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SUSTAINABLE CONSTRUCTION PRACTICES:

CONTRACTORS' PERCEPTIONS OF AWARENESS AND PARTICIPATION

A Dissertation

Presented to

The School of Graduate Studies

The College of Technology

Indiana State University

Terre Haute, Indiana

In Partial Fulfillment

of the Requirements for the Degree

Doctor of Philosophy

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by

Scott T. Fee

December 2005

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ABSTRACT

The U.S. Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) rating system is the current industry standard for sustainable building practices. This study employed an online survey instrument to collect data from contractor members of the Associated General Contractors of America (AGC). The instrument asked respondents to score their firm's awareness of LEED green building practices and the firm's participation in projects using these practices.

According to the AGC, its leadership intends to work with USGBC to build the construction industry's awareness of and participation in LEED specifically and sustainable construction in general. By conducting a survey of 4232 contractor members of the AGC, this study has established current levels of contractors' awareness of LEED practices and their participation in projects that employ LEED methods.

Correlation analysis was employed to calculate the degree of correlation between scores in the response categories of "Awareness" and "Participation." Means analysis addressed research questions regarding differences in the means of LEED awareness and LEED participation responses within selected demographic categories.

Spearman's rho analysis produced results indicating correlation between awareness and participation scores. ANOVA and Tukey post-hoc analyses indicated significant differences in the mean responses for the demographic categories of; (a) type of firm, (b) annual dollar volume and (c) company size.

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INTRODUCTION

The construction industry is one of the largest sectors of the U.S. economy, contributing nearly eight percent to the Gross National Product annually. In 2004, the industry produced $955 billion in gross output and employed over 6.7 million workers. The scale of resource use and ecological impacts associated with buildings is widely acknowledged. Due to its size and the nature of what it produces, the industry has a tremendous impact on the environment (Kibert, 1999; Rees, 1999; U.S. Department of Commerce/Bureau of Economic Analysis, 2005).

The industry relies upon demand for a built environment that inherently encroaches upon and affects the natural environment. This has traditionally meant dramatic alterations of the natural environment and consumption of natural resources at a rapid rate. Environmental accountability and responsibility accompany the industry's considerable impact on both the nation's economy and natural capital. Any changes in regulation or practice that slow the productivity or growth of this industry could have serious impacts on the national and global economy; therefore, the challenge is to find a balance between sustainably constructing the built environment and cultivating sustainable economic growth (U.S. Department of Commerce/International Trade Administration, 2000).

In 1987 the U.N. World Commission on Environment and Development (WCED)

produced *Our Common Future*, a frequently cited report that examined and documented the "perceived tensions or compatibilities between economic activity and ecological sustainability" (O'Hara, 1998, p. 43). The following excerpt from the report summarizes the Commission's conclusion that the perceived tensions can best be addressed and mitigated through parallel, sustainable growth of both the economy and the environment:

> Many people fear that a more rapidly growing world economy will apply environmental pressures that are no more sustainable than the pressure presented by growing poverty. The Commission's overall assessment is that the international economy must speed up world growth while respecting the environmental constraints (World Commission on Environment and Development, 1987, p. 89).

Need for the Study

This study quantified constructors' perceptions of green building practices by measuring the current levels of awareness of, and participation in sustainable construction methods according to the contractor members of the Associated General Contractors of America (AGC). There is concurrence in the literature that the socioeconomic practices in the developed world are not currently sustainable and that an achievable, long-term plan for the sustainable construction of the built environment is necessary. Although the complexity of constructing buildings creates significant challenges, there is a repeated call for a common system or framework to secure a sustainable built environment (Bebbington & Gray, 2001; Hemphill, McGreal, & Berry, 2002; Nobe & Dunbar, 2004; Wyatt, Sobotka, & Rogalska, 2000).

The U.S. Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) rating system is the current industry standard for sustainable building practices. A call has gone out from the AGC for USGBC assistance in increasing awareness of, and participation in LEED projects. AGC seeks to work with USGBC to build the construction industry's awareness of and participation in LEED. This can only be accomplished through opening the doors of communication and providing educational resources to the building industry on a larger scale. AGC's goal is to keep members informed and prepared to participate in projects where LEED certification is specified. This responsibility has encouraged the AGC to promote awareness of LEED to its members and to foster a working relationship with USGBC (Flores, 2005, p. 2).

Members of AGC have requested that the organization provide more resources, education and training about LEED. In turn, the AGC leadership has requested that the USGBC expand its collaboration and cooperation with the AGC. The AGC explicitly stated it would not offer in-depth LEED training to its members without USGBC's participation and could not certify LEED Accredited Professionals, but only seeks to work with USGBC to build LEED awareness and participation (Flores, 2005, p. 8).

Significance of the Study

LEED-registered projects currently represent close to 5 percent of the total square footage in U.S. new construction. Because the ultimate target is approximately 25 percent of the entire market, these results are substantial. Five percent is often considered a crucial milestone in the transition to market adoption (Lewis & Howard, 2003, p. 8).

A review of literature regarding sustainability, sustainable design and construction, the USGBC, the LEED rating system and the AGC revealed no study specifically measuring contractors' awareness of, and participation in projects requiring LEED construction methods. The AGC has proposed that their members' awareness and participation in LEED projects would substantially improve if the USGBC would provide resources, education and training to facilitate an improved understanding of LEED. Because current levels of awareness and participation have not been established, no change in these levels could be measured. This study collected and analyzed data to establish those levels (Flores, 2005).

Problem Statement

Awareness of LEED guidelines and increased participation in LEED-certified projects can give contractors an edge in the competitive construction industry. Building owners and designers on non-LEED-certified project are exhibiting a predilection for contractors experienced in sustainable construction practices (Rosenberg, Merson, & Funkhouser, 2003).

It is up to the owner and design team (of which the contractor may be a member) to decide what level of certification they want to achieve. However, the responsibility for attaining many of the identified LEED credits falls "squarely on the shoulders of general contractors, who must implement and document green building measures" (Rosenberg, Merson, and Funkhouser, 2003).

The AGC seeks to collaborate with the USGBC to increase awareness and participation in the LEED Green Building Rating System. No data exists that establishes

the current levels of awareness and participation among AGC contractor members, nor has there been a study determining the relationship between those levels and a firm's demographic characteristics. This study will examine and quantify contractors' awareness of the practices promoted by the LEED system and the firm's participation in LEED projects.

Hypothesis and Research Questions

Spearman's rho analysis calculated the degree of correlation between scores in the response categories of "Awareness" and "Participation." The following research hypothesis addressed the relationship between a firm's awareness of the practices promoted by the LEED system and the firm's participation in LEED projects.

H0: There is statistically significant correlation between awareness and participation.

Statistical analysis calculated the difference in the means of scores within selected demographic categories identified on the survey instrument. Data analysis determined if there are statistically significant differences between the scores of the demographic questions as shown in Table 1 and the responses to the LEED questions as shown in Table 2.

Means analysis addressed the following research questions regarding differences in the means of LEED awareness and LEED participation responses within the selected demographic categories:

1. Do respondents familiar with the LEED Green Building Rating System report different LEED awareness and participation than those

not familiar with the system?

2. Do commercial general contractors report different LEED awareness and participation than other types of firms?
3. Do firms with LEED experience report different LEED awareness and participation than firms that do not construct buildings?
4. Do firms with more employees report different LEED awareness and participation?
5. Do firms with higher annual dollar volume report different LEED awareness and participation?

Table 1.

LEED Questions on Survey Instrument

1	Adopt an erosion and sediment control plan for the project site during construction.
2	Adopt a commissioning plan.
3	Engage the commissioning authority early in the design phases.
4	Designate a specific area on the construction site for recycling.
5	Incorporate salvaged materials into building.
6	Establish a project goal for recycled content materials.
7	Establish a project goal for locally sourced materials.
8	Establish a project goal for rapidly renewable materials
9	Establish a project goal for Forest Stewardship Council-certified wood products.
10	Adopt an indoor air quality management plan to protect the HVAC system during construction.
11	Prior to occupancy, perform a two-week building flush out or test the contaminant levels in the building.
12	Specify low-volatile organic compound (VOC) adhesives and sealants in construction documents.
13	Specify low-VOC paints and coatings in construction documents.
14	Specify low-VOC carpet products and systems in construction documents.
15	Specify wood and agrifiber products that contain no added urea-formaldehyde resins.

Table 2.

Demographic Questions on Survey Instrument

Firm Description (5 Groups)	Commercial General Contractor Trade Contractor Architect Engineer Other
Annual Dollar Volume (5 Groups)	Less than $500,000 $500,000 to less than $1 million $1 million to less than $5 million $5 million to less than $20 million Over $20 million
Type of Construction Performed (5 Groups)	Building Highway Municipal/Utilities Federal/Heavy Demolition
Company Size (3 groups)	1 - 49 employees 50 - 99 employees 100+ employees
LEED Familiarity	Yes No
LEED Experience	Yes No I don't know

Limitations

The following limitations were inherent to this study:

1. Only green building practices identified by the USGBC and included as a prerequisite or point item in the LEED Green Building Rating System were included in the survey instrument.
2. The population includes only those members of the AGC with an e-mail address listed in the current online directory and only general

contractor/builder and subcontractor members were included in the population.

Definition of Terms

Sustainable construction/Green building – An integration of environmentally and energy efficient design, construction, operation, and demolition. Additionally, sustainable structures are built to limit energy use, create a healthy indoor environment, conserve resources and material, and improve the building's long term durability (Mead, 2001).

Natural capital - includes all the familiar resources used by humankind: water, minerals, oil, trees, fish, soil, air, et cetera. It also encompasses living systems, which include grasslands, savannas, wetlands, estuaries, oceans, coral reefs, riparian corridors, tundras, and rainforests (Hawken, 2000).

USGBC - The U.S. Green Building Council (USGBC) is a non-governmental agency comprised of a unique and diverse group of stakeholders who represent the U.S. building construction industry.

The USGBC is self-described as committee-based, member-driven, consensus-focused and the leading coalition representing the industry on environmental building matters. The USGBC has developed and promotes LEED (Leadership in Energy and Environmental Design) Green building Rating System (Appendix A) as a means of transforming the market so that green buildings become accepted as commonplace. Additionally, the LEED Steering Committee (2003) emphasizes that the rating system is (a) the most extensive, authoritative and well recognized certification standard that distinguishes green buildings by design, construction and operation from the rest of the

market; (b) is a design guideline to move building construction and operation toward sustainability; (c) is an integrated green building design training program to encourage best practice and provide support to the entire real estate industry; and (d) is a professional accreditation system to distinguish and recognize individual professionals for their expertise in the design, construction and operation of green buildings and achievement of LEED certification (p. 5).

LEED – (Leadership in Energy and Environmental Design) This Green Building Rating System is a voluntary, market-driven, consensus-based green building environmental assessment method and a national standard for rating the environmental performance of new and existing commercial buildings. LEED defines a "green building" by employing minimum, mandatory requirements in areas such as building commissioning, energy efficiency, indoor air quality, ozone depletion/CFCs, comfort, etc. The system has established a strong environmental foundation within the construction and facilities industries and is the cornerstone of the USGBC (Augenbroe & Pearce, 1998; Crawley & Aho, 1999; Fedrizzi, 2004).

According to the organization's mission statement, "LEED encourages and accelerates global adoption of green building practices and development practices through the creation and implementation of universally understood and accepted standards, tools and performance criteria" (LEED Steering Committee, 2003, p. 3).

The rating system is one mechanism that many owners are using to ensure that their buildings are meeting the criteria for sustainability. LEED uses six categories to determine if a building is sustainable. Each section has prerequisites that must be met as a minimum for LEED certification and points for going beyond these minimum

requirements. There are a total of 69 possible points, and a minimum of 26 points are required for LEED certification. Ultimately, through the course of installation, the contractor is responsible for production of all green design aspects and out of the 69 possible points, the contractor is directly responsible for 20 points and can have valuable input on another 21 points (Klehm, 2003).

AGC - The Associated General Contractors of America (AGC) was established in 1918 at the request of President Woodrow Wilson. As the largest and oldest U.S. construction trade association, the AGC is comprised of over 33,000 members and describes itself as the "voice of the construction industry . . . dedicated to skill, integrity, and responsibility" (AGC, 2005).

Chapter 2

REVIEW OF RELATED LITERATURE AND RESEARCH

This review presented the relevant literature and provides a context for the study. The review comprises the broad area of sustainability and progressively narrower concepts relevant to this study, including sustainable construction, the USGBC, the LEED Green Building Rating System, and the AGC.

Sustainability

The literature is replete with complex and sometimes conflicting definitions of the term "sustainable." Filho (2000) proposes that because sustainability is not a subject or discipline there exists an inclination for many to perceive it as a theoretical or abstract concept. Some of the difficulty is because sustainability and sustainable approaches are seen as theoretical matters, too broad to be clearly defined, or too new a field of action to be taken seriously.

Simple definitions do exist: "Sustainability refers to a very old and simple concept (The Golden Rule)...do onto future generations as you would have them do onto you" (Bartuska, Kazimee, & Owen, 1999, para. 2). The most popular definition of sustainable development can be traced to the 1987 U.N. World Commission on Environment and Development (WCED). It defined sustainable developments as those that "meet present needs without compromising the ability of future generations to meet their needs" (para.

2). Rosenbaum (1993) offers a similar definition that focuses on present responsibility versus long-term effect: "Sustainable means using methods, systems and materials that won't deplete resources or harm natural cycles" (p. 34).

The variations in the above definitions of sustainability indicate a debate on an accepted definition and make it challenging to discuss sustainability coherently. The pertinent literature is replete with diverse and even conflicting definitions of sustainability. Tisdell (1991) defines it as "maintaining the existence of the human species, intergenerational welfare, and the productivity and resilience of economic systems" (p. 164); Costanza, Daly, and Bartholomew (1992) characterize the concept as "maintaining capital stocks – including 'natural capital stocks'" (p. 9); and Hueting, Bosch, and de Boer (1992) state that sustainability is simply maintaining the environment's regenerative capacity.

Beder (1994b) describes an economic perspective of sustainable development in which the environmental impact of economic activity is of secondary importance to the wealth created by an activity. This view of sustainability equates the value of sustaining the natural environment to the value that the environment has for sustaining the economy, and implies that environmental protection will be promoted only until it becomes financially unprofitable to do so.

Sustainable Development

Throughout the sustainable development literature there is a consistent return to the results of the 1987 U.N. World Commission on Economic Development (WCED), commonly known as the Brundtland Report. Filho (2000) commends the commission's

work and suggests that it improved a previously piecemeal characterization of sustainability by drafting a reasonably accepted standard definition of the concept.

Although the definition of sustainability is modern, it can be argued that the practice is less than contemporary. Pezzoli identified a lack of integration between the current science of sustainability and the field of urban and regional planning. This disengagement between the state-of-the-art and the state-of-the-science in sustainable development practices is a legitimate concern, but not unsolvable. Principles of sustainability are adhered to, but in a way that misses opportunities to take full advantage of advances being made in science and technology. "The lesson is clear. There needs to be greater integration and synergy across disciplines" (2002p. 305).

Sustainable Design and Construction

New, complex and constantly evolving sustainable design and construction practices have created a wide spectrum of published opinion about the definition, appropriate application and future direction of the concept and practice. This lack of clarity has created a continuum of apprehension that ranges from a fear of reduced environmental laws weakening protection of the natural environment to the position that sustainable methods should be the only accepted construction practices (Venables, Newton, & Venables, 1999).

The construction industry is large and complex, and projects require many players to accomplish the necessary tasks. The breadth of the industry creates a challenge because so many workers have roles in creating the final product. The industry is comprised of geographically scattered firms of various sizes, designers and constructors

with often-conflicting goals and intentions, as well as financiers, clients, and many other diverse constituents. The disjointed nature of the industry creates an inertia that "makes it even less likely that green building will become the norm in the absence of a concerted strategy" (Cohen-Rosenthal, Schlarb, & Thorne, 2000, p. 8).

This does not imply a legislated solution, but rather a set of standards accepted across the industry. The LEED performance criteria can serve as the standards for just such a concerted industry strategy because the issues addressed by LEED are common issues - environmental, economic and social - that challenge all members of the industry and arguably all of society (LEED Steering Committee, 2003)

Because sustainable construction represents a significant change in how the built environment is designed and created, and because the building industry is the largest segment of the U.S. economy, it has the potential to affect more than the construction industry itself. Technological changes of this nature and magnitude are reported to "trigger far-reaching changes in the institutional basis of an economy," including government policy and varied reactions from society at large (Rohracher, 2001, p. 139).

Research supporting this view shows that a wider section of society is responsible for a growing interest in sustainable construction methods due not only to specific government action and regulation, but also from an increasingly environmentally-aware citizenry. This interest is articulated in the literature and is evidenced by recent changes in construction methods. These methods include reusing buildings and materials as often as possible, maximizing use of recycled materials, minimizing waste caused by design decisions and during construction, minimizing the use of energy and water in finished projects as well as during construction and minimizing the pollution of the environment

from construction activities (Venables et al., 1999).

Many factors have influenced changes in what is considered important to industry professionals and how they design and construct buildings. While there is no one reason for this shift in priorities, what is apparent is that this shift is changing how buildings are designed and constructed. Green building practices have evolved from fringe methods practiced outside the mainstream to a set of tools that is significantly altering the building design and construction process. Furthermore, green building concepts are the impetus for design and construction professional to reevaluate and revise their business practices and field operations (Austin, 1991; Riley, Pexton, & Drilling, 2003; Tinker & Burt, 2003).

Constructing new buildings "is one of the least sustainable activities currently underway on planet earth, accounting for 25 percent of deforestation and 40 percent of the total flow of raw materials into the human economy—some three billion tons of stuff per year" (AtKisson, 2000). The unsustainable practices currently employed to construct buildings make the industry inextricably connected to the environment and significantly impact natural capital. Therefore, the construction industry is urged by regulating bodies, environmental interests, and an increasingly "green" society to reduce its impact on the natural environment by changing current practices and creating new ones.

John L. Howard, Jr., the U.S. Federal Environmental Executive, identified the most important of these practices in the following definition of green building 1) the practice of increasing the efficiency with which buildings and their sites use energy, water, and materials; 2) reducing building impacts on human health and the environment, through better siting, design, construction, operation, maintenance, and removal—the

complete building life cycle (2003b).

Wild refers to construction as a weakly integrated structure with relationships based on "cohesive fragmentation [which has] proven remarkably recalcitrant to official efforts at reform." This inherent fragmentation is a difficult, even hostile environment for the evolution of industry norms and standards. This fragmentation makes collecting data from the industry's constituents challenging. (2002, p. 346)

The need for standardized sustainable construction systems is evident in the literature and in many cases, authors assess the current situation within the U.S. built environment as serious and in need of comprehensive reform. A report on national energy usage found that currently most U.S. residents "still receive their power from coal-burning power plants, live in houses that waste energy, and use inefficient appliances and lighting" (Cohen-Rosenthal et al., 2000, p. 10).

The Cohen-Rosenthal report further states that the longevity of buildings obligates designers, constructors, and occupants to consider long-term implications of structures and "look farther ahead than perhaps any other consumer product (because) those (buildings) that are under construction today will likely last 50–100 years" (Cohen-Rosenthal et al., 2000, p. 3).

Designers and constructors, meeting the demands of society, have left a legacy of an unsustainable building stock. This was not a deliberate oversight, but it does create an impetus, and arguably an obligation to revise future practices so they align with sustainable methods.

In a 2003 document extolling the need for and benefits of green buildings, the U.S. Department of Energy (DOE) further stresses the significance of the building stock's

longevity and its impact on energy consumption. The DOE reports that the more than 76 million residential buildings and nearly five million commercial buildings in the United States today use one-third of the energy and two-thirds of all electricity consumed nationally. Another 38 million buildings are expected to be constructed by 2010 (U.S. Department of Energy, 2003). The agency states that the obvious challenge posed by these figures is to construct these buildings to minimize nonrenewable energy use, pollution production, and energy costs. This DOE statement articulates much of the value of sustainable construction systems, but the remainder of the quote addresses issues that add complexity to the sustainable construction concept. The DOE document goes on to propose that sustainable building practices should not only reduce costs, pollution, and energy usage, but should also increase "the comfort, health, and safety of the people who live and work in them" (2003, para. 1).

USGBC and LEED

The USGBC is considered the leader in promoting green/sustainable construction practices in the United States. The USGBC membership includes building developers, environmental leaders, retailers, financial industry leaders, architectural and engineering firms, product manufacturers and professional construction industry organizations. These members include the Construction Specification Institute, the American Institute of Architects, Turner Construction, Bovis Lend Lease, Johnson Controls, Ford Motorland, Herman Miller, the Natural Resources Defense Council, the Rocky Mountain Institute, Starbucks, Bank of America and numerous federal, state and local government agencies (Fedrizzi, 2004; Nobe & Dunbar, 2004; USGBC, n.d.).

In 1999, the USGBC introduced the Leadership in Energy and Environmental Design (LEED) rating system. Through its use as a design guideline and third party certification tool, it aims to improve occupant wellbeing, environmental performance, and economic returns of buildings using established and innovative practices, standards and technologies. As of June 2004, its 4700 members had completed more than 1,400 LEED certified and registered projects across all 50 states (Fedrizzi, 2004; USGBC, 2002, p. i).

AGC and USGBC

The LEED system addresses the complex challenges of designing and constructing sustainable buildings and is gaining growing support from owners and design professionals. The AGC seeks membership in the USGBC due to this increasing support because as more building owners and architects choose to build LEED-certified buildings, the less voluntary LEED becomes. In other words, the success LEED is experiencing in the market is making LEED awareness and participation nearly mandatory for general contractors to remain successful. In a letter to the USGBC leadership, the AGC's Director of Environmental Programs, Melinda Tomaino Flores, explicitly addresses this issue of LEED's rapid adoption and its impact on contractors:

> "Although LEED is a voluntary standard, when public and private owners require certification, LEED is not voluntary for the contractor. As LEED continues to gain momentum in the building markets, knowledge of LEED may become essential for the building contractor [and] as more and more owners in the public and private building markets specify LEED certification, this voluntary standard

begins to take the shape of a 'requirement' to AGC's contractor members (Flores, 2005, p.6-9).

This burgeoning "requirement" has prompted the AGC to work with the USGBC to increase and improve the association's education and outreach efforts. In the same letter cited above, the AGC speculates that trade association involvement in USGBC also could provide for increased LEED awareness of, and participation in LEED projects. The increasing role of sustainable design in the construction industry has prompted trade associations to provide resources for members that "choose to move beyond environmental compliance and further reduce the impacts of their operations on the environment. Trade association involvement with USGBC would further this outreach initiative" (Flores, 2005).

LEED Survey Research

Research conducted by Rosenberg et al., revealed 10 LEED credits and prerequisites that are typically within the contractor's domain, stating that "the burden for many LEED credits falls squarely on the shoulders of general contractors, who must implement and document green building measures that are substantially different from those of typical projects" (Rosenberg et al., 2003, p. 1).

The Green Building Alliance in Pittsburgh surveyed LEED-accredited professionals, green project team members, and Pittsburgh-area USGBC members. When asked which were the most difficult to meet, 10 specific LEED credits received significant comments (2004).

The EPA published a guide to managing environmental issues on construction

projects. The topics in this guide overlap the LEED system and reinforce the contractor's responsibilities in several LEED credit areas. A white paper on sustainability published by the editors of Building Design & Construction presented results of research into the most commonly pursued LEED points (Bolin as cited in Building Design & Construction, 2003; U.S. Environmental Protection Agency, 2005). The results of these studies that identified LEED items considered the domain or responsibility of contractors are shown in Table 3.

Table 3.

Contractor's Domain LEED Items

LEED Area	LEED Credit Description	Rosenberg	Bolin	EPA	GBA
Sustainable Sites	Prerequisite 1: Erosion & Sedimentation Control	X	X	X	X
Energy & Atmosphere	Prerequisite 1: Fundamental Building Systems Commissioning	X	X		X
Indoor Environ. Quality	Credit 4.1: low-Emitting Materials: Adhesives & Sealants	X	X	X	
Indoor Environ. Quality	Credit 4.2: low-Emitting Materials: Paints and Coatings	X	X	X	
Indoor Environ. Quality	Credit 4.3: low-Emitting Materials: Carpet	X	X	X	
Indoor Environ. Quality	Credit 3.1: IAQ Management Plan (during construction)	X		X	
Indoor Environ. Quality	Credit 4.4: low-Emitting Materials: Composite Wood	X		X	
Energy & Atmosphere	Credit 3: Additional Commissioning	X			X
Materials & Resources	Credits 2.1 and 2.2: Construction Waste Management	X	X		
Materials & Resources	Credits 4.1 and 4.2: Recycled Content (post-consumer + 1/2 post-industrial)	X	X		
Materials & Resources	Credits 5.1 and 5.2: Regional Materials (manufactured regionally)	X	X		
Materials & Resources	Credit 6: Rapidly Renewable Materials	X			X
Materials & Resources	Credit 7: Certified Wood	X			X
Materials & Resources	Credits 3.1 & 3.2: Resource Reuse	X			
Indoor Environ. Quality	Credit 3.2: Construction IAQ Mgmt. Plan: Before Occupancy	X			

Chapter 3

INSTRUMENTATION, DATA COLLECTION, TREATMENT, AND ANALYSIS

This study employed both correlational and descriptive research methods. Correlational analysis of the data from the Likert-type scale responses addressed the research question, and means testing examined the relationship between responses based on the demographic characteristics of the respondent firms.

The following chapter is organized around the following topics; (a) research instrument development, validity, and reliability, (b) description of the population and sample and (c) statistical analyses.

Development of the Research Instrument

After searching the relevant literature for a suitable existing survey and finding none, the researcher proceeded to develop a new instrument. The design of the instrument was adapted from a questionnaire utilized by Dr. Barb Jackson in a study on ethics in the construction industry (Jackson, 2000).The demographic metrics and response choices were based primarily on two previous surveys conducted by the AGC of America. One survey examined AGC contractor members' views on construction and demolition waste. The other measured members' use of Environmental Management Systems (Gubeno, 2005).

The first section of the survey contained eight questions that collected

demographic data about the respondent's firm and position (Table 1). The second section asked respondents to score their firm's awareness of green construction practices and to score their firm's participation in projects employing those practices. The Likert-type five-point scale was comprised of values for scoring awareness and participation, where 1 = Strongly Disagree and 5 = Strongly Agree.

The survey instrument used for this study was developed over several iterations. The first two attempts to collect data resulted in an extremely low rate of return. The first attempt employed mailed postcards that invited respondents to complete the survey online. The postcards were mailed to the pilot sample (n=150) and one usable response was completed online. The second attempt employed a mailed paper survey for respondents to complete and return to the researcher via the included postage-paid envelope. Surveys were mailed to the pilot sample (n=150) and four usable responses were returned. Both attempts included two follow-up reminders sent to the pilot sample.

To improve the return rate the number of Likert-type scale awareness and participation questions was reduced from 72 to 30. Appendix B shows the revised online survey instrument that was employed for the third and final attempt to collect data. Appendix C shows the e-mail message sent to subjects inviting them to follow a link to the survey website. A follow-up reminder message was e-mailed five days later to respondents that had not completed the survey and whose address was not determined to be undeliverable.

Instrument Validity

The LEED Green Building Rating System, version 2.1 (Table 2) provided the basis for the questions. Responses to the awareness and participation questions were

collected via a Likert-type scale. The survey instrument was designed to measure the responses to questions about LEED practices. To ensure that the items generated were consistent to LEED-based constructs, a panel of experts was identified. The validity-testing panel consisted of six construction industry professionals with training and experience in LEED terminology and application. These panelists rated the online survey instrument items according to a Likert-type scale designed to establish validity. Panelists scored each item on the initial survey according to their perception of how well it relates to the LEED category from which it was derived. Item analysis, based on the panel of experts and analyzed using SPSS software, determined the content validity of the survey instrument by rating each item on the survey to assure the items are measuring the identified and defined constructs.

During the validity study, one respondent's responses, however, skewed the results for the preparedness questions about indoor air quality. Based on post-hoc analysis of comments from the respondent, there was a misunderstanding as to why the same topics were addressed in two different sets of questions (i.e., awareness and participation). To address this concern from the panelist the instructions at the top of each column (awareness and participation) was relocated and shortened to clarify the design of the instrument and avoid similar confusion from the respondents.

