EVERYDAY LOW IMPACT: WAL-MART, LEED, AND THE FUTURE OF THE RETAIL INDUSTRY

by

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(Under the Direction of Pratt Cassity)

ABSTRACT

Over the course of the past four years, Wal-Mart Stores, Inc., the nation's largest retailer, has enacted numerous initiatives aimed at reducing their environmental impact, and have pledged a commitment to sustainability throughout their operations. Through case-study analysis, this thesis seeks to evaluate Wal-Mart's commitment to sustainable building, and to investigate the potential for the company to develop a nationally reproducible, high-efficiency, low impact store prototype which could achieve Leadership in Energy and Environmental Design (LEED) certification by the U.S. Green Building Council (USGBC). This thesis also seeks to explore the potential benefits to both Wal-Mart and the LEED program by the incorporation of LEED certification into Wal-Mart's environmental building program, and the potential implications this may have upon the remainder of the retail industry.

INDEX WORDS: Wal-Mart, USGBC, Sustainability, Supercenter, Retail, LEED, LEED for Retail, Experimental store, Ecostore, Eco-Mart, Demonstration store

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DEDICATION

To my parents; without your support and encouragement, this would not have been possible.

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CHAPTER 1

INTRODUCTION

Over the course of the past four years, Wal-Mart Stores, Inc. has enacted numerous initiatives aimed at reducing their environmental impact, and have pledged a commitment to sustainability throughout their operations.[1] These initiatives, with particular emphasis on Wal-Mart's environmentally friendly building program, are the focus of this thesis. The thesis seeks to evaluate Wal-Mart's commitment to sustainable building, and to investigate the potential for certification under the U.S. Green Building Council's (USGBC) family of Leadership in Energy and Environmental Design (LEED) Green Building Rating Systems as a common practice in new-store development. The thesis also seeks to explore the potential benefits to both Wal-Mart and the LEED program by the incorporation of LEED certification into Wal-Mart's environmental building program.

This thesis is occurring at an early, yet crucial time in Wal-Mart's move toward sustainability and in the continuing evolution of LEED. Decisions being made today, by Wal-Mart and the USGBC, will guide the future of sustainable retail development. As the nation's largest retailer explores sustainability, and the LEED program expands into the retail segment, a unique and timely potential exists for each to assist in the development and success of the other. Wal-Mart has the ability to position LEED certification at the forefront of retail development by acting as a large scale precedent for future sustainable retail projects. Concurrently, LEED certification would provide valuable credibility to

[1] Gunther, "The Green Machine".

Wal-Mart's sustainable initiatives through independent, third-party guidance and verification.

Why was Wal-Mart specifically chosen as the focus of this thesis? In recent years, Wal-Mart has begun to realize the complex relationship between business and the environment. They have realized that the environment is not simply an externality in which they operate; it is the single most important factor that allows them to operate. Without a healthy environment, there would be no raw materials for suppliers to manufacture the products they sell. There would be no cotton to produce clothing or linens and no wood for home furnishings or paper products. There would be no farming to grow fruits or vegetables, no ranching to supply delicatessens or stock dairy cases, and no fisheries to provide seafood. Furthermore, a garden center would certainly become a moot point. Even if the resources were available, without a healthy environment, there would be no people well enough to make use of them. There would be no workforce for manufacturing, no skilled labor to build stores, no associates to man sales counters, and most of all, there would be no consumers to purchase goods.

Wal-Mart has begun to realize that the environment does not affect their business, it is their business. Wal-Mart has also recognized that they have not always treated the environment with the respect it rightfully deserves. As the company grew from a small, local operation in Bentonville, Arkansas to its current status as the largest company in the world,[2] Wal-Mart has built an empire based on big buildings. These massive structures, typically found in outlying suburban areas, occupy large tracts of land, encouraging urban sprawl. Known for operating twenty-four hours a day, seven days a week, the stores consume overwhelming amounts of energy and they produce large quantities of harmful

[2] "Fortune 500 2007: Full List1-100".

emissions. Also, the products sold within the stores are selected on the basis of cost and consumer demand, with little regard for environmental impact. This typically results in excessive packaging and leads to an increased need for shelf space and the disposal of tons of refuse.

Wal-Mart's stores, as with those of other "big-box" retailers, are designed to be fast, easy, and inexpensive to build, reflecting the emphasis on initial costs and the "bottom line" that is often characteristic of the retail industry. Wal-Mart is now realizing that every kilowatt of energy used and every pound of waste removed has a drastic effect on their operating costs, as well as the environment. While Wal-Mart buildings have always been engineered for cost effectiveness, energy efficiency and environmental impact haven't always figured into the equation. With this new understanding of how the environment affects their business, and how they, in turn, impact the environment, Wal-Mart has decided to clean-up their act, literally.

While the majority of Wal-Mart's sustainability initiatives have developed over the past four years, Wal-Mart has been experimenting with sustainable building practices since 1993 with the construction of their first environmentally friendly experimental store in Lawrence, Kansas.[3] The design and construction of the Lawrence experimental store, given the moniker "Eco-Mart," made Wal-Mart the first major retailer in the United States to investigate sustainability at this level.[4] This store was followed by two "Ecostores" in Moore, Oklahoma and City of Industry, California.[5] Continuing their foray into the world of green building, Wal-Mart recently developed two experimental

[3] "Wal-Mart: Every Day Low … Impact".
[4] Ortega, "Wal-Mart Store Comes in Colors, But is All Green," B1.
[5] "Wal-Mart: Every Day Low … Impact".

supercenters in McKinney, Texas and Aurora, Colorado which opened in 2005.[6] These stores, and the development of their environmentally friendly building program, play an integral role in Wal-Mart's move toward sustainability, and are the primary focus of this thesis.

In addition to their commitment to sustainability, and their history of exploring environmental building practices, Wal-Mart was selected as the focus for this thesis due to their unique position within the retail industry and the global economy. As the world's largest company, Wal-Mart has the ability to exert an enormous influence over the retail and construction industries. Their corporate stature also affords them the financial ability to continue experimenting with new environmental building practices and technologies. Given these factors, Wal-Mart will likely remain at the forefront of environmental building practices within the retail industry over the coming years. The enactment of sustainable practices in new store development, and the results experienced by Wal-Mart, will also be likely to enable other retailers to pursue similar goals.

This thesis will also examine the USGBC's family of LEED Green Building Rating Systems, and their potential impact upon the future of Wal-Mart and the retail industry. Though LEED certification is not specifically incorporated into Wal-Mart's sustainable building program, LEED standards were evaluated in the development of the experimental supercenters in McKinney, Texas and Aurora, Colorado. [7, 8] There are also indications that LEED certification for at least these two stores may be pursued in the future.[9]

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[6] "Wal-Mart: Every Day Low … Impact?: Wal-Mart's Experimental Supercenters".
[7] "McKinney Experimental Wal-Mart: Team & Process".
[8] "Aurora Experimental Wal-Mart: Team & Process".
[9] Yoder, "Wal-Mart Goes Green with Sustainable Store," 7.

As mentioned earlier, this thesis is occurring at a crucial time in the evolution of both Wal-Mart, and the LEED rating system. As of February 2008, six separate LEED rating systems have been fully launched and an additional four rating systems are in pilot phases or other stages of development. The currently implemented rating systems include LEED for New Construction and Major Renovations, Existing Buildings, Commercial Interiors, Core and Shell, Schools, and Homes. The additional LEED rating systems currently being developed continue the USGBC's goal of addressing specialized market segments, including two geared specifically for retail construction. These include LEED for Retail – New Construction and Major Renovations, and LEED for Retail – Commercial Interiors, as well as rating systems for Healthcare and Neighborhood Development.[10]

In this thesis, the USGBC's second pilot version of the LEED for Retail – New Construction and Major Renovations rating system, released in October 2007, will be used as the method of evaluating Wal-Mart's experimental buildings and other sustainability initiatives. This rating system shall serve as a guide for performing case-study analyses on the retailer's most recent experimental stores in McKinney, Texas and Aurora, Colorado. The results of these analyses will be used to assess the viability of incorporating LEED certification into Wal-Mart's environmental building program as a standard procedure for new store development.

[10] "LEED Rating Systems".

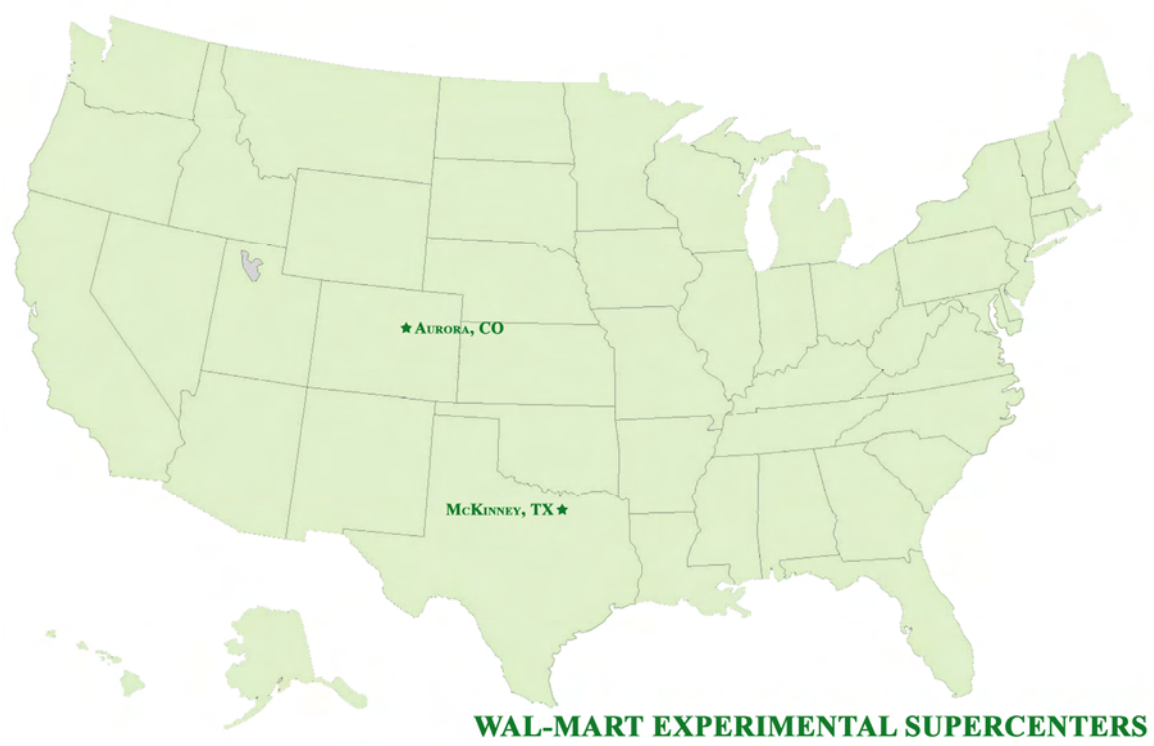

Figure 1.1: Wal-Mart's Experimental Supercenters in McKinney, TX and Aurora, CO.[11]

The case study analyses of the experimental Wal-Mart stores in McKinney, Texas, and Aurora, Colorado, conducted in this thesis will yield an estimated total of LEED credits that could potentially be achieved if LEED certification were to be pursued. It is expected that the analyses will determine that the two stores investigated will achieve, or nearly achieve, sufficient credits to qualify for at least minimum level certification under the LEED for Retail – New Construction rating system. This is based on the knowledge that Wal-Mart investigated LEED standards in the development of the McKinney and Aurora stores, and that Wal-Mart has stated that they may apply for LEED certification of these stores in the future. If these expectations are correct, the

[11] Graphic produced by author.

study should find that LEED certification is not an unreasonable goal for future development of new Wal-Mart stores.

Comments About This Thesis

In preparation for this thesis, and in the analyses contained within, several issues were identified that warrant comment. The first of these issues, and potentially the most difficult, involves the definition of sustainability. A proper definition is critical, particularly in terms of this thesis. Without a clear understanding of the properties that make a particular object, resource, or action sustainable, we have no way to evaluate when sustainability has been achieved.

Sustainability is a term used frequently in the design, construction, and environmental fields which has rapidly become ingrained in the lexicon of main-stream America. We now have sustainable products, sustainable buildings, sustainable farming, sustainable fisheries, and sustainable energy production, and countless other sustainable products and practices intended to take us one step closer to achieving sustainability. However, the terms “sustainable” and “sustainability” have numerous meanings and implied values.

According to Michael Gunder, PhD, Senior Lecturer at the School of Architecture and Planning, University of Auckland:

> Sustainability, even if a fuzzy, ill-defined, concept, has now reached the near-universal status of being a desired concept of 'good'. Indeed, its very fuzziness allows multiple actors to have diverse and even conflicting interpretations of what sustainability means. Yet even in their disagreement all can agree that sustainability is, in itself, a good thing. Moreover, sustainability, in

> its perceived goodness, transfers its positive value of 'good' to other words or concepts when joined to them. Sustainable cities, sustainable communities, sustainable regeneration, sustainable practices, and sustainable transport, to mention a few examples, all bask in sustainability's reflective goodness.[12]

At its simplest, the term “Sustainable” can be defined as “capable of being sustained.”[13] As Gunder states, most would agree that if something is sustainable, it must be good. However, this definition, while being quite simple and easy to comprehend, is exceptionally vague. With little effort, this definition could be interpreted in such a way that any resource or action could, by definition, be sustainable.

A particularly poignant, and timely, example of this would be to consider the current levels of oil consumption in the United States. Given the mainstream media and news coverage of ever-increasing oil prices, and the disparity between current levels of demand and production, most would agree that current levels of oil consumption cannot be sustained indefinitely. However, the current levels of consumption are capable of being sustained for a limited time, making them, by definition, sustainable.

However, sustainability is a term that has a bit of a gestalt quality about it. While by this simplest of definitions, virtually anything is sustainable, this is not true sustainability; at least not from an environmental standpoint. When discussing the environment, sustainability has an implied sense of perpetuity. We, as a society have begun to realize, as with the current oil situation, that we need to be thinking about long-term sustainability; about what happens when the well runs dry.

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[12] Gunder.
[13] “Sustainable”.

Clearly, there must be a better way to define a term that induces such an emotive connotation, and is perceived as so much more than a temporary condition. According to the United States Environmental Protection Agency (EPA), “Sustainability means meeting the needs of the present without compromising the ability of future generations to meet their own needs.”[14] The EPA also states:

> Common use of the term "sustainability" began with the 1987 publication of the World Commission on Environment and Development report, Our Common Future. Also known as the Brundtland Report, this document defined sustainable development as "development that meets the needs of the present without compromising the ability of future generations to meet their own needs." This concept of sustainability encompasses ideas, aspirations and values that continue to inspire public and private organizations to become better stewards of the environment and that promote positive economic growth and social objectives. The principles of sustainability can stimulate technological innovation, advance competitiveness, and improve our quality of life.[15]

By this definition, sustainability not only implies the concept of perpetuity, but also what Dr. Gunder refers to as a “triple-bottom-line approach of equally promoting and weighing, in a balanced manner, economic growth, environmental protection, and concern for social equity.”[16] [See Figure 1.2] In this rare instance, it would appear that the most appropriate definition of sustainability for this thesis also happens to be the dominant interpretation, also according to Dr. Gunder, of how to achieve it.[17]

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[14] “Sustainability”.
[15] “Sustainability: Basic Information”.
[16] Gunder.
[17] Gunder.

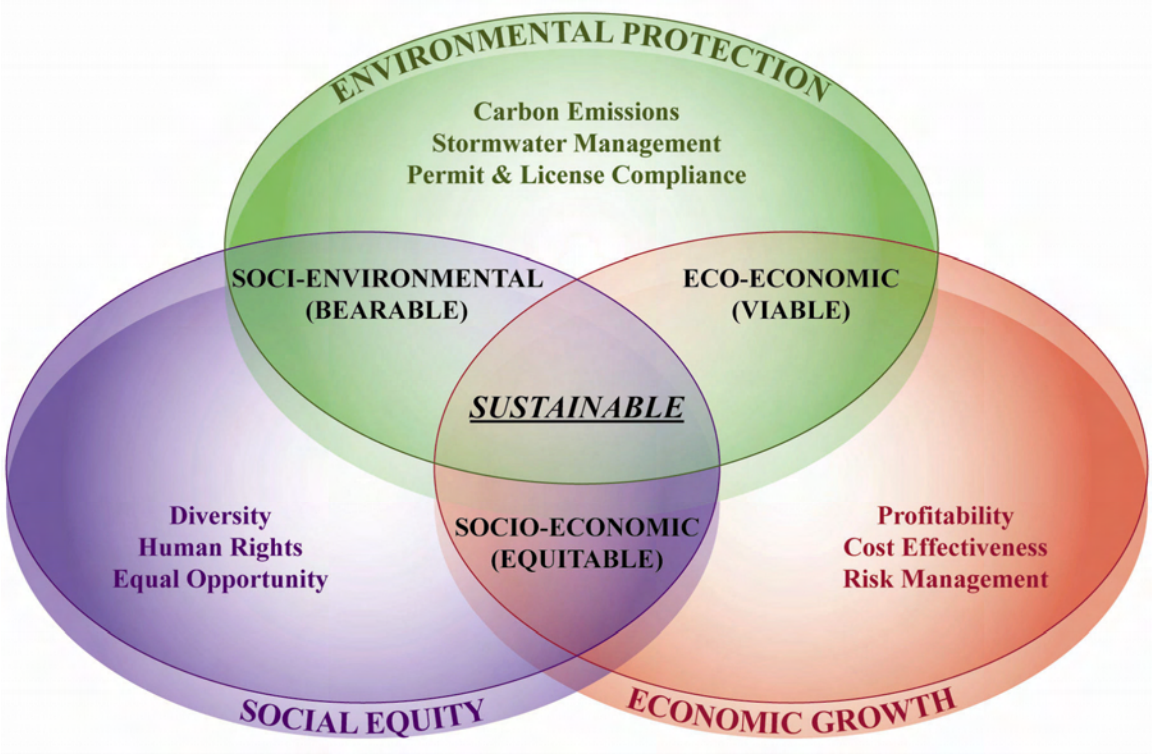

Figure 1.2: Sustainability/Sustainable Development[18] – A balance of economic growth, environmental protection, and social equity.[19, 20]

For the purposes of this thesis, the terms "sustainability" and "sustainable development" as well as their associated definitions shall be used interchangeably. However, the analyses conducted in this thesis will be limited to the evaluation and discussion of the environmental and some economic aspects of sustainability. While all three factors are essential to achieving long-term sustainability, this thesis seeks to evaluate factors which influence, or are influenced by the design of individual Wal-Mart retail facilities. As previously mentioned, the LEED Green Building Rating Systems shall be the primary method for evaluating Wal-Mart's sustainable building practices. These

[18] Graphic produced by author.
[19] Gunder.
[20] "Sustainability – The Solution Matrix".

rating systems evaluate the facilities only in terms of environmental impact and sustainability and do not address economic or social issues. Economic issues must be addressed in order to understand the costs and benefits of sustainable building, which can directly affect the facility's design. It is the author's position that while the design of a facility, site, or structure can respond to, and encourage, many aspects of social equity, including occupant well-being, interaction, and accessibility, it cannot influence internal issues relating to the occupants in terms of wages, benefits, policies, human resources, or other operational issues relating to the social equity of a company's employees.

The second issue regarding this thesis which warrants comment concerns the source material. The source data for this thesis was collected from trade and industry magazines, websites and other online resources, and press releases. As Wal-Mart and the retail industry are in the initial stages of sustainable exploration, along with the developmental status of the LEED for New Construction and Major Renovations for Retail rating system, there have been few publications in the form of books or scholarly journals that investigate these issues. While this information is factual, the potential exists for objectivity to be reduced based on the intent of the author or publication.

