient packaging and production methods, or simply asking the manufacturer / supplier to offer an alternate method in return for their patronage. To this end, a sample letter to a product vendor regarding a project’s waste prevention / recycling program is linked.

The last two topics, waste removal and recycling, are issues requiring detailed attention from general contractors. It is typically the responsibility of the G.C. to write and implement a waste management plan. Once a suitable waste management and recycling plan is established, the removal method for the various materials can be determined. Local regulations, site restrictions, available transportation routes, and documentation procedures are only a few factors which must be considered by project managers. These two sections contain links such as the Arlington County dumpster permit guide (applicable to the Navy League Building), and a recycling economics sample worksheet.

### *Indoor Environmental Quality:*

Indoor environmental quality is an integral part of green building practices. Proper ventilation and the use of low –VOC (volatile organic compounds), among many other issues must be addressed by builders on sustainable / LEED projects. In the case of LEED buildings, a total of 15 points is dedicated solely to indoor environmental quality. Given the importance of this topic, managers should develop and implement indoor air quality (IAQ) plans to insure a healthy working atmosphere for construction workers and building occupants. Some of the main issues to be addressed on an IAQ plan include:

- Moisture Intrusion
- Dust Intrusion & Reduction
- VOC Content of Materials
- Temporary Heat and Humidity Control

The subtopic of moisture intrusion specifically relates to information and research on how to reduce mold and other potentially harmful effects of moisture. One useful tool

## Reference Guide Development (Continued)

provided in this section is the Indoor Air Quality Design Tool for School by the U.S. E.P.A.

Apart from moisture, dust reduction on construction sites and low-VOC content materials are two integral parts of indoor environmental quality. Construction workers can be exposed to many harmful types of dust which cause damage upon inhalation. To address this topic, the section on Dust Intrusion & Reduction contains links such as “Control of Drywall Sanding Dust Exposures, by the NIOSH (National Institute for Occupational Safety and Health)”.

The use of low-VOC content materials affects both construction workers and building occupants alike. Materials with high levels of VOCs (Volatile Organic Compounds) can create illness and other health problems due to inhalation or prolonged exposure. To provide builders with information on the topic, links include the “Low-Emitting Materials Table”, by The Collaborative for High Performance Schools (CHPS), and “Sources of Indoor Air Pollution – Formaldehyde”, by the U.S. E.P.A. . Given these websites, as well as the others provided, construction managers can learn the best methods of insuring indoor air quality.

## Reference Guide Utilization

The possibilities for further expansion and development of the GBRG are boundless. By making the guide available online and with routine maintenance, it can become a valuable tool for building construction management. While the guide was designed to address the needs of general contractors, project managers, and other construction professionals, it is not intended to be exclusive to these groups. Architects and engineers can benefit from an increased understanding of green construction responsibilities just as builders should be aware of design requirements.

## Initial User Feedback

To test the user-friendliness and viability of the GBRG, the website files were distributed to industry professionals with green construction experience. The positive feedback from respondents indicates that the GBRG would be a beneficial resource for green builders. A few of the comments received are listed below:

### Initial User Feedback (Continued)

“Your website is very impressive. There is a lot of very useful content in it and linked to it. I agree with you that most sites and most LEED and sustainable discussions revolve around design. I think that the site you are making could be very useful for construction folks like us.”

– *quoted from a general contractor*

“I just spent a little time on your site...wow, it is awesome. I think the layout is very user friendly, and I had no difficulty navigating the site.”

– *quoted from a general contractor*

Along with the comments, initial users also provided suggestions to improve the content and features of the guide. A majority of these suggestions were later incorporated into the website.

### Conclusion

In conclusion, the Green Building Reference Guide was created to address the issues and requirements associated with green building projects. It is designed to assist construction professionals by organizing resources and information pertinent to a sustainable / LEED rated project’s management and successful completion. Through the GBRG’s simple navigation format and targeted content, this goal is accomplished.

Positive feedback from individuals illustrated how the website fills a niche among the currently available resources. Considering the initial response, the GBRG has the potential of becoming a valuable reference tool in the expanding world of green construction.