Instrument Reliability

To determine the modified instrument's reliability, 200 subjects were randomly selected from the study population to participate in a pilot study. Calculating Cronbach's alpha coefficient determined how well the questions complemented each other in their

measurement of the same LEED Topic Area. Using SPSS software, the alpha coefficient for the awareness responses was calculated at 0.9. When items with a covariance of 0.9 or higher were removed, the recalculated alpha coefficient remained at 0.9. The result for the participation questions was also a coefficient of 0.9. When 10 of 15 total items with a covariance of 0.9 or higher were removed, the recalculated alpha coefficient was 0.7. According to the literature regarding Cronbach's reliability coefficient, a coefficient of 0.7 is an acceptable coefficient. No survey questions required revision based on the results of the reliability analysis. However, the layout was changed to increase the visual clarity of the two columns of Likert-type scale responses. This was done because several respondents completed only one column of the survey (Litwin, 1995; Nunnally & Bernstein, 1994; Peterson, 2000).

Description of the Population and Sample

The population for this study consisted of 4432 contractor members of the AGC of America that listed an e-mail address in the online AGC directory. For the pilot study, a random sample of 200 was selected from this population. The entire remaining population of 4232 subjects comprised the sample.

Statistical Analyses

This study employed both correlational and descriptive research methods. The research hypotheses addressed the relationship between awareness of LEED construction practices and the firm's participation in projects that employ these practices.

Correlational analysis of the data from the Likert-type scale responses addressed

the hypothesis by calculating Spearman's rho for the scores from each respondent in the two response categories; awareness and participation. Means testing examined the relationship between the means of these response categories across the selected demographic groups.

To address the research hypothesis, the data collected from the online survey responses was analyzed using Spearman's rho to determine if a correlation exists between scores in the response categories of awareness and participation. This particular method was selected because Spearman's rho is a measure of the linear relationship between two variables and is widely practiced with variables that are of an ordinal nature. Spearman's rho, or rank order correlation coefficient, is based on ranked observations rather than actual scores. A rho value of near 1.0 indicates a strong positive relationship, and a value of near -1.0 indicates a strong negative relationship (Bryman & Cramer, 1999; Hodgins, 2002).

The means data were analyzed using frequency distributions to confirm the normal distribution assumption. With the exception of the LEED practice of adopting an erosion and sediment control plan, the frequencies of responses approximated normal distribution. This skewed distribution for this LEED practice is most likely due to the extensive regulation related to erosion control. Local, state, and federal erosion control regulations are well known and widely practiced by contractors.

Parametric tests were used because the dependent variables were approximately normally distributed and the Likert-type scale is approximately interval. Table 2 shows the mean values for each of the 15 awareness questions and the 15 participation questions, were calculated according to the identified demographic groups. The

differences in the means for research question one was calculated and significance was determined using independent sample t-tests. This analysis method is appropriate for variables that represent one independent variable with only two levels. Therefore, only the first research question regarding LEED familiarity was analyzed using solely t-tests.

The significance of the differences in the means of the independent variables in research questions 2, 3, 4 and 5 was calculated using a one-way ANOVA with SPSS software. This statistical analysis method was chosen because each variable represents one independent variable with three or more levels. The ANOVA test of difference of group means was chosen because it reduces the possibility of a Type I error. This is an appropriate analysis method because the population is independent, the data approximates normal distribution and there is homogeneity of variance. A post hoc Tukey HSD test determined between which groups the significant differences existed (Minium, Clarke, & Coladarci, 1999).

Complete SPSS software output tables for the means analysis, ANOVA and post-hoc analysis are presented in Appendices E through H.

Chapter 4

RESULTS OF THE STUDY

The results presented in this chapter are organized by the following topics; (a) discussion regarding the subjects, response rates and respondents' demographic profile, (b) results regarding contractors' LEED awareness and LEED participation, (c) results of correlation analysis that address the following hypothesis: H0 - There is statistically significant correlation between awareness and participation, and (d) means analysis of differences between responses based on demographic groups.

Sample Population

The source of the sample for this study consisted of Associated General Contractors of America (AGC) contractor members with e-mail addresses posted on the AGC website. All participant firms were AGC members in 2005.

The pilot group of 200 received e-mailed invitations to complete the online survey. Two follow-up messages were sent only to those respondents who had not already completed the survey and whose e-mail addresses were not one of the 44 that had been determined undeliverable. A total of 8 usable surveys (five percent) were completed from the pilot group of 156 delivered messages.

Following the reliability analysis, invitations were sent via e-mail to 4232 AGC of America contractor members. A total of 821 addresses were undeliverable and returned.

The remaining 3411 messages yielded 200 useable surveys (six percent). While this response appeared low during the initial analysis, other recent surveys conducted by the AGC of America that asked members to responded to environmental issues yielded response of approximately 4 percent.

Contractor Demographics

Respondents' demographic characteristics are shown in Table 4. Of the 200 respondents, 84.5 percent were commercial general contractors, 7.5 percent were trade contractors, and none of the respondents were architects or engineers. The remaining 8.0 percent identified themselves as "other."

Table 4.

Respondents' Demographic Characteristics

Category	Frequency	Percentage
Type of Firm		
Commercial General Contractor	169	84.5
Other	16	8.0
Trade Contractor	15	7.5
Architect	0	0.0
Engineer	0	0.0

Table 4. (cont.)

Respondents' Demographic Characteristics

Category	Frequency	Percentage
Annual Dollar Volume		
Over $20 million	96	48.0
$5 million to less than $20 million	68	34.0
$1 million to less than $5 million	30	15.0
$500,000 to less than $1 million	3	1.5
Less than $500,000	2	1.0
Type of Construction Performed		
Building	165	82.5
Highway	50	25.0
Municipal/Utilities	47	23.5
Federal/Heavy	45	22.5
Demolition	17	8.5
Company Size		
1-49 employees	86	43.0
50-99 employees	54	27.0
100+ employees	59	29.5

n = 200

Table 4. (cont.)

Respondents' Demographic Characteristics

Category	Frequency	Percentage
Company Location		
Midwest	50	25.0
Mountain-Plains	32	16.0
Southeast	30	15.0
Western	30	15.0
Southwest	21	10.5
New England	15	7.5
Mid-Atlantic	12	6.0
New York-New Jersey	9	4.5
No answer	1	0.5
Position		
General mgr./pres./owner/partner	143	71.5
Construction or project manager	26	13.0
Other	14	7.0
Sales or marketing manager	12	6.0
Engineer	2	1.0
Architect or designer	1	0.5
Land development	1	0.5
No answer	1	0.5

n = 200

Table 4 (cont.)

Respondents' Demographic Characteristics

Category	Frequency	Percentage
LEED Familiarity		
Yes	144	72.0
No	55	27.6
No answer	1	0.5
LEED Experience		
No	112	56.3
Yes	79	39.5
I don't know	8	4.0
No answer	1	0.5

n = 200

Correlation Analysis

Spearman's rho analysis calculated the degree of correlation between scores in the response categories of "Awareness" and "Participation" as shown in Table 5. The following research hypothesis addressed the relationship between a firm's awareness of the practices promoted by the U.S. Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) rating system and the firm's participation in LEED projects.

H_0: There is statistically significant correlation between awareness and participation.

Table 5 shows significant correlation (p=0.01, 2-tailed) between awareness and participation responses for all fifteen LEED items. The lowest correlation coefficient was 0.60 for the LEED practice of establishing a project goal for recycled-content material. The highest was a coefficient of 0.76 for adopting a commissioning plan. Based on the Spearman's rho analysis, which indicated a significant correlation between awareness and participation, the research hypothesis (H_0) was not rejected.

Table 5.

Spearman's rho Correlation Between Awareness and Participation Responses

LEED Construction Practice	Correlation Coefficient	Sig. (2-tailed)	n
Adopt an erosion and sediment control plan for the project site during construction	.703*	0.00	184
Adopt a commissioning plan	.758*	0.00	181
Engage the commissioning authority early in the design phases	.734*	0.00	174
Designate a specific area on the construction site for recycling	.628*	0.00	179
Incorporate salvaged materials into building	.608*	0.00	179
Establish a project goal for recycled content materials	.596*	0.00	177
Establish a project goal for locally sourced materials	.645*	0.00	174
Establish a project goal for rapidly renewable materials	.624*	0.00	174
Establish a project goal for Forest Stewardship Council-certified wood products	.599*	0.00	175
Adopt an indoor air quality management plan to protect the HVAC system during construction	.732*	0.00	176

* Correlation is significant at the 0.01 level (2-tailed).

Table 5. (cont.)

Spearman's rho Correlation Between Awareness and Participation Responses

LEED Construction Practice	Correlation Coefficient	Sig.	n
Prior to occupancy, perform a two week building flush-out or test the contaminant levels in the building	.686*	0.00	175
Specify low-volatile organic compound (VOC) adhesives and sealants in construction documents	.721*	0.00	171
Specify low-VOC paints and coatings in construction documents	.695*	0.00	171
Specify low-VOC carpet products and systems in construction documents	.682*	0.00	171
Specify wood and agrifiber products that contain no added urea-formaldehyde resins	.629*	0.00	166

* Correlation is significant at the 0.01 level (2-tailed).

Means Analysis

Means analysis addressed the following research questions regarding differences in the means of LEED awareness and LEED participation responses within the defined demographic categories:

1. Do respondents familiar with the LEED Green Building Rating System report different LEED awareness and participation than those not familiar with the system?
2. Do Commercial General Contractors report different LEED awareness and participation than other types of firms?
3. Do firms with LEED experience report different LEED awareness and participation than firms that do not construct buildings?
4. Do firms with more employees report different LEED awareness and

participation?

5. Do firms with higher annual dollar volume report different LEED awareness and participation?

The majority of respondents are involved in one or more of the following types of construction: building, federal, heavy, municipal, utility and highway construction. Only 8.5 percent perform demolition. Small firms (1-49 employees) comprised 43 percent of the respondents, while medium and large firms each comprised less than 30 percent of the population.

Based on regions defined by the U.S. Bureau of Labor Statistics, the respondents were geographically dispersed throughout the U.S. (2001). Nearly a quarter were from the Midwest and approximately 15 percent were from each of the following 4 regions; Southeast, Mountain-Plains, Western and Southwest. The remaining 16 percent are from the New England, Mid-Atlantic and New York-New Jersey regions combined. Three respondents did not identify their location.

Seventy-two percent of the respondents hold the position of general manager, president, owner or partner. Construction or project managers comprised 13 percent of the population, sales or marketing managers comprise 6 percent. Three respondents were designers; one architect and two engineers. One respondent was in land development. Six percent identified themselves as "other." Almost three quarters of the respondents consider themselves familiar with LEED and only 40 percent have bid on or received a project requiring LEED certification.

The mean scores of the 15 LEED construction practices are ranked from highest to lowest for awareness scores in Table 6 and for participation scores in Table 7. Of the

15 practices, the following 5 received the highest awareness scores:

1. Adopt an erosion and sediment control plan for the project site during construction ($\bar{x}$=4.70)
2. Incorporate salvaged materials into building ($\bar{x}$=3.56)
3. Designate a specific area on the construction site for recycling ($\bar{x}$=3.54)
4. Specify low-VOC paints and coatings in construction documents ($\bar{x}$=3.43)
5. Adopt an indoor air quality management plan to protect the HVAC system during construction ($\bar{x}$=3.43)

Of the 15 practices, the following 5 received the lowest awareness scores:

1. Engage the commissioning authority early in the design phases ($\bar{x}$=3.15)
2. Specify wood and agrifiber products that contain no added urea-formaldehyde resins ($\bar{x}$=3.13)
3. Prior to occupancy, perform a two week building flush-out or test the contaminant levels in the building ($\bar{x}$=2.98)
4. Establish a project goal for rapidly renewable materials ($\bar{x}$=2.94)
5. Establish a project goal for Forest Stewardship Council-certified wood products ($\bar{x}$=2.84)

Of the 15 practices, the following 5 received the highest participation scores:

1. Adopt an erosion and sediment control plan for the project site during construction ($\bar{x}$=4.55)
2. Designate a specific area on the construction site for recycling ($\bar{x}$=3.15)
3. Adopt an indoor air quality management plan to protect the HVAC system during construction ($\bar{x}$=3.10)

4. Adopt a commissioning plan ($\bar{x}$=3.06)
5. Incorporate salvaged materials into building ($\bar{x}$=2.98)

Of the 15 practices, the following 5 received the lowest participation scores:

1. Establish a project goal for recycled content materials ($\bar{x}$=2.62)
2. Specify wood and agrifiber products that contain no added urea-formaldehyde resins ($\bar{x}$=2.62)
3. Prior to occupancy, perform a two week building flush-out or test the contaminant levels in the building ($\bar{x}$=2.5)
4. Establish a project goal for rapidly renewable materials ($\bar{x}$=2.21)
5. Establish a project goal for Forest Stewardship Council-certified wood products ($\bar{x}$=2.20)

Table 6.

Means of Awareness Responses

LEED Construction Practice	Awareness Means
Adopt an erosion and sediment control plan for the project site during construction	4.70
Incorporate salvaged materials into building	3.56
Designate a specific area on the construction site for recycling	3.54
Establish a project goal for locally sourced materials	3.43
Specify low-VOC paints and coatings in construction documents	3.43
Adopt an indoor air quality management plan to protect the HVAC system during construction	3.43
Adopt a commissioning plan	3.39
Specify low-volatile organic compound (VOC) adhesives and sealants in construction documents	3.39
Specify low-VOC carpet products and systems in construction documents	3.30
Establish a project goal for recycled content materials	3.27
Engage the commissioning authority early in the design phases	3.15
Specify wood and agrifiber products that contain no added urea-formaldehyde resins	3.13
Prior to occupancy, perform a two week building flush-out or test the contaminant levels in the building	2.98
Establish a project goal for rapidly renewable materials	2.94
Establish a project goal for Forest Stewardship Council-certified wood products	2.84

Table 7.

Means of Participation Responses

LEED Construction Practice	Participation Means
Adopt an erosion and sediment control plan for the project site during construction	4.55
Designate a specific area on the construction site for recycling	3.15
Adopt an indoor air quality management plan to protect the HVAC system during construction	3.10
Adopt a commissioning plan	3.06
Incorporate salvaged materials into building	2.98
Specify low-VOC paints and coatings in construction documents	2.98
Establish a project goal for locally sourced materials	2.94
Specify low-volatile organic compound (VOC) adhesives and sealants in construction documents	2.94
Specify low-VOC carpet products and systems in construction documents	2.83
Engage the commissioning authority early in the design phases	2.77
Establish a project goal for recycled content materials	2.62
Specify wood and agrifiber products that contain no added urea-formaldehyde resins	2.62
Prior to occupancy, perform a two week building flush-out or test the contaminant levels in the building	2.50
Establish a project goal for rapidly renewable materials	2.21
Establish a project goal for Forest Stewardship Council-certified wood products	2.20

The differences in means reported below are based on one-sample t-tests, one-way ANOVA and Tukey HSD post-hoc analyses. These analyses determined that differences in means between responses were significant for the following demographic categories: (a) type of firm, (b) annual dollar volume and (c) company size.

Means Analysis of LEED Familiarity

Tables 8 and 9 show the t-test analysis results of responses to the demographic question regarding respondents' familiar with LEED. The means analyses resulted in no significant differences in the responses based on awareness and participation.

Means Analysis of Type of Firm

The results shown in tables 10 and 11 indicate that only one LEED practice, adopting an erosion and sediment control plan, received significantly different scores according to the type of firm. Tukey HSD post-hoc analysis indicated that Commercial General Contractors scored participation at 4.63, whereas the Trade Contractors' score was 3.80, a significant difference in mean scores ($F=6.238$, $p<0.05$).

Means Analysis of LEED Experience

The means analysis results shown in tables 12 and 13 were calculated based on LEED experience. Mean differences calculated using Tukey HSD post-hoc analysis indicated that firms that have bid on or received contracts for projects seeking LEED certification report significantly different LEED awareness scores for every variable than those who do not have such LEED experience.

Table 8.

Comparison of Awareness Responses by LEED Familiarity

LEED Construction Practice	Familiar with LEED		t	Sig. (2-tailed)
	Yes	No		
Adopt an erosion and sediment control plan for the project site during construction	4.80	4.42	3.383	.001
Adopt a commissioning plan	3.65	2.69	4.371	.000
Engage the commissioning authority early in the design phases	3.39	2.50	3.720	.000
Designate a specific area on the construction site for recycling	3.81	2.87	4.568	.000
Incorporate salvaged materials into building	3.82	2.91	4.369	.000
Establish a project goal for recycled content materials	3.54	2.58	4.567	.000
Establish a project goal for locally sourced materials	3.65	2.88	3.615	.000
Establish a project goal for rapidly renewable materials	3.25	2.12	5.146	.000
Establish a project goal for Forest Stewardship Council-certified wood products	3.08	2.21	3.873	.000
Adopt an indoor air quality management plan to protect the HVAC system during construction	3.61	2.92	3.009	.003
Prior to occupancy, perform a two week building flush-out or test the contaminant levels in the building	3.19	2.46	3.014	.003
Specify low-volatile organic compound (VOC) adhesives and sealants in construction documents	3.65	2.70	4.136	.000
Specify low-VOC paints and coatings in construction documents	3.68	2.78	3.983	.000
Specify low-VOC carpet products and systems in construction documents	3.57	2.61	4.071	.000
Specify wood and agrifiber products that contain no added urea-formaldehyde resins	3.40	2.43	4.279	.000

Table 9.

Comparison of Participation Responses by LEED Familiarity

LEED Construction Practice	Familiar with LEED		t	Sig. (2-tailed)
	Yes	No		
Adopt an erosion and sediment control plan for the project site during construction	4.58	4.47	.706	.481
Adopt a commissioning plan	3.18	2.48	3.139	.002
Engage the commissioning authority early in the design phases	2.86	2.26	2.606	.010
Designate a specific area on the construction site for recycling	3.26	2.56	3.068	.002
Incorporate salvaged materials into building	3.10	2.61	2.195	.029
Establish a project goal for recycled content materials	2.76	1.96	3.705	.000
Establish a project goal for locally sourced materials	2.95	2.71	1.029	.305
Establish a project goal for rapidly renewable materials	2.30	1.70	3.030	.003
Establish a project goal for Forest Stewardship Council-certified wood products	2.21	1.92	1.412	.160
Adopt an indoor air quality management plan to protect the HVAC system during construction	3.16	2.63	2.320	.021
Prior to occupancy, perform a two week building flush-out or test the contaminant levels in the building	2.56	2.06	2.110	.036
Specify low-volatile organic compound (VOC) adhesives and sealants in construction documents	3.04	2.38	2.804	.006
Specify low-VOC paints and coatings in construction documents	3.09	2.40	2.991	.003
Specify low-VOC carpet products and systems in construction documents	2.94	2.13	3.386	.001
Specify wood and agrifiber products that contain no added urea-formaldehyde resins	2.69	2.05	2.891	.004

Table 10.

Comparison of Awareness Responses by Type of Firm

LEED Construction Practice	Mean Scores GC	Trade Contractor	Other	F	Sig.
Adopt an erosion and sediment control plan for the project site during construction	4.70	4.57	4.75	.280	.756
Adopt a commissioning plan	3.49	2.80	2.88	2.872	.059
Engage the commissioning authority early in the design phases	3.20	2.80	3.00	.566	.569
Designate a specific area on the construction site for recycling	3.55	3.53	3.44	.050	.951
Incorporate salvaged materials into building	3.53	3.71	3.81	.417	.660
Establish a project goal for recycled content materials	3.31	2.93	3.19	.570	.566
Establish a project goal for locally sourced materials	3.45	3.57	3.19	.356	.701
Establish a project goal for rapidly renewable materials	2.98	2.53	3.00	.653	.522
Establish a project goal for Forest Stewardship Council-certified wood products	2.89	2.27	2.81	1.335	.266
Adopt an indoor air quality management plan to protect the HVAC system during construction	3.52	2.80	3.13	2.135	.121
Prior to occupancy, perform a two week building flush-out or test the contaminant levels in the building	3.07	2.14	2.87	2.495	.085
Specify low-volatile organic compound (VOC) adhesives and sealants in construction documents	3.42	3.00	3.43	.542	.582
Specify low-VOC paints and coatings in construction documents	3.50	3.00	3.13	1.188	.307
Specify low-VOC carpet products and systems in construction documents	3.35	3.00	3.00	.693	.501
Specify wood and agrifiber products that contain no added urea-formaldehyde resins	3.19	2.85	2.80	.767	.466

Table 11.

Comparison of Participation Responses by Type of Firm

LEED Construction Practice	Mean Scores GC	Trade Contractor	Other	F	Sig.
Adopt an erosion and sediment control plan for the project site during construction	4.63	3.80	4.38	6.238*	.002
Adopt a commissioning plan	3.08	2.57	2.50	2.015	.136
Engage the commissioning authority early in the design phases	2.73	2.36	2.71	.474	.623
Designate a specific area on the construction site for recycling	3.09	2.79	3.19	.371	.691
Incorporate salvaged materials into building	2.86	3.60	3.56	3.791	.024
Establish a project goal for recycled content materials	2.51	2.57	2.94	.733	.482
Establish a project goal for locally sourced materials	2.84	3.46	2.94	1.274	.282
Establish a project goal for rapidly renewable materials	2.10	2.21	2.57	1.050	.352
Establish a project goal for Forest Stewardship Council-certified wood products	2.07	2.15	2.69	1.915	.150
Adopt an indoor air quality management plan to protect the HVAC system during construction	3.08	2.62	2.87	.764	.467
Prior to occupancy, perform a two week building flush-out or test the contaminant levels	2.44	2.17	2.47	.216	.806
Specify low-volatile organic compound (VOC) adhesives and sealants in construction documents	2.86	2.92	2.79	.029	.972
Specify low-VOC paints and coatings in construction documents	2.92	2.75	2.87	.090	.914
Specify low-VOC carpet products and systems in construction documents	2.75	2.58	2.67	.091	.913
Specify wood and agrifiber products that contain no added urea-formaldehyde resins	2.52	2.64	2.53	.040	.961

* Tukey HSD post-hoc analysis indicates the mean difference was significant at the .05 level.

Table 12.

Comparison of Awareness Responses by Firm's LEED Experience

LEED Construction Practice	Mean of Experience			F	Sig.
	Yes	No	I Don't Know		
Adopt an erosion and sediment control plan for the project site during construction	4.82	4.66	4.00	5.017*	.008
Adopt a commissioning plan	3.92	3.04	3.17	9.555*	.000
Engage the commissioning authority early in the design phases	3.57	2.89	2.67	5.051*	.007
Designate a specific area on the construction site for recycling	4.01	3.24	3.13	8.086*	.000
Incorporate salvaged materials into building	3.92	3.36	2.88	4.880*	.009
Establish a project goal for recycled content materials	3.78	2.99	2.43	9.703*	.000
Establish a project goal for locally sourced materials	3.89	3.14	3.33	7.219*	.001
Establish a project goal for rapidly renewable materials	3.52	2.56	2.71	10.750*	.000
Establish a project goal for Forest Stewardship Council-certified wood products	3.32	2.50	3.00	7.879*	.001
Adopt an indoor air quality mgmt. plan to protect the HVAC system during construction	3.96	3.08	3.00	9.585*	.000
Prior to occupancy, perform a two week building flush-out or test contaminant levels	3.58	2.58	2.71	10.653	.000

* Tukey HSD post-hoc analysis indicates the mean difference was significant at the .05 level.

Table 12. (cont.)

Comparison of Awareness Responses by Firm's LEED Experience

LEED Construction Practice	Mean of Experience			F	Sig.
	Yes	No	I Don't Know		
Specify low-volatile organic compound (VOC) adhesives and sealants in construction documents	3.83	3.09	3.14	5.928	.003
Specify low-VOC paints and coatings in construction documents	3.82	3.15	3.57	5.015	.008
Specify low-VOC carpet products and systems in construction documents	3.75	2.98	3.14	6.109	.003
Specify wood and agrifiber products that contain no added urea-formaldehyde resins	3.49	2.88	3.14	3.970	.021

* Tukey HSD post-hoc analysis indicates the mean difference was significant at the .05 level.

Table 13

Comparison of Participation Responses by Firm's LEED Experience

LEED Construction Practice	Mean of Experience			F	Sig.
	Yes	No	I Don't Know		
Adopt an erosion and sediment control plan for the project site during construction	4.62	4.51	4.38	.479	.620
Adopt a commissioning plan	3.45	2.65	3.14	8.179*	.000
Engage the commissioning authority early in the design phases	3.04	2.46	2.71	3.904*	.022
Designate a specific area on the construction site for recycling	3.64	2.67	2.83	12.426*	.000

* Tukey HSD post-hoc analysis indicates the mean difference was significant at the .05 level.

Table 13. (cont.)

Comparison of Participation Responses by Firm's LEED Experience

	Mean of Experience				
LEED Construction Practice	Yes	No	I Don't Know	F	Sig.
Incorporate salvaged materials into building	3.19	2.82	3.14	1.674	.190
Establish a project goal for recycled content materials	3.03	2.24	2.17	8.485*	.000
Establish a project goal for locally sourced materials	3.11	2.70	3.57	2.900	.058
Establish a project goal for rapidly renewable materials	2.52	1.87	2.17	6.783	.001
Establish a project goal for Forest Stewardship Council-certified wood products	2.32	1.96	2.67	2.473*	.087
Adopt an indoor air quality management plan to protect the HVAC system during construction	3.55	2.65	2.67	10.156*	.000
Prior to occupancy, perform a two week building flush-out or test the contaminant levels in the building	2.88	2.12	2.33	6.433	.002
Specify low-volatile organic compound (VOC) adhesives and sealants in construction documents	3.10	2.69	3.00	1.790	.170
Specify low-VOC paints and coatings in construction documents	3.19	2.69	3.17	2.888	.058
Specify low-VOC carpet products and systems in construction documents	3.04	2.50	3.00	3.214	.043
Specify wood and agrifiber products that contain no added urea-formaldehyde resins	2.75	2.34	2.83	2.151	.120

* Tukey HSD post-hoc analysis indicates the mean difference was significant at the .05 level.

Means Analysis of Size of Firm

Responses based on the size of the firm show that firms with more than 100 employees reported significantly higher awareness (Table 14) for the following three LEED practices:

Item 2 - Adopt a commissioning plan (1-49 employees $\bar{x}$=3.07, 100+ employees $\bar{x}$ =3.86, F=3.954, $\bar{d}$=0.632, p=.027).

Item 3 - Engage the commissioning authority early in the design phases (F=3.954, 1-49 employees $\bar{x}$=3.07, 100+ employees $\bar{x}$=3.86, $\bar{d}$=0.705, p=.019).

Item 5 - Incorporate salvaged materials into building (F=3.491, 1-49 employees $\bar{x}$ =3.27, 100+ employees $\bar{x}$=4.07, $\bar{d}$=0.584, p=.035).

Responses from firms with more than 100 employees reported significantly higher participation (Table 15) scores for the following seven LEED practices:

Item 2 - Adopt a commissioning plan (F=7.061; 1-49 employees $\bar{x}$=2.55, 50-99 employees $\bar{x}$=3.27, $\bar{d}$=0.772, p=.004; 50-99 employees $\bar{x}$=3.27, 100+ employees $\bar{x}$ =3.23, $\bar{d}$=0.700, p=.008).

Item 3 - Engage the commissioning authority early in the design phases (F=6.908; 1-49 employees $\bar{x}$=2.24, 50-99 employees $\bar{x}$=2.86, $\bar{d}$=0.681, p=.016; 50-99 employees $\bar{x}$=2.86, 100+ employees $\bar{x}$=2.98, $\bar{d}$=0.797, p=.003).

Item 4 - Designate a specific area on the construction site for recycling (F=7.173, 1-49 employees $\bar{x}$=2.66, 100+ employees $\bar{x}$=3.57, $\bar{d}$=0.866, p=.001).

Item 5 - Incorporate salvaged materials into building (F=7.310; 1-49 employees $\bar{x}$ =2.41, 50-99 employees $\bar{x}$=3.11, $\bar{d}$=0.672, p=.013; 50-99 employees $\bar{x}$=3.11, 100+ employees $\bar{x}$=3.30, $\bar{d}$=0.789, p=.002).

Item 6 - Establish a project goal for recycled content materials (F=6.212; 1-49 employees $\bar{x}$=2.14, 50-99 employees $\bar{x}$=2.51, $\bar{d}$=0.644, p=.019; 50-99 employees $\bar{x}$=2.51, 100+ employees $\bar{x}$=2.84, $\bar{d}$=0.719, p=.005).

Item 7 - Establish a project goal for locally sourced materials (F=3.886, 1-49 employees $\bar{x}$=2.59, 100+ employees $\bar{x}$=3.05, $\bar{d}$=0.616, p=.025).

Item 8 - Establish a project goal for rapidly renewable materials (F=2.975, 1-49 employees $\bar{x}$=1.93, 100+ employees $\bar{x}$=2.39, $\bar{d}$=0.503, p=.043).