Given the current interest in sustainability, the speed of Wal-Mart's development capabilities, rapid and turbulent economic fluctuations, and the resulting pace of changes within the retail industry, information, data, and potential sources relating to the focus of this thesis are becoming available, evolving, and being superseded on a seemingly daily basis. As a result of these conditions and the academic time constraints implicit upon this thesis, it has become necessary to establish a finite research period spanning from September 2006 to February 29, 2008, with the thesis reflecting the data and conditions

of that time frame. While the lack of scholarly evaluation and the rapid availability of new information exemplify the relevance, merit, and timeliness of this thesis, they also present limitations.

One last source related issue encountered while conducting research for this thesis was the discretion of objectivity when discussing Wal-Mart. Objective, unbiased information regarding Wal-Mart is a rarity. Most sources, particularly those from an environmental point of view, reflect a negative reputation typically associated with Wal-Mart. Sources that provided a positive opinion of the company were often directly written, or heavily influenced, by Wal-Mart. While this thesis is intended to provide an unbiased, objective analysis of Wal-Mart's sustainability initiatives, it simply cannot.

CHAPTER 2

BUYING TIME

These are interesting times in which we live. Never in our nation's history has environmentalism been so prevalent in the lives of so many Americans. We are faced with environmental issues every time we turn on the news, enter a building, or go to the grocery store. Perpetually rising energy costs, depletion of the ozone layer, climate change, and fears of global warming dominate the headlines. Federal, state, and local governments are beginning to draft zoning ordinances and other regulations that require environmentally responsible buildings. Organic produce, meats, and dairy products line store shelves; and consumer interest in sustainable products is at an all-time high.

As Americans become more aware of sustainable goods, sustainable building products, and environmentally friendly buildings, consumers are turning to retailers that not only support sustainability, but practice it as well. Given the level of competition within the retail industry, shoppers can purchase the same product at essentially the same price from most of the major retailers. With that in mind, shoppers are beginning to evaluate retailers based on external factors; and sustainability is quickly topping the list. This increase in environmental awareness, and consumer interest in sustainability, has become the proverbial "writing on the wall," and the nation's retailers have read it. To that end, it is no coincidence that Wal-Mart is moving toward sustainability at the same time LEED is expanding into retail construction.

Figure 2.1: Sustainability in the news. Slide from USGBC PowerPoint presentation. © 2006 U.S. Green Building Council.[21]

Environmental Awareness

Environmental issues have flooded main-stream media. Newspapers, magazines, books, television news casts, commercial advertisements, and even feature films routinely address numerous environmental issues. As we are faced with these issues, and we begin to understand the results of our interaction with the environment, we make countless decisions based upon environmentalism. Whether these decisions are the result

[21] U.S. Green Building Council, USGBC, 7.

of conscious choice, or an instinctive reaction, they shape our daily lives, and influence everything from the goods we purchase to the buildings we construct.

With gasoline now selling for well over $3.00 per gallon, and energy costs skyrocketing, print and television media regularly discuss the nation's dependence upon oil and other fossil fuels. Almost every day, local and national news agencies report on the recent change in gas prices, typically in the form of how many cents per gallon the price has increased. Some local news stations even allocate time for a daily segment reporting which gas station in town has the cheapest fuel. Then look at automobile advertisements, fuel economy has virtually replaced horsepower as the primary selling point. As a result, hybrid vehicles are flooding the market, and quickly becoming available in virtually all of the major automobile manufacturers' product lines.

Not that long ago, ozone depletion was the global pandemic of choice. As scientists discovered a hole in the ozone layer, one of our first atmospheric defenses from cosmic radiation, above Antarctica, magazines and news media were quick to report it. Having been confronted with this environmental disaster, and tracing its origins back to emissions of harmful gasses such as chlorofluorocarbons (CFC's), governments and agencies worldwide established numerous policies and regulations including the Montreal Protocol, which have resulted in the virtual elimination of CFC's from all products, particularly those sold in aerosol form. These regulations also led to heightened consumer awareness, influencing many shoppers to read product labels and adjust their spending habits.

More recently, global warming has replaced ozone depletion as the impending pandemic. Though ozone depletion is still an issue, global warming has taken the top spot

in the headlines. Regular reports highlight the melting of polar ice caps, and warn that if changes don't occur soon, the Appalachian Mountains will eventually become beach-front property. This issue has become so prevalent in today's society that former United States Vice President Al Gore has made a feature-length documentary, and routinely lectures, on the subject. His movie, An Inconvenient Truth even won an Oscar for Best Documentary Feature at the 79th Academy Awards.[22] Here again, as we learn more about the effect on the environment, and to counteract global warming, we have begun to change our building practices to reduce the quantities of carbon dioxide and other "greenhouse gasses" they emit.

Following the devastation caused by Hurricane Katrina in 2005, the issue of global climate change has now taken center stage. Cited as a result of numerous environmental issues, including ozone depletion and global warming, global climate change has become one of the greatest threats to humanity according to the Board of Directors at the University of Chicago's *Bulletin of Atomic Scientists*.[23] This group, consisting of renowned scientists including Professor Stephen Hawking, is the keeper of the "Doomsday Clock," which represents the status of human civilization in terms of minutes to midnight. Midnight on the clock represents the total annihilation of human existence.[24] Now, the clock, which until 2007, has only cited the impending threat of nuclear war as the catalyst for change,[25] has ticked forward to stand at five minutes to midnight amid continuing fears of nuclear disaster, and climate change.[26]

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[22] "Winner: Documentary Feature".
[23] "Doomsday Clock".
[24] Madden, "Businesses Put Emphasis on Dealing with Climate Change," 14.
[25] "Doomsday Clock".
[26] Madden, 14.

How will the threat of climate change affect our daily lives? As a combination of the effects of energy dependence, resource depletion, ozone depletion, and global warming, it already has. As the effects of our interaction with the environment become more evident, we have begun to realize that environmental responsibility and a move toward sustainability are necessary in order to mitigate these issues.

Consumer Interest In Sustainability

As consumers become more environmentally conscious, they are seeking ways to reduce their environmental impact. Consumers are realizing that seemingly small actions such as purchasing sustainable products and patronizing environmentally friendly stores can have a profound cumulative effect upon the health of the environment. As a result, sales of organic products, including food and clothing items, have grown exponentially in recent years. So, too, has consumer willingness to forgo at least some level of convenience to purchase sustainable goods. These trends are beginning to resonate with retailers as revenues for sustainable products continue to increase at environmentally friendly stores, while lagging at others.

By choosing to purchase sustainable products, shoppers are reflecting the role that environmental awareness, and the associated health benefits, plays in consumer decision-making. With the impending threats of ozone depletion, global warming, and climate change, consumers are choosing to reduce their personal impact upon the environment. In so doing, shoppers are not only choosing to purchase items that benefit themselves, they are, in essence, buying time on this planet for generations to come.

But, what kind of an impact can purchasing sustainable products really have on the environment? Wal-Mart has estimated that if shoppers purchase one 13-Watt compact

fluorescent light bulb (CFL) instead of the typical 60-Watt incandescent bulb, it could save $30 in electricity costs over the life of the CFL.[27] They also estimate that if 100 million shoppers purchased one CFL in 2007, not an unreasonable goal considering over 138 million people shop at Wal-Mart each week,[28] the cumulative effect would save $3 billion worth of electricity, and prevent 20 million metric tons of greenhouse gasses from entering the atmosphere.[29] This would have approximately the same effect as removing 700,000 cars from the roads or powering 450,000 single-family houses,[30] all by changing a light bulb.

Now imagine the cumulative benefits of buying organic foods, which now include far more than produce. According to the Organic Trade Association, organic varieties of products including meat, eggs, dairy, baby food, frozen dinners, soup, cereal, ice cream, peanut butter, pasta sauce, salsa, chocolate, coffee, tea, and even beer are readily available. Given the environmental and personal health benefits, and the variety of products available, sales of organics have skyrocketed over the past decade. Since 1997, organic food sales have grown at an annual rate of 17-21%. In 2003 alone, sales of organics grew 20.4% to a total of approximately $10.38 billion.[31] While trends indicate that organic milk, cheese, meat and baby food are gaining popularity,[32] one survey found that the most commonly purchased green products included items for personal care, household cleaning, gardening, paper products, and clothing.[33]

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[27] "Wal-Mart Announces Goal of Selling 100 Million Energy Efficient Light Bulbs: with Consumers Facing High Utility Costs and Environmental Challenges, Retailer Offers Simple Solution".
[28] "Wal-Mart: Every Day Low ... Impact?".
[29] "Wal-Mart Announces Goal".
[30] "Wal-Mart Announces Goal".
[31] "Organic Food Facts".
[32] "Organic Food Facts".
[33] Graham, "The Challenge of Selling Green," 39.

Researchers have also noticed that people are not only becoming increasingly interested in sustainable products, they will go out of their way to get them. A survey of 500 individual consumers found that most respondents were willing to travel up to fifteen minutes to reach a store providing sustainable products. Of that majority, 5% were even willing to travel greater than thirty minutes to find retailers providing sustainable alternatives.[34] Despite the relative infancy of the movement toward sustainability in the retail sector, these trends are certainly not going unnoticed. The Organic Trade Association also reports that by 2003, "44% of total organic food sales were handled through supermarkets and grocery stores, mass merchandisers [big-box retailers], and club stores."[35]

As environmentally friendly products become readily available, consumers are able to buy sustainable products at numerous locations. Bearing that in mind, what distinguishes one retailer from another? Most retailers' willingness to match a competitor's price removes cost from the equation. The tendency for retailers to locate in similar areas equalizes convenience. Now it becomes a matter of personal preference; and many consumers, especially those searching for sustainable products, look to the stores' environmental practices to decide. As Barry Seifer, principal of Cubellis Marco Retail, states, "Retail is in the midst of a renaissance: Energy and environmental concerns play an increasingly important role in consumer decision-making."[36] He continues, "Consumers are sorting out the complexities of shopping and buying environmentally

[34] Graham, 39.
[35] "Organic Food Facts".
[36] Siefer, "Consumers and the Future of Green Retail," 51.

sustainable products and services with increased frequency and regularly voting their preferences with transactions."[37]

In order to continue to compete for consumer dollars, retailers themselves are realizing that sustainability is in their future. They must provide proof of their commitment to environmental responsibility to compete in today's market; it must be evident in their products, their buildings, and their practices. Given the unique complexities within the retail industry, going green will not be easy, and many retailers may be reluctant to invest the necessary resources. However, despite the numerous challenges presented by going green, many retailers and design professionals believe that sustainability is soon to become entrenched in retail design.[38]

Buildings And The Environment

Architects, landscape architects, and other design professionals have been incorporating environmental responsibility into their designs for quite some time; and, have routinely been advocates of environmentalism in numerous industries. Architect, and former dean of the University of Virginia's school of architecture, William McDonough has been a long time proponent of sustainability. He has built a solid and reputable career practicing environmentally conscious design, encompassing numerous aspects of the building industry. He, along with chemist Michael Braungart, has written a well known book entitled Cradle to Cradle: Remaking the Way We Make Things, which calls for complete paradigmatic shifts in the building and manufacturing industries. He continues to address the need for sustainability, and routinely lectures on these issues.

[37] Siefer, 51.
[38] Roy, "Greening Retail", 32-34.

Environmental responsibility in the building industry has now suffused beyond the purview of design professionals into the regulatory sector. Federal, state, and local governments are beginning to draft zoning ordinances and other regulations that require resource efficient and sustainable buildings. State governments in Minnesota and Pennsylvania have now adopted environmentally responsible guidelines for the construction of their facilities. City governments are also following suit; Portland is exploring sustainable buildings, while Seattle has now committed to design all new municipal buildings to attain silver certification under the USGBC's LEED for New Construction and Major Renovations rating system.[39] Boston has taken this a step further by amending their zoning codes to require that all buildings over 50,000 square feet attain at least 26 points under LEED for New Construction standards, becoming the first city in the United States to mandate green building through zoning.[40]

With the general increase in environmental awareness and the subsequent shift in the building industry, green building products and technologies are increasing in availability while also becoming more cost effective. "According to the U.S. Green Building Council, the annual market for green building products and services was $5.8 billion in 2004, a 34% growth from the previous year."[41] The increasing demand for these products allows the inherently higher research and development costs to be spread over a greater quantity, reducing costs to building clients.[42] It would also appear that as with most all developing technologies, the prices of green building products tend to have an inverse relationship to the length of time they have been on the market.

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[39] Johnson, The Economic Case for ~~"Green Buildings"~~ "High Performance Buildings," 1.
[40] "Component Spotlight: Boston is First Major U.S. City to Pass Green Building Zoning Code".
[41] Roy, 32-34
[42] Panchapakesan, Sustainable Building Design: Case Study : Wal-Mart Eco-Store : William McDonough Architects.

As sustainable building products and technologies accrue time on the market, they gain non-cost advantages as well. As these technologies are tested in real-world situations, their manufacturers accumulate valuable information, allowing them to further develop and refine their products. Further development based upon observation allows manufacturers to improve performance, efficiency, and reliability, all of which make these products more desirable to design professionals and building owners.

With the recent increases in environmental awareness, government requirements for sustainability, and availability of sustainable building materials, it should be no surprise that green buildings are being constructed at an increasing pace. As of 2004, the USGBC had certified approximately 217 million square feet of commercial space under the LEED rating system. This space represents numerous typologies ranging from offices, religious spaces, institutional facilities, and government buildings. However, one key segment of the building industry is conspicuously missing. While "mixed-use projects and commercial office towers top the list… there are no major retail projects."[43]

No Green Retail?

Given the recent surge in environmental awareness, consumers seeking sustainable products, and changes within the building industry, why have retailers been so reluctant to go green? Truthfully, there is no one, simple answer, due mainly to the complexities of the retail industry. A full commitment to sustainability by a major retailer would require extensive changes to store design, incur great cost, and even require conquering some fears. Despite these challenges, retailers are beginning to explore the possibilities of going green. They are also beginning to realize that a change is inevitable; it is no longer a matter of "if," but "when."

[43] Choi, "Retail REITs May Be Turning Green," 22.

The first obstacles to overcome are the matters of store design and construction, particularly for the "big-box" retailers. These stores are engineered for speed and ease of construction, with virtually the same materials and techniques used on every store. Wal-Mart, in particular, "has developed a typical process where the same materials and technologies are purchased and delivered automatically [to construction sites] from manufacturers and vendors, and installed by contractors familiar with Wal-Mart building techniques."[44] A new, environmentally friendly prototype would require changes in this system, as well as, extensive research during the design phase. New materials, products, and techniques, would have to be sourced and specified; then, manufacturers and vendors would have to be located to provide these new products.[45]

Changes of this nature would also have a substantial impact upon the construction process. New materials and techniques also tend to bring with them the potential for costly errors and delays. Contractors familiar with construction of typical stores would also have to learn the proper methods of installing these new products, which could delay the construction process. Also, many green technologies are new to the market, increasing the probability of encountering supply issues and further extending construction schedules.

Also limiting the design and construction of green retail facilities is the lack of a suitable means to evaluate their performance. Of the current rating systems, retail projects are typically evaluated against either the LEED for New Construction and Major Renovation or LEED for Core and Shell Development rating systems. These systems, despite being the recognized industry standards, do not adequately address certain issues

[44] "McKinney Experimental Wal-Mart: Team & Process".
[45] Roy, 32-34

typical of retail construction. However, these issues are being addressed by the USGBC, which is now developing LEED for Retail: New Construction and Major Renovations and LEED for Retail: Commercial Interiors rating systems.[46]

The second major hurdle to clear in the move toward sustainability is increased cost. Environmental responsibility is expensive. While "Wal-Mart's building costs are extremely low, and a store typically pays for its own construction costs in a few months," their first environmentally friendly store, the "Eco-Mart" built in 1993, in Lawrence, Kansas cost approximately 20% more than a typical store of similar size.[47] The cost of going green has greatly decreased over the past decade; as of 2006, a LEED certifiable building typically costs 1-3% more than its traditional counterpart.[48] While a 3% increase does not sound overwhelming at first, consider that increase over the multi-million dollar annual construction budget of a major retailer.

Once a retailer has come to terms with the design, construction, and budget, there is still the stigma of the unknown. What if a retailer invests the necessary time and money into sustainability, and it doesn't pay off? How can they be sure that they will receive benefits similar to other industries which have begun to "go green?" According to Teresa Burrelsman, a technical consultant to the USGBC's Retail Development Committee, "It scares some retailers… they don't want to be the first… to go green, even if other types of retailers have tried it. Retailers prefer to look at other similar retailers and then extrapolate the results to their own stores."[49]

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[46] "LEED for Retail - In Pilot".
[47] Fedrizzi, and Rogers, Energy Efficiency Opportunities: Big Box Retail and Supermarkets, 4.
[48] Manthey, "Retailers See Perks of Going Greener".
[49] Roy, 32-34.

Testing The Waters

Despite the design hurdles, increased costs, and fears of the unknown, retailers are beginning to investigate the concept of sustainability. A majority of retailers surveyed by the industry magazine *Chain Store Age* say that they are incorporating environmentally friendly materials into their facilities. This survey also reports that "home centers, perhaps fittingly, led the way with 61% buying into the green trend, compared to an industry wide average of 56%. Another 11% of all retailers said they plan to use green materials, led by 32% of the big-box stores."[50]

Though there may be no major retail projects certified under LEED standards, retailers are beginning to explore the possibility. Costco Wholesale Stores have now adopted Energy Conservation Management Guidelines,[51] while other retailers, including Giant Eagle and Food Lion, have earned U.S. Department of Energy (DOE) and Environmental Protection Agency (EPA) sanctioned Energy Star awards.[52] In 2003, Giant Eagle was the first supermarket to achieve LEED certification for its 80,000 square foot store in Brunswick, Ohio,[53] and in 2005, Abercorn Commons, a retail development in Savannah, Georgia was developed to attain certification under LEED for Core and Shell Development guidelines. This development contains Circuit City's first LEED store.[54]

Even though many retailers are beginning to explore sustainability, and a few have even reached LEED certification with single stores, the steps currently taken do not represent a full-scale shift toward sustainability by a major retailer. However, by all

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[50] "Growing Pains," 31A.
[51] Fedrizzi, and Rogers, 9.
[52] "Growing Pains," 31A.
[53] Roy, 32-34.
[54] Choi, 22.

indications, it is only a matter of time. As Seifer states well, “Green retailing is not optional. Full-scale market conversion is coming to a city, shopping center, and corner store near you, soon. Consumer values, public policy, and market dynamics are going green.”[55]

[55] Seifer, 52.

CHAPTER 3

WAL-MART

By all indications, the climate, in both the literal sense and that of the retail, construction, and regulatory industries, is poised to be a catalyst for what many see as an impending renaissance within the retail industry. As pressures continue to mount in the forms of environmental degradation, government policy, and consumer demand, retailers are beginning to investigate the prospects and associated costs of sustainability. However, no major retailer has been willing to lead the industry in a full-scale shift toward environmental responsibility. At least, not until the nation's largest retailer decided that it was time for a change.

Wal-Mart Stores, Inc. has been exploring energy efficiency and sustainability since the opening of their first environmentally friendly test store in 1993, with deeper investigations into their environmental impact beginning a decade later.[56] Since that time, under the direction of President and CEO H. Lee Scott, Jr., Wal-Mart has enacted numerous initiatives aimed at reducing their environmental impact, and have pledged a commitment to sustainability throughout their operations. However, does this truly represent a full-scale shift toward sustainability? Are these initiatives founded in reality? Is the company truly committed to these policies? Are their goals even attainable? And, finally, what impact will this have upon the remainder of the retail industry?

Wal-Mart is actually in a unique position to be the first retailer to incorporate sustainability into their business model. As the largest company in the world, and the

[56] "Wal-Mart: Every Day Low ... Impact?".

nation's largest retailer, Wal-Mart has the resources and the financial ability to experiment with new techniques and technologies, and to develop them into practical applications. They have shown a long term interest in energy efficiency and environmental responsibility, and have made sustainability a corporate goal. Additionally, they have set corporate goals to address issues of sustainability in their stores, products, and corporate fleet. Wal-Mart has also introduced large-scale sustainability initiatives including their "Acres for America" and "Sustainability 360" programs. They even have the support of the Chief Executive Officer to implement these policies.

Wal-Mart also has many critics, and reputation issues to overcome. Many people also question the validity of their seemingly new-found corporate responsibility, and accuse them of enacting these policies simply as a green-washing campaign. There are even manufacturers and suppliers who equate being associated with Wal-Mart as selling their souls. However, if Wal-Mart can overcome these obstacles and reach their goals, they have the potential to be the final catalyst necessary to bring environmentalism to the masses.

A Corporate Giant

Founded in 1962 by brothers Sam and Bud Walton, Wal-Mart has grown from a single store operation in Rogers, Arkansas[57] to a corporate giant. Currently ranked as the world's largest company,[58] Wal-Mart was ranked number one in the Fortune 500 from 2002-2005, joining General Motors and Exxon Mobil as one of only three companies to

[57] "Wal-Mart Stores Timeline".
[58] "Fortune 500 2007: Full List 1-100".

top the list since it was first compiled in 1955.[59] According to numbers from the 2005 fiscal year, Wal-Mart employs 1.8 million people at approximately 6,500 stores in 15 countries[60] including Argentina, Brazil, Canada, China, Japan, Mexico, and the United Kingdom.[61] In a December 2005 poll, 84% of Americans shopped at Wal-Mart the previous year with approximately 138 million people visiting a Wal-Mart each week.[62]

Wal-Mart has built this big empire by building big stores. In the United States alone, Wal-Mart operates approximately 600 million square feet (approximately 14,000 acres) of indoor retail space. This space is divided among four different store types ranging from 42,000-200,000 square feet each. Wal-Mart operates 42,000 square foot Neighborhood Markets, 100,000 square foot Wal-Mart Stores (often referred to as retail or discount stores), 130,000 square foot Sam's Clubs, and their ever popular 200,000 square foot Supercenters.[63] These stores also occupy large tracts of land. Currently totaling 88,000 acres, and growing by 5,000 acres annually, the company's stores are typically situated in suburban areas, and are estimated to occupy up to 138,000 acres within the next ten years.[64]

Wal-Mart's 2006 revenues totaled $315.7 billion. With profits of $11.2 billion,[65] Wal-Mart has a virtually unparalleled construction budget within the retail industry. According to Wal-Mart's 2006 annual report, they will incur nearly $17.5 billion in capital expenditures during the 2007 fiscal year. These expenditures will cover the construction of new facilities including 20-30 discount stores, 270-280 supercenters, 15-

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[59] "Fortune 500 1995-2005".
[60] "The Wal-Mart Story".
[61] "Wal-Mart Stores Timeline".
[62] "Wal-Mart: Every Day Low ... Impact?".
[63] "Wal-Mart: Every Day Low ... Impact?".
[64] "Wal-Mart: Every Day Low ... Impact?".
[65] "Fortune Global 500 2006: Full List 1-100".

20 Neighborhood Markets, 30-40 Sam's Clubs, and 220-230 international stores.[66] Not only does Wal-Mart have an unparalleled construction budget, they also consume unparalleled amounts of energy. The nation's largest retailer is also the nation's largest private energy purchaser. With each supercenter using approximately 1.5 million kilowatts of electricity annually, Wal-Mart is estimated to purchase $1-2 billion worth of electricity each year.[67] However, Wal-Mart's energy usage alone gives them a viable incentive to become more environmentally conscious. If they could reduce their energy consumption by even 1%, they could trim $10-$20 million from their bottom line each year. And, what self-respecting business could pass up an opportunity like that?

Sphere Of Influence

Despite the extraordinary costs associated with the size of Wal-Mart, being a corporate giant also has its advantages. Wal-Mart's size allows them to produce revenues that will enable them to invest heavily in research and development. Their overwhelming market share, and the associated influence it commands, allows Wal-Mart to negotiate with its suppliers to reduce their environmental impact and their costs. Also, the number of stores they build, and the level of competition within the retail industry makes Wal-Mart likely to be an effective catalyst for change within the retail and construction industries.

As mentioned earlier, environmental responsibility can be expensive. With the move toward environmentally friendly retailing still in its infancy, green strategies implemented in other industries may not be tested in a retail environment; and given the unique characteristics of the retail industry, adapting these existing technologies will

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[66] Building Smiles: Wal-Mart 2006 Annual Report, 27.
[67] Illia, "Always Green Building, Always, Wal-Mart Announces".

likely be difficult or impractical. In order for a retailer to overcome these challenges, they will have to invest large amounts of time, money, and other resources into the development of new environmentally friendly materials, techniques, and technologies. This is an area where Wal-Mart can outperform other retailers.

The scale at which Wal-Mart operates, and their enormous footprint, actually become advantages when moving toward sustainability. Being the largest company in the world, Wal-Mart has the necessary resources and financial ability to experiment with, and develop new technologies. With annual corporate profits of $11 billion, and a construction budget of $18 billion, Wal-Mart is one of the few retailers capable of financing aggressive sustainability initiatives. In fact, as Wal-Mart continues to investigate sustainability, they have allocated $500 million for the annual research and development of sustainable technologies and innovations.[68]

Also, the number of stores Wal-Mart builds, and the percentage of market share they receive, gives Wal-Mart negotiating power with suppliers. Some suppliers are able to reduce prices based upon Wal-Mart's volume, and the associated economies of scale, while others are willing to sell to Wal-Mart at reduced prices just to gain the exposure. Wal-Mart, for instance, sells approximately 30% of all household items purchased in the U.S., including toothpaste and paper towels; they are also the single largest seller of videos, CD's, and DVD's, accounting for 15-20% of total U.S. sales.[69] Considering that the average Wal-Mart Supercenter offers over 140,000 different products,[70] and is typically the product's single largest seller, the chance to do business with Wal-Mart

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[68] Sustainability Fact Sheet.
[69] Bianco, and Zellner. "Is Wal-Mart Too Powerful?".
[70] "Our Retail Divisions".

commands attention. As one supplier noted, "When Wal-Mart hiccups, it's all we can talk about."[71]

So, how does this affect sustainability? Wal-Mart is using its influence to encourage suppliers to become more environmentally friendly. For example, Wal-Mart sells both Tide, by Proctor & Gamble, and All detergent by Unilever. When Unilever concentrated its formula and developed "Small and Mighty" All, thereby reducing packaging (which saves energy, shipping costs, and shelf space) Wal-Mart increased its level of promotion over the bulkier, less efficient Tide. Now, Proctor & Gamble is testing smaller, concentrated versions of all of its detergents for an upcoming nation-wide rollout.[72] In similar fashion, Wal-Mart has committed to begin showing preference to suppliers who also set environmentally conscious goals for themselves.[73]

This same affect carries over into the construction industry as well. As stated by a January 2006 article in *Environmental Building News*, "when an organization this large pushes for environmental action, through its own practices and the demands it makes on its suppliers, the impacts can be enormous. In the building sector alone, Wal-Mart's research and purchasing can jumpstart new technologies that might otherwise languish."[74] In fact, Bill McDonough, the architect who designed Wal-Mart's "Eco-Mart," hoped that the company's size, and the development of the store, would lead to broad changes in the retail industry. According to McDonough, "the marvelous thing about Wal-Mart is that they're so big. We can go to manufacturers of building supplies

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[71] Gunther.
[72] Gunther.
[73] Sustainability Fact Sheet.
[74] "Wal-Mart: Every Day Low ... Impact?".

and we can say if this works, this is the market of the future, because it's huge."[75] Now, it appears that as Wal-Mart embarks upon their mission of greener building and sustainability, their market influence and the level of competition within the retail industry will likely, however slowly, profuse sustainability to the masses. According to Robert P. Corman, the president of the Partnership for Social Enterprise, "Efforts by marketers like Wal-Mart to bring environmental issues into commercial areas will slowly build a competitive spirit among other companies to do the same."[76]

Commitment Issues

Most retailers do not want to be the first to commit to a potentially overwhelming paradigmatic shift, such as practicing sustainability. The fear of the unknown and the resources required to accomplish such a goal lead many retailers to take a wait and see attitude. While, on the other hand, retailers are willing to match their competitors' actions, making the competitive spirit within the retail industry essential for enacting change. Given the current levels of consumer interest and government encouragement, a serious commitment to sustainability by a major retailer, such as Wal-Mart's, will likely be all that is necessary to bring environmental responsibility to the retail industry.

Just how committed is Wal-Mart? Well, in their own words, "At Wal-Mart, we know that being an efficient and profitable business and being a good steward of the environment are goals that can work together. Our environmental goals at Wal-Mart are simple and straightforward: To be supplied 100 percent by renewable energy; to create

[75] Ortega, B1.
[76] Fitzgerald, "It's Green, It's Friendly, It's Wal-Mart 'Eco-Store'".

zero waste; and to sell products that sustain our resources and our environment."[77] Sounds good, right? But, how are they actually going to do it?

In order to accomplish these goals, Wal-Mart has enacted numerous corporate policies and environmental initiatives. Though Wal-Mart has yet to give a finite deadline for attaining their overall goals, they have begun to pursue these short term policies as a means to reach their desired end. Over the past four years, Wal-Mart has committed to develop a new, energy efficient and environmentally friendly store prototype. They have committed to sell organic and sustainable products, and to reduce product packaging. They have committed to reduce solid wastes and refuse, and to improve the efficiency of their corporate fleet, all by 2009. And, they have launched large-scale sustainability initiatives including their "Acres for America" and "Sustainability 360" programs.

Wal-Mart also has two key components that increase their likelihood of success in these endeavors. The first of which is a long history of research into energy efficiency and sustainability within their building designs. As mentioned earlier, Wal-Mart developed their first environmental test store nearly fifteen years ago. The second component, and possibly the most important in a corporate environment, is the commitment of top management. Both Wal-Mart's Chairman of the Board of Directors, S. Robson Walton, and their President and Chief Executive Officer, H. Lee Scott, Jr. support the company's move toward sustainability. Though the company's investigations into environmental responsibility began under his predecessor, Scott has made sustainability a personal crusade. As he recently remarked, "When I first started to learn about sustainability, it certainly interested me. But pretty soon it started to excite me."[78]

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[77] Sustainability Fact Sheet.
[78] Scott. "Sustainability 360: Doing Good, Better, Together".

"I had an intellectual interest when we started; I have a passion today."[79] This commitment to sustainability has led Scott to create many of the company's current policies aimed at reducing their environmental impact. Though some of the company's veteran executives fear that these new initiatives may be a "costly distraction,"[80] Scott explains his, and therefore, the company's, views regarding sustainability as follows:

> To me, there can't be anything good about putting all these chemicals in the air. There can't be anything good about the smog you see in cities. There can't be anything good about putting chemicals in these rivers in Third World countries so that somebody can buy an item for less money in a developed country. Those things are just inherently wrong, whether you are an environmentalist or not.[81]

Having the support of company executives has greatly facilitated the enactment of Wal-Mart's initiatives, and resulted in a rapid acceleration of data collection, analysis, and application of new techniques and technologies in order to aid in achieving their goals.

The first of these short-term policies to be pursued, calls for the design of a new, high efficiency, low impact store prototype. This new prototype will reduce energy consumption and greenhouse gas emissions by 25-30%, each.[82] This level of reduction would save approximately 450,000 kilowatts of electricity at each supercenter, and a combined total of approximately 5 million metric tons of greenhouse gas emissions per

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[79] Gunther.
[80] Gunther.
[81] Gunther.
[82] Sustainability Fact Sheet.

year when compared to the 2005 model supercenter. This new prototype is to be developed, constructed, and opened by 2009.[83]

Also during this time period, Wal-Mart has committed to increase the number of sustainable and organic products they sell. Wal-Mart is currently the world's largest seller of organic milk,[84] and, they have also revolutionized the organic cotton industry. In 2001, the global market for organic cotton consisted of approximately 6,400 metric tons. In 2006 Wal-Mart used 6,800 metric tons,[85] becoming the largest purchaser of organic cotton in the world.[86] Also, within three to five years, Wal-Mart will begin purchasing all of its wild-caught seafood from fisheries that are certified as sustainable by the Marine Stewardship Council.[87] Similarly, they have already begun selling imported, farm-raised shrimp certified by the Aquaculture Certification Council.[88]

In addition to improving the sustainability of their products, Wal-Mart is also taking steps to improve their packaging. They have committed to revamping the packaging on all of their private label products by eliminating PVC, increasing the amount of recyclables, and reducing overall packaging in general, all by the end of 2007.[89] By replacing PVC based plastics in the packaging of four items with PLA plastics, made from corn, they were able to save the equivalent of 800,000 gallons of gasoline, and eliminate 11 million pounds of greenhouse gas emissions. They have also discovered that by eliminating excess packaging on their Kid Connection brand of toys,

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[83] "Wal-Mart: Every Day Low ... Impact?".
[84] Gunther.
[85] Gunther.
[86] Sustainability Fact Sheet.
[87] Gunther.
[88] "Wal-Mart: Every Day Low ... Impact?".
[89] "Wal-Mart: Every Day Low ... Impact?".

they could eliminate 497 containers, save 3,800 trees, and prevent the consumption of 1,000 barrels of oil.[90]

Reducing packaging also compliments Wal-Mart's goal of a 25% reduction in solid wastes from its stores by the end of 2008. To accomplish this goal, Wal-Mart has already begun installing sandwich balers at most store locations. These machines combine excess cardboard packaging and waste plastic, typically from garment bags and shrink-wrap, into compressed, tidy bundles. This process makes the plastics and the cardboard more compact, and therefore easier and more efficient to transport. The bales produced by the machines are then taken to recycling centers, rather than landfills.[91]

Wal-Mart is also working to improve the efficiency of its corporate fleet by 25% prior to the end of 2008, and to double the efficiency within ten years. This, again, is a lofty goal considering that Wal-Mart owns one of the largest private trucking fleets in the United States, consisting of approximately 7,100 road tractors and 44,500 trailers.[92] In order to increase fuel efficiency, they installed auxiliary power units on each of their trucks. These units enable the driver to heat and cool the cab of the truck during extended break periods, without running the engine.[93] Wal-Mart has also joined the U.S. EPA's SmartWay Transport Partnership, which is a voluntary program aimed at reducing emissions and improving efficiency of diesel engines.[94] To further improve vehicle efficiency, they have also incorporated hybrid vehicles into their corporate fleet since 2003, adding their 200th hybrid to the fleet in 2006.[95]

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[90] Sustainability Fact Sheet.
[91] "Wal-Mart: Every Day Low ... Impact?".
[92] "Wal-Mart: Every Day Low ... Impact?".
[93] Gunther.
[94] "Wal-Mart: Every Day Low ... Impact?".
[95] Sustainability Fact Sheet.

Beyond their short term initiatives, Wal-Mart has recently created two long term, large scale sustainability initiatives aimed at improving their impact far beyond the confines of their stores. The first of these initiatives is the "Acres for America" program, formed as a partnership between Wal-Mart and the National Fish and Wildlife Foundation in 2005. Under this program, Wal-Mart has committed to offset its entire corporate footprint by conserving at least one acre of prime wildlife habitat for each acre of land occupied by a Wal-Mart facility. According to Max Chapman, Jr., Chairman of the National Fish and Wildlife Foundation, "Wal-Mart is the first corporation to commit to offsetting its entire developed land use for conservation."[96] This program is also one of the largest public-private partnerships ever conceived.

Under this program, Wal-Mart has pledged $35 million for the next ten years to offset their footprint. The goal is to preserve one acre of habitat for every acre Wal-Mart currently occupies, and will occupy over the next ten years, totaling approximately 138,000 acres. Wal-Mart will donate funding to the National Fish and Wildlife Foundation, to be spent at their discretion, for the conservation of priority wildlife habitat. The foundation also has the ability to leverage Wal-Mart's funding in order to secure matching grants allowing for acreage to be conserved at a rate of 2:1 or even 3:1. At the time the program was announced in April, 2005, five key projects had been identified for the initial round of grants. These areas in Arizona, Arkansas, Louisiana, Maine, and Oregon totaled 321,000 acres, greater than doubling the long term goal of 138,000 acres. The Foundation will also be responsible for identifying priority habitats to be conserved, purchasing the lands, and conserving the area in perpetuity.[97]

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[96] "Wal-Mart Pledges One Acre for Every Acre Developed".
[97] "Wal-Mart Pledges One Acre for Every Acre Developed".

As Wal-Mart continues to investigate new methods of reducing their environmental impact, they have developed a second comprehensive sustainability initiative entitled “Sustainability 360.” The “Sustainability 360” program is the overlying system through which Wal-Mart will achieve their primary sustainability goals. This initiative is a six-tiered program[98] aimed at not only reducing the company’s impact, but also the impact of their employees, suppliers, customers, and the communities they serve.[99] These tiers allow Wal-Mart to explore how they can bring sustainability into all aspects of their business. By focusing on their own environmental footprint, products, suppliers, and the communities they serve, they can make sustainability accessible to the masses, encouraging sustainability by their associates, and creating new markets for sustainability.[100] Through the tiers of “Sustainability 360,” they will work with suppliers to not only make their products more sustainable, but also improve the supplier’s own level of sustainability; they will improve the efficiency of their stores and reduce wastes; and, they will help manufacturers create new markets for the sustainable techniques and technologies they develop. Using this tiered structure as a metric to evaluate and guide their short term policies, Wal-Mart is well on their way to being the first retailer to truly embrace sustainability.

While these policies are intended to bring sustainability into the company’s daily operations, greatly reducing the company’s carbon footprint, they will also reduce their development footprint as well. As Wal-Mart’s suppliers increase the availability of concentrated products and reduce product packaging, less shelf space will be required to display the same number of items. This will allow for a reduction in not only “front-of-

[98] Scott.
[99] "Wal-Mart C.E.O. Unveils 'Sustainability 360' Effort".
[100] Scott.

house" retail space, but will also require less storage space in warehouses. The reduced packaging will also produce less waste, requiring fewer dumpsters and refuse handling facilities, all of which will allow the company to bring the same number of products to consumers, in smaller, more environmentally friendly facilities.

Building Blocks

Wal-Mart is actually accustomed to leading the way toward sustainability. The first company to offset its entire development footprint through conservation was also the first major retailer to build a cutting-edge environmentally friendly store.[101] In their nearly two decade history of exploring efficiency and sustainability, Wal-Mart has constructed multiple environmentally friendly test stores, each one building upon the successes of its predecessors. They have also shown a long term commitment to learning from their store designs, and how their interaction with the environment and the surrounding community can be improved.

Wal-Mart's environmentally friendly building program essentially began in 1990 with the planning of the "Eco-Mart," conducted by an advisory committee chaired by future First Lady, and 2008 Presidential candidate Hillary Rodham Clinton, who also served on the company's Board of Advisors. The "Eco-Mart," designed by architect William McDonough, was created to be as environmentally friendly as possible. By the time the store was constructed in 1993, Wal-Mart had also begun working with their suppliers to investigate more environmentally friendly products, and packaging.[102]

[101] Ortega, B1.
[102] Ortega, B1.