Table 14.

Comparison of Awareness Responses by Size of Firm

LEED Construction Practice	Mean Scores 1-49	50-99	100+	F	Sig.
Adopt an erosion and sediment control plan for the project site during construction	4.61	4.81	4.82	1.736	.179
Adopt a commissioning plan	3.07	3.65	3.86	3.954*	.021
Engage the commissioning authority early in the design phases	2.86	3.16	3.77	3.720*	.026
Designate a specific area on the construction site for recycling	3.34	3.57	4.09	2.417	.092
Incorporate salvaged materials into building	3.27	3.78	4.07	3.491*	.032
Establish a project goal for recycled content materials	3.03	3.24	3.84	2.524	.083
Establish a project goal for locally sourced materials	3.27	3.54	3.80	1.640	.197
Establish a project goal for rapidly renewable materials	2.79	2.97	3.30	1.873	.156
Establish a project goal for Forest Stewardship Council-certified wood products	2.79	2.59	3.14	1.508	.224
Adopt an indoor air quality management plan to protect the HVAC system during construction	3.45	3.51	3.57	.039	.962
Prior to occupancy, perform a two week building flush-out or test the contaminant levels in the building	2.85	2.84	3.50	2.235	.110
Specify low-volatile organic compound (VOC) adhesives and sealants in construction documents	3.34	3.51	3.57	.235	.791
Specify low-VOC paints and coatings in construction documents	3.46	3.57	3.45	.140	.869
Specify low-VOC carpet products and systems in construction documents	3.32	3.38	3.39	.037	.964
Specify wood and agrifiber products that contain no added urea-formaldehyde resins	3.11	3.11	3.20	.005	.995

* Tukey HSD post-hoc analysis indicates the mean difference was significant at the .05 level.

Table 15.

Comparison of Participation Responses by Size of Firm

LEED Construction Practice	Mean Scores 1-49	50-99	100+	F	Sig.
Adopt an erosion and sediment control plan for the project site during construction	4.42	4.65	4.68	1.887	.154
Adopt a commissioning plan	2.55	3.27	3.23	7.061*	.001
Engage the commissioning authority early in the design phases	2.24	2.86	2.98	6.908*	.001
Designate a specific area on the construction site for recycling	2.66	3.00	3.57	7.173*	.001
Incorporate salvaged materials into building	2.41	3.11	3.30	7.310*	.001
Establish a project goal for recycled content materials	2.14	2.51	2.84	6.212*	.002
Establish a project goal for locally sourced materials	2.59	2.89	3.05	3.886*	.022
Establish a project goal for rapidly renewable materials	1.93	2.11	2.39	2.975*	.054
Establish a project goal for Forest Stewardship Council-certified wood products	2.03	1.92	2.30	1.025*	.361
Adopt an indoor air quality management plan to protect the HVAC system during construction	2.94	2.92	3.18	.541	.583
Prior to occupancy, perform a two week building flush-out or test the contaminant levels in the building	2.21	2.16	2.80	2.831	.062
Specify low-volatile organic compound (VOC) adhesives and sealants in construction documents	2.73	2.78	3.05	.247	.781
Specify low-VOC paints and coatings in construction documents	2.82	2.84	2.98	.138	.872
Specify low-VOC carpet products and systems in construction documents	2.72	2.59	2.75	.003	.997
Specify wood and agrifiber products that contain no added urea-formaldehyde resins	2.39	2.46	2.64	.645	.526

* Tukey HSD post-hoc analysis indicates the mean difference was significant at the .05 level.

Means Analysis of Annual Dollar Volume

The greatest number of significant differences was in the annual dollar volume demographic category as shown in Tables 16 and 17. Eight LEED construction practices generated significant differences in the awareness responses. Five LEED construction practices produced significant differences in participation responses.

Firms with the largest annual dollar volume, over $20 million per year, reported the highest significantly different awareness and participation mean scores for the following five items:

Item 1 - Adopt an erosion and sediment control plan for the project site during construction

Item 2 - Adopt a commissioning plan

Item 3 - Engage the commissioning authority early in the design phases

Item 4 - Designate a specific area on the construction site for recycling

Item 11 - Prior to occupancy, perform a two-week building flush-out or test the contaminant levels in the building.

Firms with the highest annual volume also reported the highest significantly different mean scores for only the awareness responses for the following three items:

Item 5 - Incorporate salvaged materials into building

Item 6 - Establish a project goal for recycled content materials

Item 7 - Establish a project goal for locally sourced materials.

Table 16.

Comparison of Awareness Responses by Annual Dollar Volume

	Firm's Annual Dollar Volume					
LEED Construction Practice	< $ 0.5m	$0.5m to < $1m	$1m to < $5m	$5m to < $20m	> $20m	F
Adopt an erosion and sediment control plan for the project site during construction	4.00	5.00	4.29	4.70	4.82	4.106*
Adopt a commissioning plan	4.00	2.67	2.90	2.94	3.88	6.171*
Engage the commissioning authority early in the design phases	5.00	2.67	2.71	2.66	3.65	6.320*
Designate a specific area on the construction site for recycling	5.00	4.00	3.38	3.15	3.85	3.477*
Incorporate salvaged materials into building	5.00	2.33	3.24	3.30	3.89	3.767*
Establish a project goal for recycled content materials	4.50	3.00	3.21	2.86	3.59	3.309*
Establish a project goal for locally sourced materials	5.00	4.00	3.08	3.09	3.75	3.816*
Establish a project goal for rapidly renewable materials	4.50	2.00	2.93	2.62	3.19	2.433

* Tukey HSD post-hoc analysis indicates the mean difference was significant at the .05 level.

Table 16 (cont.)

Comparison of Awareness Responses by Annual Dollar Volume

LEED Construction Practice	Firm's Annual Dollar Volume < $ 0.5m	$0.5m to < $1m	$1m to < $5m	$5m to < $20m	>$20m	F	Sig.
Establish a project goal for Forest Stewardship Council-certified wood product	4.50	1.67	2.86	2.56	3.05	2.416	.050
Adopt an indoor air quality management plan to protect the HVAC system during construction	5.00	2.00	3.48	3.26	3.57	1.886	.115
Prior to occupancy, perform a two week building flush-out or test the contaminant levels in the building	4.50	1.00	2.93	2.50	3.40	5.642*	.000
Specify low-volatile organic compound (VOC) adhesives and sealants in construction documents	4.00	2.00	3.35	3.16	3.62	1.752	.141
Specify low-VOC paints and coatings in construction documents	4.50	2.00	3.41	3.20	3.66	2.076	.086
Specify low-VOC carpet products and systems in construction documents	4.00	2.00	3.22	3.12	3.51	.037	.964
Specify wood and agrifiber products that contain no added urea-formaldehyde resins	4.50	2.50	3.11	2.88	3.31	.005	.995

* Tukey HSD post-hoc analysis indicates the mean difference was significant at the .05 level.

Table 17.

Comparison of Participation Responses by Annual Dollar Volume

	Firm's Annual Dollar Volume						
LEED Construction Practice	< $ 0.5m	$0.5m to < $1m	$1m to < $5m	$5m to < $20m	> $20m	F	Sig.
Adopt an erosion and sediment control plan for the project site during construction	2.00	3.00	4.40	4.50	4.73	8.065*	.000
Adopt a commissioning plan	2.00	2.00	2.48	2.68	3.42	5.131*	.001
Engage the commissioning authority early in the design phases	3.50	2.00	2.23	2.37	3.09	4.021*	.004
Designate a specific area on the construction site for recycling	3.50	1.67	2.58	2.85	3.41	3.769*	.006
Incorporate salvaged materials into building	3.50	2.00	2.79	2.92	3.12	.889	.472
Establish a project goal for recycled content materials	2.00	1.67	2.35	2.33	2.81	1.888	.115
Establish a project goal for locally sourced materials	3.50	2.33	2.65	2.87	3.00	.572	.683
Establish a project goal for rapidly renewable materials	2.00	1.33	1.92	2.04	2.32	1.207	.309
Establish a project goal for Forest Stewardship Council-certified wood products	3.00	1.33	2.15	2.03	2.20	.741	.565

* Tukey HSD post-hoc analysis indicates the mean difference was significant at the .05 level.

Table 17 (cont.)

Comparison of Participation Responses by Annual Dollar Volume

	Firm's Annual Dollar Volume						
LEED Construction Practice	< $ 0.5m	$0.5m to < $1m	$1m to < $5m	$5m to < $20m	>$20m	F	Sig.
Adopt an indoor air quality management plan to protect the HVAC system during construction	3.50	1.67	2.85	3.07	3.11	.975	.423
Prior to occupancy, perform a two week building flush-out or test the contaminant levels in the building	3.00	1.00	2.42	2.00	2.76	3.622*	.007
Specify low-volatile organic compound (VOC) adhesives and sealants in construction documents	2.50	2.00	2.88	2.68	3.03	.878	.478
Specify low-VOC paints and coatings in construction documents	3.00	2.00	2.85	2.73	3.09	.940	.442
Specify low-VOC carpet products and systems in construction documents	2.50	2.00	2.78	2.58	2.87	.577	.680
Specify wood and agrifiber products that contain no added urea-formaldehyde resins	3.00	2.00	2.40	2.37	2.67	.666	.616

* Tukey HSD post-hoc analysis indicates the mean difference was significant at the .05 level.

Chapter 5

SUMMARY FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

The results presented in this chapter are organized by (a) discussion regarding the significance of the study, (b) restatement of the need for the study, (c) restatement of the problem, (d) explanation of the data collection and analysis process, (e) summary of findings, (f) discussion of conclusions, and (g) implications and recommendations for further research.

Significance of Study

The construction industry is one of the largest sectors of the U.S. economy. In 2004, the industry generated $955 billion of output and employed 6.7 million workers. The largest U.S. trade organization is the Associated General Contractors of America (AGC), known as "the voice of the construction industry" and is comprised of over 33,000 members.

The U.S. Green Building Council's (USGBC) green building rating system, Leadership in Energy and Environmental Design (LEED) is the current industry standard for green building practices. LEED-registered projects represent nearly five percent of the total square footage of new construction in the U.S.

AGC of America proposed a stronger relationship with the USGBC to increase LEED awareness and participation among AGC members. No data exists that establishes

current levels of LEED awareness and participation within the population of AGC contractor members.

Restatement of the Need for the Study

This study quantified constructors' perceptions of green building practices by measuring the current levels of awareness of, and participation in sustainable construction methods according to the contractor members of the AGC. There is concurrence in the literature that the socioeconomic practices in the developed world are not currently sustainable and that an achievable, long-term plan for the sustainable construction of the built environment is necessary. Although the complexity of constructing buildings creates significant challenges, there is a repeated call for a common system or framework to secure a sustainable built environment (Bebbington & Gray, 2001; Hemphill et al., 2002; Nobe & Dunbar, 2004; Wyatt et al., 2000).

The LEED system is the recognized leader in the evolving market of green building practices, The AGC seeks to work with the USGBC to build the construction industry's awareness of and participation in LEED. This can only be accomplished through open communication and providing educational resources to the building industry on a larger scale. AGC's goal is to keep members informed and prepared to participate in projects where LEED certification is specified. This responsibility has encouraged the AGC to promote awareness of LEED to its members and to foster a working relationship with USGBC (Flores, 2005, p. 2).

Members of AGC have requested that the organization provide more resources, education and training about LEED. In turn, the AGC leadership has requested that the

USGBC expand its collaboration and cooperation with the AGC. The AGC explicitly stated it would not offer in-depth LEED training to its members without USGBC's participation and could not certify LEED Accredited Professionals, but only seeks to work with USGBC to build LEED awareness and participation (Flores, 2005, p. 8).

Restatement of the Problem

The AGC seeks to collaborate with the USGBC to increase awareness and participation in the LEED Green Building Rating System. No data existed that established the current levels of awareness and participation among AGC contractor members, nor has there been a study determining the relationship between those levels and a firm's demographic characteristics. This study examined and quantified contractors' awareness of the practices promoted by the LEED system and the firm's participation in LEED projects.

Data Collection and Analysis

Data were collected from contractor members of the AGC via an online survey instrument. Using SPSS software, statistical analysis of the data examined correlations and differences in means.

The scale for "Awareness" and "Participation" responses ranged from a rating of (1) Strongly Disagree, to (5) Strongly Agree. The demographic categories in the survey were based on earlier AGC surveys regarding environmental issues. A panel of experts reviewed and commented on the survey instrument. Item analysis based on the panel of experts' feedback determined the content validity of the survey instrument.

The population for this study consisted of 4432 contractor members of the AGC of America that listed an e-mail address in the online AGC directory, From this population a random sample of 200 was selected for a pilot study to establish the instrument's reliability. Cronbach's alpha analysis resulted in a 0.9 correlation coefficient for both the awareness and participation responses. The entire remaining population of 4232 subjects comprised the sample. The respondents returned 200 useable surveys, a return rate of 6 percent.

Summary of Findings

The instrument employed a Likert-type five-point scale comprised of values for scoring awareness and participation, where 1 = Strongly Disagree and 5 = Strongly Agree. The means for "Awareness" ranged from 4.70 to 2.84, with an average mean of 3.37 (Table 6). The means for "Participation" ranged from 4.55 to 2.20, with an average mean of 2.83 (Table 7). Results identified relationships between LEED awareness and LEED participation. Table 5 shows significant correlation (p=0.01, 2-tailed) between awareness and participation responses for all fifteen LEED items. The lowest correlation coefficient was 0.60 for the LEED practice of establishing a project goal for recycled-content material. The highest was a coefficient of 0.76 for adopting a commissioning plan. Based on the Spearman's rho analysis, which indicated a significant correlation between awareness and participation, the research hypothesis (H_0) was not rejected.

Differences between the means of responses from the demographic categories in the survey were analyzed using SPSS software for t-tests, ANOVA and post-hoc analyses. Only the LEED familiarity variable was analyzed using t-tests (Tables 8 and 9).

ANOVA calculations were performed on 1) type of firm (Tables 10 and 11); 2) LEED experience (Tables 12 and 13); 3) size of firm (Tables 14 and 15); and 4) annual dollar volume (Tables 16 and 17).

The ANOVA results indicated significant differences between means. Therefore, Tukey HSD post-hoc analyses were required to determine which means had significant differences. Results from the Tukey HSD post-hoc analyses are shown in Appendixes D, E, F and G.

Correlation Analysis

The research hypothesis stated that there is statistically significant correlation between awareness and participation. Correlational analysis of the data from the Likert-type scale responses addressed the hypothesis by calculating Spearman's rho for the scores from each respondent in the two response categories; awareness and participation.

Spearman's rho analysis resulted in correlation coefficient between all 15 variables at the 0.01 level of significance. The resulting correlation coefficients ranged between 0.60 and 0.78 (p=0.01). These positive correlations indicate that contractors aware of LEED practices tend to participate in projects employing LEED practices.

Discussion of LEED Familiarity

Tukey HSD post-hoc analysis results from the demographic question regarding respondents' familiarity with LEED, shown in tables 8 and 9, resulted in no significant differences in the responses based on awareness and participation. The familiarity question in the demographic section of the survey instrument inquired specifically about

the respondent's personal familiarity with LEED and was not a question about the respondent's firm, whereas, the means analysis addressed the firm's LEED awareness and participation. Therefore, it is not unexpected that the means analysis did not produce any significant differences.

Discussion of Firm Type Results

Tukey HSD post-hoc analysis results, shown in Tables 10 and 11, suggested that only one LEED item (adopt an erosion and sediment control plan) in the participation category, and none in awareness, received significantly different mean scores based on the type of firm. Participation in the practice of adopting an erosion control plan received a significantly higher mean score from General Contractors than from Trade Contractors.

This is not a surprising result since erosion control is almost solely the responsibility of the General Contractor and a Trade Contractor would not typically be involved in, or responsible for such a plan.

Discussion of LEED Experience Results

Tukey HSD post-hoc analysis results, shown in Table 12, suggest that firms that have bid on or received contracts for projects seeking LEED certification report significantly different LEED awareness scores for every variable than those who do not have such LEED experience. It is reasonable and expected that participation in LEED increases awareness.

Tukey HSD post-hoc analysis results, shown in Table 13, indicate that participation was significantly higher for only six LEED items according to firms that

have LEED experience. This could indicate that having past experience with LEED diminishes a firm's interest in participating in more LEED projects.

Discussion of Firm Size Results

Tukey HSD post-hoc analysis results, shown in Table 14, suggest that three LEED items received significantly different mean scores in the awareness category based on the firm's size. Smaller firms reported the lower scores for (a) adopt a commissioning plan, (b) engage a commissioning authority early in the design phases, and (c) incorporate salvaged materials into the building.

Tukey HSD post-hoc analysis results, shown in Table 15, indicate that the mean participation scores for seven LEED items were significantly different according to the firm's size. In all cases, small firms (1-49 employees) rated the LEED items lower than the large firms (100+ employees).

This significant difference could be due to the nature of these particular LEED items. All seven relate to recycling, material selections and/or commissioning practices. These practices take considerable human and financial resources to implement and monitor and may therefore be more practical for larger firms.

Discussion of Annual Dollar Volume Results

Tukey HSD post-hoc analysis results, shown in Tables 16 and 17, indicate that the greatest number of significant differences was in the annual dollar volume demographic category. Eight LEED construction practices generated significant differences in the awareness responses. Five LEED construction practices produced significant differences

in participation responses.

Tukey HSD post-hoc analysis results, shown in table 18, indicated that firms with the largest annual dollar volume, over $20 million per year, reported the highest significantly different awareness and participation mean scores for five items; 1) adopt an erosion and sediment control plan for the project site during construction; 2) adopt a commissioning plan; 3) engage the commissioning authority early in the design phases; 4) designate a specific area on the construction site for recycling; 5) prior to occupancy, perform a two-week building flush-out or test the contaminant levels in the building.

Table 18.

Tukey Comparisons of Awareness Responses by Annual Dollar Volume

LEED Practice	Annual Dollar Volume		Mean Diff. (d)	Sig. (p)
Adopt an erosion and sediment control plan for the project site during construction	$1m to <$5m	>$20m	.535	.003
Adopt a commissioning plan	$1m to <$5m	>$20m	.983	.006
	$5m to <$20m	>$20m	.941	.000
Engage the commissioning authority early in the design phases	$1m to <$5m	>$20m	.933	.022
	$5m to <$20m	>$20m	.986	.000
Designate a specific area on the construction site for recycling	$5m to <$20m	>$20m	.692	.012
Incorporate salvaged materials into building	$5m to <$20m	>$20m	.593	.048
Establish a project goal for recycled content materials	$5m to <$20m	>$20m	.725	.008
Establish a project goal for locally sourced materials	$5m to <$20m	>$20m	.656	.019
Prior to occupancy, perform a two week building flush-out or test the contaminant levels in the building	$0.5m to <$1m	>$20m	2.396	.041
	$5m to <$20m	>$20m	.896	.002

Tukey HSD post-hoc analysis results, shown in Table 19, indicated that firms with the highest annual volume also reported the highest significantly different mean scores for only the awareness responses for three items; 1) incorporate salvaged materials into building; 2) establish a project goal for recycled content materials; and 3) establish a project goal for locally sourced materials.

Table 19.

Tukey Comparisons of Participation Responses by Annual Dollar Volume

LEED Practice	Annual Dollar Volume		Mean Diff. (d)	Sig. (p)
Adopt an erosion and sediment control plan for the project site during construction	<$0.5m	$1m to <$5m	2.400	.002
	<$0.5m	$5m to <$20m	2.500	.001
	<$0.5m	>$20m	2.729	.000
	$0.5m to <$1m	$5m to <$20m	1.500	.030
	$0.5m to <$1m	>$20m	1.729	.007
Adopt a commissioning plan	>$20m	$1m to <$5m	.938	.011
	>$20m	$5m to <$20m	.742	.006
Engage the commissioning authority early in the design phases	>$20m	$1m to <$5m	.858	.035
	>$20m	$5m to <$20m	.722	.012
Designate a specific area on the construction site for recycling	>$20m	$1m to <$5m	.838	.039
Prior to occupancy, perform a two week building flush-out or test the contaminant levels in the building	>$20m	$5m to <$20m	.756	.011

Implications and Conclusions

The LEED practice of adopting an erosion control plan received the highest mean score in both the awareness and participation category for every demographic group. This is not only an environmentally responsible construction practice, but also highly

regulated and potentially costly if implemented improperly or avoided. This could be a practice for the USGBC and the AGC to model when trying to educate contractors about the value of adopting these practices. If the cost-benefit of other practices can be shown as comparable to erosion control, contractors' adoption rate for other practices, such as commissioning or recycling may be increased (Phillis & Andriantiatsaholiniaina, 2001).

The following three items also rated among the five highest mean scores in both the awareness and participation categories: (a) incorporating salvaged materials into buildings, (b) designating a specific area on the construction site for recycling, (c) adopting an indoor air quality management plan to protect the HVAC system during construction.

High mean scores for incorporating salvaged materials into buildings could be the result of several industry factors, including increasing costs of new materials, increasing costs of waste removal, or aesthetic and environmental preferences of clients and architects. High awareness and participation implies that constructors either see inherent value in the practice or market forces are encouraging implementation of this practice (Roodman & Lenssen, 1995).

Cost savings and potential income opportunities may be factors influencing the high mean scores for the practice of designating a specific area on the construction site for recycling. Some municipalities and clients require contractors to recycle certain materials during construction. Some materials have resale value and or the cost of giving the recyclables to a processor costs less than placing the material in a landfill (Seiter, 2001).

Adopting an indoor air-quality management plan to protect the HVAC system

during construction is a practice influenced by clients and the ultimate occupants of a building, as well as architects, engineers, municipalities, subcontractors and suppliers. Protecting the air quality and the mechanical systems during construction can affect the efficiency, life-span and warranty of the HVAC equipment. A management plan can also increase the health and productivity of workers during construction and the indoor air quality of the finished structure. This is another practice the USGBC and AGC can use to show contractors the cost-benefits of green building methods.

Four LEED practices rated among the five lowest mean scores in both the awareness and participation categories; (a) specify wood and agrifiber products that contain no added urea-formaldehyde resin, (b) specify low-VOC carpet products and systems in construction documents, (c) establish a project goal for Forest Stewardship Council-certified wood products and (d) establish a project goal for rapidly renewable materials.

As the number of LEED-certified projects has increased, the greater exposure has increased the number of LEED critics and opponents. Rick Fedrizzi, President of the USGBC, has openly acknowledged the need for critical and constant review and revisions to the system. The data from this study, specifically results indicating the least known or practiced LEED items, could be used in those revisions. The lowest-scoring items may need to be removed from the system or rewritten to increase their utility (Fedrizzi, 2004).

The data may have value to the AGC as they attempt to increase awareness and participation. By focusing little or no time on the LEED items contractors choose not to utilize, the organization can spend its resources focusing on the practices some of their

members are already employing.

Recommendations for Further Research

This study measured current levels of AGC contractors' awareness and participation regarding the LEED Green Building Rating System. According to the AGC Director of Environmental Programs, the organization seeks to increase its members' awareness and participation in LEED via an improved relationship with, and possible membership in the USGBC. Follow-up studies could measure and track the relationship between the organizations by regularly gathering the same information as this study and comparing the data.

Although this study has shown a positive relationship between LEED awareness and participation, the causation has not been studied. It is possible that involvement in a LEED project (participation) increases a contractor's knowledge or consciousness of LEED practices (awareness). However, it could also be the case that awareness is a prerequisite to participation. This research established correlation, but further study should attempt to determine causation.

An additional recommendation of this study is to complete a subsequent series of longitudinal studies, which would employ the same instrument and population every several years to measure changes in LEED participation and awareness. This study could examine this population to determine if the AGC's LEED training efforts result in increased awareness and participation.

While this study used a questionnaire-based approach, it is recommended that case study research would examine specific firms in this population to investigate if

respondents holding different positions perceive the firm's awareness and participation differently from their colleagues in that same firm.

This study revealed opportunities to study the need for, and the effect training has, on AGC members and firms. Future research should determine if LEED training is most effective if delivered by the firm, the AGC, the USGBC or another source. Additional research regarding training could measure the effectiveness of increasing LEED awareness and participation based on which employees in a firm receive the training. For example, estimators, project managers and presidents from different firma could receive identical training and a study could measure which firm's awareness and participation were most improved. Further research in this vein could also examine how LEED point items become standard operating procedures for firms.

Construction management curriculum at the baccalaureate level should also be studied in relation to LEED awareness and participation. Subsequent research should determine how educators can best integrate LEED principles and practices with current curriculum content. In the future, a researcher could conduct a comparative analysis of the LEED items from this study and the required curriculum components for American Council for Construction Education accreditation. This could result in recommendations for incorporating LEED concepts into construction curriculum.

Tukey HSD post-hoc analysis results indicated that participation was significantly higher for only six LEED items according to firms that have LEED experience. Subsequent research could investigate if having past experience with LEED diminishes a firm's interest in participating in more LEED projects.

The growth in LEED usage and industry acceptance has created a very new

market for LEED-related technology. Digital tools for implementing, measuring and tracking LEED projects, as well as LEED training software applications are appearing on the market with increasing frequency. Industry professionals are often inundated with technology options and further study is needed to assess and analyze these tools to meet these professionals' need for unbiased evaluation.

LEED as a construction rating system may have utility as a rating system for manufactured goods produced in LEED certified buildings. Additional studies could develop metrics for measuring the combined environmental impact of buildings and the output from those buildings. This research agenda could provide a means for designers, constructors, and manufacturers to cooperate in the design and production of buildings and manufactured goods to minimize environmental impact.

Analysis of the data for this study indicated that AGC contractors perceive their firms' awareness and participation of erosion control practices to be very high. Additional study could determine if this particular LEED item, and the associated legislation that reinforces and requires its use, could serve as a model for the AGC and USGBC to use when training AGC contractors as part of the effort to increase participation and awareness in other LEED areas.

There exists both need and opportunity for further study of AGC contractors and LEED. The most effective future research will likely result from collaboration between the AGC, specifically the Environmental Program office, the USGBC and the researcher. The resulting data will have utility and value to students, practitioners, researchers, clients and a society that is affected by and reliant upon the built environment.