Figure 3.1: "Eco-Mart" - Wal-Mart's first environmental test store in Lawrence, KS.[103]

Wal-Mart's next venture into environmentally friendly building came just two years later with the construction of the first of two demonstration stores,[104] referred to as "Ecostores." These stores, built in Moore, Oklahoma and City of Industry, California,[105] were supercenters rather than discount stores, and were considerably larger than the "Eco-Mart."[106] Wal-Mart monitored these stores for almost a decade before building their two most recent environmentally friendly experimental supercenters. These new

[103] Panchapakesan.
[104] "Wal-Mart Plans Energy Efficient "Supercenter"".
[105] "Wal-Mart: Every Day Low ... Impact?".
[106] "Wal-Mart Plans Energy Efficient "Supercenter"".

experimental stores were built in McKinney, Texas and Aurora, Colorado, both of which opened in 2005.[107]

Each of these five stores was designed with a particular goal in mind. The "Eco-Mart" was designed to be as environmentally friendly as possible, but also to investigate sustainable building materials. The store in Moore, Oklahoma was designed to maximize energy efficiency, while the City of Industry store was designed to incorporate the most successful features of the previous two.[108] The McKinney and Aurora stores, unlike the previous environmental test stores, were not designed to maximize any particular aspect of environmentalism, but were intended to test new green strategies and technologies.[109] As the company learns from each new experimental store, Wal-Mart expands their knowledge of sustainable building, and continues to develop new strategies for improving future store deigns. The lessons learned from these experiments will soon be incorporated into a national prototype that meets the company's goal of reducing store energy consumption and greenhouse gas emissions by 25-30% and will likely become the standard basis for new store development.

High-Priced Green-Washing

Despite Wal-Mart's recent efforts to become more environmentally responsible, and Scott's commitment to sustainability, there are many who continue to question the company's motives. The company's critics are certainly not difficult to find, and range from local business owners, community associations, and faith-based groups, to nationally organized coalitions, including the Sierra Club. Many of these people see

[107] "Wal-Mart: Every Day Low ... Impact? : Wal-Mart's Experimental Supercenters".
[108] "Wal-Mart: Every Day Low ... Impact?".
[109] "Wal-Mart: Every Day Low ... Impact? : Wal-Mart's Experimental Supercenters".

Wal-Mart's move toward sustainability as nothing more than a "high-priced green-washing campaign."[110]

This is one of the last and most unique hurdles Wal-Mart will have to surmount as they pursue sustainability. It seems as though everyone has an opinion of Wal-Mart, and the majority, by far, of those opinions are negative. Many "see the company in a race to pave the planet and turn it into a giant emporium of cheap goods," while others see it as a company that "stands for everything that's wrong with big business."[111] These sentiments even carry over into the people and companies Wal-Mart has approached in their efforts to become more sustainable. A manufacturer of non-toxic household products refused to sell to Wal-Mart, stating "We might sell a lot more products in giant mass-market outlets, but we're not living up to our own values and helping the world get to a better place if we sell our soul to do it."[112] Also, a Vancouver based architect approached to design an environmentally friendlier Wal-Mart for a nearby area said that "the offer sparked a debate among his staff about whether they were comfortable with working for Wal-Mart."[113]

Scott realizes that the company's reputation is an issue, and that it needs to be addressed in a better fashion, stating "[in the past] we would put up the sandbags and get out the machine guns."[114] Their reputation not only influences suppliers and opponents, but also customer relations. One study found that approximately 8% of customers no

[110] Gunther.
[111] Gunther.
[112] Gunther.
[113] O'Connor, "Green Architect Wants to Make a Difference with Wal-Mart".
[114] Gunther.

longer shop at Wal-Mart due to its reputation.[115] This is an area in which sustainability becomes both an asset and a challenge.

Sustainability becomes increasingly difficult to achieve when manufacturers and suppliers of sustainable technologies equate selling to Wal-Mart with selling their soul to the devil. However, while Wal-Mart believes that incorporating sustainability into their everyday operations will likely alleviate some of these sentiments, proving that their actions are legitimate will likely be difficult. This is a situation where independent third party verification of Wal-Mart's sustainability initiatives through an organization like the U. S. Green Building Council (USGBC), and their Leadership in Energy and Environmental Design (LEED) green building rating system, would offer multiple benefits to the greening corporate giant.

[115] Gunther.

CHAPTER 4

A RUBRIC FOR THE CONSTRUCTION INDUSTRY

As Wal-Mart continues along the path toward sustainability, they will undoubtedly encounter continued skepticism from numerous critics and be the subject of rigorous scrutiny. This is to be expected as such an overwhelming paradigmatic shift by a major corporation is virtually unprecedented within the retail industry. However, this is, yet again, another area in which Wal-Mart is unique among other retailers. As previously mentioned, Wal-Mart is often seen as a company that "stands for everything that's wrong with big business," and "in a race to pave the planet and turn it into a giant emporium of cheap goods."[116]

While a given level of scrutiny is warranted, and in the best interests of the environment, consumers, and the retail industry, Wal-Mart will undoubtedly be held to a higher standard. Though improving efficiency and reducing emissions by any degree will have a significant impact upon the environment, and would be sufficient for other retailers, Wal-Mart will have to go above and beyond the "call of duty" in order to overcome their reputation and prove the legitimacy of their initiatives. But, how does one evaluate the sustainability of a major retailer, especially one with this level of emotional baggage? By what rubric can Wal-Mart be graded?

The industry standard for evaluating sustainable construction is the U.S. Green Building Council's (USGBC) Leadership in Energy and Environmental Design (LEED) green building rating system, which would offer numerous advantages in this situation.

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[116] Gunther.

The USGBC is an independent, nonprofit organization at the forefront of the sustainable building industry, which has seen virtually exponential membership growth in its relatively short history. As the USGBC and the entire green building market have grown over the past few years, an ever increasing number of building professionals have discovered the advantages of pursuing LEED certification, causing a similar trend in the number of LEED projects.

As the USGBC strives to expand LEED certification into new building segments, and Wal-Mart continues in their pursuit of sustainability, the unique opportunity for these industry leaders to benefit each other presents itself once again. LEED certification would quantify Wal-Mart's efforts, and lend credibility to the company's initiatives. Concurrently, Wal-Mart's stature and level of influence would open the door for other retailers to embrace sustainability and pursue LEED certification. Given that many are expecting an environmental renaissance within the retail industry, the adoption of LEED certification as a standard building practice by Wal-Mart would likely be the catalyst necessary to bring sustainability to the retail sector.

Auspicious Beginnings

Approximately fourteen years ago, as Wal-Mart began to notice the need for environmentally responsible building practices others within the design and construction industries were coming to this same realization. Not only were building professionals discovering a need for sustainability, they were also realizing the need for a means to evaluate and develop new environmentally friendly building methods, and facilitate their introduction to the construction industry. This led to the formation of the USGBC in

1993[117] and the development of their LEED green building rating system beginning two years later.

In its relatively short existence, the USGBC has rapidly become the nation's foremost leader in promoting and quantifying sustainability within the construction industry. Since the launch of the first LEED rating system, both membership in the USGBC and the number of registered LEED projects have experienced virtually exponential growth. In just fourteen years, the USGBC has grown from a fledgling nonprofit organization to an industry leader consisting of well over 10,000 members.[118] The group's diverse membership, which represents all aspects of the construction industry, increased by more than 1,000 percent between 2000 and 2004.[119]

The organization's membership, which includes design professionals, building owners, product manufacturers, professional societies, environmental groups, public utilities, and various federal, state, and local governments, is now active among 75 regional chapters throughout the United States.[120] The diversity of their membership, and the vested interest these member organizations have in both environmental responsibility and building construction, makes the USGBC a highly respected, and effective, industry organization. The USGBC has made it their primary goal to "transform the way buildings and communities are designed, built and operated, enabling an environmentally and socially responsible, healthy, and prosperous environment that improves the quality of life."[121] Striving to best serve its membership, and their respective communities, the

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[117] Corbett and Muthulingam, Adoption of Voluntary Standards: The Role of Signaling and Intrinsic Benefits in the Diffusion of the LEED Green Building Standards, 4.
[118] U.S. Green Building Council, LEED for Homes Technical Review Workshop, 13.
[119] Roy, 32-34.
[120] "About USGBC".
[121] "About USGBC".

USGBC pursues their goals through a number of activities including the development of industry standards, design practices, and evaluation tools, as well as advocacy of environmental building policies, facilitation of information exchange, and education.[122]

The primary means in which the USGBC affects the construction industry is through the development, maintenance, and oversight of the various LEED rating systems. The USGBC is also responsible for the review and certification of LEED projects, which, like the organization's membership, have also experienced substantial growth since the program was developed. The first twelve LEED projects received certification in 2000,[123] at which time an estimated $656 million worth of new construction was registered under LEED.[124] In 2005, $8.34 billion worth of new projects filed for LEED registration,[125] which is an increase of 1,270% in five years. As of May 2008, there are 13,468 registered projects,[126] 1,540 of which have attained certification under the various LEED rating systems.[127]

Metric Systems

The flagship of these systems, LEED for New Construction and Major Renovations, was the first to be developed by the USGBC. This rating system also serves as the model from which all other LEED systems have evolved. Since the release of LEED for New Construction version 2.0 in 2000, additional LEED systems have been created to evaluate Existing Buildings, Core and Shell Developments, and Commercial

[122] U.S. Green Building Council, YOUsgbc, 3.
[123] "LEED for New Construction".
[124] U.S. Green Building Council, LEED-EB, 23.
[125] LEED-EB, 23.
[126] U.S. Green Building Council, Leadership in Energy and Environmental Design, 11.
[127] Leadership in Energy and Environmental Design, 12.

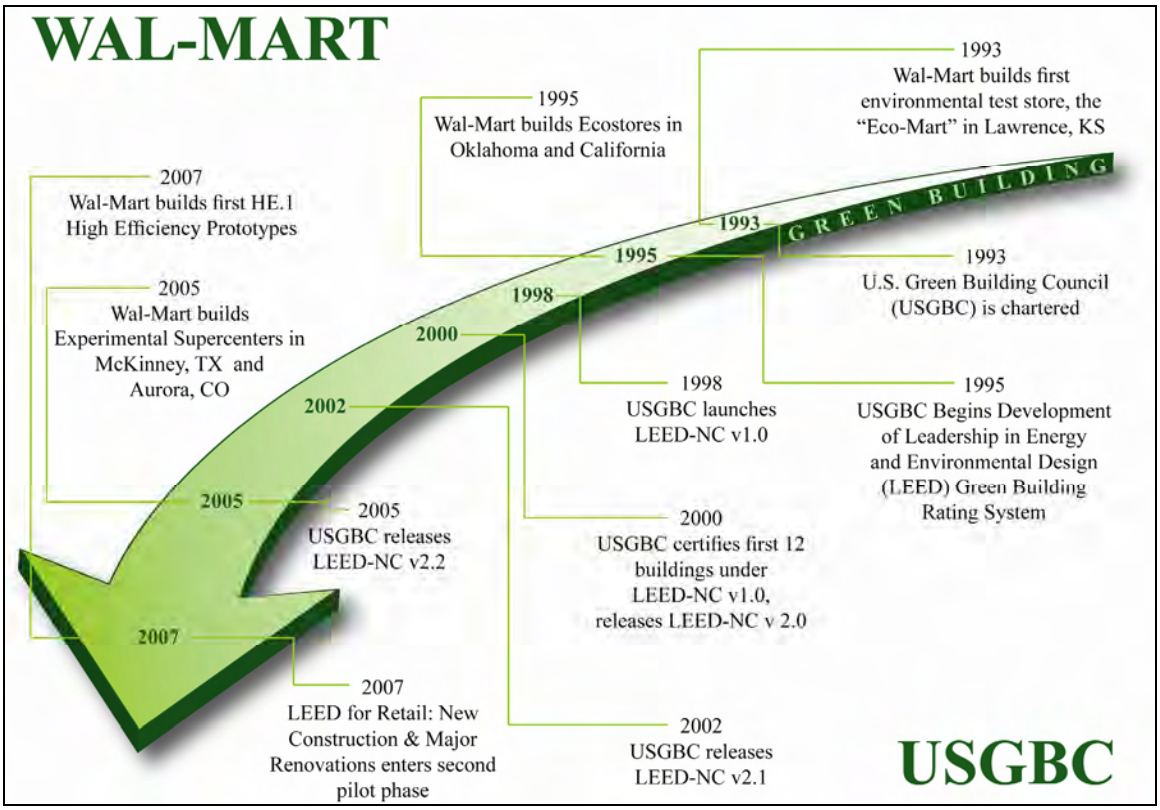

Figure 4.1: Development of Wal-Mart's environmental building program and the USGBC.[128]

Interiors. Consisting of these four base rating systems, the LEED program now addresses multiple building types and lifecycles. There are also multiple rating systems currently being developed which will address a wide range of specialized building typologies. Hoping to diversify beyond the commercial office building, these new rating systems will address environmentally responsible strategies, techniques, and opportunities for new building segments including homes, schools, healthcare facilities, neighborhood developments, multiple buildings and campuses, laboratories, and retail facilities.

[128] Graphic produced by author.

By fortuitous happenstance, the LEED system developed along a timeline strikingly similar to that of Wal-Mart's sustainable building program. [See Figure 4.1] As stated earlier, the USGBC was founded in 1993, the same year in which Wal-Mart constructed their first environmentally friendly test store in Lawrence, Kansas. In 1995, development began on the first LEED rating system;[129] that same year, Wal-Mart constructed their two "Ecostores" in Oklahoma and California. Ten years later, the most current version of the system, LEED for New Construction and Major Renovations version 2.2, was released,[130] and Wal-Mart constructed their newest experimental supercenters in Texas and Colorado. Most recently, in October 2007, the USGBC has released a second pilot version of the LEED for Retail: New Construction rating system.[131]

The LEED green building rating systems are designed to assess the methodology used within a particular project to achieve sustainability. Participation in, and certification under, one of the various LEED rating systems is in most cases voluntary, and typically falls under the discretion of the building owner. The exceptions being some Federal, State, and locally funded government buildings, or in cities such as Seattle or Boston, where, as previously mentioned, LEED certification is mandated by policy or zoning. In order to pursue LEED certification, the project must be registered with the USGBC, which will oversee the certification process. Along with registration, supplemental documentation must be submitted to the USGBC describing the project, designating the rating system the project will be following, and supporting the level of

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[129] Hays, Epler, and Blair, US Green Building Council Leadership in Energy and Environmental Design Certification Program, 4.
[130] "LEED for New Construction".
[131] U.S. Green Building Council. Green Building Rating System: LEED for Retail - New Construction and Major Renovations Pilot Version 2, 1.

certification the project is attempting to attain. Once the project has been completed, the USGBC will perform a final review of the project documentation and confer certification.[132]

Although originally developed to evaluate commercial office buildings, which account for the majority of certified projects,[133] all newly constructed buildings, excluding those that fall under LEED for Core and Shell Development, must currently pursue certification under LEED for New Construction version 2.2. This has been a major factor limiting the diversity of project typologies that elect to pursue LEED certification due to the disparity between certain building types, such as retail or healthcare, and commercial offices. Fortunately, these issues are now being addressed through the development of a series of new rating systems based upon LEED for New Construction, which address these differing typologies.

Each LEED rating system intended for use during new construction or major renovations is organized through a series of prerequisites and credits classified into six categories including Sustainable Sites (SS), Water Efficiency (WE), Energy & Atmosphere (EA), Materials & Resources (MR), Indoor Environmental Quality (EQ), and Innovation & Design Process (ID). When a project commits to follow the LEED system, all prerequisites in each category must be met in order to achieve certification, and do not increase the total score received by the project. Each of the remaining credits are voluntary and are assigned a value ranging from one to ten possible points which, upon successful implementation, accrue to determine the project's certification level.[134]

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[132] "Certification".
[133] Choi, 22.
[134] U.S. Green Building Council. Green Building Rating System: LEED for New Construction and Major Renovations Version 2.2, 5.

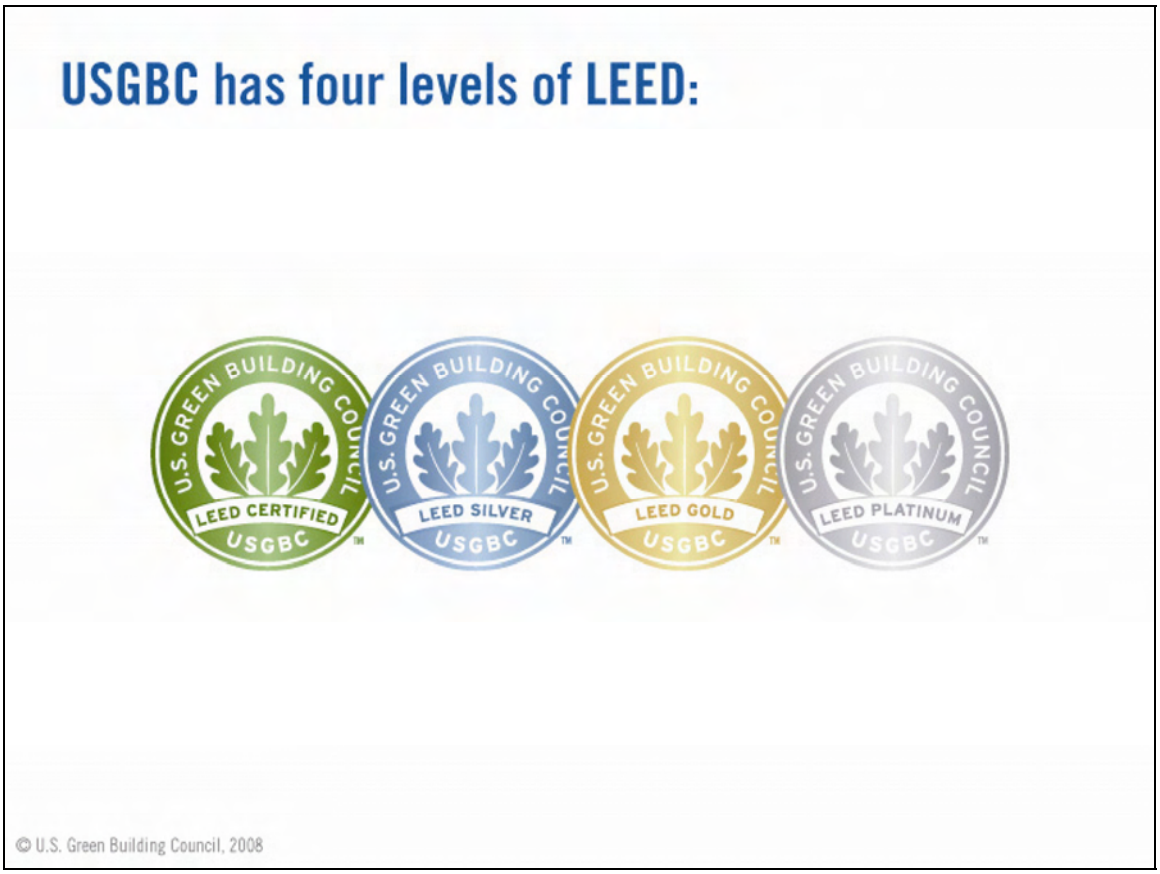

Figure 4.2: LEED Certification Levels.[135]

Under LEED for New Construction and Major Renovations, a total of 69 points are available for a project; however, some credits are contradictory to others, eliminating the possibility of achieving every credit. Based upon the total number of points awarded to a project during the review process, one of four progressive certification levels may be conferred. The first of these levels, achieving a rating of LEED Certified, is conferred upon projects totaling 26-32 points, while projects receiving 33-38 points attain a rating of LEED Silver. Projects receiving the highest levels of certification, LEED Gold and

[135] Leadership in Energy and Environmental Design, 8.

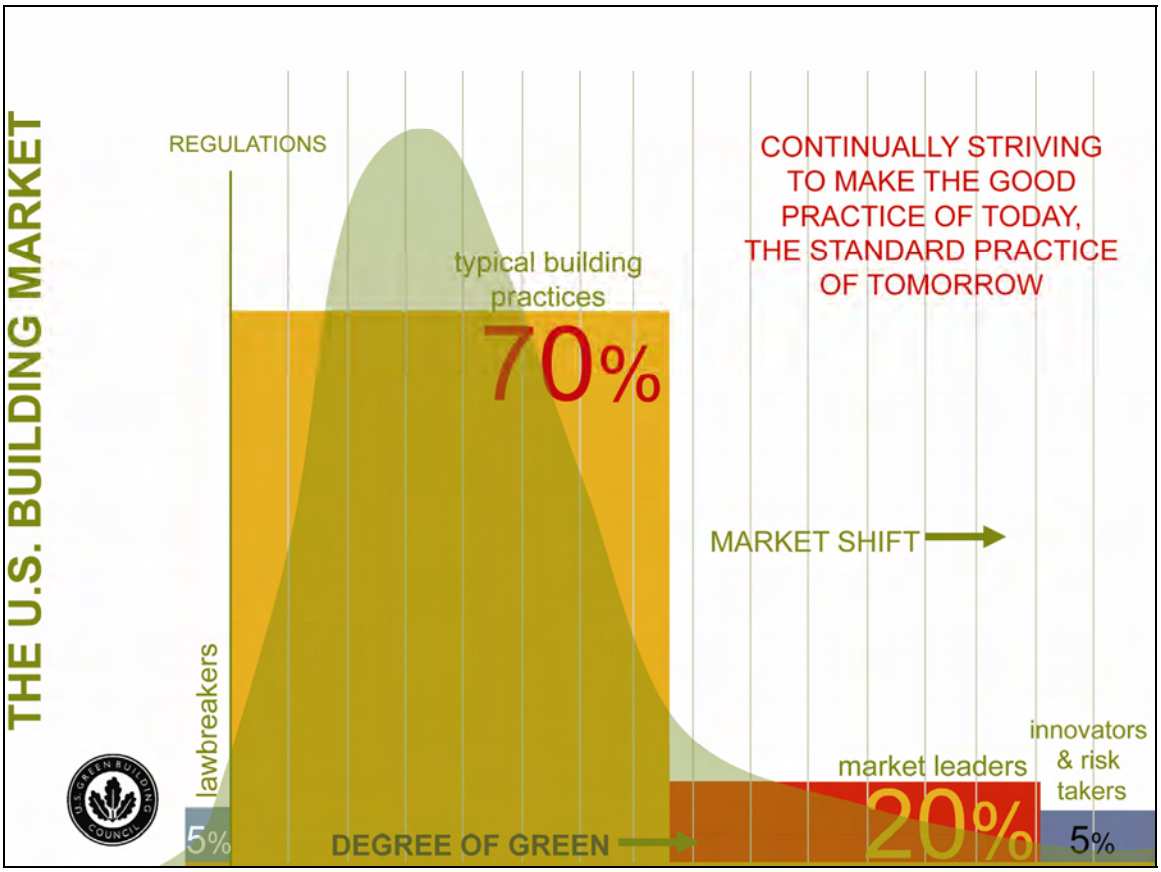

Figure 4.3: U.S. Building Market. Slide from USGBC PowerPoint presentation. © 2006 U.S. Green Building Council.[136]

LEED Platinum, must attain 39-51 or 52-69 points respectively.[137] According to the USGBC, only the upper 25% of the current building market seek LEED Certification, pursuing a LEED Certified or LEED Silver rating. Projects undertaken by those seen as market leaders or innovators and risk takers, which only represent the upper 5% of the building market, typically pursue LEED Gold or LEED Platinum certification.[138] [See Figure 4.3]

[136] LEED-EB, 17.
[137] Green Building Rating System: LEED for New Construction, 10.
[138] LEED-EB, 17.

As previously mentioned, this thesis shall utilize the second pilot version of the LEED for Retail: New Construction rating system, which is currently being developed, to perform case-study analyses of Wal-Mart's newest experimental stores in McKinney, TX and Aurora, CO. This rating system is being developed to specifically address the myriad of characteristics which are unique to retail construction and the retail industry in general. LEED for Retail: New Construction, according to the USGBC, "recognizes the unique nature of the retail environment and addresses the different types of spaces that retailers need for their distinctive product lines."[139] The second pilot version of this system has completed one round of public comment, and is in the process of gathering market feedback from in excess of thirty-five selected green retail projects. A second round of public comment is expected in the Spring of 2008; after which, the system will likely be balloted following USGBC policies and procedures in preparation for an official launch.[140]

LEED for Retail: New Construction is structured in an almost identical manner to LEED for New Construction and Major Renovations version 2.2, with LEED for Retail having a total of 70 possible points and the latter a total of 69. Each rating system has the same number of possible points in the categories of Water Efficiency (5). Energy & Atmosphere (17), Materials & Resources (13), and Innovation & Design Process (5). The differences are found in the categories of Sustainable Sites, and Indoor Environmental Quality with LEED for Retail: New Construction having 16 and 14 points respectively, as opposed to 14 and 15 points for LEED for New Construction and Major Renovations. Though the point totals available to the two rating systems differ, certification thresholds

[139] "LEED for Retail - In Pilot".
[140] "LEED for Retail - In Pilot".

remain identical among the two, with the extra point falling into the Platinum certification level under the LEED for Retail: New Construction rating system.[141, 142]

Pro et Contra

As is typically the case, all decisions in life have their advantages and disadvantages; and in this manner, the choice to pursue LEED certification is no different. However, when discussing these advantages, it becomes rapidly clear that the pursuit of LEED certification is a unique decision. While the economic and environmental benefits of sustainable building practices, which many would argue are the incentives for undertaking a LEED project, are clearly evident, and will be discussed later in greater detail, they, in actuality, are not the result of LEED certification. As Charles J. Corbett et al. from the UCLA Anderson School of Management state in a paper entitled *Adoption of Voluntary Environmental Standards: The Role of Signaling and Intrinsic Benefits in the Diffusion of the LEED Green Building Standards*, "environmental technologies do in fact provide intrinsic benefits, economic and/or environmental"[143] and that "an organization would adopt a collection of LEED elements but would choose not to incur the documentation and auditing costs involved in certification, as the intrinsic benefits would accrue independently from the certification."[144] In actuality, the primary benefits of pursuing LEED certification come in the form of recognition, and validation, which can be quite impalpable and considerably difficult to measure. These benefits do, however, have a significant gestalt value which can be worth far more than their weight in silver, or gold, or platinum, whichever the case may be.

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[141] Green Building Rating System: LEED for New Construction, 9-10.
[142] Green Building Rating System: LEED for Retail, 7-9.
[143] Corbett and Muthulingam, 11.
[144] Corbett and Muthulingam, 12.

If the advantages of LEED certification are not economic, not environmental, and not easy to quantify, why have over 5,000 projects registered with the USGBC, and over 700 completed the certification process? Corbett et al postulate that "the motivation for adoption of innovations, including voluntary standards, may be related to the quest for signaling, meaning that the organization wishes to communicate something about its practices to the outside world, including regulators, customers, the public, etc."[145] In this case, as also stated by Corbett et al. "a fundamentally different motivation for adoption of (environmental) practices lies in their external signaling value, where the action required for a decision maker to be able to send a signal has no value other than that provided by the signal itself.[146]

As was discussed earlier, "consumers are becoming increasingly environmentally conscious, and businesses are realizing the importance of demonstrating that they are reducing their impact on the environment."[147] This is where LEED certification has a distinct advantage. According to the USGBC, LEED certification provides companies with the asset of being recognized for the company's commitment to environmental issues within the community, industry, and within the organization itself.[148] This recognition then turns into a marketing ability. As also stated by the USBGC, LEED certified projects "receive marketing exposure through [the] USGBC Web site, Greenbuild conference[s], case studies, and media announcements."[149] All of which can then help a company attract a more environmentally conscious clientele, and improve their market exposure.

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[145] Corbett and Muthulingam, 2.
[146] Corbett and Muthulingam, 7.
[147] Madden, 14.
[148] Green Building Rating System: LEED for Retail, 2.
[149] Green Building Rating System: LEED for Retail, 3.

Figure 4.4: LEED Certification Plaque – Among the numerous assets of LEED certification, the building plaque provides the project with permanent and tangible marketing exposure and "signaling" benefits. Slide from USGBC PowerPoint presentation. © 2006 U.S. Green Building Council.[150]

Recognition is not only important to consumers, but to corporate shareholders as well. According to Brendan Owens, LEED program manager for technical support for the USGBC, "shareholders are reading the corporate sustainability reports and they want to see claims backed up by a credible third-party organization."[151] This, again, is an advantage of pursuing LEED certification. As the USGBC is an independent, non-profit organization and a respected leader in the sustainable building industry, certification

[150] USGBC, 22.
[151] Brill, and Saulson, "The Paradox of Green Retail" 34.

under one of the LEED green building rating systems provides that level of validation that shareholders and patrons are seeking.

Recognition and validation, or signaling values, as discussed in the study of Corbett et al., have a significant impact upon LEED certified projects. For example, if Wal-Mart, who have lost approximately 8%[152] of their 138 million shoppers-per-week[153] customer base due to their environmentally negative reputation, were to recover even half of that amount as a result of USGBC validation, that would translate into a weekly increase of over 5.5 million customers. This accounts for data observed by Corbett et al., which indicates "that a significant part of LEED certification behavior is driven by signaling considerations."[154]

Beyond recognition and verification, there is a rapidly increasing array of more tangible benefits including incentives and programs designed to encourage sustainable building practices being implemented by city and county governments across the country. As stated in a November 2007 report prepared by the National Association of Industrial and Office Properties (NAIOP) Research Foundation, "With a lack of substantial federal and state green building legislation, locally-based, market-driven incentives are sprouting up in municipalities across the country."[155] They continue, "for example, in July of 2007, Howard County, Maryland passed Bill 47-2008 which included expedited permitting for projects aiming for LEED Gold or Platinum and granted a five-year property tax credit

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[152] Gunther.
[153] "Wal-Mart: Every Day Low ... Impact?".
[154] Corbett and Muthulingam, 24.
[155] Yudelson Associates, Green Building Incentives That Work: A Look at How Local Governments Are Incentivizing Green Development, 7.

for projects obtaining [LEED for New Construction and Major Renovations] and [LEED for Core and Shell Development] certification."[156]

Incentives such as these, though not available in every municipality, and not as advantageous as the recognition and validation provided by LEED certification, do provide some intrinsic benefits to pursuing LEED certification. As in the case of the Howard County policy, these incentives typically serve to effectively offset the costs associated with the LEED certification process. However, these incentives, while significant, seldom account for, but do contribute to, the vast number of LEED registered and certified projects. This fact is supported by the findings and conclusions of Corbett et al.'s study which states "We analyze data on the adoption of specific LEED elements … to test whether signaling or the pursuit of intrinsic benefits dominates organizations' decisions to adopt the LEED standard. We find that neither factor independently can explain the observed pattern of adoption of LEED elements, however, the two factors together can do so."[157]

Despite the numerous benefits of becoming LEED certified, there are a number of disadvantages inherent to the certification process, which have limited both the number and type of projects following the LEED program. The primary disadvantage of pursuing LEED certification, particularly in the retail segment, is the level of documentation required by the USGBC. In an article titled *The Paradox of Green Retail*, authors Eric Brill and Gary Saulson explain the lack of retail projects pursuing LEED certification stating, "It's not that green construction is more expensive – sustainable building often compares favorably with or even provides savings over traditional strategies. Rather, it's

[156] Yudelson Associates, 7.
[157] Corbett and Muthulingam, 5-6.

that retailers are faced with the substantial time and cost of filing for LEED credentials for each store in a roll-out portfolio … For retailers this process can be multiplied many times over - some companies roll-out up to 100 new stores a year – making LEED certification simply unfeasible."[158]

The documentation required to support LEED certification can be extensive. When applying for LEED certification, documentation must include information relating to the rating system being used, project type, size, and scope, number of occupants, and date of construction completion, as well as architectural drawings including various plans, sections, elevations, and photographs or renderings of the project. There must also be a project narrative, including three project highlights, a copy of the LEED project checklist acknowledging the required prerequisites and listing the credits being pursued, and the total estimated score the project should receive. Each credit attempted by a LEED project must then be supported in the form of drawings, reports, calculations, photographs, or a combination thereof, which must be prepared and submitted by the appropriate member or members of the project's design team. A list of all Credit Interpretation Rulings (CIRs), and their respective dates, being referenced by the project must also be submitted for review; and lastly, the associated certification fees must be remitted as well.[159]

Not only is this level of documentation and "red-tape" a burden on the project team in terms of preparation and organization; it is also very time consuming, which becomes the primary deterrent. Each document submitted requires preparation by a member of the design team. This adds to both design and construction schedules, and

[158] Brill, and Saulson, 30.
[159] "Certification".

therefore increases the project budget. The project budget is also increased, though not significantly, by the certification fees assessed by the USGBC.

LEED project fees are assessed in two categories, with discounts given to projects undertaken by USGBC members. Registration fees range from $450.00 for USGBC members to $600.00 for non-members. Certification fees are then typically assessed as a cost per square foot of building space. Certification fees are assessed in two segments corresponding to the project's certification reviews. The design and construction reviews may occur individually, or be combined, at the project team's request. Total certification fees range from 3.5-4.5 cents per square foot, for buildings between 50,000 and 500,000 square feet. Projects falling outside this range are assessed either a minimum fee of $1,750.00-$2,250.00, or a maximum fee of $17,500.00-$22,500, depending upon membership status.[40] There is, however, one benefit to the USGBC's fee schedule, which comes in the form of a complete refund of all certification fees for projects earning LEED Platinum certification.[160]

These disadvantages, including issues relating to cost and the level of documentation necessary to meet the certification requirements, have come to the attention of the USGBC and are being addressed. As stated by Brill and Saulson, "for the past few years, the USGBC's Retail Development Committee (RDC) has been focused on developing a streamlined LEED process for volume-build projects. It has gathered input from major retailers such as Starbucks and Target to establish new standards correlative to bulk building, as well as to rethink and simplify the documentation process for certification."[161]

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[160] "Registration".
[161] Brill, and Saulson, 30.

These efforts have led to the development of the USGBC's Portfolio Program, which is currently in the piloting process. The Portfolio Program, according to the USGBC, "enables companies and building owners to integrate LEED into their new and existing building projects using a cost-effective, streamlined certification process."[162] This program is being designed specifically to address the issues relating to documenting and certifying volume build projects, with the primary focus of the pilot phase being to test volume certification strategies.[163] The current pilot, with participants including financial institutions, hoteliers, and retailers,[164] was launched in 2006,[165] and is scheduled to run through early 2009.[166]

[162] "Portfolio Program".
[163] "Portfolio Program: Frequently Asked Questions".
[164] "Portfolio Program: Frequently Asked Questions".
[165] "Portfolio Program".
[166] "Portfolio Program: Frequently Asked Questions".

CHAPTER 5

CASE STUDIES: WAL-MART EXPERIMENTAL SUPERCENTERS, McKINNEY, TEXAS AND AURORA, COLORADO

Wal-Mart's environmentally friendly building program, now approaching its fifteenth year of development, began a period of rapid growth and exploration with the planning of two sustainability-oriented experimental test stores in 2003. These stores, and the process in which they were developed, would be like no other in the company's history. Rather than exploring a single environmental technology or strategy such as certified lumber, daylighting, or energy efficiency, as done in previous demonstration stores, the new experimental stores would serve as full-scale, living laboratories investigating as many sustainable techniques as possible; and they would test them in the company's largest format, the 200,000 square foot supercenter.

Unlike typical stores, which are developed from a nationally implemented prototype and have a virtually automated construction process, the experimental stores required extensive research and a total restructuring of the company's procedures. Most Wal-Mart stores are designed and constructed by building professionals who are experienced and familiar with Wal-Mart processes, have been involved in the development of previous stores, and typically work independently from one another, focusing on their particular scope within the project. The project team assembled to

develop the experimental stores, however, was comprised of both Wal-Mart project veterans, and those entirely new to the Wal-Mart process.[167]

In preparation for initial project meetings and design charrettes, which began in mid-2003, members of the project team were sent to numerous buildings in the United States, Great Britain, and Germany to see, first-hand, environmental strategies being employed by projects of similar size and scope. Team members were also sent to meetings and conferences discussing numerous green products and technologies including green roofs, solar energy, and porous asphalt.[168] Based upon this research, a mission statement was developed for the experimental supercenters which states, "In order to learn more about how Wal-Mart, and the entire industry, can improve in the area of environmental sustainability, [these stores] will experiment with materials, technology, and processes which will reduce the amounts of energy and natural resources required to operate and maintain the store[s], reduce the amount of raw materials needed to construct the [facilities], and substitute, when appropriate, the amount of renewable materials used to construct and maintain the [facilities]."[169, 170]

Along with a mission statement, the project team developed a set of criteria which would be used to evaluate potential locations for the new experimental stores. The stores would need to be located in communities which had an existing supercenter built following the current, conventional prototype, providing a basis of comparison to evaluate the effectiveness of the new technologies. Secondly, the stores would need to be constructed in locations with differing climates, allowing the experiments to be tested

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[167] "McKinney Experimental Wal-Mart: Team & Process".
[168] "Aurora Experimental Wal-Mart: Team & Process".
[169] "McKinney Experimental Wal-Mart: Team & Process."
[170] "Aurora Experimental Wal-Mart: Team & Process".

Figure 5.1: Wal-Mart's Experimental Supercenter in McKinney, TX.[171]

under various weather patterns. Thirdly, the project sites must be readily accessible to suppliers, vendors, Wal-Mart executives, and other visitors. Lastly, priority would be given to communities in which Wal-Mart had good working relationships with the local governments.[172] These criteria led the project teams to select McKinney, Texas, a Dallas suburb, and Aurora, Colorado, a suburb of Denver, as the locations for the new stores.

In addition to meeting the experimental store project team's criteria, McKinney, TX was chosen as a location because a new supercenter had already been designed for the area and was in the final permitting stages. The project team elected to modify the existing design, and incorporate experimental technologies into the building components, leaving the shell of the building unchanged. This, in theory, would expedite the experimental building program and ease the development process. In actuality, however, incorporating environmental practices and technologies as an afterthought was much more difficult than anticipated, resulting in a lengthy redesign process, and also

[171] Wal-Mart Experimental Store [McKinney, TX - Press Kit], 2.
[172] "Aurora Experimental Wal-Mart: Team & Process".

limiting the number of experiments that could be incorporated into the store.[173] The Aurora experimental store, conversely, was designed from scratch, allowing the project team to incorporate sustainable practices into all parts of the building.

As each store was designed, the project team explored numerous green strategies for potential incorporation into the stores. Referring to the McKinney store, Roderick Wille, Senior Vice President of Sustainable Construction for the Turner Corporation's office in Sacramento, CA, the general contractor for the two experimental supercenters, states, "when this store was in its planning stages, Wal-Mart executives, [Architectural Energy Corporation], LPA, and everyone involved in the building sat down and every sustainable element was put on the board… It was a long list."[174] (Architectural Energy Corporation (AEC) and LPA provided commissioning and design services, respectively, for both stores.) Each potential strategy was then evaluated by the project team to determine if the experiment would help meet at least one of the goals set forth in the mission statement, would be feasible to implement and document, and would pass cost-benefit analyses.[175] These analyses resulted in the incorporation of over twenty experiments in the McKinney store[176] and some fifty-plus in Aurora.[177]

The experimental nature of the McKinney and Aurora stores affected the permitting and construction processes as well. Experiments common to both stores, including wind turbines and bio-fuel boilers, which burn waste cooking and automotive oils, encountered some resistance during the permitting process. Whereas, plans to

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[173] "McKinney Experimental Wal-Mart: Team & Process."
[174] Yoder, 6.
[175] "McKinney Experimental Wal-Mart: Team & Process."
[176] Yoder, 6.
[177] Lovely, "Wal-Mart: Energy Experiment, Take Two".