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APPENDIX A:

LEED Green Building Rating System, version 2.0

Project Checklist

Sustainable Sites — 14 Possible Points

Y	Prereq 1	**Erosion & Sedimentation Control**	Required
	Credit 1	**Site Selection**	1
	Credit 2	**Urban Redevelopment**	1
	Credit 3	**Brownfield Redevelopment**	1
	Credit 4.1	**Alternative Transportation**, Public Transportation Access	1
	Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms	1
	Credit 4.3	**Alternative Transportation**, Alternative Fuel Vehicles	1
	Credit 4.4	**Alternative Transportation**, Parking Capacity	1
	Credit 5.1	**Reduced Site Disturbance**, Protect or Restore Open Space	1
	Credit 5.2	**Reduced Site Disturbance**, Development Footprint	1
	Credit 6.1	**Stormwater Management**, Rate and Quantity	1
	Credit 6.2	**Stormwater Management**, Treatment	1
	Credit 7.1	**Heat Island Effect**, Non-Roof	1
	Credit 7.2	**Heat Island Effect**, Roof	1
	Credit 8	**Light Pollution Reduction**	1

Water Efficiency — 5 Possible Points

	Credit 1.1	**Water Efficient Landscaping**, Reduce by 50%	1
	Credit 1.2	**Water Efficient Landscaping**, No Potable Use or No Irrigation	1
	Credit 2	**Innovative Wastewater Technologies**	1
	Credit 3.1	**Water Use Reduction**, 20% Reduction	1
	Credit 3.2	**Water Use Reduction**, 30% Reduction	1

Energy & Atmosphere — 17 Possible Points

Y	Prereq 1	**Fundamental Building Systems Commissioning**	Required
Y	Prereq 2	**Minimum Energy Performance**	Required
Y	Prereq 3	**CFC Reduction in HVAC&R Equipment**	Required
	Credit 1	**Optimize Energy Performance**	1–10
	Credit 2.1	**Renewable Energy**, 5%	1
	Credit 2.2	**Renewable Energy**, 10%	1
	Credit 2.3	**Renewable Energy**, 20%	1
	Credit 3	**Additional Commissioning**	1
	Credit 4	**Ozone Depletion**	1
	Credit 5	**Measurement & Verification**	1
	Credit 6	**Green Power**	1

LEED

Materials & Resources — 13 Possible Points

Y	Prereq 1	**Storage & Collection of Recyclables**	Required
	Credit 1.1	**Building Reuse**, Maintain 75% of Existing Shell	1
	Credit 1.2	**Building Reuse**, Maintain 100% of Shell	1
	Credit 1.3	**Building Reuse**, Maintain 100% Shell & 50% Non-Shell	1
	Credit 2.1	**Construction Waste Management**, Divert 50%	1
	Credit 2.2	**Construction Waste Management**, Divert 75%	1
	Credit 3.1	**Resource Reuse**, Specify 5%	1
	Credit 3.2	**Resource Reuse**, Specify 10%	1
	Credit 4.1	**Recycled Content**, Specify 5% (p.c. + 1/2 p.i.)	1
	Credit 4.2	**Recycled Content**, Specify 10% (p.c. + 1/2 p.i.)	1
	Credit 5.1	**Local/Regional Materials**, 20% Manufactured Locally	1
	Credit 5.2	**Local/Regional Materials**, of 20% in MRc5.1, 50% Harvested Locally	1
	Credit 6	**Rapidly Renewable Materials**	1
	Credit 7	**Certified Wood**	1

Indoor Environmental Quality — 15 Possible Points

Y	Prereq 1	**Minimum IAQ Performance**	Required
Y	Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	Required
	Credit 1	**Carbon Dioxide** (CO_2) **Monitoring**	1
	Credit 2	**Ventilation Effectiveness**	1
	Credit 3.1	**Construction IAQ Management Plan**, During Construction	1
	Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy	1
	Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	1
	Credit 4.2	**Low-Emitting Materials**, Paints	1
	Credit 4.3	**Low-Emitting Materials**, Carpet	1
	Credit 4.4	**Low-Emitting Materials**, Composite Wood	1
	Credit 5	**Indoor Chemical & Pollutant Source Control**	1
	Credit 6.1	**Controllability of Systems**, Perimeter	1
	Credit 6.2	**Controllability of Systems**, Non-Perimeter	1
	Credit 7.1	**Thermal Comfort**, Comply with ASHRAE 55-1992	1
	Credit 7.2	**Thermal Comfort**, Permanent Monitoring System	1
	Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces	1
	Credit 8.2	**Daylight & Views**, Views for 90% of Spaces	1

Innovation & Design Process — 5 Possible Points

	Credit 1.1	**Innovation in Design**	1
	Credit 1.2	**Innovation in Design**	1
	Credit 1.3	**Innovation in Design**	1
	Credit 1.4	**Innovation in Design**	1
	Credit 2	**LEED™ Accredited Professional**	1

Project Totals — 69 Possible Points

Certified 26-32 points **Silver** 33-38 points **Gold** 39-51 points **Platinum** 52-69 points

APPENDIX B:

Online Survey Instrument

CONSTRUCTION PRACTICES SURVEY

Confidentiality & Contact Information

Please answer the following questions regarding you and your firm.

1. Which of the following best describes your firm?

- ○ Commercial General Contractor
- ○ Trade Contractor
- ○ Architect
- ○ Engineer
- ○ Other

2. What type of construction does your firm perform? (check all that apply)

- ☐ Building
- ☐ Highway
- ☐ Municipal/Utilities
- ☐ Federal/Heavy
- ☐ Demolition

3. Please indicate the size of your company in calendar year 2004? (If you're self- employed, be sure to include yourself and any partners)

- ○ 1 - 49 employees
- ○ 50 - 99 employees
- ○ 100+ employees

4. Where are your company's headquarters located?

5. What was your company's total dollar volume in 2004?

- ○ Less than $500,000
- ○ $500,000 to less than $1 million
- ○ $1 million to less than $5 million
- ○ $5 million to less than $20 million
- ○ Over $20 million

6. What is your function within your organization?

- ○ Construction or project manager
- ○ Purchasing manager
- ○ Land development
- ○ Architect or designer
- ○ General manager/president/owner/partner
- ○ Engineer
- ○ Sales or marketing manager
- ○ Other

7. Are you familiar with the LEED Green Building Rating System?

- ○ Yes
- ○ No

8. Has your company bid on or received a contract for a project seeking LEED certification?

- ○ Yes
- ○ No
- ○ I don't know

Please provide an e-mail address to gain access to the results of this study. Your address will not be shared:

Online survey, page 2 of 2

INSTRUCTIONS: Please provide an answer in both columns. Select a response (from 1 to 5) for both of the questions in the right columns. The questions refer to the descriptions listed below.	**My firm is AWARE of this construction practice.**					**My firm PARTICIPATES in projects that use this construction practice.**				
	Strongly Disagree				Strongly Agree	Strongly Disagree				Strongly Agree
	1	2	3	4	5	1	2	3	4	5
1. Adopt an erosion and sediment control plan for the project site during construction.	○	○	○	○	○	○	○	○	○	○
2. Adopt a commissioning plan.	○	○	○	○	○	○	○	○	○	○
3. Engage the commissioning authority early in the design phases.	○	○	○	○	○	○	○	○	○	○
4. Designate a specific area on the construction site for recycling.	○	○	○	○	○	○	○	○	○	○
5. Incorporate salvaged materials into building.	○	○	○	○	○	○	○	○	○	○
6. Establish a project goal for recycled content materials.	○	○	○	○	○	○	○	○	○	○
7. Establish a project goal for locally sourced materials.	○	○	○	○	○	○	○	○	○	○
8. Establish a project goal for rapidly renewable materials (bamboo flooring, wool carpets, straw board, cotton batt insulation, linoleum flooring, poplar OSB, sunflower seed board, wheatgrass cabinetry, etc.)	○	○	○	○	○	○	○	○	○	○
9. Establish a project goal for Forest Stewardship Council-certified wood products.	○	○	○	○	○	○	○	○	○	○
10. Adopt an indoor air quality management plan to protect the HVAC system during construction.	○	○	○	○	○	○	○	○	○	○
11. Prior to occupancy, perform a two week building flush-out or test the contaminant levels in the building.	○	○	○	○	○	○	○	○	○	○
12. Specify Low-volatile organic compound (VOC) adhesives and sealants in construction documents.	○	○	○	○	○	○	○	○	○	○
13. Specify Low-VOC paints and coatings in construction documents.	○	○	○	○	○	○	○	○	○	○
14. Specify Low-VOC carpet products and systems in construction documents.	○	○	○	○	○	○	○	○	○	○
15. Specify wood and agrifiber products that contain no added urea-formaldehyde resins.	○	○	○	○	○	○	○	○	○	○

Click here to finish

APPENDIX C:

E-mail Invitation to Complete the Online Survey

AGC Member-
My name is Scott Fee and I'm a construction management professor in Minnesota. I'm researching the green construction practices of AGC contractors.

Please click here to complete an online survey. It will take less than 5 minutes. Only AGC contractors are receiving this message and the results will be shared with the AGC of America.

Thanks for your time,

Scott Fee
Dept. Chair & Assistant Professor
Construction Management Program
Minnesota State University, Mankato
507.389.1170

APPENDIX D:

Type of Firm Means Analysis Tables

Descriptive Statistics for Type of Firm

LEED Practice	Type of Firm	N	Mean	SD	Std. Error
A1-Adopt an erosion and sediment control plan for the project site during construction	Commercial GC	154	4.70	.668	.054
	Trade Contractor	14	4.57	1.089	.291
	Other	16	4.75	.447	.112
	Total	184	4.70	.689	.051
A2-Adopt a commissioning plan	Commercial GC	160	3.49	1.378	.109
	Trade Contractor	15	2.80	1.474	.380
	Other	16	2.88	1.500	.375
	Total	191	3.39	1.409	.102
A3-Engage the commissioning authority early in the design phases	Commercial GC	157	3.20	1.456	.116
	Trade Contractor	15	2.80	1.568	.405
	Other	15	3.00	1.813	.468
	Total	187	3.15	1.492	.109
A4-Designate a specific area on the construction site for recycling	Commercial GC	160	3.55	1.359	.107
	Trade Contractor	15	3.53	1.246	.322
	Other	16	3.44	1.459	.365
	Total	191	3.54	1.352	.098
A5-Incorporate salvaged materials into building	Commercial GC	160	3.53	1.308	.103
	Trade Contractor	14	3.71	1.729	.462
	Other	16	3.81	1.559	.390
	Total	190	3.56	1.358	.099
A6-Establish a project goal for recycled content materials	Commercial GC	159	3.31	1.318	.104
	Trade Contractor	15	2.93	1.668	.431
	Other	16	3.19	1.515	.379
	Total	190	3.27	1.360	.099
A7-Establish a project goal for locally sourced materials	Commercial GC	154	3.45	1.278	.103
	Trade Contractor	14	3.57	1.651	.441
	Other	16	3.19	1.559	.390
	Total	184	3.43	1.329	.098

Descriptive Statistics for Type of Firm (cont.)

LEED Practice	Type of Firm	N	Mean	SD	Std. Error
A8-Establish a project goal for rapidly renewable materials	Commercial GC	161	2.98	1.414	.111
	Trade Contractor	15	2.53	1.685	.435
	Other	15	3.00	1.558	.402
	Total	191	2.94	1.444	.105
A9-Establish a project goal for Forest Stewardship Council-certified wood products	Commercial GC	160	2.89	1.408	.111
	Trade Contractor	15	2.27	1.580	.408
	Other	16	2.81	1.424	.356
	Total	191	2.84	1.425	.103
A10-Adopt an indoor air quality management plan to protect the HVAC system during construction	Commercial GC	157	3.52	1.357	.108
	Trade Contractor	15	2.80	1.740	.449
	Other	15	3.13	1.552	.401
	Total	187	3.43	1.414	.103
A11-Prior to occupancy, perform a two week building flush-out or test the contaminant levels in the building	Commercial GC	160	3.07	1.480	.117
	Trade Contractor	14	2.14	1.657	.443
	Other	15	2.87	1.598	.413
	Total	189	2.98	1.514	.110
A12-Specify Low-volatile organic compound (VOC) adhesives and sealants in construction documents	Commercial GC	153	3.42	1.431	.116
	Trade Contractor	14	3.00	1.664	.445
	Other	14	3.43	1.399	.374
	Total	181	3.39	1.443	.107
A13-Specify Low-VOC paints and coatings in construction documents	Commercial GC	153	3.50	1.387	.112
	Trade Contractor	14	3.00	1.664	.445
	Other	15	3.13	1.407	.363
	Total	182	3.43	1.412	.105
A14-Specify Low-VOC carpet products and systems in construction documents	Commercial GC	155	3.35	1.472	.118
	Trade Contractor	14	3.00	1.664	.445
	Other	15	3.00	1.512	.390
	Total	184	3.30	1.487	.110
A15-Specify wood and agrifiber products that contain no added urea-formaldehyde resins	Commercial GC	156	3.19	1.431	.115
	Trade Contractor	13	2.85	1.625	.451
	Other	15	2.80	1.320	.341
	Total	184	3.13	1.435	.106

Descriptive Statistics for Type of Firm (cont.)

LEED Practice	Type of Firm	N	Mean	SD	Std. Error
P1-Adopt an erosion and sediment control plan for the project site during construction	Commercial GC	169	4.63	.792	.061
	Trade Contractor	15	3.80	1.699	.439
	Other	16	4.38	.957	.239
	Total	200	4.55	.923	.065
P2-Adopt a commissioning plan	Commercial GC	158	3.08	1.380	.110
	Trade Contractor	14	2.57	1.284	.343
	Other	16	2.50	1.211	.303
	Total	188	2.99	1.368	.100
P3-Engage the commissioning authority early in the design phases	Commercial GC	154	2.73	1.382	.111
	Trade Contractor	14	2.36	1.277	.341
	Other	14	2.71	1.541	.412
	Total	182	2.70	1.383	.102
P4-Designate a specific area on the construction site for recycling	Commercial GC	156	3.09	1.388	.111
	Trade Contractor	14	2.79	1.311	.350
	Other	16	3.19	1.328	.332
	Total	186	3.08	1.373	.101
P5-Incorporate salvaged materials into building	Commercial GC	157	2.86	1.283	.102
	Trade Contractor	15	3.60	1.682	.434
	Other	16	3.56	1.459	.365
	Total	188	2.98	1.352	.099
P6-Establish a project goal for recycled content materials	Commercial GC	154	2.51	1.305	.105
	Trade Contractor	14	2.57	1.555	.416
	Other	16	2.94	1.436	.359
	Total	184	2.55	1.334	.098
P7-Establish a project goal for locally sourced materials	Commercial GC	155	2.84	1.326	.107
	Trade Contractor	13	3.46	1.664	.462
	Other	16	2.94	1.389	.347
	Total	184	2.89	1.359	.100
P8-Establish a project goal for rapidly renewable materials	Commercial GC	151	2.10	1.130	.092
	Trade Contractor	14	2.21	1.424	.381
	Other	14	2.57	1.453	.388
	Total	179	2.15	1.181	.088

Descriptive Statistics for Type of Firm (cont.)

LEED Practice	Type of Firm	N	Mean	SD	Std. Error
P9-Establish a project goal for Forest Stewardship Council-certified wood products	Commercial GC	151	2.07	1.153	.094
	Trade Contractor	13	2.15	1.725	.478
	Other	16	2.69	1.250	.313
	Total	180	2.13	1.215	.091
P10-Adopt an indoor air quality management plan to protect the HVAC system during construction	Commercial GC	157	3.08	1.375	.110
	Trade Contractor	13	2.62	1.805	.500
	Other	15	2.87	1.187	.307
	Total	185	3.03	1.393	.102
P11-Prior to occupancy, perform a two week building flush-out or test the contaminant levels in the building	Commercial GC	154	2.44	1.405	.113
	Trade Contractor	12	2.17	1.801	.520
	Other	15	2.47	1.187	.307
	Total	181	2.43	1.411	.105
P12-Specify Low-volatile organic compound (VOC) adhesives and sealants in construction documents	Commercial GC	155	2.86	1.410	.113
	Trade Contractor	12	2.92	1.929	.557
	Other	14	2.79	1.188	.318
	Total	181	2.86	1.425	.106
P13-Specify Low-VOC paints and coatings in construction documents	Commercial GC	155	2.92	1.398	.112
	Trade Contractor	12	2.75	1.815	.524
	Other	15	2.87	1.187	.307
	Total	182	2.91	1.405	.104
P14-Specify Low-VOC carpet products and systems in construction documents	Commercial GC	152	2.75	1.420	.115
	Trade Contractor	12	2.58	1.881	.543
	Other	15	2.67	1.234	.319
	Total	179	2.73	1.432	.107
P15-Specify wood and agrifiber products that contain no added urea-formaldehyde resins	Commercial GC	146	2.52	1.288	.107
	Trade Contractor	11	2.64	1.804	.544
	Other	15	2.53	1.125	.291
	Total	172	2.53	1.304	.099

ANOVA Between Groups for Type of Firm

LEED Practice	Sum of Squares	df	Mean Square	F	Sig.
A1-Adopt an erosion and sediment control plan for the project site during construction	.268	2	.134	.280	.756
A2-Adopt a commissioning plan	11.186	2	5.593	2.872	.059
A3-Engage the commissioning authority early in the design phases	2.529	2	1.264	.566	.569
A4-Designate a specific area on the construction site for recycling	.185	2	.092	.050	.951
A5-Incorporate salvaged materials into building	1.547	2	.774	.417	.660
A6-Establish a project goal for recycled content materials	2.121	2	1.060	.570	.566
A7-Establish a project goal for locally sourced materials	1.267	2	.633	.356	.701
A8-Establish a project goal for rapidly renewable materials	2.733	2	1.366	.653	.522
A9-Establish a project goal for Forest Stewardship Council-certified wood products	5.404	2	2.702	1.335	.266
A10-Adopt an indoor air quality management plan to protect the HVAC system during construction	8.432	2	4.216	2.135	.121
A11-Prior to occupancy, perform a two week building flush-out or test the contaminant levels in the building	11.261	2	5.631	2.495	.085
A12-Specify Low-volatile organic compound (VOC) adhesives and sealants in construction documents	2.271	2	1.135	.542	.582
A13-Specify Low-VOC paints and coatings in construction documents	4.727	2	2.364	1.188	.307
A14-Specify Low-VOC carpet products and systems in construction documents	3.076	2	1.538	.693	.501
A15-Specify wood and agrifiber products that contain no added urea-formaldehyde resins	3.168	2	1.584	.767	.466

ANOVA Between Groups (cont.)

LEED Practice	Sum of Squares	df	Mean Square	F	Sig.
P1-Adopt an erosion and sediment control plan for the project site during construction	10.096	2	5.048	6.238	.002
P2-Adopt a commissioning plan	7.462	2	3.731	2.015	.136
P3-Engage the commissioning authority early in the design phases	1.822	2	.911	.474	.623
P4-Designate a specific area on the construction site for recycling	1.408	2	.704	.371	.691
P5-Incorporate salvaged materials into building	13.460	2	6.730	3.791	.024
P6-Establish a project goal for recycled content materials	2.616	2	1.308	.733	.482
P7-Establish a project goal for locally sourced materials	4.690	2	2.345	1.274	.282
P8-Establish a project goal for rapidly renewable materials	2.928	2	1.464	1.050	.352
P9-Establish a project goal for Forest Stewardship Council-certified wood products	5.594	2	2.797	1.915	.150
P10-Adopt an indoor air quality management plan to protect the HVAC system during construction	2.972	2	1.486	.764	.467
P11-Prior to occupancy, perform a two week building flush-out or test the contaminant levels in the building	.869	2	.435	.216	.806
P12-Specify Low-volatile organic compound (VOC) adhesives and sealants in construction documents	.118	2	.059	.029	.972
P13-Specify Low-VOC paints and coatings in construction documents	.358	2	.179	.090	.914
P14-Specify Low-VOC carpet products and systems in construction documents	.378	2	.189	.091	.913
P15-Specify wood and agrifiber products that contain no added urea-formaldehyde resins	.138	2	.069	.040	.961

Welch Robust Tests of Equality of Means

LEED Practice	Statistic(a)	df1	df2	Sig.
A1-Adopt an erosion and sediment control plan for the project site during construction	0.183	2	22.675	0.834
A2-Adopt a commissioning plan	2.519	2	22.365	0.103
A3-Engage the commissioning authority early in the design phases	0.490	2	21.242	0.619
A4-Designate a specific area on the construction site for recycling	0.043	2	22.931	0.958
A5-Incorporate salvaged materials into building	0.309	2	20.699	0.737
A6-Establish a project goal for recycled content materials	0.394	2	21.800	0.679
A7-Establish a project goal for locally sourced materials	0.249	2	20.775	0.782
A8-Establish a project goal for rapidly renewable materials	0.477	2	21.213	0.627
A9-Establish a project goal for Forest Stewardship Council-certified wood products	1.073	2	22.448	0.359
A10-Adopt an indoor air quality management plan to protect the HVAC system during construction	1.495	2	21.018	0.247
A11-Prior to occupancy, perform a two week building flush-out or test the contaminant levels in the building	2.031	2	20.549	0.157

Welch Robust Tests of Equality of Means (cont.)

LEED Practice	Statistic(a)	df1	df2	Sig.
A12-Specify Low-volatile organic compound (VOC) adhesives and sealants in construction documents	0.405	2	20.028	0.672
A13-Specify Low-VOC paints and coatings in construction documents	0.972	2	20.669	0.395
A14-Specify Low-VOC carpet products and systems in construction documents	0.610	2	20.738	0.553
A15-Specify wood and agrifiber products that contain no added urea-formaldehyde resins	0.761	2	20.057	0.480
P1-Adopt an erosion and sediment control plan for the project site during construction	2.182	2	20.851	0.138
P2-Adopt a commissioning plan	2.277	2	22.575	0.126
P3-Engage the commissioning authority early in the design phases	0.533	2	20.277	0.595
P4-Designate a specific area on the construction site for recycling	0.395	2	22.260	0.678
P5-Incorporate salvaged materials into building	2.829	2	21.785	0.081
P6-Establish a project goal for recycled content materials	0.626	2	21.198	0.544
P7-Establish a project goal for locally sourced materials	0.854	2	20.194	0.441

Welch Robust Tests of Equality of Means (cont.)

LEED Practice	Statistic(a)	df1	df2	Sig.
P8-Establish a project goal for rapidly renewable materials	0.702	2	19.251	0.508
P9-Establish a project goal for Forest Stewardship Council-certified wood products	1.757	2	19.859	0.198
P10-Adopt an indoor air quality management plan to protect the HVAC system during construction	0.555	2	19.974	0.583
P11-Prior to occupancy, perform a two week building flush-out or test the contaminant levels in the building	0.135	2	19.069	0.874
P12-Specify Low-volatile organic compound (VOC) adhesives and sealants in construction documents	0.032	2	18.288	0.969
P13-Specify Low-VOC paints and coatings in construction documents	0.061	2	19.017	0.941
P14-Specify Low-VOC carpet products and systems in construction documents	0.068	2	18.957	0.934
P15-Specify wood and agrifiber products that contain no added urea-formaldehyde resins	0.021	2	17.814	0.979

(a) Asymptotically F distributed.

Tukey HSD Multiple Comparisons

LEED Practice	Type of Firm		Mean	Std. Error	Sig.
A1-Adopt an erosion and sediment control plan for the project site during construction	Commercial GC	Trade Contractor	.130	.193	.780
		Other	-.049	.182	.961
	Trade Contractor	Commercial GC	-.130	.193	.780
		Other	-.179	.253	.761
	Other	Commercial GC	.049	.182	.961
		Trade Contractor	.179	.253	.761
A2-Adopt a commissioning plan	Commercial GC	Trade Contractor	.694	.377	.159
		Other	.619	.366	.211
	Trade Contractor	Commercial GC	-.694	.377	.159
		Other	-.075	.502	.988
	Other	Commercial GC	-.619	.366	.211
		Trade Contractor	.075	.502	.988
A3-Engage the commissioning authority early in the design phases	Commercial GC	Trade Contractor	.397	.404	.588
		Other	.197	.404	.877
	Trade Contractor	Commercial GC	-.397	.404	.588
		Other	-.200	.546	.929
	Other	Commercial GC	-.197	.404	.877
		Trade Contractor	.200	.546	.929
A4-Designate a specific area on the construction site for recycling	Commercial GC	Trade Contractor	.017	.367	.999
		Other	.112	.356	.947
	Trade Contractor	Commercial GC	-.017	.367	.999
		Other	.096	.488	.979
	Other	Commercial GC	-.112	.356	.947
		Trade Contractor	-.096	.488	.979
A5-Incorporate salvaged materials into building	Commercial GC	Trade Contractor	-.189	.380	.872
		Other	-.288	.357	.701
	Trade Contractor	Commercial GC	.189	.380	.872
		Other	-.098	.499	.979
	Other	Commercial GC	.288	.357	.701
		Trade Contractor	.098	.499	.979
A6-Establish a project goal for recycled content materials	Commercial GC	Trade Contractor	.381	.368	.556
		Other	.127	.358	.933
	Trade Contractor	Commercial GC	-.381	.368	.556
		Other	-.254	.490	.862
	Other	Commercial GC	-.127	.358	.933
		Trade Contractor	.254	.490	.862

Tukey HSD Multiple Comparisons (cont.)

LEED Practice	Type of Firm		Mean	Std. Err.	Sig.
A7-Establish a project goal for locally sourced materials	Commercial GC	Trade Contractor	-.123	.372	.941
		Other	.261	.350	.738
	Trade Contractor	Commercial GC	.123	.372	.941
		Other	.384	.488	.712
	Other	Commercial GC	-.261	.350	.738
		Trade Contractor	-.384	.488	.712
A8-Establish a project goal for rapidly renewable materials	Commercial GC	Trade Contractor	.442	.391	.496
		Other	-.025	.391	.998
	Trade Contractor	Commercial GC	-.442	.391	.496
		Other	-.467	.528	.652
	Other	Commercial GC	.025	.391	.998
		Trade Contractor	.467	.528	.652
A9-Establish a project goal for Forest Stewardship Council-certified wood products	Commercial GC	Trade Contractor	.627	.384	.235
		Other	.081	.373	.974
	Trade Contractor	Commercial GC	-.627	.384	.235
		Other	-.546	.511	.535
	Other	Commercial GC	-.081	.373	.974
		Trade Contractor	.546	.511	.535
A10-Adopt an indoor air quality management plan to protect the HVAC system during construction	Commercial GC	Trade Contractor	.716	.380	.146
		Other	.383	.380	.573
	Trade Contractor	Commercial GC	-.716	.380	.146
		Other	-.333	.513	.793
	Other	Commercial GC	-.383	.380	.573
		Trade Contractor	.333	.513	.793
A11-Prior to occupancy, perform a two week building flush-out or test the contaminant levels in the building	Commercial GC	Trade Contractor	.926	.419	.072
		Other	.202	.406	.872
	Trade Contractor	Commercial GC	-.926	.419	.072
		Other	-.724	.558	.399
	Other	Commercial GC	-.202	.406	.872
		Trade Contractor	.724	.558	.399
A12-Specify Low-volatile organic compound (VOC) adhesives and sealants in construction documents	Commercial GC	Trade Contractor	.418	.404	.556
		Other	-.010	.404	1.000
	Trade Contractor	Commercial GC	-.418	.404	.556
		Other	-.429	.547	.714
	Other	Commercial GC	.010	.404	1.000
		Trade Contractor	.429	.547	.714
A13-Specify Low-VOC paints and coatings in construction documents	Commercial GC	Trade Contractor	.503	.394	.409
		Other	.370	.382	.597
	Trade Contractor	Commercial GC	-.503	.394	.409
		Other	-.133	.524	.965
	Other	Commercial GC	-.370	.382	.597
		Trade Contractor	.133	.524	.965

Tukey HSD Multiple Comparisons (cont.)

LEED Practice	Type of Firm		Mean	Std. Err.	Sig.
A14-Specify Low-VOC carpet products and systems in construction documents	Commercial GC	Trade Contractor	.355	.416	.670
		Other	.355	.403	.653
	Trade Contractor	Commercial GC	-.355	.416	.670
		Other	.000	.553	1.000
	Other	Commercial GC	-.355	.403	.653
		Trade Contractor	.000	.553	1.000
A15-Specify wood and agrifiber products that contain no added urea-formaldehyde resins	Commercial GC	Trade Contractor	.340	.415	.692
		Other	.386	.388	.582
	Trade Contractor	Commercial GC	-.340	.415	.692
		Other	.046	.544	.996
	Other	Commercial GC	-.386	.388	.582
		Trade Contractor	-.046	.544	.996
P1-Adopt an erosion and sediment control plan for the project site during construction	Commercial GC	Trade Contractor	.833*	.242	.002
		Other	.258	.235	.517
	Trade Contractor	Commercial GC	-.833*	.242	.002
		Other	-.575	.323	.179
	Other	Commercial GC	-.258	.235	.517
		Trade Contractor	.575	.323	.179
P2-Adopt a commissioning plan	Commercial GC	Trade Contractor	.505	.379	.381
		Other	.576	.357	.243
	Trade Contractor	Commercial GC	-.505	.379	.381
		Other	.071	.498	.989
	Other	Commercial GC	-.576	.357	.243
		Trade Contractor	-.071	.498	.989
P3-Engage the commissioning authority early in the design phases	Commercial GC	Trade Contractor	.377	.387	.595
		Other	.019	.387	.999
	Trade Contractor	Commercial GC	-.377	.387	.595
		Other	-.357	.524	.775
	Other	Commercial GC	-.019	.387	.999
		Trade Contractor	.357	.524	.775
P4-Designate a specific area on the construction site for recycling	Commercial GC	Trade Contractor	.304	.384	.709
		Other	-.098	.362	.961
	Trade Contractor	Commercial GC	-.304	.384	.709
		Other	-.402	.504	.706
	Other	Commercial GC	.098	.362	.961
		Trade Contractor	.402	.504	.706
P5-Incorporate salvaged materials into building	Commercial GC	Trade Contractor	-.740	.360	.102
		Other	-.703	.350	.113
	Trade Contractor	Commercial GC	.740	.360	.102
		Other	.038	.479	.997
	Other	Commercial GC	.703	.350	.113
		Trade Contractor	-.038	.479	.997

* Tukey HSD post-hoc analysis indicates the mean difference was significant at the .05 level.

Tukey HSD Multiple Comparisons (cont.)