Figure 5.2: Wal-Mart's Experimental Supercenter in Aurora, CO.[178]

transplant large trees onto the McKinney site,[179] and xeriscaping at Aurora[180] eased the permitting process in each community. At both McKinney and Aurora, frequent issues arose during construction which primarily resulted from contractors and installers being unfamiliar with the experimental technologies. In both locations, the project team found that early and frequent meetings with permitting officials, and providing supplemental training for construction crews, were effective in resolving potential issues.[181, 182] The Aurora store had the benefit of being constructed after its counterpart in McKinney, allowing the project team to prevent many of the permitting and construction issues encountered with the previous store.[183]

Even after construction, the McKinney and Aurora stores required changes to Wal-Mart's typical post-occupancy procedures. First among these changes was to

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[178] Wal-Mart Experimental Store [Aurora, CO - Press Kit], 2.
[179] "McKinney Experimental Wal-Mart: Team & Process."
[180] "Aurora Experimental Wal-Mart: Team & Process".
[181] "McKinney Experimental Wal-Mart: Team & Process."
[182]"Aurora Experimental Wal-Mart: Team & Process".
[183] "Aurora Experimental Wal-Mart: Team & Process".

educate future facilities and maintenance personnel about the experimental technologies they would encounter. In order to accomplish this, unique signage was posted at each piece of experimental technology stating the intent and operating characteristics of the equipment, as well as specialized maintenance requirements.[184]

The second, and most notable, change in the post-occupancy phase of the stores involves monitoring the experiments and data collection. Though each Wal-Mart store is automated and electronically monitored to some extent, the McKinney and Aurora stores take this to a whole new level. Technicians and scientists from the Oak Ridge National Laboratory (ORNL) in Oak Ridge, Tennessee and the National Renewable Energy Lab (NREL) of Golden, Colorado will provide testing, monitoring, and analysis of the sustainable concepts, technologies, and materials used in the McKinney and Aurora stores respectively.[185, 186] The ORNL and the NREL will monitor the experimental supercenters, along with the conventional supercenter serving as their local base-line for comparison, for a period of three years in order to evaluate the success of the experiments. Also, in unprecedented fashion, Wal-Mart has pledged to make the results of these analyses available to the general public, including shoppers, product manufacturers, and other retailers, at the end of the three year monitoring period.[187]

Case and Point

The upcoming pages of this chapter will evaluate Wal-Mart's experimental supercenters in McKinney, TX and Aurora, CO, based upon the data available at the writing of this thesis, to determine the potential for certification of each store under the

[184] "McKinney Experimental Wal-Mart: Team & Process."
[185] "The Machine Goes Green: Wal-Mart's Eco-Experiment in McKinney, Texas".
[186] Lovely.
[187] "The Machine Goes Green".

second pilot version of the LEED for Retail: New Construction Rating system. As previously mentioned, the documentation required by the USGBC to prove LEED certification, consisting of architectural and engineering drawings and calculations, is intensive, and highly technical. This information is also considered proprietary, and is generally not publicly available. Therefore, the information used in the analyses of these stores is largely anecdotal, and narrative in nature.

In this analysis, each prerequisite and credit in the LEED for Retail: New Construction rating system has been investigated and the achievement of each, by one or both stores, determined to be "likely," "possible," or "unlikely." Though similar in function to the USGBC's LEED Project Checklist, which is included in most LEED rating systems, Tables 5.1-5.9 have been created in order to display the results of the analysis, along with the stores' potential point totals in each category, a summary of possible "extra credits," and the aggregate point totals for each store. The intent of this thesis is not to prove that the stores will be certified by the USGBC, for this can only be requested by Wal-Mart and their project design team, and is solely at the discretion of the USGBC. This thesis does, however, seek to evaluate the likelihood that the stores in question could receive LEED certification, should Wal-Mart choose to pursue that option.

Sustainable Sites Credits (SS)

Sustainable Sites (SS) credits, as the name suggests, are used to evaluate strategies that affect the landscape in which a project is constructed. These credits, which address issues including site selection, brownfield redevelopment, stormwater control,

Table 5.1: Sustainable Sites Credits (SS)[188]

LEED FOR RETAIL: NEW CONSTRUCTION SUSTAINABLE SITES (SS)				WAL-MART EXPERIMENTAL STORES						
				Location:	McKINNEY, TX			AURORA, CO		
				Type:	Large Format Retail			Large Format Retail		
				Size:	206,000 sf			206,000 sf		
				Completed:	July 2005			July 2005		
Credits				Available	Points					
Number		Description			L	P	U	L	P	U
Prereq	1	Construction Activity Pollution Prevention		Required						
Credit	1	Site Selection		1			1			1
Credit	2	Development Density & Community Connectivity		1			1			1
Credit	3	Brownfield Redevelopment		1			1			1
Credit	4	Alternative Transportation		4			4	1		3
		Public Transportation Access	(1 Point)					*		
		Bicycle Storage & Commuting	(1 Point)							
		Low Emitting & Fuel Efficient Vehicles	(1 Point)							
		Parking Capacity	(1 Point)							
		Delivery Service	(1 Point)							
		Incentives	(1 Point)							
		Car-Share Membership	(1 Point)							
		Alternative Transportation Education	(1 Point)							
Credit	5.1	Site Development: Protect or Restore Habitat		1		1			1	
Credit	5.2	Site Development: Maximize Open Space		1		1			1	
Credit	6.1	Stormwater Design: Quantity Control		1	1			1		
Credit	6.2	Stormwater Design: Quality Control		1	1			1		
Credit	7.1	Heat Island Effect: Non-Roof		1	1			1		
Credit	7.2	Heat Island Effect: Non-Roof		1		1				1
Credit	7.3	Heat Island Effect: Non-Roof		1			1			1
Credit	7.4	Heat Island Effect: Roof		1	1			1		
Credit	8	Light Pollution Reduction		1	1			1		
Points: L = Likely, P = Possible, U = Unlikely, * = Indicates Option Pursued			**TOTALS:**	**16**	**5**	**3**	**8**	**6**	**2**	**8**

and light pollution, account for all environmental measures undertaken by a project, which are external to the building shell. This category includes sixteen credits and one prerequisite, and accounts for just under one fourth of the total points available under the LEED for Retail: New Construction rating system. See Table 5.1 for SS credits attainable by the McKinney and Aurora Stores.

[188] Table produced by author.

SS Prerequisite 1 - Construction Activity Pollution Prevention

SS Prerequisite 1 is the first of only seven mandatory prerequisites found in the LEED for Retail: New Construction rating system. This prerequisite is intended to reduce the level of pollution in the forms of erosion, sedimentation, and dust generation, typically generated by site grading and construction activities. SS Prerequisite 1 requires that the project design team create and implement an Erosion and Sediment Control Plan, which will conform to the more stringent of either local sediment and erosion standards, or those found in the 2003 EPA Construction General Permit.[189]

While no specific information has been found which addresses Erosion and Sediment Control Plans for the experimental supercenters in McKinney or Aurora, it is likely that these plans existed. Plans of this nature, which often include the use of silt fencing, earthen dykes, sediment basins, and temporary groundcover seeding, are becoming increasingly prevalent in local building codes across the country. Beyond the increasing prevalence of local codes, Wal-Mart has initiated an "aggressive program for controlling stormwater from its construction sites…implement[ing] a comprehensive training and certification program for the contractors who build its stores."[190] This program was developed in response to a $3.1 million fine levied in 2004 by the U.S. EPA for violations to the Clean Water Act.[191]

SS Credit 1 – Site Selection

SS Credit 1 is intended to reduce the impacts of development by rewarding projects located on sites which are not environmentally sensitive. To achieve this credit, projects must be located on sites which avoid previously undeveloped lands that are

[189] Green Building Rating System: LEED for Retail, 10.
[190] "Wal-Mart: Every Day Low ... Impact?".
[191] "Wal-Mart: Every Day Low ... Impact?".

within 50 feet of any water body capable of supporting fish, recreation, or industrial uses, as defined by the Clean Water Act, or with an elevation less than five feet higher than a Federal Emergency Management Agency (FEMA) designated 100-year flood plain. Project sites must also avoid: lands currently used as public parks, unless equivalent or more suitable land is given to the public landowner in exchange; lands within 100 feet of a wetland; lands classified as habitat for an endangered species; or lands designated as prime farmland, as defined by the United States Department of Agriculture in the United States Code of Federal Regulations, Title 7, Volume 6, Parts 400 to 699, Section 657.5.[192]

This credit is unlikely to be achieved by either the McKinney, TX or Aurora, CO experimental supercenters. It is unlikely that either site, being located in rapidly developing suburban areas, is within a flood plain or serves as habitat for endangered species. However, portions of both sites have soils which are classified as prime farmlands for their areas by the National Resources Conservation Service.[193]

SS Credit 2 – Development Density and Community Connectivity

This credit is intended to preserve wildlife habitat and natural resources by rewarding projects in dense or urban areas with existing infrastructure. Projects may earn a point under SS Credit 2 by selecting a previously developed site within a community having a net density of 60,000 square feet per acre, including the project. Projects may also choose a previously developed site with a residential area having a density of ten dwelling units per acre and a minimum of ten basic services located within a one-half mile radius of the main project entrance. Projects choosing the latter site condition must also have pedestrian access to the adjacent basic services, which may include, but are not

[192] Green Building Rating System: LEED for Retail, 11.
[193] "Web Soil Survey"

limited to banks, dry-cleaners, convenience stores, supermarkets, schools, day cares, post offices, fire stations, medical facilities, theaters, museums, or places of worship. Of the ten adjacent services, two may be planned for construction, so long as both have purchased or leased properties, and will be completed and operating within one year of the completion of the project applying for LEED certification.[194]

It is, once again, unlikely that either the McKinney or Aurora stores would receive points under SS Credit 2. While the site of the Aurora store was graded and stripped of all vegetation prior to Wal-Mart's acquisition of the land,[195] both sites were previously undeveloped;[196] thus eliminating the possibility of achieving this credit.

SS Credit 3 – Brownfield Redevelopment

SS Credit 3 is designed to reduce the demand for undeveloped lands by encouraging projects to rehabilitate damaged or contaminated. Projects choosing to develop sites designated by a government, agency, or group as brownfields, sites having some level of pollution, contamination, or other damage resulting from prior use or development, may earn one point for remediating the existing unfavorable conditions. Projects may achieve this credit by locating on a site which has been rehabilitated by a previous group or owner, so long as the remediation is properly documented for submission to the USGBC.[197]

As previously mentioned, both the McKinney and Aurora sites were previously undeveloped. No information has been found which would indicate the status of either site as a brownfield, making this credit unavailable to both projects.

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[194] Green Building Rating System: LEED for Retail, 12.
[195] "Aurora Experimental Wal-Mart: Site Description".
[196] "McKinney Experimental Wal-Mart: Site Description".
[197] Green Building Rating System: LEED for Retail, 13.

SS Credit 4 - Public Transportation

SS Credit 4 is one of the more unique credits in the LEED for Retail: New Construction rating system in which there are multiple options given for achieving points. Under this rating system, eight optional methods valued at one point each are available, any combination of which may be pursued for a maximum of 4 points. By addressing numerous transportation-related strategies including, public transportation access, bicycling, reduced parking capacity, and car-share programs, this credit is intended to "reduce pollution and land development impacts from automobile use."[198]

Option A: Public Transportation Access, under SS Credit 4, is likely to be achieved by the Aurora experimental supercenter. This option, which requires that the project be located within one half mile of an existing or planned commuter rail station, or that the project is within one quarter mile of one or more bus stops being served by a minimum total of two different bus lines. However, any project located near the routes of two or more bus lines can petition the appropriate transit authority to locate a stop on their site and receive this point. The Aurora store has both an on-site bus stop, and a stop on the street which forms the sites eastern border. These stops are currently served by Denver Regional Transportation District bus lines 43 and 169L respectively.[199]

Though Option A of SS Credit 4 is the only point likely to be earned by either of Wal-Mart's experimental supercenters, three of the remaining seven available options for this credit are particularly easy to incorporate into most projects. These options could be retroactively pursued by Wal-Mart at both locations, providing an opportunity to earn "extra credit" points toward the overall totals for each store. While the decision to pursue

[198] Green Building Rating System: LEED for Retail, 14.
[199] "Aurora, CO".

a credit as an afterthought, or purely for the sake of increasing a project's score, is discouraged by the USGBC, and can often prove difficult or impractical, these options are noteworthy as they may present an opportunity for a project to achieve a higher level of certification in some situations.

The first option of note, SS Credit 4 Option B, is to accommodate bicycle traffic. For a project on the scale of the McKinney and Aurora stores, this can be accomplished by providing bicycle racks sufficient to hold ten bicycles and providing a shower and lockable changing area in the employee break room, or initiating a bicycle maintenance program for employees.[200] These measures will again add a point to the project total with minimal effort.

Second in this category, Option C, would be to encourage the use of low-emitting, fuel-efficient, or alternative fuel vehicles. Projects may receive a point under this option by designating preferred parking spaces equivalent to 3% of the projects parking capacity for low-emitting and fuel-efficient vehicles. This can be accomplished by posting signage or repainting the parking spaces closest to the buildings entrances, exclusive of handicapped accessible spaces, reserving them for preferred vehicles. This point may also be achieved by providing alternative fueling stations to accommodate 3% of the projects parking capacity.[201] For a retailer such as Wal-Mart, this can be accomplished simply by selling E85 of biodiesel at the gas station which is a part of nearly every supercenter.

Lastly, and equally simple, Option F rewards projects which provide an incentive program for employees wishing to carpool. Incentives may include preferred parking,

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[200] Green Building Rating System: LEED for Retail, 15.
[201] Green Building Rating System: LEED for Retail, 15-16.

guaranteed ride home programs, or even store discount or gift cards which are given to employees as a reward for carpooling.[202]

SS Credit 5.1 – Site Development: Protect or Restore Habitat

The goal of this credit is to conserve and/or restore natural areas, providing wildlife habitat and encouraging biodiversity. These goals may be achieved through the pursuit of one of two predefined options, determined by the existing site conditions before the project begins construction.

The first of these options, available only to projects on greenfield sites, those which have never been developed or graded and remain in a natural state, requires strict limits of disturbance beyond constructed areas. Option 1 restricts all site disturbance to an area within 40 feet of the building perimeter, 10 feet of any hardscapes or utility lines less than 12 inches in diameter (15 feet for roadways and major utilities), and 25 feet beyond stormwater detention facilities, porous pavements, or other permeable constructed surfaces.[203]

The second option for achieving SS Credit 5.1 is available to sites which have been previously graded or developed. In order to meet Option B, 50% of the site area, excluding that covered by the building footprint, must be restored or protected with native vegetation. Projects incorporating green roofs may apply the roof area, if planted with native vegetation, to meet this requirement under certain circumstances.[204]

Though the McKinney, TX site was previously undeveloped,[205] the project may be able to earn a point for SS Credit 5.1 for following the intent of the credit. The site

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[202] Green Building Rating System: LEED for Retail, 17.
[203] Green Building Rating System: LEED for Retail, 19.
[204] Green Building Rating System: LEED for Retail, 19.
[205] "McKinney Experimental Wal-Mart: Site Description".

contains numerous strategies aimed at creating wildlife habitat and restoration of native vegetation. All turf areas which would be planted with Bermuda grass at a conventional store were instead planted with native grasses, while other landscaped areas, contained other native, and climate-appropriate species.[206] Larger undeveloped areas of the site were restored to native wildflower meadows planted with species which annually reseed, and are native to Northern Central Texas.[207] The site's stormwater management features, including bioswales, a landscaped stormwater retention pond, and a constructed wetland, also provide habitat for birds, waterfowl, and other fauna.[208] While it is unknown exactly what proportion of the 24 acre site these features comprise, they do accomplish the goals and intent of the credit. In this situation, a request for a Credit Interpretation Ruling during the certification process would be required to determine the status of the credit.

Wal-Mart undertook similar measures at the Aurora, CO site, which, unlike McKinney, had been graded and completely denuded of all natural features prior to their acquisition of the land.[209] The Aurora site, once again, forgoes traditional turf areas and landscaping for native grasses and plantings. Large open areas were restored to native short-grass prairie planted with nearly ten differing native species.[210] And, like McKinney, the Aurora site features a landscaped stormwater harvesting pond and constructed wetland.[211] All of these measures are once again aimed at creating wildlife habitat and restoring native vegetation to areas of the 28 acre site, following the intent of SS Credit 5.1.

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[206] "McKinney Experimental Wal-Mart: Site Description".
[207] Wal-Mart Experimental Store [McKinney, TX - Press Kit], 9.
[208] Wal-Mart Experimental Store [McKinney, TX - Press Kit], 8.
[209] "Aurora Experimental Wal-Mart: Site Description".
[210] "Aurora Experimental Wal-Mart: Site Description".
[211] Wal-Mart Experimental Store [Aurora, CO - Press Kit], 4.

SS Credit 5.2 – Site Development: Maximize Open Space

SS Credit 5.2, as the title suggests, is intended to maximize the amount of open space on a project's site, promoting wildlife habitat and biodiversity. This is accomplished by establishing a high ratio of open space when compared to the project's development footprint. This credit may be attained in one of three ways, depending upon the project site. In areas where open space requirements are established by local zoning ordinances, a project may receive a point in SS Credit 5.2 for exceeding the required amount of vegetated open space by 25%. For areas with no local zoning, a point can be earned by providing vegetated open space equal in area to the building footprint. Lastly, if a zoning ordinance exists, but does not contain an open space requirement, providing vegetated open space on 20% of the site will also earn a point under SS Credit 5.2.[212]

This credit represents a possible point for both the McKinney and Aurora stores. As both of the stores are governed by zoning ordinances without open space requirements, the McKinney and Aurora sites would receive credit for having open spaces totaling 4.8 acres and 5.6 acres respectively, totaling 20% of their 24 acre and 28 acre sites. Areas within the projects which would accrue to meet these totals include the wildflower and short-grass prairies, vegetated bioswales, and the landscaped rainwater retention ponds and constructed wetlands discussed in SS Credit 5.1, provided the ponds and wetlands have side slopes which do not exceed a 1:4 slope.[213]

SS Credit 6.1 – Stormwater Design: Quantity Control

Development of any kind can have devastating effects on local hydrology due to the reduction of pervious surfaces, particularly in the case of large-format retail

[212] Green Building Rating System: LEED for Retail, 20.
[213] Green Building Rating System: LEED for Retail, 20.

developments containing massive buildings and acres of parking. SS Credit 6.1 is intended to lessen these effects by reducing the area of impervious surfaces, reducing runoff, and eliminating stormwater contaminants by increasing opportunities for on-site infiltration. On previously undeveloped sites, or those with an existing imperviousness of 50% or less, SS Credit 6.1 may be achieved by designing stormwater systems resulting in a peak discharge rate and quantity less than or equal to the site's pre-development peak discharge for one and two-year design storms. These sites may earn a point under SS Credit 6.1 by instead implementing stream channel protection and stormwater quantity control strategies that protect receiving streams. Sites with an existing imperviousness greater than 50% may achieve this credit by designing stormwater systems resulting in a 25% decrease in runoff volume from the two-year 24-hour design storm.[214]

Both the McKinney and Aurora store would likely meet the requirements of SS Credit 6.1. At both stores, the site features which contribute wildlife habitat and open space as discussed in SS Credits 5.1 and 5.2 will contribute to the achievement of this credit. These natural features will allow on-site infiltration, while maintaining or improving the permeability of the previously undeveloped sites. Beyond these features, all stormwater falling on the roofs of the 206,000 square foot buildings, each of which accounts for approximately 4.8 acres of site area, flows into the rainwater retention ponds and constructed wetlands.[215, 216] At the McKinney store, stormwater from approximately 2 acres of the parking lot flows through the site's bioswales and is collected in the constructed wetland, while over 8,000 square feet of porous pavements allow stormwater

[214] Green Building Rating System: LEED for Retail, 22.
[215] Wal-Mart Experimental Store [McKinney, TX - Press Kit], 8.
[216] Wal-Mart Experimental Store [Aurora, CO - Press Kit], 4.

Figure 5.3: Porous pavement at McKinney, TX.[217]

to directly infiltrate.[218] These strategies are taken even further at Aurora, where all stormwater from the nearly 6 acre main parking area is collected in bioswales which flow into approximately 4 acres of infiltration beds located under the western 2/3 of the parking lot. This same area of parking lot also contains 1.59 acres of porous asphalt, and

[217] "Wal-Mart Opens First Experimental Supercenter"
[218] "McKinney Experimental Wal-Mart: Site Description".

0.27 acres of porous concrete. All stormwater facilities at the Aurora store were also designed to accommodate a 100-year design storm.[219]

SS Credit 6.2 – Stormwater Design: Quality Control

Much like SS Credit 6.1, SS Credit 6.2 is designed to reduce pollution from runoff. To meet this credit, a project must design stormwater systems to capture and treat runoff from 90% of the site's average annual precipitation using accepted best management practices. These practices must be able to remove 80% of the average post-development total suspended solids carried by stormwater. For the purposes of this credit, the USGBC accepts stormwater systems designed to accommodate 1 inch of rainfall in areas, like McKinney, TX,[220] receiving over 40 inches of annual precipitation, 0.75 inches of rainfall in areas receiving 20-40 inches annually, and 0.5 inches of rainfall in areas such as Aurora, CO,[221] which receive less than 20 annual inches, as meeting the 90% requirement.[222]

This credit, once again, is likely to be earned by both the McKinney and Aurora stores. Also, the site features that allow the projects to meet previously discussed credits contribute to the fulfillment of these requirements. All of the stormwater features listed under SS Credit 6.1 are common best management practices, which not only reduce the amount of runoff, they serve to reduce pollution and suspended solids such as silt, sediment, and other particulate contaminants. Areas at both stores covered with porous pavements, as well as the infiltration beds found at Aurora allow stormwater to directly infiltrate, trapping sediment. The remaining natural features including the meadows,

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[219] "Aurora Experimental Wal-Mart: Site Description".
[220] "McKinney, TX Weather".
[221] "Aurora, CO Weather".
[222] Green Building Rating System: LEED for Retail, 24.

Figure 5.4: Stormwater retention ponds and constructed wetlands at McKinney, TX.[223]

prairies, bioswales, and constructed wetlands serve to slow the flow of runoff, filter out sediment, and also naturally treat stormwater, reducing pollution through phytoremediation.[224]

SS Credits 7.1, 7.2, and 7.3 – Heat Island Effect: Non-Roof

These three credits are aimed at reducing the urban heat island effect experienced as a result of development. The requirements of these credits can be met by reducing the heat island effect for a designated portion of the site's hardscapes, including roads, sidewalks, and parking surfaces, through any combination of strategies which include

[223] "Wal-Mart Opens First Experimental Supercenter"
[224] "McKinney Experimental Wal-Mart: Site Description".

providing shade within 5 years of occupancy, paving with materials having a minimum Solar Reflective Index (SRI) of 29, or use of open-grid paving systems. These credits may instead be attained by placing a designated portion of the site's parking spaces under cover. For the purposes of these credits, shade must be provided by vegetation, or by roof surfaces having a SRI of at least 29. SS Credits 7.1, 7.2, and 7.3 are cumulative, earning 1 point each as determined by the reduction of heat island effect. SS Credit 7.1 is achieved by reducing the heat island effect for 25% of the project's hardscapes or covering 25% of the total parking spaces. SS Credits 7.2 and 7.3 are achieved by pursuing similar measures for 50% and 75% of hardscapes and/or parking respectively.[225]

The project team developing Wal-Mart's experimental supercenters implemented several measures addressing these credits at the store in McKinney, TX. As previously mentioned, large trees were transplanted to the site, which will shade parking surfaces, hardscapes, and structures. Wal-Mart is also testing the use of arbors, along with a variety of other shade structures, to cover areas of the parking lot and reduce the urban heat island effect. The McKinney store also incorporates light colored pavements into the parking and hardscape areas which will reflect sunlight, and further reduce heat gains.[226] The combination of these measures, along with typical Wal-Mart building practices including the use of standard concrete, which the USGBC accepts as having a SRI of 35,[227] for sidewalks and paving around loading docks and gas pumps, would likely accrue to meet the 25% requirement for SS Credit 7.1, and possibly, go so far as to earn an additional point under SS Credit 7.2.

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[225] Green Building Rating System: LEED for Retail, 26-28.
[226] "McKinney Experimental Wal-Mart: Site Description".
[227] "Benefits: Heat Island Reduction".

SS Credit 7.4 – Heat Island Effect: Roof

As with SS Credits 7.1-7.3, this credit is intended to reduce the urban heat island effect resulting from development. To earn a point under SS Credit 7.4, which specifically addresses the building's roof surfaces, the project must use high reflectance materials on 75% of the roof, have a vegetated roof covering 50% of the total building area, or a combination of the two as determined by the following formula: (Area of SRI Roof / 0.75) + (Area of Vegetated Roof / 0.5) ≥ Total Roof Area. For the purposes of this credit, low sloped roofs, those having a 2:12 pitch or less, must have a minimum SRI of 78, while those above a 2:12 pitch must have a SRI of at least 29.[228] White roofing, as used on both the McKinney and Aurora experimental Wal-Marts,[229, 230] is defined by the USGBC as having a SRI of 100,[231] fulfilling the requirements of SS Credit 7.4.

SS Credit 8 – Light Pollution Reduction

SS Credit 8 is designed to reduce the impacts of development upon nocturnal environments, and to reduce light pollution in the forms of sky-glow, light trespass, and glare. This credit requires that all interior lighting fixtures be designed and located so that the angle of maximum candela strikes an interior opaque surface and is prevented from passing through windows to the exterior, or that the fixtures automatically turn off during non-business hours. Also, all exterior lighting fixtures are required to "not exceed 80% of the lighting power densities for exterior areas and 50% for building facades and

[228] Green Building Rating System: LEED for Retail, 29.
[229] "McKinney Experimental Wal-Mart: Site Description".
[230] "Aurora Experimental Wal-Mart: Energy".
[231] Green Building Rating System: LEED for Retail, 29.

landscape features as defined by ASHRE/IESNA Standard 90.1-2004, Exterior Lighting Section, without amendments."[232]

Additional requirements for this credit are determined based upon the appropriate zone in which the project would be classified, as defined by IESNA RP-33. These zones range from Dark (LZ1) to High (LZ4), with the McKinney and Aurora stores falling under zone Medium (LZ3). Requirements for LZ3 include the design and placement of exterior site and building mounted luminaires which will not exceed an initial illuminance value of 0.2 horizontal and vertical foot-candles at the site boundary, and .01 foot-candles 15 feet beyond. The project must also document that at least 95% of the total initial designed fixture lumens are emitted within 90 degrees or less from straight down.[233]

This credit, once again, is likely to be achieved by both experimental stores. At each site, parking lot illumination, which accounts for the majority of the requirements of SS Credit 8, is provided by high efficiency, night-sky-friendly, full-cutoff luminaires.[234, 235] These fixtures, which are listed by the USGBC as a recommended technology for achieving this credit,[236] are designed to minimize light trespass and glare while maximizing visibility for on-site users.[237]

Water Efficiency Credits (WE)

Water Efficiency Credits (WE) are used to evaluate strategies within a given project which reduce the demand for utility provided potable water. Strategies and

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[232] Green Building Rating System: LEED for Retail, 30.
[233] Green Building Rating System: LEED for Retail, 30-31.
[234] "McKinney Experimental Wal-Mart: Energy".
[235] "Aurora Experimental Wal-Mart: Energy".
[236] Green Building Rating System: LEED for Retail, 31.
[237] "McKinney Experimental Wal-Mart: Energy".

Table 5.2: Water Efficiency Credits (WE).[238]

LEED FOR RETAIL: NEW CONSTRUCTION WATER EFFICIENCY (WE)		WAL-MART EXPERIMENTAL STORES						
		Location:	McKINNEY, TX			AURORA, CO		
		Type:	Large Format Retail			Large Format Retail		
		Size:	206,000 sf			206,000 sf		
		Completed:	July 2005			July 2005		
Credits		Available	Points					
Number	Description		L	P	U	L	P	U
Credit 1.1	Water Efficient Landscaping: Reduce by 50%	1	1			1		
Credit 1.2	Water Efficient Landscaping: No Potable Use or No Irrigation	1	1			1		
Credit 2	Innovative Water Technologies	1	1			1		
Credit 3.1	Water Use Reduction: 20%	1			1			1
Credit 3.2	Water Use Reduction: 30%	1			1			1
Points: L = Likely, P = Possible, U = Unlikely	**TOTALS:**	**5**	**3**	**0**	**2**	**3**	**0**	**2**

technologies found both within the building and the landscape, including rainwater harvesting, greywater reuse, and low-flow fixtures, can earn a retailer up to five points toward the project's final score. Table 5.2 lists the available WE credits as well as potential point totals for the McKinney and Aurora stores in this category.

WE Credits 1.1 and 1.2 – Water Efficient Landscaping

These credits address the use of potable and natural surface or subsurface water for landscape irrigation. Through a combination of strategies including xeriscaping, native plant use, rainwater harvesting, and efficient irrigation techniques, a project can earn one point under WE Credit 1.1 for reducing potable water use for irrigation by 50%.[239] Completely eliminating the use of potable water, or the need for irrigation altogether, will earn an additional point under WE Credit 1.2.[240]

Both WE Credits 1.1 and 1.2 are likely to be earned by the McKinney and Aurora stores. The use of native plantings in both landscapes, including the previously mentioned

[238] Table created by author.
[239] Green Building Rating System: LEED for Retail, 32.
[240] Green Building Rating System: LEED for Retail, 33.

wildflower meadows and short-grass prairies, require no irrigation after establishment. Other landscaped areas use drought-tolerant plants watered through drip-irrigation systems, which deliver water directly to the roots of specific plants, reducing water loss due to unnecessary watering and evaporation.[241, 242] Water for drip-irrigation, as well as other landscape needs, is supplied by the rainwater detention ponds and constructed wetlands which capture stormwater from the buildings' roofs and portions of the parking areas.[243, 244] Wal-Mart estimates that 95% of all irrigation water for both sites will be supplied through the rainwater harvesting systems, [245, 246] virtually eliminating the use of potable water for irrigation.

WE Credit 2 – Innovative Water Technologies

WE Credit 2 is intended to reduce the generation of wastewater. Projects earn a point under this credit for reducing sewage conveyance by 50% through the installation of low or no-flow fixtures or the use of non-potable water for waste functions. This credit can also be achieved by treating and using 50% of the project waste water on-site; wastewater must be treated to tertiary standards in order to satisfy this option.[247] Wal-Mart is likely to achieve this credit for testing water efficient technologies which include restroom sinks operated by infrared sensors, waterless urinals, and low-flow fixtures at both the McKinney and Aurora locations.[248, 249]

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[241] "McKinney Experimental Wal-Mart: Site Description".
[242] "Aurora Experimental Wal-Mart: Site Description".
[243] Wal-Mart Experimental Store [McKinney, TX - Press Kit], 8.
[244] Wal-Mart Experimental Store [Aurora, CO - Press Kit], 4.
[245] "McKinney Experimental Wal-Mart: Site Description".
[246] Wal-Mart Experimental Store [Aurora, CO - Press Kit], 4.
[247] Green Building Rating System: LEED for Retail, 34.
[248] "McKinney Experimental Wal-Mart: Site Description".
[249] "Aurora Experimental Wal-Mart: Site Description".

WE Credits 3.1 and 3.2 – Water Use Reduction

WE Credits 3.1 and 3.2 are intended to reduce demand on potable water from municipalities and other sources. Under WE Credit 3.1, projects may earn one point for reducing total potable water consumption by 20%, as compared to a baseline derived by calculating water use for the project if conventional fixtures and strategies which conform to the Energy Policy Act of 2005 were employed. Projects may earn a second point, under WE Credit 3.2, by reducing potable consumption by 30%, as compared to the baseline. For both credits, projects must include values for clothes washers, dishwashers, ice machines, food steams, pre-rinse sprays, and combination ovens in baseline calculations.[250]

It is unlikely that either the McKinney or Aurora experimental supercenters would earn points in this category. As mentioned in WE Credit 2, both stores employ water conservation strategies including low-flow and zero-flow fixtures, which reduce demand for both water supply and conveyance. However, both the McKinney and Aurora locations use water for hydronic and radiant heating systems as well as refrigeration.[251, 252] At Aurora, water is also used in the store's exterior snow-melt system, and for evaporative cooling.[253]

Water used in these non-consumption applications, referred to as process water, though not required to be of potable quality, is supplied from the local municipalities. Much of this process water is lost during use to the forces of evaporation, thereby not affecting conveyance loads. While this leaves the potential for Wal-Mart's experimental

[250] Green Building Rating System: LEED for Retail, 35-38.
[251] "McKinney Experimental Wal-Mart: Energy".
[252] "Aurora Experimental Wal-Mart: Energy".
[253] "Aurora Experimental Wal-Mart: Energy".

Table 5.3: Energy & Atmosphere Credits (EA).[254]

LEED FOR RETAIL: NEW CONSTRUCTION ENERGY & ATMOSPHERE (EA)			WAL-MART EXPERIMENTAL STORES						
			Location:	McKINNEY, TX			AURORA, CO		
			Type:	Large Format Retail			Large Format Retail		
			Size:	206,000 sf			206,000 sf		
			Completed:	July 2005			July 2005		
Credits			Available	Points					
Number		Description		L	P	U	L	P	U
Prereq	1	Fundamental Commissioning of Building Energy Systems	Required						
Prereq	2	Minimum Energy Performance	Required						
Prereq	3	Fundamental Refrigerant Management	Required						
Credit	1	Optimize Energy Performance	10	6	4		6	4	
Credit	2	On-Site Renewable Energy	3	2		1	2		1
Credit	3	Enhanced Commissioning	1	1			1		
Credit	4	Enhanced Refrigerant Management	1			1			1
Credit	5	Measurement & Verification	1	1			1		
Credit	6	Green Power	1			1			1
Points: L = Likely, P = Possible, U = Unlikely		**TOTALS:**	**17**	**10**	**4**	**3**	**10**	**4**	**3**

supercenters to earn points under WE Credit 2, the demand for the supply of this process water makes earning points under WE Credits 3.1 and 3.2 unlikely.

Energy & Atmosphere Credits (EA)

With three prerequisites and seventeen possible points available through six credits, the Energy & Atmosphere (EA) category is the most stringent, and highest scoring, section of the LEED for Retail: New Construction rating system. Credits in this category evaluate strategies and technologies concerning energy efficiency, renewable energy, and atmospheric pollution resulting from the use of refrigerants.[255] See Table 5.3 for potential point totals earned by the McKinney and Aurora stores in this category.

EA Prerequisite 1 – Fundamental Commissioning of Building Energy Systems

EA Prerequisite 1 requires the project team to include an independent Commissioning Authority who will be responsible for "[verifying] that the building's

[254] Table created by author.
[255] Green Building Rating System: LEED for Retail, 39-60.

energy related systems are installed, calibrated, and perform according to the owner's project requirements, basis of design, and construction documents."[256] The Commissioning Authority designated by the project team must be independent of the project's design and construction management and have documented experience as a Commissioning Authority for a minimum of two other building projects. The Commissioning Authority may, however, be a consultant hired by the project owner, or a qualified employee of the one of the project's design or construction firms, but must report all results, findings, and recommendations directly to the building owner.[257]

Under this prerequisite, the Commissioning Authority is required to review the Owner's Project Requirements and Basis of Design documents, as prepared and updated by the owner and project teams respectively, for completeness and clarity. He or she must also develop and implement a commissioning plan, including commissioning requirements which will be incorporated into the construction documents. The Commissioning Authority is also required to verify the installation and performance of heating, ventilation, air conditioning, and refrigeration (HVAC&R) systems, domestic hot water systems, renewable energy systems, if included, and lighting and daylighting controls, all of which shall be included in a summary commissioning report.[258]

As previously mentioned, Wal-Mart selected Architectural Energy Corporation (AEC) as the Commissioning Authority for the McKinney and Aurora stores. The company's contract with AEC not only includes the fundamental commissioning services required by EA Prerequisite 1, but also includes enhanced commissioning services which will be discussed later in EA Credit 3.

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[256] Green Building Rating System: LEED for Retail, 39.
[257] Green Building Rating System: LEED for Retail, 39.
[258] Green Building Rating System: LEED for Retail, 39-40.

EA Prerequisite 2 – Minimum Energy Performance

This prerequisite establishes minimum energy performance standards for projects pursuing certification under LEED for Retail: New Construction. Projects must be designed to comply with the mandatory and either the prescriptive or performance provisions of ASHRAE/IESNA Standard 90.1-204, without amendments. EA Prerequisite 2 encourages project teams to design building components including the building envelope, HVAC, and lighting systems for maximum energy efficiency.[259]

As mentioned earlier, Wal-Mart is the largest private purchaser of energy in the United States. With this in mind, the company designated energy efficiency as a top priority as they began developing the McKinney and Aurora experimental supercenters. To that end, many, if not a majority, of the environmental technologies being tested at these stores, which will be discussed in greater detail under EA Credit 1, are intended to reduce energy consumption. The combined effect of these technologies is anticipated to reduce energy usage at the McKinney and Aurora stores by 30%-50%,[260] far exceeding the most stringent minimum standards, and likely earning the projects multiple points in this category.

EA Prerequisite 3 – Fundamental Refrigerant Management

The intent of EA Prerequisite 3 is to reduce ozone depletion through the elimination of chlorofluorocarbon (CFC) based refrigerants in HVAC&R systems and free-standing equipment. New construction projects are required to specify equipment which does not require CFC-based refrigerants. Projects reusing existing HVAC

[259] Green Building Rating System: LEED for Retail, 41.
[260] "The Machine Goes Green".

equipment must phase out the use of all CFC-based refrigerants in a timely manner in order to meet this requirement.

Though specific documentation addressing this requirement has not been found for the McKinney, TX experimental supercenter, it is likely that CFC-based refrigerants were not used at the store, or could be phased out in order to comply with this prerequisite. It is known that the Aurora store uses R-404a, an ozone-friendly refrigerant which is free of both CFC's and HCFC's (hydrochlorofluorocarbons), for the coolant in the store's refrigeration systems.[261] Given the measures undertaken to eliminate other atmospheric pollutants, including volatile organic compounds (VOC's) and polyvinylchloride (PVC), it is likely that the project team also took measures to eliminate CFC's.[262, 263, 264]

EA Credit 1 – Optimize Energy Performance

EA Credit 1 is another of only four credits in which multiple points may be earned; and of those credits, EA Credit 1, with ten possible points, is the highest scoring credit in the entire LEED for Retail: New Construction system. EA Credit 1 is also the only credit in the LEED for Retail: New Construction system in which a minimum number of points must be earned. The intent of this credit is to encourage a level of energy performance above and beyond the minimum requirements set forth in EA Prerequisite 2.[265]

The preferred method of earning points under EA Credit 1 is to document a reduction of energy use for the entire project as compared to a typical, or baseline,

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[261] Green Building Rating System: LEED for Retail, 42.
[262] "McKinney Experimental Wal-Mart: Materials & Resources".
[263] "McKinney Experimental Wal-Mart: Indoor Environment".
[264] "Aurora Experimental Wal-Mart: Materials & Resources".
[265] Green Building Rating System: LEED for Retail, 46.

building using a whole building-project simulation which conforms to the Building Performance Rating Method in Appendix G of ASHRAE/IESNA Standard 90.1-2004, without amendments. This simulation must include all energy loads within the project from standard building systems such as interior lighting and HVAC to process loads including display lighting and food preparation equipment. In a retail setting, the model is not required to include small movable appliances, or merchandise being demonstrated. To achieve this credit, both the project being evaluated and the baseline project must meet the requirements of EA Prerequisite 2.[266]

Points for this credit, when documented using a building simulation model, are distributed via a graduated scale based upon the energy reduction between the evaluated and baseline projects. A project showing a 10.5% energy reduction over the baseline will receive 1 point under EA Credit 1, with an additional point being earned for every 3.5% increase in energy savings, up to a maximum of ten points for an energy reduction of at least 42%.[267] Projects not wanting to use a full project simulation may earn up to four points in this credit by following one of two prescriptive methods of compliance. The first of these methods, available only to buildings fewer than 20,000 square feet in area, requires the project to meet the prescriptive measures outlined in the ASHRAE Advanced Energy Design Guide for Small Retail Buildings 2004. The second method requires compliance with the Basic Criteria and Prescriptive Measures of the Advanced Buildings Benchmark Version 1.1, excluding sections 1.7, 1.11, and 1.14. When following either method of prescriptive compliance, all energy loads within the project must meet

[266] Green Building Rating System: LEED for Retail, 46-47.
[267] Green Building Rating System: LEED for Retail, 46-47.

requirements outlined in a series of tables included in the LEED for Retail: New Construction rating system under EA Credit 1.[268]

As noted earlier, energy efficiency was given top priority in the design and development of the McKinney and Aurora stores. Given the number of energy saving measures incorporated into each store, well exceeding fifteen, and that the design team performed other building simulations including a computational fluid dynamics analysis of the HVAC systems,[269, 270] it is likely that a full project energy simulation was also completed. Beyond an energy simulation, Wal-Mart has the benefit of being able to document the efficiency of the experimental stores against a real-world baseline, allowing the company to evaluate the transition between theory and reality.