LEED Practice	Type of Firm		Mean	Std. Err.	Sig.
P6-Establish a project goal for recycled content materials	Commercial GC	Trade Contractor	-.058	.373	.987
		Other	-.425	.351	.449
	Trade Contractor	Commercial GC	.058	.373	.987
		Other	-.366	.489	.735
	Other	Commercial GC	.425	.351	.449
		Trade Contractor	.366	.489	.735
P7-Establish a project goal for locally sourced materials	Commercial GC	Trade Contractor	-.623	.392	.253
		Other	-.099	.356	.959
	Trade Contractor	Commercial GC	.623	.392	.253
		Other	.524	.507	.556
	Other	Commercial GC	.099	.356	.959
		Trade Contractor	-.524	.507	.556
P8-Establish a project goal for rapidly renewable materials	Commercial GC	Trade Contractor	-.115	.330	.935
		Other	-.472	.330	.327
	Trade Contractor	Commercial GC	.115	.330	.935
		Other	-.357	.446	.703
	Other	Commercial GC	.472	.330	.327
		Trade Contractor	.357	.446	.703
P9-Establish a project goal for Forest Stewardship Council-certified wood products	Commercial GC	Trade Contractor	-.088	.349	.966
		Other	-.621	.318	.126
	Trade Contractor	Commercial GC	.088	.349	.966
		Other	-.534	.451	.465
	Other	Commercial GC	.621	.318	.126
		Trade Contractor	.534	.451	.465
P10-Adopt an indoor air quality management plan to protect the HVAC system during construction	Commercial GC	Trade Contractor	.461	.402	.487
		Other	.210	.377	.843
	Trade Contractor	Commercial GC	-.461	.402	.487
		Other	-.251	.528	.883
	Other	Commercial GC	-.210	.377	.843
		Trade Contractor	.251	.528	.883
P11-Prior to occupancy, perform a two week building flush-out or test the contaminant levels in the building	Commercial GC	Trade Contractor	.275	.425	.794
		Other	-.025	.383	.998
	Trade Contractor	Commercial GC	-.275	.425	.794
		Other	-.300	.549	.848
	Other	Commercial GC	.025	.383	.998
		Trade Contractor	.300	.549	.848
P12-Specify Low-volatile organic compound (VOC) adhesives and sealants in construction documents	Commercial GC	Trade Contractor	-.052	.429	.992
		Other	.079	.400	.979
	Trade Contractor	Commercial GC	.052	.429	.992
		Other	.131	.564	.971
	Other	Commercial GC	-.079	.400	.979
		Trade Contractor	-.131	.564	.971

* Tukey HSD post-hoc analysis indicates the mean difference was significant at the .05 level.

Tukey HSD Multiple Comparisons (cont.)

LEED Practice	Type of Firm		Mean	Std. Err.	Sig.
P13-Specify Low-VOC paints and coatings in construction documents	Commercial GC	Trade Contractor	.173	.423	.912
		Other	.056	.382	.988
	Trade Contractor	Commercial GC	-.173	.423	.912
		Other	-.117	.547	.975
	Other	Commercial GC	-.056	.382	.988
		Trade Contractor	.117	.547	.975
P14-Specify Low-VOC carpet products and systems in construction documents	Commercial GC	Trade Contractor	.167	.432	.921
		Other	.083	.390	.975
	Trade Contractor	Commercial GC	-.167	.432	.921
		Other	-.083	.558	.988
	Other	Commercial GC	-.083	.390	.975
		Trade Contractor	.083	.558	.988
P15-Specify wood and agrifiber products that contain no added urea-formaldehyde resins	Commercial GC	Trade Contractor	-.116	.410	.957
		Other	-.013	.356	.999
	Trade Contractor	Commercial GC	.116	.410	.957
		Other	.103	.521	.979
	Other	Commercial GC	.013	.356	.999
		Trade Contractor	-.103	.521	.979

* Tukey HSD post-hoc analysis indicates the mean difference was significant at the .05 level.

APPENDIX E:

LEED Experience Means Analysis Tables

Descriptive Statistics for Firm's LEED Experience

LEED Practice	LEED Experienced?	N	Mean	SD	Std. Error
A1-Adopt an erosion and sediment control plan for the project site during construction	Yes	71	4.82	.457	.054
	No	105	4.66	.691	.067
	I don't know	7	4.00	1.732	.655
	Total	183	4.69	.691	.051
A2-Adopt a commissioning plan	Yes	75	3.92	1.228	.142
	No	109	3.04	1.407	.135
	I don't know	6	3.17	1.835	.749
	Total	190	3.39	1.413	.102
A3-Engage the commissioning authority early in the design phases	Yes	74	3.57	1.376	.160
	No	106	2.89	1.495	.145
	I don't know	6	2.67	1.966	.803
	Total	186	3.15	1.496	.110
A4-Designate a specific area on the construction site for recycling	Yes	74	4.01	1.092	.127
	No	108	3.24	1.413	.136
	I don't know	8	3.13	1.642	.581
	Total	190	3.54	1.355	.098
A5-Incorporate salvaged materials into building	Yes	74	3.92	1.191	.138
	No	107	3.36	1.417	.137
	I don't know	8	2.88	1.458	.515
	Total	189	3.56	1.362	.099
A6-Establish a project goal for recycled content materials	Yes	74	3.78	1.219	.142
	No	108	2.99	1.343	.129
	I don't know	7	2.43	1.512	.571
	Total	189	3.28	1.361	.099
A7-Establish a project goal for locally sourced materials	Yes	72	3.89	1.015	.120
	No	105	3.14	1.410	.138
	I don't know	6	3.33	1.862	.760
	Total	183	3.44	1.328	.098

Descriptive Statistics for Firm's LEED Experience (cont.)

LEED Practice	LEED Experienced?	N	Mean	SD	Std. Error
A8-Establish a project goal for rapidly renewable materials	Yes	75	3.52	1.277	.147
	No	108	2.56	1.416	.136
	I don't know	7	2.71	1.799	.680
	Total	190	2.95	1.447	.105
A9-Establish a project goal for Forest Stewardship Council-certified wood products	Yes	75	3.32	1.337	.154
	No	108	2.50	1.364	.131
	I don't know	7	3.00	2.000	.756
	Total	190	2.84	1.428	.104
A10-Adopt an indoor air quality management plan to protect the HVAC system during construction	Yes	73	3.96	1.184	.139
	No	106	3.08	1.412	.137
	I don't know	7	3.00	2.000	.756
	Total	186	3.42	1.413	.104
A11-Prior to occupancy, perform a two week building flush-out or test the contaminant levels in the building	Yes	74	3.58	1.405	.163
	No	107	2.58	1.421	.137
	I don't know	7	2.71	2.138	.808
	Total	188	2.98	1.516	.111
A12-Specify Low-volatile organic compound (VOC) adhesives and sealants in construction documents	Yes	71	3.83	1.331	.158
	No	102	3.09	1.415	.140
	I don't know	7	3.14	2.035	.769
	Total	180	3.38	1.447	.108
A13-Specify Low-VOC paints and coatings in construction documents	Yes	72	3.82	1.346	.159
	No	102	3.15	1.382	.137
	I don't know	7	3.57	1.813	.685
	Total	181	3.43	1.415	.105
A14-Specify Low-VOC carpet products and systems in construction documents	Yes	73	3.75	1.362	.159
	No	103	2.98	1.468	.145
	I don't know	7	3.14	2.035	.769
	Total	183	3.30	1.490	.110
A15-Specify wood and agrifiber products that contain no added urea-formaldehyde resins	Yes	72	3.49	1.363	.161
	No	104	2.88	1.405	.138
	I don't know	7	3.14	2.035	.769
	Total	183	3.13	1.438	.106

Descriptive Statistics for Firm's LEED Experience (cont.)

LEED Practice	LEED Experienced?	N	Mean	SD	Std. Error
P1-Adopt an erosion and sediment control plan for the project site during construction	Yes	79	4.62	.837	.094
	No	112	4.51	.949	.090
	I don't know	8	4.38	1.408	.498
	Total	199	4.55	.925	.066
P2-Adopt a commissioning plan	Yes	75	3.45	1.244	.144
	No	105	2.65	1.352	.132
	I don't know	7	3.14	1.676	.634
	Total	187	2.99	1.372	.100
P3-Engage the commissioning authority early in the design phases	Yes	73	3.04	1.409	.165
	No	101	2.46	1.300	.129
	I don't know	7	2.71	1.799	.680
	Total	181	2.70	1.386	.103
P4-Designate a specific area on the construction site for recycling	Yes	76	3.64	1.262	.145
	No	103	2.67	1.324	.130
	I don't know	6	2.83	1.329	.543
	Total	185	3.08	1.377	.101
P5-Incorporate salvaged materials into building	Yes	75	3.19	1.312	.152
	No	105	2.82	1.364	.133
	I don't know	7	3.14	1.574	.595
	Total	187	2.98	1.356	.099
P6-Establish a project goal for recycled content materials	Yes	75	3.03	1.355	.157
	No	102	2.24	1.212	.120
	I don't know	6	2.17	1.602	.654
	Total	183	2.56	1.337	.099
P7-Establish a project goal for locally sourced materials	Yes	73	3.11	1.220	.143
	No	103	2.70	1.399	.138
	I don't know	7	3.57	1.813	.685
	Total	183	2.90	1.361	.101
P8-Establish a project goal for rapidly renewable materials	Yes	73	2.52	1.192	.139
	No	99	1.87	1.085	.109
	I don't know	6	2.17	1.602	.654
	Total	178	2.15	1.184	.089

Descriptive Statistics for Firm's LEED Experience (cont.)

LEED Practice	LEED Experienced?	N	Mean	SD	Std. Error
P9-Establish a project goal for Forest Stewardship Council-certified wood products	Yes	72	2.32	1.173	.138
	No	101	1.96	1.183	.118
	I don't know	6	2.67	1.966	.803
	Total	179	2.13	1.218	.091
P10-Adopt an indoor air quality management plan to protect the HVAC system during construction	Yes	75	3.55	1.233	.142
	No	103	2.65	1.348	.133
	I don't know	6	2.67	1.966	.803
	Total	184	3.02	1.389	.102
P11-Prior to occupancy, perform a two week building flush-out or test the contaminant levels in the building	Yes	72	2.88	1.433	.169
	No	102	2.12	1.284	.127
	I don't know	6	2.33	2.066	.843
	Total	180	2.43	1.414	.105
P12-Specify Low-volatile organic compound (VOC) adhesives and sealants in construction documents	Yes	72	3.10	1.386	.163
	No	102	2.69	1.400	.139
	I don't know	6	3.00	2.191	.894
	Total	180	2.86	1.429	.107
P13-Specify Low-VOC paints and coatings in construction documents	Yes	72	3.19	1.401	.165
	No	103	2.69	1.365	.135
	I don't know	6	3.17	1.835	.749
	Total	181	2.91	1.409	.105
P14-Specify Low-VOC carpet products and systems in construction documents	Yes	71	3.04	1.409	.167
	No	101	2.50	1.376	.137
	I don't know	6	3.00	2.191	.894
	Total	178	2.73	1.436	.108
P15-Specify wood and agrifiber products that contain no added urea-formaldehyde resins	Yes	71	2.75	1.295	.154
	No	94	2.34	1.249	.129
	I don't know	6	2.83	2.041	.833
	Total	171	2.53	1.308	.100

ANOVA Between Groups for Experience

LEED Practice	Sum of Squares	df	Mean Square	F	Sig.
A1-Adopt an erosion and sediment control plan for the project site during construction	4.587	2	2.293	5.017	.008
A2-Adopt a commissioning plan	34.972	2	17.486	9.555	.000
A3-Engage the commissioning authority early in the design phases	21.648	2	10.824	5.051	.007
A4-Designate a specific area on the construction site for recycling	27.640	2	13.820	8.086	.000
A5-Incorporate salvaged materials into building	17.377	2	8.688	4.880	.009
A6-Establish a project goal for recycled content materials	32.892	2	16.446	9.703	.000
A7-Establish a project goal for locally sourced materials	23.846	2	11.923	7.219	.001
A8-Establish a project goal for rapidly renewable materials	40.779	2	20.389	10.750	.000
A9-Establish a project goal for Forest Stewardship Council-certified wood products	29.943	2	14.972	7.879	.001
A10-Adopt an indoor air quality management plan to protect the HVAC system during construction	35.017	2	17.509	9.585	.000
A11-Prior to occupancy, perform a two week building flush-out or test the contaminant levels in the building	44.398	2	22.199	10.653	.000
A12-Specify Low-volatile organic compound (VOC) adhesives and sealants in construction documents	23.515	2	11.758	5.928	.003
A13-Specify Low-VOC paints and coatings in construction documents	19.226	2	9.613	5.015	.008
A14-Specify Low-VOC carpet products and systems in construction documents	25.686	2	12.843	6.109	.003
A15-Specify wood and agrifiber products that contain no added urea-formaldehyde resins	15.891	2	7.946	3.970	.021

ANOVA Between Groups (cont.)

LEED Practice	Sum of Squares	df	Mean Square	F	Sig.
P1-Adopt an erosion and sediment control plan for the project site during construction	.823	2	.411	.479	.620
P2-Adopt a commissioning plan	28.573	2	14.286	8.179	.000
P3-Engage the commissioning authority early in the design phases	14.535	2	7.267	3.904	.022
P4-Designate a specific area on the construction site for recycling	41.923	2	20.961	12.426	.000
P5-Incorporate salvaged materials into building	6.109	2	3.054	1.674	.190
P6-Establish a project goal for recycled content materials	28.015	2	14.007	8.485	.000
P7-Establish a project goal for locally sourced materials	10.520	2	5.260	2.900	.058
P8-Establish a project goal for rapidly renewable materials	17.857	2	8.928	6.783	.001
P9-Establish a project goal for Forest Stewardship Council-certified wood products	7.217	2	3.608	2.473	.087
P10-Adopt an indoor air quality management plan to protect the HVAC system during construction	35.614	2	17.807	10.156	.000
P11-Prior to occupancy, perform a two week building flush-out or test the contaminant levels in the building	24.265	2	12.132	6.433	.002
P12-Specify Low-volatile organic compound (VOC) adhesives and sealants in construction documents	7.248	2	3.624	1.790	.170
P13-Specify Low-VOC paints and coatings in construction documents	11.234	2	5.617	2.888	.058
P14-Specify Low-VOC carpet products and systems in construction documents	12.935	2	6.468	3.214	.043
P15-Specify wood and agrifiber products that contain no added urea-formaldehyde resins	7.255	2	3.628	2.151	.120

Welch Robust Tests of Equality of Means

LEED Practice	Statistic(a)	df1	df2	Sig.
A1-Adopt an erosion and sediment control plan for the project site during construction	.823	2	.411	.479
A2-Adopt a commissioning plan	28.573	2	14.286	8.179
A3-Engage the commissioning authority early in the design phases	14.535	2	7.267	3.904
A4-Designate a specific area on the construction site for recycling	41.923	2	20.961	12.426
A5-Incorporate salvaged materials into building	6.109	2	3.054	1.674
A6-Establish a project goal for recycled content materials	28.015	2	14.007	8.485
A7-Establish a project goal for locally sourced materials	10.520	2	5.260	2.900
A8-Establish a project goal for rapidly renewable materials	17.857	2	8.928	6.783
A9-Establish a project goal for Forest Stewardship Council-certified wood products	7.217	2	3.608	2.473
A10-Adopt an indoor air quality management plan to protect the HVAC system during construction	35.614	2	17.807	10.156
A11-Prior to occupancy, perform a two week building flush-out or test the contaminant levels in the building	24.265	2	12.132	6.433

Welch Robust Tests of Equality of Means (cont.)

LEED Practice	Statistic(a)	df1	df2	Sig.
A12-Specify Low-volatile organic compound (VOC) adhesives and sealants in construction documents	5.999	2	15.943	.011
A13-Specify Low-VOC paints and coatings in construction documents	4.965	2	16.065	.021
A14-Specify Low-VOC carpet products and systems in construction documents	6.213	2	15.989	.010
A15-Specify wood and agrifiber products that contain no added urea-formaldehyde resins	4.000	2	15.939	.039
P1-Adopt an erosion and sediment control plan for the project site during construction	.421	2	18.536	.663
P2-Adopt a commissioning plan	8.212	2	16.127	.003
P3-Engage the commissioning authority early in the design phases	3.750	2	16.019	.046
P4-Designate a specific area on the construction site for recycling	12.053	2	13.730	.001
P5-Incorporate salvaged materials into building	1.631	2	16.253	.226
P6-Establish a project goal for recycled content materials	7.812	2	13.419	.006
P7-Establish a project goal for locally sourced materials	2.510	2	16.050	.113

Welch Robust Tests of Equality of Means (cont.)

LEED Practice	Statistic(a)	df1	df2	Sig.
P8-Establish a project goal for rapidly renewable materials	6.461	2	13.314	.011
P9-Establish a project goal for Forest Stewardship Council-certified wood products	2.087	2	13.217	.163
P10-Adopt an indoor air quality management plan to protect the HVAC system during construction	10.198	2	13.305	.002
P11-Prior to occupancy, perform a two week building flush-out or test the contaminant levels in the building	6.110	2	13.233	.013
P12-Specify Low-volatile organic compound (VOC) adhesives and sealants in construction documents	1.764	2	13.255	.209
P13-Specify Low-VOC paints and coatings in construction documents	2.744	2	13.378	.100
P14-Specify Low-VOC carpet products and systems in construction documents	3.101	2	13.241	.079
P15-Specify wood and agrifiber products that contain no added urea-formaldehyde resins	2.023	2	13.239	.171

(b) Asymptotically F distributed.

Tukey HSD Multiple Comparisons

LEED Practice	LEED Experience?		Mean	Std. Error	Sig.
A1-Adopt an erosion and sediment control plan for the project site during construction	Yes	No	.160	.104	.276
		I don't know	.817*	.268	.007
	No	Yes	-.160	.104	.276
		I don't know	.657*	.264	.036
	I Don't Know	Yes	-.817*	.268	.007
		No	-.657*	.264	.036
A2-Adopt a commissioning plan	Yes	No	.883*	.203	.000
		I don't know	.753	.574	.390
	No	Yes	-.883*	.203	.000
		I don't know	-.130	.567	.971
	I Don't Know	Yes	-.753	.574	.390
		No	.130	.567	.971
A3-Engage the commissioning authority early in the design phases	Yes	No	.681*	.222	.007
		I don't know	.901	.621	.318
	No	Yes	-.681*	.222	.007
		I don't know	.220	.614	.932
	I Don't Know	Yes	-.901	.621	.318
		No	-.220	.614	.932
A4-Designate a specific area on the construction site for recycling	Yes	No	.773*	.197	.000
		I don't know	.889	.487	.164
	No	Yes	-.773*	.197	.000
		I don't know	.116	.479	.968
	I Don't Know	Yes	-.889	.487	.164
		No	-.116	.479	.968
A5-Incorporate salvaged materials into building	Yes	No	.554*	.202	.018
		I don't know	1.044	.497	.092
	No	Yes	-.554*	.202	.018
		I don't know	.489	.489	.577
	I Don't Know	Yes	-1.044	.497	.092
		No	-.489	.489	.577
A6-Establish a project goal for recycled content materials	Yes	No	.793*	.196	.000
		I don't know	1.355*	.515	.025
	No	Yes	-.793*	.196	.000
		I don't know	.562	.508	.511
	I Don't Know	Yes	-1.355*	.515	.025
		No	-.562	.508	.511

* Tukey HSD post-hoc analysis indicates the mean difference was significant at the .05 level.

Tukey HSD Multiple Comparisons (cont.)

LEED Practice	LEED Experience?		Mean	Std. Error	Sig.
A7-Establish a project goal for locally sourced materials	Yes	No	.746*	.197	.001
		I don't know	.556	.546	.567
	No	Yes	-.746*	.197	.001
		I don't know	-.190	.539	.934
	I Don't Know	Yes	-.556	.546	.567
		No	.190	.539	.934
A8-Establish a project goal for rapidly renewable materials	Yes	No	.955*	.207	.000
		I don't know	.806	.544	.303
	No	Yes	-.955*	.207	.000
		I don't know	-.149	.537	.958
	I Don't Know	Yes	-.806	.544	.303
		No	.149	.537	.958
A9-Establish a project goal for Forest Stewardship Council-certified wood products	Yes	No	.820*	.207	.000
		I don't know	.320	.545	.827
	No	Yes	-.820*	.207	.000
		I don't know	-.500	.538	.622
	I Don't Know	Yes	-.320	.545	.827
		No	.500	.538	.622
A10-Adopt an indoor air quality management plan to protect the HVAC system during construction	Yes	No	.883*	.206	.000
		I don't know	.959	.535	.175
	No	Yes	-.883*	.206	.000
		I don't know	.075	.527	.989
	I Don't Know	Yes	-.959	.535	.175
		No	-.075	.527	.989
A11-Prior to occupancy, perform a two week building flush-out or test the contaminant levels in the building	Yes	No	1.002*	.218	.000
		I don't know	.867	.571	.285
	No	Yes	-1.002*	.218	.000
		I don't know	-.135	.563	.969
	I Don't Know	Yes	-.867	.571	.285
		No	.135	.563	.969
A12-Specify Low-volatile organic compound (VOC) adhesives and sealants in construction documents	Yes	No	.743*	.218	.002
		I don't know	.688	.558	.435
	No	Yes	-.743*	.218	.002
		I don't know	-.055	.550	.995
	I Don't Know	Yes	-.688	.558	.435
		No	.055	.550	.995

* Tukey HSD post-hoc analysis indicates the mean difference was significant at the .05 level.

Tukey HSD Multiple Comparisons (cont.)

LEED Practice	LEED Experience?		Mean	Std. Error	Sig.
A13-Specify Low-VOC paints and coatings in construction documents	Yes	No	.672*	.213	.005
		I don't know	.248	.548	.893
	No	Yes	-.672*	.213	.005
		I don't know	-.424	.541	.713
	I Don't Know	Yes	-.248	.548	.893
		No	.424	.541	.713
A14-Specify Low-VOC carpet products and systems in construction documents	Yes	No	.773*	.222	.002
		I don't know	.611	.574	.537
	No	Yes	-.773*	.222	.002
		I don't know	-.162	.566	.956
	I Don't Know	Yes	-.611	.574	.537
		No	.162	.566	.956
A15-Specify wood and agrifiber products that contain no added urea-formaldehyde resins	Yes	No	.611*	.217	.015
		I don't know	.343	.560	.813
	No	Yes	-.611*	.217	.015
		I don't know	-.268	.552	.879
	I Don't Know	Yes	-.343	.560	.813
		No	.268	.552	.879
P1-Adopt an erosion and sediment control plan for the project site during construction	Yes	No	.111	.136	.693
		I don't know	.245	.344	.756
	No	Yes	-.111	.136	.693
		I don't know	.134	.339	.918
	I Don't Know	Yes	-.245	.344	.756
		No	-.134	.339	.918
P2-Adopt a commissioning plan	Yes	No	.806*	.200	.000
		I don't know	.310	.522	.823
	No	Yes	-.806*	.200	.000
		I don't know	-.495	.516	.603
	I Don't Know	Yes	-.310	.522	.823
		No	.495	.516	.603
P3-Engage the commissioning authority early in the design phases	Yes	No	.586*	.210	.016
		I don't know	.327	.540	.817
	No	Yes	-.586*	.210	.016
		I don't know	-.259	.533	.878
	I Don't Know	Yes	-.327	.540	.817
		No	.259	.533	.878
P4-Designate a specific area on the construction site for recycling	Yes	No	.975*	.196	.000
		I don't know	.811	.551	.306
	No	Yes	-.975*	.196	.000
		I don't know	-.163	.545	.952
	I Don't Know	Yes	-.811	.551	.306
		No	.163	.545	.952

* Tukey HSD post-hoc analysis indicates the mean difference was significant at the .05 level.

Tukey HSD Multiple Comparisons (cont.)

LEED Practice	LEED Experience?		Mean	Std. Error	Sig.
P5-Incorporate salvaged materials into building	Yes	No	.368	.204	.172
		I don't know	.044	.534	.996
	No	Yes	-.368	.204	.172
		I don't know	-.324	.527	.813
	I Don't Know	Yes	-.044	.534	.996
		No	.324	.527	.813
P6-Establish a project goal for recycled content materials	Yes	No	.791*	.195	.000
		I don't know	.860	.545	.258
	No	Yes	-.791*	.195	.000
		I don't know	.069	.540	.991
	I Don't Know	Yes	-.860	.545	.258
		No	-.069	.540	.991
P7-Establish a project goal for locally sourced materials	Yes	No	.411	.206	.117
		I don't know	-.462	.533	.662
	No	Yes	-.411	.206	.117
		I don't know	-.872	.526	.224
	I Don't Know	Yes	.462	.533	.662
		No	.872	.526	.224
P8-Establish a project goal for rapidly renewable materials	Yes	No	.652*	.177	.001
		I don't know	.354	.487	.748
	No	Yes	-.652*	.177	.001
		I don't know	-.298	.482	.811
	I Don't Know	Yes	-.354	.487	.748
		No	.298	.482	.811
P9-Establish a project goal for Forest Stewardship Council-certified wood products	Yes	No	.359	.186	.134
		I don't know	-.347	.513	.777
	No	Yes	-.359	.186	.134
		I don't know	-.706	.508	.348
	I Don't Know	Yes	.347	.513	.777
		No	.706	.508	.348
P10-Adopt an indoor air quality management plan to protect the HVAC system during construction	Yes	No	.896*	.201	.000
		I don't know	.880	.562	.263
	No	Yes	-.896*	.201	.000
		I don't know	-.016	.556	1.000
	I Don't Know	Yes	-.880	.562	.263
		No	.016	.556	1.000
P11-Prior to occupancy, perform a two week building flush-out or test the contaminant levels in the building	Yes	No	.757*	.211	.001
		I don't know	.542	.584	.623
	No	Yes	-.757*	.211	.001
		I don't know	-.216	.577	.926
	I Don't Know	Yes	-.542	.584	.623
		No	.216	.577	.926

* Tukey HSD post-hoc analysis indicates the mean difference was significant at the .05 level.

Tukey HSD Multiple Comparisons (cont.)

LEED Practice	LEED Experience?		Mean	Std. Error	Sig.
P12-Specify Low-volatile organic compound (VOC) adhesives and sealants in construction documents	Yes	No	.411	.219	.149
		I don't know	.097	.605	.986
	No	Yes	-.411	.219	.149
		I don't know	-.314	.598	.859
	I Don't Know	Yes	-.097	.605	.986
		No	.314	.598	.859
P13-Specify Low-VOC paints and coatings in construction documents	Yes	No	.505	.214	.051
		I don't know	.028	.593	.999
	No	Yes	-.505	.214	.051
		I don't know	-.477	.586	.694
	I Don't Know	Yes	-.028	.593	.999
		No	.477	.586	.694
P14-Specify Low-VOC carpet products and systems in construction documents	Yes	No	.547*	.220	.036
		I don't know	.042	.603	.997
	No	Yes	-.547*	.220	.036
		I don't know	-.505	.596	.674
	I Don't Know	Yes	-.042	.603	.997
		No	.505	.596	.674
P15-Specify wood and agrifiber products that contain no added urea-formaldehyde resins	Yes	No	.406	.204	.118
		I don't know	-.087	.552	.986
	No	Yes	-.406	.204	.118
		I don't know	-.493	.547	.640
	I Don't Know	Yes	.087	.552	.986
		No	.493	.547	.640

* Tukey HSD post-hoc analysis indicates the mean difference was significant at the .05 level.

APPENDIX F:

Size of Firm Means Analysis Tables

Descriptive Statistics for Size of Firm

LEED Practice	Type of Firm	N	Mean	SD	Std. Error
A1-Adopt an erosion and sediment control plan for the project site during construction	1-49 employees	81	4.59	.877	.097
	50-99 employees	49	4.73	.569	.081
	100+ employees	53	4.81	.395	.054
	Total	183	4.69	.691	.051
A2-Adopt a commissioning plan	1-49 employees	84	3.07	1.446	.158
	50-99 employees	52	3.56	1.320	.183
	100+ employees	54	3.70	1.369	.186
	Total	190	3.38	1.412	.102
A3-Engage the commissioning authority early in the design phases	1-49 employees	83	2.88	1.509	.166
	50-99 employees	50	3.12	1.409	.199
	100+ employees	53	3.58	1.473	.202
	Total	186	3.15	1.494	.110
A4-Designate a specific area on the construction site for recycling	1-49 employees	82	3.37	1.436	.159
	50-99 employees	53	3.49	1.339	.184
	100+ employees	55	3.87	1.187	.160
	Total	190	3.55	1.351	.098
A5-Incorporate salvaged materials into building	1-49 employees	83	3.29	1.453	.159
	50-99 employees	51	3.71	1.346	.188
	100+ employees	55	3.87	1.139	.154
	Total	189	3.57	1.357	.099
A6-Establish a project goal for recycled content materials	1-49 employees	83	3.07	1.455	.160
	50-99 employees	51	3.25	1.339	.188
	100+ employees	55	3.60	1.196	.161
	Total	189	3.28	1.364	.099
A7-Establish a project goal for locally sourced materials	1-49 employees	80	3.25	1.445	.162
	50-99 employees	49	3.49	1.309	.187
	100+ employees	54	3.67	1.149	.156
	Total	183	3.44	1.332	.098

Descriptive Statistics for Size of Firm (cont.)

LEED Practice	Type of Firm	N	Mean	SD	Std. Error
A8-Establish a project goal for rapidly renewable materials	1-49 employees	83	2.73	1.499	.164
	50-99 employees	51	2.98	1.516	.212
	100+ employees	56	3.21	1.275	.170
	Total	190	2.94	1.448	.105
A9-Establish a project goal for Forest Stewardship Council-certified wood products	1-49 employees	83	2.73	1.474	.162
	50-99 employees	51	2.69	1.435	.201
	100+ employees	56	3.11	1.330	.178
	Total	190	2.83	1.427	.103
A10-Adopt an indoor air quality management plan to protect the HVAC system during construction	1-49 employees	83	3.40	1.497	.164
	50-99 employees	49	3.47	1.356	.194
	100+ employees	54	3.43	1.368	.186
	Total	186	3.42	1.417	.104
A11-Prior to occupancy, perform a two week building flush-out or test the contaminant levels in the building	1-49 employees	81	2.80	1.536	.171
	50-99 employees	50	2.88	1.560	.221
	100+ employees	57	3.33	1.418	.188
	Total	188	2.98	1.518	.111
A12-Specify Low-volatile organic compound (VOC) adhesives and sealants in construction documents	1-49 employees	81	3.33	1.449	.161
	50-99 employees	45	3.51	1.440	.215
	100+ employees	54	3.35	1.469	.200
	Total	180	3.38	1.447	.108
A13-Specify Low-VOC paints and coatings in construction documents	1-49 employees	82	3.45	1.398	.154
	50-99 employees	47	3.49	1.412	.206
	100+ employees	52	3.35	1.467	.203
	Total	181	3.43	1.415	.105
A14-Specify Low-VOC carpet products and systems in construction documents	1-49 employees	82	3.29	1.486	.164
	50-99 employees	47	3.34	1.522	.222
	100+ employees	54	3.26	1.494	.203
	Total	183	3.30	1.490	.110
A15-Specify wood and agrifiber products that contain no added urea-formaldehyde resins	1-49 employees	81	3.14	1.438	.160
	50-99 employees	48	3.13	1.453	.210
	100+ employees	54	3.11	1.449	.197
	Total	183	3.13	1.438	.106

Descriptive Statistics for Size of Firm (cont.)

LEED Practice	Type of Firm	N	Mean	SD	Std. Error
P1-Adopt an erosion and sediment control plan for the project site during construction	1-49 employees	86	4.41	1.099	.119
	50-99 employees	54	4.61	.787	.107
	100+ employees	59	4.69	.725	.094
	Total	199	4.55	.925	.066
P2-Adopt a commissioning plan	1-49 employees	81	2.57	1.350	.150
	50-99 employees	50	3.34	1.319	.187
	100+ employees	56	3.27	1.300	.174
	Total	187	2.98	1.370	.100
P3-Engage the commissioning authority early in the design phases	1-49 employees	79	2.28	1.300	.146
	50-99 employees	49	2.96	1.428	.204
	100+ employees	53	3.08	1.313	.180
	Total	181	2.70	1.383	.103
P4-Designate a specific area on the construction site for recycling	1-49 employees	80	2.69	1.374	.154
	50-99 employees	49	3.18	1.253	.179
	100+ employees	56	3.55	1.334	.178
	Total	185	3.08	1.375	.101
P5-Incorporate salvaged materials into building	1-49 employees	81	2.57	1.332	.148
	50-99 employees	50	3.24	1.333	.189
	100+ employees	56	3.36	1.257	.168
	Total	187	2.98	1.354	.099
P6-Establish a project goal for recycled content materials	1-49 employees	77	2.16	1.309	.149
	50-99 employees	50	2.80	1.325	.187
	100+ employees	56	2.88	1.266	.169
	Total	183	2.55	1.337	.099
P7-Establish a project goal for locally sourced materials	1-49 employees	78	2.58	1.428	.162
	50-99 employees	48	3.04	1.320	.191
	100+ employees	57	3.19	1.231	.163
	Total	183	2.89	1.362	.101
P8-Establish a project goal for rapidly renewable materials	1-49 employees	78	1.92	1.182	.134
	50-99 employees	46	2.17	1.122	.165
	100+ employees	54	2.43	1.191	.162
	Total	178	2.14	1.182	.089

Descriptive Statistics for Size of Firm (cont.)

LEED Practice	Type of Firm	N	Mean	SD	Std. Error
P9-Establish a project goal for Forest Stewardship Council-certified wood products	1-49 employees	78	2.01	1.211	.137
	50-99 employees	46	2.07	1.200	.177
	100+ employees	55	2.31	1.215	.164
	Total	179	2.12	1.210	.090
P10-Adopt an indoor air quality management plan to protect the HVAC system during construction	1-49 employees	81	2.90	1.480	.164
	50-99 employees	48	3.10	1.309	.189
	100+ employees	55	3.13	1.348	.182
	Total	184	3.02	1.395	.103
P11-Prior to occupancy, perform a two week building flush-out or test the contaminant levels in the building	1-49 employees	80	2.23	1.423	.159
	50-99 employees	46	2.33	1.367	.202
	100+ employees	54	2.80	1.392	.189
	Total	180	2.42	1.414	.105
P12-Specify Low-volatile organic compound (VOC) adhesives and sealants in construction documents	1-49 employees	80	2.78	1.526	.171
	50-99 employees	45	2.89	1.335	.199
	100+ employees	55	2.95	1.367	.184
	Total	180	2.86	1.426	.106
P13-Specify Low-VOC paints and coatings in construction documents	1-49 employees	81	2.84	1.487	.165
	50-99 employees	46	2.96	1.282	.189
	100+ employees	54	2.94	1.406	.191
	Total	181	2.90	1.407	.105
P14-Specify Low-VOC carpet products and systems in construction documents	1-49 employees	81	2.73	1.525	.169
	50-99 employees	45	2.73	1.321	.197
	100+ employees	52	2.71	1.405	.195
	Total	178	2.72	1.433	.107
P15-Specify wood and agrifiber products that contain no added urea-formaldehyde resins	1-49 employees	76	2.39	1.297	.149
	50-99 employees	45	2.60	1.286	.192
	100+ employees	50	2.64	1.336	.189
	Total	171	2.52	1.303	.100

ANOVA Between Groups for Size of Firm

LEED Practice	Sum of Squares	df	Mean Square	F	Sig.
A1-Adopt an erosion and sediment control plan for the project site during construction	1.644	2	.822	1.736	.179
A2-Adopt a commissioning plan	15.295	2	7.648	3.954	.021
A3-Engage the commissioning authority early in the design phases	16.138	2	8.069	3.720	.026
A4-Designate a specific area on the construction site for recycling	8.695	2	4.347	2.417	.092
A5-Incorporate salvaged materials into building	12.528	2	6.264	3.491	.032
A6-Establish a project goal for recycled content materials	9.241	2	4.620	2.524	.083
A7-Establish a project goal for locally sourced materials	5.782	2	2.891	1.640	.197
A8-Establish a project goal for rapidly renewable materials	7.786	2	3.893	1.873	.156
A9-Establish a project goal for Forest Stewardship Council-certified wood products	6.104	2	3.052	1.508	.224
A10-Adopt an indoor air quality management plan to protect the HVAC system during construction	.159	2	.079	.039	.962
A11-Prior to occupancy, perform a two week building flush-out or test the contaminant levels in the building	10.166	2	5.083	2.235	.110
A12-Specify Low-volatile organic compound (VOC) adhesives and sealants in construction documents	.991	2	.495	.235	.791
A13-Specify Low-VOC paints and coatings in construction documents	.568	2	.284	.140	.869
A14-Specify Low-VOC carpet products and systems in construction documents	.166	2	.083	.037	.964
A15-Specify wood and agrifiber products that contain no added urea-formaldehyde resins	.020	2	.010	.005	.995

ANOVA Between Groups (cont.)

LEED Practice	Sum of Squares	df	Mean Square	F	Sig.
P1-Adopt an erosion and sediment control plan for the project site during construction	3.199	2	1.599	1.887	.154
P2-Adopt a commissioning plan	24.873	2	12.437	7.061	.001
P3-Engage the commissioning authority early in the design phases	24.797	2	12.399	6.908	.001
P4-Designate a specific area on the construction site for recycling	25.410	2	12.705	7.173	.001
P5-Incorporate salvaged materials into building	25.098	2	12.549	7.310	.001
P6-Establish a project goal for recycled content materials	21.002	2	10.501	6.212	.002
P7-Establish a project goal for locally sourced materials	13.982	2	6.991	3.886	.022
P8-Establish a project goal for rapidly renewable materials	8.138	2	4.069	2.975	.054
P9-Establish a project goal for Forest Stewardship Council-certified wood products	2.999	2	1.500	1.025	.361
P10-Adopt an indoor air quality management plan to protect the HVAC system during construction	2.115	2	1.057	.541	.583
P11-Prior to occupancy, perform a two week building flush-out or test the contaminant levels in the building	11.093	2	5.547	2.831	.062
P12-Specify Low-volatile organic compound (VOC) adhesives and sealants in construction documents	1.014	2	.507	.247	.781
P13-Specify Low-VOC paints and coatings in construction documents	.550	2	.275	.138	.872
P14-Specify Low-VOC carpet products and systems in construction documents	.013	2	.007	.003	.997
P15-Specify wood and agrifiber products that contain no added urea-formaldehyde resins	2.200	2	1.100	.645	.526

Welch Robust Tests of Equality of Means

LEED Practice	Statistic(a)	df1	df2	Sig.
A1-Adopt an erosion and sediment control plan for the project site during construction	1.946	2	112.806	.148
A2-Adopt a commissioning plan	3.846	2	114.617	.024
A3-Engage the commissioning authority early in the design phases	3.631	2	110.528	.030
A4-Designate a specific area on the construction site for recycling	2.686	2	117.489	.072
A5-Incorporate salvaged materials into building	3.588	2	115.556	.031
A6-Establish a project goal for recycled content materials	2.753	2	115.485	.068
A7-Establish a project goal for locally sourced materials	1.713	2	112.168	.185
A8-Establish a project goal for rapidly renewable materials	2.038	2	114.113	.135
A9-Establish a project goal for Forest Stewardship Council-certified wood products	1.621	2	114.504	.202
A10-Adopt an indoor air quality management plan to protect the HVAC system during construction	.040	2	111.659	.961
A11-Prior to occupancy, perform a two week building flush-out or test the contaminant levels in the building	2.377	2	112.739	.097

Welch Robust Tests of Equality of Means (cont.)

LEED Practice	Statistic(a)	df1	df2	Sig.
A12-Specify Low-volatile organic compound (VOC) adhesives and sealants in construction documents	0.405	2	20.028	0.672
A13-Specify Low-VOC paints and coatings in construction documents	0.972	2	20.669	0.395
A14-Specify Low-VOC carpet products and systems in construction documents	0.610	2	20.738	0.553
A15-Specify wood and agrifiber products that contain no added urea-formaldehyde resins	0.761	2	20.057	0.48
P1-Adopt an erosion and sediment control plan for the project site during construction	2.182	2	20.851	0.138
P2-Adopt a commissioning plan	2.277	2	22.575	0.126
P3-Engage the commissioning authority early in the design phases	0.533	2	20.277	0.595
P4-Designate a specific area on the construction site for recycling	0.395	2	22.260	0.678
P5-Incorporate salvaged materials into building	2.829	2	21.785	0.081
P6-Establish a project goal for recycled content materials	0.626	2	21.198	0.544
P7-Establish a project goal for locally sourced materials	0.854	2	20.194	0.441

Welch Robust Tests of Equality of Means (cont.)

LEED Practice	Statistic(a)	df1	df2	Sig.
P8-Establish a project goal for rapidly renewable materials	0.702	2	19.251	0.508
P9-Establish a project goal for Forest Stewardship Council-certified wood products	1.757	2	19.859	0.198
P10-Adopt an indoor air quality management plan to protect the HVAC system during construction	0.555	2	19.974	0.583
P11-Prior to occupancy, perform a two week building flush-out or test the contaminant levels in the building	0.135	2	19.069	0.874
P12-Specify Low-volatile organic compound (VOC) adhesives and sealants in construction documents	0.032	2	18.288	0.969
P13-Specify Low-VOC paints and coatings in construction documents	0.061	2	19.017	0.941
P14-Specify Low-VOC carpet products and systems in construction documents	0.068	2	18.957	0.934
P15-Specify wood and agrifiber products that contain no added urea-formaldehyde resins	0.021	2	17.814	0.979

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Tukey HSD Multiple Comparisons

LEED Practice	Type of Firm		Mean Diff.	Std. Error	Sig.
A1-Adopt an erosion and sediment control plan for the project site during construction	1-49 employees	50-99 employees	-.142	.125	.490
		100+ employees	-.219	.122	.173
	50-99 employees	1-49 employees	.142	.125	.490
		100+ employees	-.077	.136	.840
	100+ employees	1-49 employees	.219	.122	.173
		50-99 employees	.077	.136	.840
A2-Adopt a commissioning plan	1-49 employees	50-99 employees	-.486	.245	.120
		100+ employees	-.632*	.243	.027
	50-99 employees	1-49 employees	.486	.245	.120
		100+ employees	-.146	.270	.851
	100+ employees	1-49 employees	.632*	.243	.027
		50-99 employees	.146	.270	.851
A3-Engage the commissioning authority early in the design phases	1-49 employees	50-99 employees	-.240	.264	.633
		100+ employees	-.705*	.259	.019
	50-99 employees	1-49 employees	.240	.264	.633
		100+ employees	-.465	.290	.248
	100+ employees	1-49 employees	.705*	.259	.019
		50-99 employees	.465	.290	.248
A4-Designate a specific area on the construction site for recycling	1-49 employees	50-99 employees	-.125	.236	.858
		100+ employees	-.507	.234	.079
	50-99 employees	1-49 employees	.125	.236	.858
		100+ employees	-.382	.258	.303
	100+ employees	1-49 employees	.507	.234	.079
		50-99 employees	.382	.258	.303
A5-Incorporate salvaged materials into building	1-49 employees	50-99 employees	-.417	.238	.190
		100+ employees	-.584*	.233	.035
	50-99 employees	1-49 employees	.417	.238	.190
		100+ employees	-.167	.260	.798
	100+ employees	1-49 employees	.584*	.233	.035
		50-99 employees	.167	.260	.798
A6-Establish a project goal for recycled content materials	1-49 employees	50-99 employees	-.183	.241	.729
		100+ employees	-.528	.235	.067
	50-99 employees	1-49 employees	.183	.241	.729
		100+ employees	-.345	.263	.390
	100+ employees	1-49 employees	.528	.235	.067
		50-99 employees	.345	.263	.390

* Tukey HSD post-hoc analysis indicates the mean difference was significant at the .05 level.

Tukey HSD Multiple Comparisons (cont.)

LEED Practice	Type of Firm		Mean	Std. Err.	Sig.
A7-Establish a project goal for locally sourced materials	1-49 employees	50-99 employees	-.240	.241	.581
		100+ employees	-.417	.234	.179
	50-99 employees	1-49 employees	.240	.241	.581
		100+ employees	-.177	.262	.778
	100+ employees	1-49 employees	.417	.234	.179
		50-99 employees	.177	.262	.778
A8-Establish a project goal for rapidly renewable materials	1-49 employees	50-99 employees	-.245	.256	.605
		100+ employees	-.479	.249	.135
	50-99 employees	1-49 employees	.245	.256	.605
		100+ employees	-.234	.279	.680
	100+ employees	1-49 employees	.479	.249	.135
		50-99 employees	.234	.279	.680
A9-Establish a project goal for Forest Stewardship Council-certified wood products	1-49 employees	50-99 employees	.049	.253	.980
		100+ employees	-.372	.246	.287
	50-99 employees	1-49 employees	-.049	.253	.980
		100+ employees	-.421	.275	.280
	100+ employees	1-49 employees	.372	.246	.287
		50-99 employees	.421	.275	.280
A10-Adopt an indoor air quality management plan to protect the HVAC system during construction	1-49 employees	50-99 employees	-.072	.257	.958
		100+ employees	-.028	.249	.993
	50-99 employees	1-49 employees	.072	.257	.958
		100+ employees	.043	.281	.987
	100+ employees	1-49 employees	.028	.249	.993
		50-99 employees	-.043	.281	.987
A11-Prior to occupancy, perform a two week building flush-out or test the contaminant levels in the building	1-49 employees	50-99 employees	-.078	.271	.956
		100+ employees	-.531	.261	.107
	50-99 employees	1-49 employees	.078	.271	.956
		100+ employees	-.453	.292	.270
	100+ employees	1-49 employees	.531	.261	.107
		50-99 employees	.453	.292	.270
A12-Specify Low-volatile organic compound (VOC) adhesives and sealants in construction documents	1-49 employees	50-99 employees	-.178	.270	.788
		100+ employees	-.019	.255	.997
	50-99 employees	1-49 employees	.178	.270	.788
		100+ employees	.159	.293	.850
	100+ employees	1-49 employees	.019	.255	.997
		50-99 employees	-.159	.293	.850
A13-Specify Low-VOC paints and coatings in construction documents	1-49 employees	50-99 employees	-.038	.260	.988
		100+ employees	.105	.252	.909
	50-99 employees	1-49 employees	.038	.260	.988
		100+ employees	.143	.286	.871
	100+ employees	1-49 employees	-.105	.252	.909
		50-99 employees	-.143	.286	.871

* Tukey HSD post-hoc analysis indicates the mean difference was significant at the .05 level.

Tukey HSD Multiple Comparisons (cont.)

LEED Practice	Type of Firm		Mean	Std. Err.	Sig.
A14-Specify Low-VOC carpet products and systems in construction documents	1-49 employees	50-99 employees	-.048	.274	.983
		100+ employees	.033	.263	.991
	50-99 employees	1-49 employees	.048	.274	.983
		100+ employees	.081	.299	.960
	100+ employees	1-49 employees	-.033	.263	.991
		50-99 employees	-.081	.299	.960
A15-Specify wood and agrifiber products that contain no added urea-formaldehyde resins	1-49 employees	50-99 employees	.011	.263	.999
		100+ employees	.025	.254	.995
	50-99 employees	1-49 employees	-.011	.263	.999
		100+ employees	.014	.287	.999
	100+ employees	1-49 employees	-.025	.254	.995
		50-99 employees	-.014	.287	.999
P1-Adopt an erosion and sediment control plan for the project site during construction	1-49 employees	50-99 employees	-.204	.160	.410
		100+ employees	-.288	.156	.156
	50-99 employees	1-49 employees	.204	.160	.410
		100+ employees	-.084	.173	.879
	100+ employees	1-49 employees	.288	.156	.156
		50-99 employees	.084	.173	.879
P2-Adopt a commissioning plan	1-49 employees	50-99 employees	-.772*	.239	.004
		100+ employees	-.700*	.231	.008
	50-99 employees	1-49 employees	.772*	.239	.004
		100+ employees	.072	.258	.958
	100+ employees	1-49 employees	.700*	.231	.008
		50-99 employees	-.072	.258	.958
P3-Engage the commissioning authority early in the design phases	1-49 employees	50-99 employees	-.681*	.244	.016
		100+ employees	-.797*	.238	.003
	50-99 employees	1-49 employees	.681*	.244	.016
		100+ employees	-.116	.266	.900
	100+ employees	1-49 employees	.797*	.238	.003
		50-99 employees	.116	.266	.900
P4-Designate a specific area on the construction site for recycling	1-49 employees	50-99 employees	-.496	.241	.102
		100+ employees	-.866*	.232	.001
	50-99 employees	1-49 employees	.496	.241	.102
		100+ employees	-.370	.260	.332
	100+ employees	1-49 employees	.866*	.232	.001
		50-99 employees	.370	.260	.332
P5-Incorporate salvaged materials into building	1-49 employees	50-99 employees	-.672*	.236	.013
		100+ employees	-.789*	.228	.002
	50-99 employees	1-49 employees	.672*	.236	.013
		100+ employees	-.117	.255	.890
	100+ employees	1-49 employees	.789*	.228	.002
		50-99 employees	.117	.255	.890

* Tukey HSD post-hoc analysis indicates the mean difference was significant at the .05 level.

Tukey HSD Multiple Comparisons (cont.)

LEED Practice	Type of Firm		Mean	Std. Err.	Sig.
P6-Establish a project goal for recycled content materials	1-49 employees	50-99 employees	-.644*	.236	.019
		100+ employees	-.719*	.228	.005
	50-99 employees	1-49 employees	.644*	.236	.019
		100+ employees	-.075	.253	.953
	100+ employees	1-49 employees	.719*	.228	.005
		50-99 employees	.075	.253	.953
P7-Establish a project goal for locally sourced materials	1-49 employees	50-99 employees	-.465	.246	.145
		100+ employees	-.616*	.234	.025
	50-99 employees	1-49 employees	.465	.246	.145
		100+ employees	-.151	.263	.833
	100+ employees	1-49 employees	.616*	.234	.025
		50-99 employees	.151	.263	.833
P8-Establish a project goal for rapidly renewable materials	1-49 employees	50-99 employees	-.251	.217	.482
		100+ employees	-.503*	.207	.043
	50-99 employees	1-49 employees	.251	.217	.482
		100+ employees	-.252	.235	.531
	100+ employees	1-49 employees	.503*	.207	.043
		50-99 employees	.252	.235	.531
P9-Establish a project goal for Forest Stewardship Council-certified wood products	1-49 employees	50-99 employees	-.052	.225	.971
		100+ employees	-.296	.213	.348
	50-99 employees	1-49 employees	.052	.225	.971
		100+ employees	-.244	.242	.572
	100+ employees	1-49 employees	.296	.213	.348
		50-99 employees	.244	.242	.572
P10-Adopt an indoor air quality management plan to protect the HVAC system during construction	1-49 employees	50-99 employees	-.203	.255	.705
		100+ employees	-.226	.244	.625
	50-99 employees	1-49 employees	.203	.255	.705
		100+ employees	-.023	.276	.996
	100+ employees	1-49 employees	.226	.244	.625
		50-99 employees	.023	.276	.996
P11-Prior to occupancy, perform a two week building flush-out or test the contaminant levels in the building	1-49 employees	50-99 employees	-.101	.259	.920
		100+ employees	-.571	.247	.056
	50-99 employees	1-49 employees	.101	.259	.920
		100+ employees	-.470	.281	.218
	100+ employees	1-49 employees	.571	.247	.056
		50-99 employees	.470	.281	.218
P12-Specify Low-volatile organic compound (VOC) adhesives and sealants in construction documents	1-49 employees	50-99 employees	-.114	.267	.905
		100+ employees	-.170	.251	.776
	50-99 employees	1-49 employees	.114	.267	.905
		100+ employees	-.057	.288	.979
	100+ employees	1-49 employees	.170	.251	.776
		50-99 employees	.057	.288	.979

* Tukey HSD post-hoc analysis indicates the mean difference was significant at the .05 level.

Tukey HSD Multiple Comparisons (cont.)

LEED Practice	Type of Firm		Mean	Std. Err.	Sig.
P13-Specify Low-VOC paints and coatings in construction documents	1-49 employees	50-99 employees	-.117	.261	.895
		100+ employees	-.105	.248	.906
	50-99 employees	1-49 employees	.117	.261	.895
		100+ employees	.012	.284	.999
	100+ employees	1-49 employees	.105	.248	.906
		50-99 employees	-.012	.284	.999
P14-Specify Low-VOC carpet products and systems in construction documents	1-49 employees	50-99 employees	-.005	.268	1.000
		100+ employees	.017	.256	.998
	50-99 employees	1-49 employees	.005	.268	1.000
		100+ employees	.022	.293	.997
	100+ employees	1-49 employees	-.017	.256	.998
		50-99 employees	-.022	.293	.997
P15-Specify wood and agrifiber products that contain no added urea-formaldehyde resins	1-49 employees	50-99 employees	-.205	.246	.681
		100+ employees	-.245	.238	.558
	50-99 employees	1-49 employees	.205	.246	.681
		100+ employees	-.040	.268	.988
	100+ employees	1-49 employees	.245	.238	.558
		50-99 employees	.040	.268	.988

* Tukey HSD post-hoc analysis indicates the mean difference was significant at the .05 level.

APPENDIX G:

Annual Dollar Volume Means Analysis Tables

Descriptive Statistics for Annual Dollar Volume

LEED Practice	Annual Dollar Volume	N	Mean	SD	Std. Err.
A1-Adopt an erosion and sediment control plan for the project site during construction	Less than $500,000	2	4.00	1.414	1.000
	$500,000 to less than $1 million	3	5.00	.000	.000
	$1 million to less than $5 million	28	4.29	1.213	.229
	$5 million to less than $20 million	61	4.70	.587	.075
	Over $20 million	89	4.82	.441	.047
	Total	183	4.69	.691	.051
A2-Adopt a commissioning plan	Less than $500,000	2	4.00	1.414	1.000
	$500,000 to less than $1 million	3	2.67	1.528	.882
	$1 million to less than $5 million	29	2.90	1.566	.291
	$5 million to less than $20 million	65	2.94	1.402	.174
	Over $20 million	91	3.88	1.210	.127
	Total	190	3.39	1.413	.102
A3-Engage the commissioning authority early in the design phases	Less than $500,000	2	5.00	.000	.000
	$500,000 to less than $1 million	3	2.67	1.528	.882
	$1 million to less than $5 million	28	2.71	1.512	.286
	$5 million to less than $20 million	65	2.66	1.450	.180
	Over $20 million	88	3.65	1.348	.144
	Total	186	3.16	1.487	.109
A4-Designate a specific area on the construction site for recycling	Less than $500,000	2	5.00	.000	.000
	$500,000 to less than $1 million	3	4.00	1.732	1.000
	$1 million to less than $5 million	29	3.38	1.474	.274
	$5 million to less than $20 million	65	3.15	1.349	.167
	Over $20 million	91	3.85	1.219	.128
	Total	190	3.55	1.343	.097

Descriptive Statistics for Annual Dollar Volume (cont.)

LEED Practice	Annual Dollar Volume	N	Mean	SD	Std. Err.
A5-Incorporate salvaged materials into building	Less than $500,000	2	5.00	.000	.000
	$500,000 to less than $1 million	3	2.33	2.309	1.333
	$1 million to less than $5 million	29	3.24	1.504	.279
	$5 million to less than $20 million	64	3.30	1.376	.172
	Over $20 million	91	3.89	1.169	.122
	Total	189	3.58	1.349	.098
A6-Establish a project goal for recycled content materials	Less than $500,000	2	4.50	.707	.500
	$500,000 to less than $1 million	3	3.00	2.000	1.155
	$1 million to less than $5 million	28	3.21	1.524	.288
	$5 million to less than $20 million	66	2.86	1.391	.171
	Over $20 million	90	3.59	1.198	.126
	Total	189	3.28	1.361	.099
A7-Establish a project goal for locally sourced materials	Less than $500,000	2	5.00	.000	.000
	$500,000 to less than $1 million	3	4.00	1.000	.577
	$1 million to less than $5 million	26	3.08	1.495	.293
	$5 million to less than $20 million	64	3.09	1.433	.179
	Over $20 million	88	3.75	1.117	.119
	Total	183	3.44	1.328	.098
A8-Establish a project goal for rapidly renewable materials	Less than $500,000	2	4.50	.707	.500
	$500,000 to less than $1 million	3	2.00	1.732	1.000
	$1 million to less than $5 million	28	2.93	1.538	.291
	$5 million to less than $20 million	66	2.62	1.507	.185
	Over $20 million	91	3.19	1.324	.139
	Total	190	2.95	1.447	.105

Descriptive Statistics for Annual Dollar Volume (cont.)

LEED Practice	Annual Dollar Volume	N	Mean	SD	Std. Err.
A9-Establish a project goal for Forest Stewardship Council-certified wood products	Less than $500,000	2	4.50	.707	.500
	$500,000 to less than $1 million	3	1.67	1.155	.667
	$1 million to less than $5 million	28	2.86	1.533	.290
	$5 million to less than $20 million	66	2.56	1.469	.181
	Over $20 million	91	3.05	1.320	.138
	Total	190	2.85	1.423	.103
A10-Adopt an indoor air quality management plan to protect the HVAC system during construction	Less than $500,000	2	5.00	.000	.000
	$500,000 to less than $1 million	3	2.00	1.732	1.000
	$1 million to less than $5 million	29	3.48	1.455	.270
	$5 million to less than $20 million	62	3.26	1.514	.192
	Over $20 million	90	3.57	1.281	.135
	Total	186	3.44	1.406	.103
A11-Prior to occupancy, perform a two week building flush-out or test the contaminant levels in the building	Less than $500,000	2	4.50	.707	.500
	$500,000 to less than $1 million	3	1.00	.000	.000
	$1 million to less than $5 million	28	2.93	1.438	.272
	$5 million to less than $20 million	64	2.50	1.522	.190
	Over $20 million	91	3.40	1.405	.147
	Total	188	2.99	1.511	.110
A12-Specify Low-volatile organic compound (VOC) adhesives and sealants in construction documents	Less than $500,000	2	4.00	1.414	1.000
	$500,000 to less than $1 million	3	2.00	1.732	1.000
	$1 million to less than $5 million	26	3.35	1.231	.241
	$5 million to less than $20 million	63	3.16	1.598	.201
	Over $20 million	86	3.62	1.347	.145
	Total	180	3.39	1.444	.108

Descriptive Statistics for Annual Dollar Volume (cont.)

LEED Practice	Annual Dollar Volume	N	Mean	SD	Std. Err.
A13-Specify Low-VOC paints and coatings in construction documents	Less than $500,000	2	4.50	.707	.500
	$500,000 to less than $1 million	3	2.00	1.732	1.000
	$1 million to less than $5 million	27	3.41	1.185	.228
	$5 million to less than $20 million	64	3.20	1.555	.194
	Over $20 million	85	3.66	1.323	.144
	Total	181	3.44	1.412	.105
A14-Specify Low-VOC carpet products and systems in construction documents	Less than $500,000	2	4.00	1.414	1.000
	$500,000 to less than $1 million	3	2.00	1.732	1.000
	$1 million to less than $5 million	27	3.22	1.340	.258
	$5 million to less than $20 million	65	3.12	1.576	.196
	Over $20 million	86	3.51	1.429	.154
	Total	183	3.31	1.481	.109
A15-Specify wood and agrifiber products that contain no added urea-formaldehyde resin	Less than $500,000	2	4.50	.707	.500
	$500,000 to less than $1 million	2	2.50	2.121	1.500
	$1 million to less than $5 million	27	3.11	1.368	.263
	$5 million to less than $20 million	65	2.88	1.474	.183
	Over $20 million	87	3.31	1.417	.152
	Total	183	3.13	1.439	.106

Descriptive Statistics for Annual Dollar Volume (cont.)

LEED Practice	Annual Dollar Volume	N	Mean	SD	Std. Err.
P1-Adopt an erosion and sediment control plan for the project site during construction	Less than $500,000	2	2.00	.000	.000
	$500,000 to less than $1 million	3	3.00	2.000	1.155
	$1 million to less than $5 million	30	4.40	1.037	.189
	$5 million to less than $20 million	68	4.50	.985	.119
	Over $20 million	96	4.73	.657	.067
	Total	199	4.55	.925	.066
P2-Adopt a commissioning plan	Less than $500,000	2	2.00	.000	.000
	$500,000 to less than $1 million	3	2.00	1.000	.577
	$1 million to less than $5 million	27	2.48	1.451	.279
	$5 million to less than $20 million	62	2.68	1.290	.164
	Over $20 million	93	3.42	1.288	.134
	Total	187	3.00	1.364	.100
P3-Engage the commissioning authority early in the design phases	Less than $500,000	2	3.50	2.121	1.500
	$500,000 to less than $1 million	3	2.00	1.000	.577
	$1 million to less than $5 million	26	2.23	1.306	.256
	$5 million to less than $20 million	60	2.37	1.262	.163
	Over $20 million	90	3.09	1.387	.146
	Total	181	2.71	1.381	.103
P4-Designate a specific area on the construction site for recycling	Less than $500,000	2	3.50	2.121	1.500
	$500,000 to less than $1 million	3	1.67	.577	.333
	$1 million to less than $5 million	26	2.58	1.301	.255
	$5 million to less than $20 million	60	2.85	1.273	.164
	Over $20 million	94	3.41	1.371	.141
	Total	185	3.09	1.369	.101

Descriptive Statistics for Annual Dollar Volume (cont.)

LEED Practice	Annual Dollar Volume	N	Mean	SD	Std. Err
P5-Incorporate salvaged materials into building	Less than $500,000	2	3.50	2.121	1.500
	$500,000 to less than $1 million	3	2.00	1.732	1.000
	$1 million to less than $5 million	28	2.79	1.397	.264
	$5 million to less than $20 million	61	2.92	1.345	.172
	Over $20 million	93	3.12	1.318	.137
	Total	187	2.99	1.348	.099
P6-Establish a project goal for recycled content materials	Less than $500,000	2	2.00	.000	.000
	$500,000 to less than $1 million	3	1.67	1.155	.667
	$1 million to less than $5 million	26	2.35	1.468	.288
	$5 million to less than $20 million	58	2.33	1.343	.176
	Over $20 million	94	2.81	1.272	.131
	Total	183	2.56	1.332	.098
P7-Establish a project goal for locally sourced materials	Less than $500,000	2	3.50	2.121	1.500
	$500,000 to less than $1 million	3	2.33	1.155	.667
	$1 million to less than $5 million	26	2.65	1.548	.304
	$5 million to less than $20 million	60	2.87	1.512	.195
	Over $20 million	92	3.00	1.186	.124
	Total	183	2.90	1.355	.100
P8-Establish a project goal for rapidly renewable materials	Less than $500,000	2	2.00	.000	.000
	$500,000 to less than $1 million	3	1.33	.577	.333
	$1 million to less than $5 million	26	1.92	1.197	.235
	$5 million to less than $20 million	56	2.04	1.206	.161
	Over $20 million	91	2.32	1.173	.123
	Total	178	2.15	1.181	.089

Descriptive Statistics for Annual Dollar Volume (cont.)

LEED Practice	Annual Dollar Volume	N	Mean	SD	Std. Err.
P9-Establish a project goal for Forest Stewardship Council-certified wood products	Less than $500,000	2	3.00	1.414	1.000
	$500,000 to less than $1 million	3	1.33	.577	.333
	$1 million to less than $5 million	26	2.15	1.347	.264
	$5 million to less than $20 million	58	2.03	1.213	.159
	Over $20 million	90	2.20	1.192	.126
	Total	179	2.13	1.215	.091
P10-Adopt an indoor air quality management plan to protect the HVAC system during construction	Less than $500,000	2	3.50	2.121	1.500
	$500,000 to less than $1 million	3	1.67	1.155	.667
	$1 million to less than $5 million	27	2.85	1.486	.286
	$5 million to less than $20 million	61	3.07	1.448	.185
	Over $20 million	91	3.11	1.312	.138
	Total	184	3.04	1.388	.102
P11-Prior to occupancy, perform a two week building flush-out or test the contaminant levels in the building	Less than $500,000	2	3.00	1.414	1.000
	$500,000 to less than $1 million	3	1.00	.000	.000
	$1 million to less than $5 million	26	2.42	1.447	.284
	$5 million to less than $20 million	59	2.00	1.300	.169
	Over $20 million	90	2.76	1.409	.148
	Total	180	2.43	1.411	.105
P12-Specify Low-volatile organic compound (VOC) adhesives and sealants in construction documents	Less than $500,000	2	2.50	.707	.500
	$500,000 to less than $1 million	3	2.00	1.732	1.000
	$1 million to less than $5 million	26	2.88	1.532	.300
	$5 million to less than $20 million	59	2.68	1.502	.196
	Over $20 million	90	3.03	1.336	.141
	Total	180	2.87	1.422	.106

Descriptive Statistics for Annual Dollar Volume (cont.)

LEED Practice	Annual Dollar Volume	N	Mean	SD	Std. Err.
P13-Specify Low-VOC paints and coatings in construction documents	Less than $500,000	2	3.00	1.414	1.000
	$500,000 to less than $1 million	3	2.00	1.732	1.000
	$1 million to less than $5 million	27	2.85	1.433	.276
	$5 million to less than $20 million	59	2.73	1.448	.189
	Over $20 million	90	3.09	1.355	.143
	Total	181	2.92	1.402	.104
P14-Specify Low-VOC carpet products and systems in construction documents	Less than $500,000	2	2.50	.707	.500
	$500,000 to less than $1 million	3	2.00	1.732	1.000
	$1 million to less than $5 million	27	2.78	1.528	.294
	$5 million to less than $20 million	60	2.58	1.430	.185
	Over $20 million	86	2.87	1.413	.152
	Total	178	2.74	1.430	.107
P15-Specify wood and agrifiber products that contain no added urea-formaldehyde resins	Less than $500,000	2	3.00	1.414	1.000
	$500,000 to less than $1 million	2	2.00	1.414	1.000
	$1 million to less than $5 million	25	2.40	1.384	.277
	$5 million to less than $20 million	57	2.37	1.248	.165
	Over $20 million	85	2.67	1.331	.144
	Total	171	2.53	1.308	.100

ANOVA Between Groups for Annual Dollar Volume

LEED Practice	Sum of Squares	df	Mean Square	F	Sig.
A1-Adopt an erosion and sediment control plan for the project site during construction	7.337	4	1.834	4.106	.003
A2-Adopt a commissioning plan	44.398	4	11.100	6.171	.000
A3-Engage the commissioning authority early in the design phases	50.147	4	12.537	6.320	.000
A4-Designate a specific area on the construction site for recycling	23.838	4	5.960	3.477	.009
A5-Incorporate salvaged materials into building	25.900	4	6.475	3.767	.006
A6-Establish a project goal for recycled content materials	23.362	4	5.840	3.309	.012
A7-Establish a project goal for locally sourced materials	25.364	4	6.341	3.816	.005
A8-Establish a project goal for rapidly renewable materials	19.762	4	4.941	2.433	.049
A9-Establish a project goal for Forest Stewardship Council-certified wood products	18.996	4	4.749	2.416	.050
A10-Adopt an indoor air quality management plan to protect the HVAC system during construction	14.637	4	3.659	1.886	.115
A11-Prior to occupancy, perform a two week building flush-out or test the contaminant levels in the building	46.879	4	11.720	5.642	.000
A12-Specify Low-volatile organic compound (VOC) adhesives and sealants in construction documents	14.360	4	3.590	1.752	.141
A13-Specify Low-VOC paints and coatings in construction documents	16.157	4	4.039	2.076	.086
A14-Specify Low-VOC carpet products and systems in construction documents	.166	2	.083	.037	.964
A15-Specify wood and agrifiber products that contain no added urea-formaldehyde resins	.020	2	.010	.005	.995

ANOVA Between Groups

LEED Practice	Sum of Squares	df	Mean Square	F	Sig.
P1-Adopt an erosion and sediment control plan for the project site during construction	24.138	4	6.035	8.065	.000
P2-Adopt a commissioning plan	35.066	4	8.766	5.131	.001
P3-Engage the commissioning authority early in the design phases	28.723	4	7.181	4.021	.004
P4-Designate a specific area on the construction site for recycling	26.634	4	6.659	3.769	.006
P5-Incorporate salvaged materials into building	6.475	4	1.619	.889	.472
P6-Establish a project goal for recycled content materials	13.147	4	3.287	1.888	.115
P7-Establish a project goal for locally sourced materials	4.245	4	1.061	.572	.683
P8-Establish a project goal for rapidly renewable materials	6.705	4	1.676	1.207	.309
P9-Establish a project goal for Forest Stewardship Council-certified wood products	4.400	4	1.100	.741	.565
P10-Adopt an indoor air quality management plan to protect the HVAC system during construction	7.521	4	1.880	.975	.423
P11-Prior to occupancy, perform a two week building flush-out or test the contaminant levels in the building	27.232	4	6.808	3.622	.007
P12-Specify Low-volatile organic compound (VOC) adhesives and sealants in construction documents	7.126	4	1.781	.878	.478
P13-Specify Low-VOC paints and coatings in construction documents	7.400	4	1.850	.940	.442
P14-Specify Low-VOC carpet products and systems in construction documents	4.769	4	1.192	.577	.680
P15-Specify wood and agrifiber products that contain no added urea-formaldehyde resins	4.592	4	1.148	.666	.616

Welch Robust Tests of Equality of Means(b,c,d,e,f,g,h,i,j,k,l,m)

LEED Practice	Statistic(a)	df1	df2	Sig.
A1-Adopt an erosion and sediment control plan for the project site during construction	.	.	.	.
A2-Adopt a commissioning plan	4.494	4	5.304	.060
A3-Engage the commissioning authority early in the design phases	.	.	.	.
A4-Designate a specific area on the construction site for recycling	.	.	.	.
A5-Incorporate salvaged materials into building	.	.	.	.
A6-Establish a project goal for recycled content materials	3.155	4	5.466	.110
A7-Establish a project goal for locally sourced materials	.	.	.	.
A8-Establish a project goal for rapidly renewable materials	2.930	4	5.523	.124
A9-Establish a project goal for Forest Stewardship Council-certified wood products	3.393	4	5.559	.096
A10-Adopt an indoor air quality management plan to protect the HVAC system during construction	.	.	.	.
A11-Prior to occupancy, perform a two week building flush-out or test the contaminant levels in the building	.	.	.	.

Welch Robust Tests of Equality of Means (cont.)

LEED Practice	Statistic(a)	df1	df2	Sig.
A12-Specify Low-volatile organic compound (VOC) adhesives and sealants in construction documents	1.081	4	5.316	.451
A13-Specify Low-VOC paints and coatings in construction documents	1.830	4	5.526	.250
A14-Specify Low-VOC carpet products and systems in construction documents	.891	4	5.327	.528
A15-Specify wood and agrifiber products that contain no added urea-formaldehyde resins	1.805	4	4.117	.287
P1-Adopt an erosion and sediment control plan for the project site during construction	.	.	.	.
P2-Adopt a commissioning plan	.	.	.	.
P3-Engage the commissioning authority early in the design phases	2.957	4	5.326	.126
P4-Designate a specific area on the construction site for recycling	5.172	4	5.497	.043
P5-Incorporate salvaged materials into building	.497	4	5.266	.741
P6-Establish a project goal for recycled content materials	.	.	.	.
P7-Establish a project goal for locally sourced materials	.396	4	5.285	.805
P8-Establish a project goal for rapidly renewable materials	.396	4	5.285	.805

Welch Robust Tests of Equality of Means (cont.)

LEED Practice	Statistic(a)	df1	df2	Sig.
P9-Establish a project goal for Forest Stewardship Council-certified wood products	.	.	.	.
P10-Adopt an indoor air quality management plan to protect the HVAC system during construction	1.269	4	5.484	.384
P11-Prior to occupancy, perform a two week building flush-out or test the contaminant levels in the building	.915	4	5.306	.518
P12-Specify Low-volatile organic compound (VOC) adhesives and sealants in construction documents	.	.	.	.
P13-Specify Low-VOC paints and coatings in construction documents	.662	4	5.529	.643
P14-Specify Low-VOC carpet products and systems in construction documents	.604	4	5.309	.676
P15-Specify wood and agrifiber products that contain no added urea-formaldehyde resins	.417	4	5.552	.792

a Asymptotically F distributed.

b Robust tests of equality of means cannot be performed for A1-Adopt an erosion and sediment control plan for the project site during construction because at least one group has 0 variance.

c Robust tests of equality of means cannot be performed for A3-Engage the commissioning authority early in the design phases because at least one group has 0 variance.

d Robust tests of equality of means cannot be performed for A4-Designate a specific area on the construction site for recycling because at least one group has 0 variance.

e Robust tests of equality of means cannot be performed for A5-Incorporate salvaged materials into building because at least one group has 0 variance.

f Robust tests of equality of means cannot be performed for A7-Establish a project goal for locally sourced materials because at least one group has 0 variance.

g Robust tests of equality of means cannot be performed for A10-Adopt an indoor air quality management plan to protect the HVAC system during construction because at least one group has 0 variance.

h Robust tests of equality of means cannot be performed for A11-Prior to occupancy, perform a two week building flush-out or test the contaminant levels in the building because at least one group has 0 variance.

i Robust tests of equality of means cannot be performed for P1-Adopt an erosion and sediment control plan for the project site during construction because at least one group has 0 variance.

j Robust tests of equality of means cannot be performed for P2-Adopt a commissioning plan because at least one group has 0 variance.

k Robust tests of equality of means cannot be performed for P6-Establish a project goal for recycled content materials because at least one group has 0 variance.

l Robust tests of equality of means cannot be performed for P8-Establish a project goal for rapidly renewable materials (bamboo flooring, wool carpets, straw board, cotton batt insulation, linoleum flooring, poplar OSB, sunflower seed board, wheatgrass cabinetry because at least one group has 0 variance.

m Robust tests of equality of means cannot be performed for P11-Prior to occupancy, perform a two week building flush-out or test the contaminant levels in the building because at least one group has 0 variance.

Tukey HSD Multiple Comparisons

LEED Practice	Annual Dollar Volume		Mean Diff.	Std. Error	Sig.
A1-Adopt an erosion and sediment control plan for the project site during construction.	<$500,000	$500,000 to less than $1 million	-1.000	.610	.475
		$1 million to less than $5 million	-.286	.489	.977
		$5 million to less than $20 million	-.705	.480	.585
		Over $20 million	-.820	.478	.427
	$500,000 to<$1 million	Less than $500,000	1.000	.610	.475
		$1 million to less than $5 million	.714	.406	.401
		$5 million to less than $20 million	.295	.395	.945
		Over $20 million	.180	.392	.991
	$1 million to < $5 million	Less than $500,000	.286	.489	.977
		$500,000 to less than $1 million	-.714	.406	.401
		$5 million to less than $20 million	-.419	.153	.051
		Over $20 million	-.535*	.145	.003
	$5 million to less than $20 million	Less than $500,000	.705	.480	.585
		$500,000 to less than $1 million	-.295	.395	.945
		$1 million to less than $5 million	.419	.153	.051
		Over $20 million	-.115	.111	.837
	Over $20 million	Less than $500,000	.820	.478	.427
		$500,000 to less than $1 million	-.180	.392	.991
		$1 million to less than $5 million	.535*	.145	.003
		$5 million to less than $20 million	.115	.111	.837

Tukey HSD Multiple Comparisons (cont.)

LEED Practice	Annual Dollar Volume		Mean Diff.	Std. Error	Sig.
A2-Adopt a commissioning plan	Less than $500,000	$500,000 to less than $1 million	1.333	1.224	.812
		$1 million to less than $5 million	1.103	.981	.793
		$5 million to less than $20 million	1.062	.963	.805
		Over $20 million	.121	.959	1.000
	$500,000 to less than $1 million	Less than $500,000	-1.333	1.224	.812
		$1 million to less than $5 million	-.230	.813	.999
		$5 million to less than $20 million	-.272	.792	.997
		Over $20 million	-1.212	.787	.537
	$1 million to less than $5 million	Less than $500,000	-1.103	.981	.793
		$500,000 to less than $1 million	.230	.813	.999
		$5 million to less than $20 million	-.042	.300	1.000
		Over $20 million	-.983*	.286	.006
	$5 million to less than $20 million	Less than $500,000	-1.062	.963	.805
		$500,000 to less than $1 million	.272	.792	.997
		$1 million to less than $5 million	.042	.300	1.000
		Over $20 million	-.941*	.218	.000
	Over $20 million	Less than $500,000	-.121	.959	1.000
		$500,000 to less than $1 million	1.212	.787	.537
		$1 million to less than $5 million	.983*	.286	.006
		$5 million to less than $20 million	.941*	.218	.000
A3-Engage the commissioning authority early in the design phases	Less than $500,000	$500,000 to less than $1 million	2.333	1.286	.368
		$1 million to less than $5 million	2.286	1.031	.178
		$5 million to less than $20 million	2.338	1.011	.146

Tukey HSD Multiple Comparisons (cont.)

LEED Practice	Annual Dollar Volume		Mean Diff.	Std. Error	Sig.
		Over $20 million	1.352	1.007	.665
	$500,000 to less than $1 million	Less than $500,000	-2.333	1.286	.368
		$1 million to less than $5 million	-.048	.856	1.000
		$5 million to less than $20 million	.005	.832	1.000
		Over $20 million	-.981	.827	.759
	$1 million to less than $5 million	Less than $500,000	-2.286	1.031	.178
		$500,000 to less than $1 million	.048	.856	1.000
		$5 million to less than $20 million	.053	.318	1.000
		Over $20 million	-.933*	.306	.022
	$5 million to less than $20 million	Less than $500,000	-2.338	1.011	.146
		$500,000 to less than $1 million	-.005	.832	1.000
		$1 million to less than $5 million	-.053	.318	1.000
		Over $20 million	-.986*	.230	.000
	Over $20 million	Less than $500,000	-1.352	1.007	.665
		$500,000 to less than $1 million	.981	.827	.759
		$1 million to less than $5 million	.933*	.306	.022
		$5 million to less than $20 million	.986*	.230	.000
A4-Designate a specific area on the construction site for recycling	Less than $500,000	$500,000 to less than $1 million	1.000	1.195	.919
		$1 million to less than $5 million	1.621	.957	.441
		$5 million to less than $20 million	1.846	.940	.288
		Over $20 million	1.154	.936	.732
	$500,000 to less than $1 million	Less than $500,000	-1.000	1.195	.919
		$1 million to less than $5 million	.621	.794	.936
		$5 million to less than $20 million	.846	.773	.809

Tukey HSD Multiple Comparisons (cont.)

LEED Practice	Annual Dollar Volume		Mean Diff.	Std. Error	Sig.
		Over $20 million	.154	.768	1.000
	$1 million to less than $5 million	Less than $500,000	-1.621	.957	.441
		$500,000 to less than $1 million	-.621	.794	.936
		$5 million to less than $20 million	.225	.292	.939
		Over $20 million	-.467	.279	.454
	$5 million to less than $20 million	Less than $500,000	-1.846	.940	.288
		$500,000 to less than $1 million	-.846	.773	.809
		$1 million to less than $5 million	-.225	.292	.939
		Over $20 million	-.692*	.213	.012
	Over $20 million	Less than $500,000	-1.154	.936	.732
		$500,000 to less than $1 million	-.154	.768	1.000
		$1 million to less than $5 million	.467	.279	.454
		$5 million to less than $20 million	.692*	.213	.012
A5-Incorporate salvaged materials into building	Less than $500,000	$500,000 to less than $1 million	2.667	1.197	.174
		$1 million to less than $5 million	1.759	.958	.357
		$5 million to less than $20 million	1.703	.941	.371
		Over $20 million	1.110	.937	.760
	$500,000 to less than $1 million	Less than $500,000	-2.667	1.197	.174
		$1 million to less than $5 million	-.908	.795	.784
		$5 million to less than $20 million	-.964	.774	.725
		Over $20 million	-1.557	.769	.259
	$1 million to less than $5 million	Less than $500,000	-1.759	.958	.357
		$500,000 to less than $1 million	.908	.795	.784
		$5 million to less than $20 million	-.055	.293	1.000

Tukey HSD Multiple Comparisons (cont.)

LEED Practice	Annual Dollar Volume		Mean Diff.	Std. Error	Sig.
		Over $20 million	-.649	.280	.143
	$5 million to less than $20 million	Less than $500,000	-1.703	.941	.371
		$500,000 to less than $1 million	.964	.774	.725
		$1 million to less than $5 million	.055	.293	1.000
		Over $20 million	-.593*	.214	.048
	Over $20 million	Less than $500,000	-1.110	.937	.760
		$500,000 to less than $1 million	1.557	.769	.259
		$1 million to less than $5 million	.649	.280	.143
		$5 million to less than $20 million	.593*	.214	.048
A6-Establish a project goal for recycled content materials	Less than $500,000	$500,000 to less than $1 million	1.500	1.213	.730
		$1 million to less than $5 million	1.286	.972	.678
		$5 million to less than $20 million	1.636	.954	.427
		Over $20 million	.911	.950	.873
	$500,000 to less than $1 million	Less than $500,000	-1.500	1.213	.730
		$1 million to less than $5 million	-.214	.807	.999
		$5 million to less than $20 million	.136	.784	1.000
		Over $20 million	-.589	.780	.943
	$1 million to less than $5 million	Less than $500,000	-1.286	.972	.678
		$500,000 to less than $1 million	.214	.807	.999
		$5 million to less than $20 million	.351	.300	.768
		Over $20 million	-.375	.287	.690
	$5 million to less than $20 million	Less than $500,000	-1.636	.954	.427
		$500,000 to less than $1 million	-.136	.784	1.000
		$1 million to less than $5 million	-.351	.300	.768

Tukey HSD Multiple Comparisons (cont.)

LEED Practice	Annual Dollar Volume		Mean Diff.	Std. Error	Sig.
		Over $20 million	-.725*	.215	.008
	Over $20 million	Less than $500,000	-.911	.950	.873
		$500,000 to less than $1 million	.589	.780	.943
		$1 million to less than $5 million	.375	.287	.690
		$5 million to less than $20 million	.725*	.215	.008
A7-Establish a project goal for locally sourced materials	Less than $500,000	$500,000 to less than $1 million	1.000	1.177	.914
		$1 million to less than $5 million	1.923	.946	.255
		$5 million to less than $20 million	1.906	.926	.243
		Over $20 million	1.250	.922	.657
	$500,000 to less than $1 million	Less than $500,000	-1.000	1.177	.914
		$1 million to less than $5 million	.923	.786	.766
		$5 million to less than $20 million	.906	.761	.757
		Over $20 million	.250	.757	.997
	$1 million to less than $5 million	Less than $500,000	-1.923	.946	.255
		$500,000 to less than $1 million	-.923	.786	.766
		$5 million to less than $20 million	-.017	.300	1.000
		Over $20 million	-.673	.288	.138
	$5 million to less than $20 million	Less than $500,000	-1.906	.926	.243
		$500,000 to less than $1 million	-.906	.761	.757
		$1 million to less than $5 million	.017	.300	1.000
		Over $20 million	-.656*	.212	.019
	Over $20 million	Less than $500,000	-1.250	.922	.657
		$500,000 to less than $1 million	-.250	.757	.997
		$1 million to less than $5 million	.673	.288	.138

Tukey HSD Multiple Comparisons (cont.)

LEED Practice	Annual Dollar Volume		Mean Diff.	Std. Error	Sig.
		$5 million to less than $20 million	.656*	.212	.019
A8-Establish a project goal for rapidly renewable materials	Less than $500,000	$500,000 to less than $1 million	2.500	1.301	.309
		$1 million to less than $5 million	1.571	1.043	.560
		$5 million to less than $20 million	1.879	1.023	.356
		Over $20 million	1.313	1.019	.698
	$500,000 to less than $1 million	Less than $500,000	-2.500	1.301	.309
		$1 million to less than $5 million	-.929	.866	.820
		$5 million to less than $20 million	-.621	.841	.947
		Over $20 million	-1.187	.836	.616
	$1 million to less than $5 million	Less than $500,000	-1.571	1.043	.560
		$500,000 to less than $1 million	.929	.866	.820
		$5 million to less than $20 million	.307	.321	.874
		Over $20 million	-.258	.308	.918
	$5 million to less than $20 million	Less than $500,000	-1.879	1.023	.356
		$500,000 to less than $1 million	.621	.841	.947
		$1 million to less than $5 million	-.307	.321	.874
		Over $20 million	-.566	.230	.106
	Over $20 million	Less than $500,000	-1.313	1.019	.698
		$500,000 to less than $1 million	1.187	.836	.616
		$1 million to less than $5 million	.258	.308	.918
		$5 million to less than $20 million	.566	.230	.106
A9-Establish a project goal for Forest Stewardship Council-certified wood products	Less than $500,000	$500,000 to less than $1 million	2.833	1.280	.179
		$1 million to less than $5 million	1.643	1.026	.499
		$5 million to less than $20 million	1.939	1.006	.306

Tukey HSD Multiple Comparisons (cont.)

LEED Practice	Annual Dollar Volume		Mean Diff.	Std. Error	Sig.
		Over $20 million	1.445	1.002	.601
	$500,000 to less than $1 million	Less than $500,000	-2.833	1.280	.179
		$1 million to less than $5 million	-1.190	.852	.630
		$5 million to less than $20 million	-.894	.828	.817
		Over $20 million	-1.388	.823	.444
	$1 million to less than $5 million	Less than $500,000	-1.643	1.026	.499
		$500,000 to less than $1 million	1.190	.852	.630
		$5 million to less than $20 million	.297	.316	.882
		Over $20 million	-.198	.303	.966
	$5 million to less than $20 million	Less than $500,000	-1.939	1.006	.306
		$500,000 to less than $1 million	.894	.828	.817
		$1 million to less than $5 million	-.297	.316	.882
		Over $20 million	-.494	.227	.192
	Over $20 million	Less than $500,000	-1.445	1.002	.601
		$500,000 to less than $1 million	1.388	.823	.444
		$1 million to less than $5 million	.198	.303	.966
		$5 million to less than $20 million	.494	.227	.192
A10-Adopt an indoor air quality management plan to protect the HVAC system during construction	Less than $500,000	$500,000 to less than $1 million	3.000	1.272	.131
		$1 million to less than $5 million	1.517	1.018	.570
		$5 million to less than $20 million	1.742	1.001	.412
		Over $20 million	1.433	.996	.603
	$500,000 to less than $1 million	Less than $500,000	-3.000	1.272	.131
		$1 million to less than $5 million	-1.483	.845	.403
		$5 million to less than $20 million	-1.258	.823	.546

Tukey HSD Multiple Comparisons (cont.)

LEED Practice	Annual Dollar Volume		Mean Diff.	Std. Error	Sig.
		Over $20 million	-1.567	.818	.312
	$1 million to less than $5 million	Less than $500,000	-1.517	1.018	.570
		$500,000 to less than $1 million	1.483	.845	.403
		$5 million to less than $20 million	.225	.313	.952
		Over $20 million	-.084	.297	.999
	$5 million to less than $20 million	Less than $500,000	-1.742	1.001	.412
		$500,000 to less than $1 million	1.258	.823	.546
		$1 million to less than $5 million	-.225	.313	.952
		Over $20 million	-.309	.230	.665
	Over $20 million	Less than $500,000	-1.433	.996	.603
		$500,000 to less than $1 million	1.567	.818	.312
		$1 million to less than $5 million	.084	.297	.999
		$5 million to less than $20 million	.309	.230	.665
A11-Prior to occupancy, perform a two week building flush-out or test the contaminant levels in the building	Less than $500,000	$500,000 to less than $1 million	3.500	1.316	.064
		$1 million to less than $5 million	1.571	1.055	.570
		$5 million to less than $20 million	2.000	1.035	.304
		Over $20 million	1.104	1.030	.821
	$500,000 to less than $1 million	Less than $500,000	-3.500	1.316	.064
		$1 million to less than $5 million	-1.929	.876	.183
		$5 million to less than $20 million	-1.500	.851	.399
		Over $20 million	-2.396*	.846	.041
	$1 million to less than $5 million	Less than $500,000	-1.571	1.055	.570
		$500,000 to less than $1 million	1.929	.876	.183
		$5 million to less than $20 million	.429	.327	.684

Tukey HSD Multiple Comparisons (cont.)

LEED Practice	Annual Dollar Volume		Mean Diff.	Std. Error	Sig.
		Over $20 million	-.467	.311	.564
	$5 million to less than $20 million	Less than $500,000	-2.000	1.035	.304
		$500,000 to less than $1 million	1.500	.851	.399
		$1 million to less than $5 million	-.429	.327	.684
		Over $20 million	-.896*	.235	.002
	Over $20 million	Less than $500,000	-1.104	1.030	.821
		$500,000 to less than $1 million	2.396*	.846	.041
		$1 million to less than $5 million	.467	.311	.564
		$5 million to less than $20 million	.896*	.235	.002
A12-Specify Low-volatile organic compound (VOC) adhesives and sealants in construction documents	Less than $500,000	$500,000 to less than $1 million	2.000	1.307	.544
		$1 million to less than $5 million	.654	1.050	.971
		$5 million to less than $20 million	.841	1.028	.925
		Over $20 million	.384	1.024	.996
	$500,000 to less than $1 million	Less than $500,000	-2.000	1.307	.544
		$1 million to less than $5 million	-1.346	.873	.537
		$5 million to less than $20 million	-1.159	.846	.648
		Over $20 million	-1.616	.841	.309
	$1 million to less than $5 million	Less than $500,000	-.654	1.050	.971
		$500,000 to less than $1 million	1.346	.873	.537
		$5 million to less than $20 million	.187	.334	.980
		Over $20 million	-.270	.320	.917
	$5 million to less than $20 million	Less than $500,000	-.841	1.028	.925
		$500,000 to less than $1 million	1.159	.846	.648
		$1 million to less than $5 million	-.187	.334	.980

Tukey HSD Multiple Comparisons (cont.)

LEED Practice	Annual Dollar Volume		Mean Diff.	Std. Error	Sig.
		Over $20 million	-.458	.237	.307
	Over $20 million	Less than $500,000	-.384	1.024	.996
		$500,000 to less than $1 million	1.616	.841	.309
		$1 million to less than $5 million	.270	.320	.917
		$5 million to less than $20 million	.458	.237	.307
A13-Specify Low-VOC paints and coatings in construction documents	Less than $500,000	$500,000 to less than $1 million	2.500	1.273	.288
		$1 million to less than $5 million	1.093	1.022	.822
		$5 million to less than $20 million	1.297	1.002	.695
		Over $20 million	.841	.998	.917
	$500,000 to less than $1 million	Less than $500,000	-2.500	1.273	.288
		$1 million to less than $5 million	-1.407	.849	.463
		$5 million to less than $20 million	-1.203	.824	.590
		Over $20 million	-1.659	.819	.259
	$1 million to less than $5 million	Less than $500,000	-1.093	1.022	.822
		$500,000 to less than $1 million	1.407	.849	.463
		$5 million to less than $20 million	.204	.320	.969
		Over $20 million	-.251	.308	.925
	$5 million to less than $20 million	Less than $500,000	-1.297	1.002	.695
		$500,000 to less than $1 million	1.203	.824	.590
		$1 million to less than $5 million	-.204	.320	.969
		Over $20 million	-.456	.231	.283
	Over $20 million	Less than $500,000	-.841	.998	.917
		$500,000 to less than $1 million	1.659	.819	.259
		$1 million to less than $5 million	.251	.308	.925

Tukey HSD Multiple Comparisons (cont.)

LEED Practice	Annual Dollar Volume		Mean Diff.	Std. Error	Sig.
		$5 million to less than $20 million	.456	.231	.283
A14-Specify Low-VOC carpet products and systems in construction documents	Less than $500,000	$500,000 to less than $1 million	2.000	1.346	.573
		$1 million to less than $5 million	.778	1.081	.952
		$5 million to less than $20 million	.877	1.059	.922
		Over $20 million	.488	1.055	.990
	$500,000 to less than $1 million	Less than $500,000	-2.000	1.346	.573
		$1 million to less than $5 million	-1.222	.898	.653
		$5 million to less than $20 million	-1.123	.871	.698
		Over $20 million	-1.512	.866	.409
	$1 million to less than $5 million	Less than $500,000	-.778	1.081	.952
		$500,000 to less than $1 million	1.222	.898	.653
		$5 million to less than $20 million	.099	.338	.998
		Over $20 million	-.289	.325	.900
	$5 million to less than $20 million	Less than $500,000	-.877	1.059	.922
		$500,000 to less than $1 million	1.123	.871	.698
		$1 million to less than $5 million	-.099	.338	.998
		Over $20 million	-.389	.242	.497
	Over $20 million	Less than $500,000	-.488	1.055	.990
		$500,000 to less than $1 million	1.512	.866	.409
		$1 million to less than $5 million	.289	.325	.900
		$5 million to less than $20 million	.389	.242	.497
A15-Specify wood and agrifiber products that contain no added urea-formaldehyde resins	Less than $500,000	$500,000 to less than $1 million	2.000	1.433	.631
		$1 million to less than $5 million	1.389	1.050	.677
		$5 million to less than $20 million	1.623	1.028	.513

Tukey HSD Multiple Comparisons (cont.)

LEED Practice	Annual Dollar Volume		Mean Diff.	Std. Error	Sig.
		Over $20 million	1.190	1.025	.773
	$500,000 to less than $1 million	Less than $500,000	-2.000	1.433	.631
		$1 million to less than $5 million	-.611	1.050	.978
		$5 million to less than $20 million	-.377	1.028	.996
		Over $20 million	-.810	1.025	.933
	$1 million to less than $5 million	Less than $500,000	-1.389	1.050	.677
		$500,000 to less than $1 million	.611	1.050	.978
		$5 million to less than $20 million	.234	.328	.953
		Over $20 million	-.199	.316	.970
	$5 million to less than $20 million	Less than $500,000	-1.623	1.028	.513
		$500,000 to less than $1 million	.377	1.028	.996
		$1 million to less than $5 million	-.234	.328	.953
		Over $20 million	-.433	.235	.351
	Over $20 million	Less than $500,000	-1.190	1.025	.773
		$500,000 to less than $1 million	.810	1.025	.933
		$1 million to less than $5 million	.199	.316	.970
		$5 million to less than $20 million	.433	.235	.351
P1-Adopt an erosion and sediment control plan for the project site during construction	Less than $500,000	$500,000 to less than $1 million	-1.000	.790	.712
		$1 million to less than $5 million	-2.400*	.632	.002
		$5 million to less than $20 million	-2.500*	.621	.001
		Over $20 million	-2.729*	.618	.000
	$500,000 to less than $1 million	Less than $500,000	1.000	.790	.712
		$1 million to less than $5 million	-1.400	.524	.062
		$5 million to less than $20 million	-1.500*	.510	.030

Tukey HSD Multiple Comparisons (cont.)

LEED Practice	Annual Dollar Volume		Mean Diff.	Std. Error	Sig.
		Over $20 million	-1.729*	.507	.007
	$1 million to less than $5 million	Less than $500,000	2.400*	.632	.002
		$500,000 to less than $1 million	1.400	.524	.062
		$5 million to less than $20 million	-.100	.190	.984
		Over $20 million	-.329	.181	.365
	$5 million to less than $20 million	Less than $500,000	2.500*	.621	.001
		$500,000 to less than $1 million	1.500*	.510	.030
		$1 million to less than $5 million	.100	.190	.984
		Over $20 million	-.229	.137	.454
	Over $20 million	Less than $500,000	2.729*	.618	.000
		$500,000 to less than $1 million	1.729*	.507	.007
		$1 million to less than $5 million	.329	.181	.365
		$5 million to less than $20 million	.229	.137	.454
P2-Adopt a commissioning plan	Less than $500,000	$500,000 to less than $1 million	.000	1.193	1.000
		$1 million to less than $5 million	-.481	.958	.987
		$5 million to less than $20 million	-.677	.939	.951
		Over $20 million	-1.419	.934	.551
	$500,000 to less than $1 million	Less than $500,000	.000	1.193	1.000
		$1 million to less than $5 million	-.481	.795	.974
		$5 million to less than $20 million	-.677	.773	.905
		Over $20 million	-1.419	.767	.348
	$1 million to less than $5 million	Less than $500,000	.481	.958	.987
		$500,000 to less than $1 million	.481	.795	.974
		$5 million to less than $20 million	-.196	.301	.966

Tukey HSD Multiple Comparisons (cont.)

LEED Practice	Annual Dollar Volume		Mean Diff.	Std. Error	Sig.
		Over $20 million	-.938*	.286	.011
	$5 million to less than $20 million	Less than $500,000	.677	.939	.951
		$500,000 to less than $1 million	.677	.773	.905
		$1 million to less than $5 million	.196	.301	.966
		Over $20 million	-.742*	.214	.006
	Over $20 million	Less than $500,000	1.419	.934	.551
		$500,000 to less than $1 million	1.419	.767	.348
		$1 million to less than $5 million	.938*	.286	.011
		$5 million to less than $20 million	.742*	.214	.006
P3-Engage the commissioning authority early in the design phases	Less than $500,000	$500,000 to less than $1 million	1.500	1.220	.734
		$1 million to less than $5 million	1.269	.981	.695
		$5 million to less than $20 million	1.133	.961	.763
		Over $20 million	.411	.955	.993
	$500,000 to less than $1 million	Less than $500,000	-1.500	1.220	.734
		$1 million to less than $5 million	-.231	.815	.999
		$5 million to less than $20 million	-.367	.791	.990
		Over $20 million	-1.089	.784	.636
	$1 million to less than $5 million	Less than $500,000	-1.269	.981	.695
		$500,000 to less than $1 million	.231	.815	.999
		$5 million to less than $20 million	-.136	.314	.993
		Over $20 million	-.858*	.298	.035
	$5 million to less than $20 million	Less than $500,000	-1.133	.961	.763
		$500,000 to less than $1 million	.367	.791	.990
		$1 million to less than $5 million	.136	.314	.993

Tukey HSD Multiple Comparisons (cont.)

LEED Practice	Annual Dollar Volume		Mean Diff.	Std. Error	Sig.
		Over $20 million	-.722*	.223	.012
	Over $20 million	Less than $500,000	-.411	.955	.993
		$500,000 to less than $1 million	1.089	.784	.636
		$1 million to less than $5 million	.858*	.298	.035
		$5 million to less than $20 million	.722*	.223	.012
P4-Designate a specific area on the construction site for recycling	Less than $500,000	$500,000 to less than $1 million	1.833	1.213	.557
		$1 million to less than $5 million	.923	.975	.878
		$5 million to less than $20 million	.650	.955	.960
		Over $20 million	.085	.950	1.000
	$500,000 to less than $1 million	Less than $500,000	-1.833	1.213	.557
		$1 million to less than $5 million	-.910	.810	.794
		$5 million to less than $20 million	-1.183	.786	.561
		Over $20 million	-1.748	.780	.169
	$1 million to less than $5 million	Less than $500,000	-.923	.975	.878
		$500,000 to less than $1 million	.910	.810	.794
		$5 million to less than $20 million	-.273	.312	.906
		Over $20 million	-.838*	.295	.039
	$5 million to less than $20 million	Less than $500,000	-.650	.955	.960
		$500,000 to less than $1 million	1.183	.786	.561
		$1 million to less than $5 million	.273	.312	.906
		Over $20 million	-.565	.220	.080
	Over $20 million	Less than $500,000	-.085	.950	1.000
		$500,000 to less than $1 million	1.748	.780	.169
		$1 million to less than $5 million	.838*	.295	.039

Tukey HSD Multiple Comparisons (cont.)

LEED Practice	Annual Dollar Volume		Mean Diff.	Std. Error	Sig.
		$5 million to less than $20 million	.565	.220	.080
P5-Incorporate salvaged materials into building	Less than $500,000	$500,000 to less than $1 million	1.500	1.232	.741
		$1 million to less than $5 million	.714	.988	.951
		$5 million to less than $20 million	.582	.970	.975
		Over $20 million	.382	.965	.995
	$500,000 to less than $1 million	Less than $500,000	-1.500	1.232	.741
		$1 million to less than $5 million	-.786	.820	.873
		$5 million to less than $20 million	-.918	.798	.779
		Over $20 million	-1.118	.792	.620
	$1 million to less than $5 million	Less than $500,000	-.714	.988	.951
		$500,000 to less than $1 million	.786	.820	.873
		$5 million to less than $20 million	-.132	.308	.993
		Over $20 million	-.333	.291	.783
	$5 million to less than $20 million	Less than $500,000	-.582	.970	.975
		$500,000 to less than $1 million	.918	.798	.779
		$1 million to less than $5 million	.132	.308	.993
		Over $20 million	-.200	.222	.896
	Over $20 million	Less than $500,000	-.382	.965	.995
		$500,000 to less than $1 million	1.118	.792	.620
		$1 million to less than $5 million	.333	.291	.783
		$5 million to less than $20 million	.200	.222	.896
P6-Establish a project goal for recycled content materials	Less than $500,000	$500,000 to less than $1 million	.333	1.204	.999
		$1 million to less than $5 million	-.346	.968	.996
		$5 million to less than $20 million	-.328	.949	.997

Tukey HSD Multiple Comparisons (cont.)

LEED Practice	Annual Dollar Volume		Mean Diff.	Std. Error	Sig.
		Over $20 million	-.809	.943	.912
	$500,000 to less than $1 million	Less than $500,000	-.333	1.204	.999
		$1 million to less than $5 million	-.679	.805	.916
		$5 million to less than $20 million	-.661	.781	.916
		Over $20 million	-1.142	.774	.580
	$1 million to less than $5 million	Less than $500,000	.346	.968	.996
		$500,000 to less than $1 million	.679	.805	.916
		$5 million to less than $20 million	.019	.311	1.000
		Over $20 million	-.462	.292	.511
	$5 million to less than $20 million	Less than $500,000	.328	.949	.997
		$500,000 to less than $1 million	.661	.781	.916
		$1 million to less than $5 million	-.019	.311	1.000
		Over $20 million	-.481	.220	.191
	Over $20 million	Less than $500,000	.809	.943	.912
		$500,000 to less than $1 million	1.142	.774	.580
		$1 million to less than $5 million	.462	.292	.511
		$5 million to less than $20 million	.481	.220	.191
P7-Establish a project goal for locally sourced materials	Less than $500,000	$500,000 to less than $1 million	1.167	1.243	.881
		$1 million to less than $5 million	.846	.999	.915
		$5 million to less than $20 million	.633	.979	.967
		Over $20 million	.500	.973	.986
	$500,000 to less than $1 million	Less than $500,000	-1.167	1.243	.881
		$1 million to less than $5 million	-.321	.830	.995
		$5 million to less than $20 million	-.533	.806	.964

Tukey HSD Multiple Comparisons (cont.)

LEED Practice	Annual Dollar Volume		Mean Diff.	Std. Error	Sig.
		Over $20 million	-.667	.799	.920
	$1 million to less than $5 million	Less than $500,000	-.846	.999	.915
		$500,000 to less than $1 million	.321	.830	.995
		$5 million to less than $20 million	-.213	.320	.963
		Over $20 million	-.346	.302	.783
	$5 million to less than $20 million	Less than $500,000	-.633	.979	.967
		$500,000 to less than $1 million	.533	.806	.964
		$1 million to less than $5 million	.213	.320	.963
		Over $20 million	-.133	.226	.976
	Over $20 million	Less than $500,000	-.500	.973	.986
		$500,000 to less than $1 million	.667	.799	.920
		$1 million to less than $5 million	.346	.302	.783
		$5 million to less than $20 million	.133	.226	.976
P8-Establish a project goal for rapidly renewable materials	Less than $500,000	$500,000 to less than $1 million	.667	1.076	.972
		$1 million to less than $5 million	.077	.865	1.000
		$5 million to less than $20 million	-.036	.848	1.000
		Over $20 million	-.319	.842	.996
	$500,000 to less than $1 million	Less than $500,000	-.667	1.076	.972
		$1 million to less than $5 million	-.590	.718	.924
		$5 million to less than $20 million	-.702	.698	.852
		Over $20 million	-.985	.691	.612
	$1 million to less than $5 million	Less than $500,000	-.077	.865	1.000
		$500,000 to less than $1 million	.590	.718	.924
		$5 million to less than $20 million	-.113	.280	.994

Tukey HSD Multiple Comparisons (cont.)

LEED Practice	Annual Dollar Volume		Mean Diff.	Std. Error	Sig.
		Over $20 million	-.396	.262	.558
	$5 million to less than $20 million	Less than $500,000	.036	.848	1.000
		$500,000 to less than $1 million	.702	.698	.852
		$1 million to less than $5 million	.113	.280	.994
		Over $20 million	-.283	.200	.620
	Over $20 million	Less than $500,000	.319	.842	.996
		$500,000 to less than $1 million	.985	.691	.612
		$1 million to less than $5 million	.396	.262	.558
		$5 million to less than $20 million	.283	.200	.620
P9-Establish a project goal for Forest Stewardship Council-certified wood products	Less than $500,000	$500,000 to less than $1 million	1.667	1.112	.565
		$1 million to less than $5 million	.846	.894	.878
		$5 million to less than $20 million	.966	.876	.805
		Over $20 million	.800	.871	.890
	$500,000 to less than $1 million	Less than $500,000	-1.667	1.112	.565
		$1 million to less than $5 million	-.821	.743	.804
		$5 million to less than $20 million	-.701	.722	.868
		Over $20 million	-.867	.715	.745
	$1 million to less than $5 million	Less than $500,000	-.846	.894	.878
		$500,000 to less than $1 million	.821	.743	.804
		$5 million to less than $20 million	.119	.288	.994
		Over $20 million	-.046	.271	1.000
	$5 million to less than $20 million	Less than $500,000	-.966	.876	.805
		$500,000 to less than $1 million	.701	.722	.868
		$1 million to less than $5 million	-.119	.288	.994

Tukey HSD Multiple Comparisons (cont.)

LEED Practice	Annual Dollar Volume		Mean Diff.	Std. Error	Sig.
		Over $20 million	-.166	.205	.928
	Over $20 million	Less than $500,000	-.800	.871	.890
		$500,000 to less than $1 million	.867	.715	.745
		$1 million to less than $5 million	.046	.271	1.000
		$5 million to less than $20 million	.166	.205	.928
P10-Adopt an indoor air quality management plan to protect the HVAC system during construction	Less than $500,000	$500,000 to less than $1 million	1.833	1.268	.599
		$1 million to less than $5 million	.648	1.018	.969
		$5 million to less than $20 million	.434	.998	.992
		Over $20 million	.390	.993	.995
	$500,000 to less than $1 million	Less than $500,000	-1.833	1.268	.599
		$1 million to less than $5 million	-1.185	.845	.627
		$5 million to less than $20 million	-1.399	.821	.434
		Over $20 million	-1.443	.815	.394
	$1 million to less than $5 million	Less than $500,000	-.648	1.018	.969
		$500,000 to less than $1 million	1.185	.845	.627
		$5 million to less than $20 million	-.214	.321	.963
		Over $20 million	-.258	.304	.915
	$5 million to less than $20 million	Less than $500,000	-.434	.998	.992
		$500,000 to less than $1 million	1.399	.821	.434
		$1 million to less than $5 million	.214	.321	.963
		Over $20 million	-.044	.230	1.000
	Over $20 million	Less than $500,000	-.390	.993	.995
		$500,000 to less than $1 million	1.443	.815	.394
		$1 million to less than $5 million	.258	.304	.915

Tukey HSD Multiple Comparisons (cont.)

LEED Practice	Annual Dollar Volume		Mean Diff.	Std. Error	Sig.
		$5 million to less than $20 million	.044	.230	1.000
P11-Prior to occupancy, perform a two week building flush-out or test the contaminant levels in the building	Less than $500,000	$500,000 to less than $1 million	2.000	1.252	.501
		$1 million to less than $5 million	.577	1.006	.979
		$5 million to less than $20 million	1.000	.986	.848
		Over $20 million	.244	.980	.999
	$500,000 to less than $1 million	Less than $500,000	-2.000	1.252	.501
		$1 million to less than $5 million	-1.423	.836	.435
		$5 million to less than $20 million	-1.000	.811	.732
		Over $20 million	-1.756	.805	.192
	$1 million to less than $5 million	Less than $500,000	-.577	1.006	.979
		$500,000 to less than $1 million	1.423	.836	.435
		$5 million to less than $20 million	.423	.323	.685
		Over $20 million	-.332	.305	.812
	$5 million to less than $20 million	Less than $500,000	-1.000	.986	.848
		$500,000 to less than $1 million	1.000	.811	.732
		$1 million to less than $5 million	-.423	.323	.685
		Over $20 million	-.756*	.230	.011
	Over $20 million	Less than $500,000	-.244	.980	.999
		$500,000 to less than $1 million	1.756	.805	.192
		$1 million to less than $5 million	.332	.305	.812
		$5 million to less than $20 million	.756*	.230	.011
P12-Specify Low-volatile organic compound (VOC) adhesives and sealants in construction documents	Less than $500,000	$500,000 to less than $1 million	.500	1.300	.995
		$1 million to less than $5 million	-.385	1.045	.996
		$5 million to less than $20 million	-.178	1.024	1.000

Tukey HSD Multiple Comparisons (cont.)

LEED Practice	Annual Dollar Volume		Mean Diff.	Std. Error	Sig.
		Over $20 million	-.533	1.018	.985
	$500,000 to less than $1 million	Less than $500,000	-.500	1.300	.995
		$1 million to less than $5 million	-.885	.868	.846
		$5 million to less than $20 million	-.678	.843	.929
		Over $20 million	-1.033	.836	.730
	$1 million to less than $5 million	Less than $500,000	.385	1.045	.996
		$500,000 to less than $1 million	.885	.868	.846
		$5 million to less than $20 million	.207	.335	.972
		Over $20 million	-.149	.317	.990
	$5 million to less than $20 million	Less than $500,000	.178	1.024	1.000
		$500,000 to less than $1 million	.678	.843	.929
		$1 million to less than $5 million	-.207	.335	.972
		Over $20 million	-.355	.239	.571
	Over $20 million	Less than $500,000	.533	1.018	.985
		$500,000 to less than $1 million	1.033	.836	.730
		$1 million to less than $5 million	.149	.317	.990
		$5 million to less than $20 million	.355	.239	.571
P13-Specify Low-VOC paints and coatings in construction documents	Less than $500,000	$500,000 to less than $1 million	1.000	1.281	.936
		$1 million to less than $5 million	.148	1.028	1.000
		$5 million to less than $20 million	.271	1.009	.999
		Over $20 million	-.089	1.003	1.000
	$500,000 to less than $1 million	Less than $500,000	-1.000	1.281	.936
		$1 million to less than $5 million	-.852	.854	.856
		$5 million to less than $20 million	-.729	.830	.905

Tukey HSD Multiple Comparisons (cont.)

LEED Practice	Annual Dollar Volume		Mean Diff.	Std. Error	Sig.
		Over $20 million	-1.089	.823	.678
	$1 million to less than $5 million	Less than $500,000	-.148	1.028	1.000
		$500,000 to less than $1 million	.852	.854	.856
		$5 million to less than $20 million	.123	.326	.996
		Over $20 million	-.237	.308	.939
	$5 million to less than $20 million	Less than $500,000	-.271	1.009	.999
		$500,000 to less than $1 million	.729	.830	.905
		$1 million to less than $5 million	-.123	.326	.996
		Over $20 million	-.360	.235	.543
	Over $20 million	Less than $500,000	.089	1.003	1.000
		$500,000 to less than $1 million	1.089	.823	.678
		$1 million to less than $5 million	.237	.308	.939
		$5 million to less than $20 million	.360	.235	.543
P14-Specify Low-VOC carpet products and systems in construction documents	Less than $500,000	$500,000 to less than $1 million	.500	1.312	.995
		$1 million to less than $5 million	-.278	1.053	.999
		$5 million to less than $20 million	-.083	1.033	1.000
		Over $20 million	-.372	1.028	.996
	$500,000 to less than $1 million	Less than $500,000	-.500	1.312	.995
		$1 million to less than $5 million	-.778	.875	.901
		$5 million to less than $20 million	-.583	.850	.959
		Over $20 million	-.872	.844	.840
	$1 million to less than $5 million	Less than $500,000	.278	1.053	.999
		$500,000 to less than $1 million	.778	.875	.901
		$5 million to less than $20 million	.194	.333	.977

Tukey HSD Multiple Comparisons (cont.)

LEED Practice	Annual Dollar Volume		Mean Diff.	Std. Error	Sig.
		Over $20 million	-.094	.317	.998
	$5 million to less than $20 million	Less than $500,000	.083	1.033	1.000
		$500,000 to less than $1 million	.583	.850	.959
		$1 million to less than $5 million	-.194	.333	.977
		Over $20 million	-.289	.242	.755
	Over $20 million	Less than $500,000	.372	1.028	.996
		$500,000 to less than $1 million	.872	.844	.840
		$1 million to less than $5 million	.094	.317	.998
		$5 million to less than $20 million	.289	.242	.755
P15-Specify wood and agrifiber products that contain no added urea-formaldehyde resins	Less than $500,000	$500,000 to less than $1 million	1.000	1.313	.941
		$1 million to less than $5 million	.600	.965	.971
		$5 million to less than $20 million	.632	.944	.963
		Over $20 million	.329	.939	.997
	$500,000 to less than $1 million	Less than $500,000	-1.000	1.313	.941
		$1 million to less than $5 million	-.400	.965	.994
		$5 million to less than $20 million	-.368	.944	.995
		Over $20 million	-.671	.939	.953
	$1 million to less than $5 million	Less than $500,000	-.600	.965	.971
		$500,000 to less than $1 million	.400	.965	.994
		$5 million to less than $20 million	.032	.315	1.000
		Over $20 million	-.271	.299	.894
	$5 million to less than $20 million	Less than $500,000	-.632	.944	.963
		$500,000 to less than $1 million	.368	.944	.995
		$1 million to less than $5 million	-.032	.315	1.000

Tukey HSD Multiple Comparisons (cont.)

LEED Practice	Annual Dollar Volume		Mean Diff.	Std. Error	Sig.
		Over $20 million	-.302	.225	.664
	Over $20 million	Less than $500,000	-.329	.939	.997
		$500,000 to less than $1 million	.671	.939	.953
		$1 million to less than $5 million	.271	.299	.894
		$5 million to less than $20 million	.302	.225	.664

* Tukey HSD post-hoc analysis indicates the mean difference was significant at the .05 level.