Among the fifteen-plus energy efficient strategies being tested at each store are technologies which include LED lighting, high efficiency HVAC&R equipment, skylights, solar panels, and on-site wind turbines. The combined effects of these measures are estimated by Jeffrey E. Christian, director of the Buildings Technology Center of the Oak Ridge National Laboratory, to produce an energy savings of 30%-50% when compared to a baseline store.[271] In fact, energy efficiency measures in the lighting system alone are estimated to reduce electricity consumption at the Aurora store by 350,000-450,000 kilowatt-hours per year.[272]

The efforts undertaken by Wal-Mart to reduce energy consumption at the experimental supercenters are likely to be rewarded when pursuing LEED certification. On the conservative end of the anticipated energy savings, a 30% reduction, which is

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[268] Green Building Rating System: LEED for Retail, 46-53.
[269] "McKinney Experimental Wal-Mart: Team & Process."
[270] "Aurora Experimental Wal-Mart: Team & Process".
[271] "The Machine Goes Green".
[272] Lovely.

quite likely, would earn each store six points under EA Credit 1, while meeting the full estimated energy reduction of 50% would add another four points to each store's final tally. Earning the maximum number of points under this single credit, which would give a project nearly half of the 26 point minimum requirement, greatly increases the possibility that each store would attain some level of certification under the LEED for Retail: New Construction system.

EA Credit 2 – On-Site Renewable Energy

EA Credit 2 is designed to reduce the economic and environmental impacts of fossil fuel based energy production by encouraging the use of on-site renewable energy. Like EA Credit 1, this credit awards multiple points based upon the level of energy produced on-site. To meet the requirements of this credit, the amount of renewable energy produced must be expressed as a savings in annual energy costs for the project. A project reducing energy costs by 2.5 % through on-site renewable production will receive one point under EA Credit 2, with projects reducing energy costs by 7.5% or 12.5% will receive two or three points respectively.[273]

As has been common thus far, measures undertaken at the McKinney store to achieve this credit are also present at Aurora. Both stores make extensive use of photovoltaic (solar) panels in numerous locations throughout the project. At McKinney, polycrystalline photovoltaic laminates were incorporated into the canopy over the garden center, while thin-film photovoltaics were mounted to the roofs of the entry vestibules and the auto center. Amorphous and polycrystalline panels were also incorporated into the south-facing walls of the building, with the polycrystalline panels forming the

[273] Green Building Rating System: LEED for Retail, 54.

Figure 5.5: Solar panels form the "signature blue stripe" across the façade of the McKinney, TX experimental supercenter.[274]

"signature blue stripe" across the top of the front façade.[275] Additionally, solar panels are incorporated into the roof of the Aurora store,[276] and are used to power exterior monument and parking lot signage at both stores.[277, 278] Each store also produces energy from a 50 kilowatt wind turbine.[279, 280] These measures are estimated to reduce each

[274] "Photos and Images: Sustainability"
[275] "McKinney Experimental Wal-Mart: Energy".
[276] "Aurora Experimental Wal-Mart: Energy".
[277] "McKinney Experimental Wal-Mart: Energy".
[278] "Aurora Experimental Wal-Mart: Site Description".
[279] "McKinney Experimental Wal-Mart: Energy".
[280] "Aurora Experimental Wal-Mart: Energy".

store's energy consumption by approximately 8%,[281] likely earning each store 2 points under EA Credit 2.

EA Credit 3 – Enhanced Commissioning

This credit is intended to encourage projects to pursue commissioning earlier in the development process, and on a wider scope, than required by EA Prerequisite 1. For the purposes of this credit, the Commissioning Authority must meet all qualifications required by EA Prerequisite 1, with the exception that the Commissioning Authority may not be an employee of the design or construction firms when the project is larger than 50,000 square feet. Responsibilities of the Commissioning Authority for this credit include performing a review of the Owner's Project Requirements, Basis of Design, and other design documents, prior to 50% completion of the construction documents phase, as well as reviewing contractor submittals regarding commissioned systems for compliance with these documents. The Commissioning Authority is also required to develop an operations manual for future building personnel providing information on the nature and operations of the commissioned systems, as well as verify that training requirements for operating personnel and building occupants have been established. Lastly, the Commissioning Authority is required to review the operation of commissioned systems within ten months of occupancy with operation and maintenance staff, and provide a plan for correcting any commissioning-related issues.[282]

AEC, the Commissioning Authority for the McKinney and Aurora stores, was hired by Wal-Mart to perform a wide array of commissioning tasks which both meet and exceed the requirements of EA prerequisite 1, and EA Credit 3. Tasks which exceed these

[281] Yoder, 7.
[282] Green Building Rating System: LEED for Retail, 55-56.

requirements include planning and conducting meetings regarding commissioned systems, providing on-site monitoring of component and system installations, providing signage addressing the operations and maintenance of commissioned systems, and maintaining deficiency and resolution logs, among many others. In total, AEC, as the Commissioning Authority, had approximately twenty differing responsibilities throughout the development of the McKinney and Aurora stores,[283, 284] likely earning each one point under EA Credit 3.

EA Credit 4 – Enhanced Refrigerant Management

This credit is intended to reduce the emission of gasses which are environmentally hazardous and may contribute to ozone depletion and global warming. Projects may earn a point under EA Credit 4 by eliminating the use of refrigerants in aggregate, or by selecting HVAC&R equipment and refrigerants which minimize or eliminate the emission of harmful gasses as well as selecting fire suppression systems which do not use ozone-depleting substances. Following this option, all HVAC&R equipment must conform to the formula "LCGWP + LCODP x $10^5 \leq 100$," as defined under EA Credit 4 of the LEED for Retail: New Construction rating system.[285]

In this instance, there is insufficient information available regarding the refrigerants and fire suppression systems used at the McKinney and Aurora stores to make an accurate determination of the potential for earning points under EA Credit 4. Therefore, it must be assumed that it is unlikely that either store will achieve this credit.

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[283] "McKinney Experimental Wal-Mart: Team & Process."
[284] "Aurora Experimental Wal-Mart: Team & Process".
[285] Green Building Rating System: LEED for Retail, 57-58.

EA Credit 5 – Measurement & Verification

EA Credit 5 requires that project teams "develop and implement a Measurement and Verification (M&V) Plan consistent with Option D: Calibrated Simulation (Savings Estimation Method 2), or Option B: Energy Conservation Measure Isolation, as specified in the *International Performance Measurement & Verification Protocol (IPMVP) Volume III: Concepts and Options for Determining Energy Savings in New Construction, April, 2003*." The M&V plan must be implemented for a minimum of one year following substantial completion in order to receive this credit.[286]

Wal-Mart once again exceeds the requirements of this credit, having contracted with the Oak Ridge National Laboratory and the National Renewable Energy Lab to monitor the performance of the McKinney and Aurora stores respectively.[287] These organizations will not only monitor energy consumption, but will also test the performance and reliability of building systems, materials and finishes, space conditions, and water harvesting and runoff control systems.[288, 289] Each of the experimental supercenters, as well as its baseline comparison store, shall be monitored for a minimum period of three years, more than satisfying the requirements of this credit, and adding another point to each stores' tally.

EA Credit 6 – Green Power

This credit, though again not pursued at either the McKinney or Aurora stores, provides another opportunity for earning "extra credit" points. EA Credit 6 is intended to encourage the use and development of non-polluting grid-source renewable energy. To

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[286] Green Building Rating System: LEED for Retail, 59.
[287] "Wal-Mart Experimental Stores Evaluate Progress After One Year of Operation: Innovative Technologies Reveal the Retailer's Progress Toward Its Environmental Goals."
[288] "The Machine Goes Green".
[289] Lovely.

achieve this credit, projects must enter into a two-year contract to purchase renewable energy equivalent to 35% of the projects annual energy consumption. According to the USGBC, this energy "can be purchased on a centralized basis and credit attributed to a certain retail project."[290] This energy must, however, be certified as renewable by the Center for Resource Solutions' (CRS) Green-e program.[291] This credit provides projects with a means to earn a point toward their totals with no effort required beyond that of simply "writing a check."

Materials & Resources Credits (MR)

Materials & Resources Credits (MR), see Table 5.4, evaluate the use of sustainable building materials and practices. This category, representing thirteen of the seventy possible points in the LEED for Retail: New Construction rating system, encourages the use of recycled content and regional materials, as well as those that are locally sourced or rapidly renewable. The Materials & Resources category also contains the fifth of seven prerequisites within the rating system.

MR Prerequisite 1 – Storage & Collection of Recyclables

This prerequisite is intended to reduce the amount of waste produced by building occupants which is disposed of in landfills. MR Prerequisite 1 requires project teams to conduct a waste stream audit indentifying the projects five primary recyclable waste streams as determined by either weight or volume, and list the three of those five for which storage and collection space shall be provided. An easily accessible area must be

[290] Green Building Rating System: LEED for Retail, 60.
[291] Green Building Rating System: LEED for Retail, 60.

Table 5.4: Materials & Resources Credits (MR).[292]

LEED FOR RETAIL: NEW CONSTRUCTION MATERIALS & RESOURCES (MR)			WAL-MART EXPERIMENTAL STORES						
			Location:	McKINNEY, TX			AURORA, CO		
			Type:	Large Format Retail			Large Format Retail		
			Size:	206,000 sf			206,000 sf		
			Completed:	July 2005			July 2005		
Credits			**Available**	**Points**					
Number		**Description**		**L**	**P**	**U**	**L**	**P**	**U**
Prereq	1	Storage & Collection of Recyclables	Required						
Credit	1.1	Building Reuse: Maintain 75% of Existing Walls, Floor, Roof	1			1			1
Credit	1.2	Building Reuse: Maintain 95% of Existing Walls, Floor, Roof	1			1			1
Credit	1.3	Building Reuse: Maintain 50% of Interior Non-Structural Elements	1			1			1
Credit	2.1	Construction Waste Management: Divert 50% from Disposal	1		1		1		
Credit	2.2	Construction Waste Management: Divert 75% from Disposal	1			1			1
Credit	3.1	Materials Reuse: 5%	1			1			1
Credit	3.2	Materials Reuse: 10%	1			1			1
Credit	4.1	Recycled Content: 10% (post consumer + 0.5 pre-consumer)	1		1		1		
Credit	4.2	Recycled Content: 20% (post consumer + 0.5 pre-consumer)	1			1	1		
Credit	5.1	Regional Materials: 10% (Extracted, Processed, & Manufactured)	1			1	1		
Credit	5.2	Regional Materials: 20% (Extracted, Processed, & Manufactured)	1			1			1
Credit	6	Rapidly Renewable Materials	1		1		1		
Credit	7	Certified Wood	1			1		1	
Points: L = Likely, P = Possible, U = Unlikely		**TOTALS:**	**13**	**0**	**3**	**10**	**5**	**1**	**7**

dedicated to the collection, separation, and storage of recyclable materials resulting from, at minimum, the three selected waste streams identified in the waste stream audit.[293]

Separation and storage of recyclable materials is, to some extent, an already common practice at most Wal-Mart facilities. The company began experimenting with equipment known as sandwich balers which are used to compact and package cardboard and plastics, two of the company's largest waste streams, for recycling. These machines bundle the cardboard and plastic into more efficient and easier to handle bales, like those seen in Figure 5.6, which can then be neatly transported to recycling centers. In 2005, the company's sandwich baling program had been expanded to include nearly 600 stores, with nation-wide adoption planned for 2006.[294]

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[292] Table created by author.
[293] Green Building Rating System: LEED for Retail, 61.

Figure 5.6: Sandwich Bales – Bundles of cardboard and plastic ready to be recycled outside a Wal-Mart supercenter in Bristol, VA.[295]

MR Credits 1.1-1.3 – Building Reuse

These credits are designed to reduce waste, reduce demand for raw materials, and extend the lifecycle of existing building stock within communities. Projects may earn one point under MR Credit 1.1 for maintaining 75%, by surface area, of existing building structure and envelope components; excluding window assemblies and any hazardous materials. A second point may be earned under MR Credit 1.2 by preserving an additional 20% of the existing building elements for a total of 95%. Lastly, projects may

[294] "Wal-Mart: Every Day Low ... Impact?".
[295] Photo by author, August 30, 2008.

earn a point under MR Credit 1.3 by maintaining 50% of all existing, non-structural, interior building components and elements.[296]

As mentioned earlier, the McKinney and Aurora stores were constructed on previously undeveloped sites, with no existing structures to reuse. Therefore, both projects are ineligible to earn points under these credits.

MR Credits 2.1 and 2.2 – Construction Waste Management

The intent of MR Credits 2.1 and 2.2 is to reduce the burden on landfills by diverting, either through recycling or reuse, non-hazardous construction, demolition, and land clearing debris from disposal. A construction waste management plan must also be developed and implemented which identifies materials to be diverted from disposal, and where the materials are to be stored and/or separated. For the purposes of this credit, calculations may be done by weight or volume, and must exclude excavated soils. Projects diverting 50% of their construction waste earn one point under MR Credit 2.1, while those diverting 75% earn an additional point under MR Credit 2.2.[297]

It is indeed possible that both the McKinney and Aurora stores would receive a point under MR Credit 2.1, though the Aurora store is the more likely of the two. Wal-Mart does acknowledge that much, actually several thousand pounds, of the waste and debris generated during the construction of the McKinney store was recycled in lieu of disposal,[298] At Aurora, however, the company specifically states that 50%, or approximately 600,000 pounds, of the construction related debris was recycled rather than sent to a landfill.[299]

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[296] Green Building Rating System: LEED for Retail, 63-65.
[297] Green Building Rating System: LEED for Retail, 66-67.
[298] "McKinney Experimental Wal-Mart: Materials & Resources".
[299] "Aurora Experimental Wal-Mart: Materials & Resources".

MR Credits 3.1 and 3.2 – Materials Reuse

In similar fashion to MR Credits 1.1 and 1.2, MR Credits 3.1 and 3.2 are designed to reduce the demand for waste disposal as well as raw materials. Projects may earn one point under MR Credit 3.1 for incorporating sufficient reused or refurbished materials as to account for 5% of the projects total materials as determined by cost. A second point may be earned under MR Credit 3.2 by incorporating a total of 10% reused or refurbished materials.[300]

Once again, it is unlikely that either the McKinney or Aurora store would receive points under these credits. No information exists which would indicate the use of salvaged, refurbished, or otherwise reclaimed materials in the construction of either facility.

MR Credits 4.1 and 4.2 – Recycled Content

MR Credits 4.1 and 4.2 encourage the use of building products made from recycled materials. These credits require the use of materials in which the sum of post-consumer, plus one-half of the pre-consumer, recycled content represents 10% (Post-Consumer + 0.5 Pre-Consumer $\geq$ 10%) of the total materials cost for the project under MR Credit 4.1, and 20% under MR Credit 4.2. For any material having recycled content, the proportion of the weight of the recycled content, following the prior-mentioned formula, as compared to the total weight of the material should be multiplied by the cost of the complete unit to determine the cost of the recycled portion.[301]

These credits, once again, primarily apply to the Aurora store. While it is possible that the McKinney store could receive a point under MR Credit 4.1, it is likely that both

[300] Green Building Rating System: LEED for Retail, 68-69.
[301] Green Building Rating System: LEED for Retail, 70-71.

credits would be achieved at Aurora, which Wal-Mart officials refer to as “the world’s largest recycling project.”[302] Both stores use finishing materials, such as linoleum flooring, which have recycled content, and both use approximately 800 tons of flyash, a post-industrial byproduct of the coal industry, in the concrete forming the slab and foundations of each building. Both stores also have sections of concrete with up to 50% slag content. This post-industrial byproduct of the iron industry is used to replace Portland cement in concrete mixtures.[303, 304]

The Aurora store takes this theme even farther. Beyond typical recycled finishes like linoleum, the Aurora store uses newly developed and innovative products including countertop materials comprised of 75% recycled glass and concrete.[305] The split-faced block used along most of the building’s exterior walls are post-industrial masonry units made from recycled materials. In the store’s landscape, paths are constructed of recycled rubber, bridges along the paths are built from recycled plastic and lumber, and concrete reclaimed from the demolition of the old Denver Stapleton Airport’s runways was recycled into the headwalls of the landscape bridges.[306] Nearly 10,000 cubic yards, or over 16,000 tons, of recycled concrete, 518 tons of which came from the demolition of Stapleton’s runways,[307] was used as base material for concrete and pavements, as well as bedding material for subterranean piping. The Aurora store is also testing recycled asphalt pavements with up to 25% recycled content in sections of the parking lots.[308] Given that the calculations for MR Credits 4.1 and 4.2 are based upon the weight of

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[302] Lovely.
[303] "McKinney Experimental Wal-Mart: Materials & Resources".
[304] "Aurora Experimental Wal-Mart: Materials & Resources".
[305] Lovely.
[306] "Aurora Experimental Wal-Mart: Materials & Resources".
[307] Lovely.
[308] "Aurora Experimental Wal-Mart: Materials & Resources".

recycled content within materials, and that the majority of the project's recycled content is comprised of particularly heavy materials such as masonry and pavements, it is likely that the store will meet the 20% requirement necessary to earn points under both credits.

MR Credits 5.1 and 5.2 – Regional Materials

These credits are intended to reduce the environmental impacts resulting from the transportation of building materials and to encourage the use of locally sourced and manufactured indigenous materials. These credits require the use of materials that are in-part or completely extracted, processed, and manufactured within a 500 mile radius of the project site. Projects with 10% of their materials, based on cost, will earn one point under MR Credit 5.1, while those with 20% will earn a second under MR Credit 5.2. As in the previous credits, products only partially containing regional materials must calculate the regional value by weight.[309]

The Aurora experimental supercenter is likely to receive a point under MR Credit 5.1 for the use of recycled concrete from the demolition of the Denver Stapleton Airport, as mentioned in the previous credits. This material was supplied by Recycled Materials Company Incorporated (RMCI), a locally based company specializing, as the name would suggest, in recycled materials. RMCI was the company primarily responsible for the demolition and salvage of Stapleton's runways.[310]

MR Credit 6 – Rapidly Renewable Materials

This credit encourages the use of rapidly renewable materials thereby reducing demand for finite raw materials and those with a long-term renewal cycle. Projects earn one point under MR Credit 6 by using rapidly renewable materials to account for 2.5% of

[309] Green Building Rating System: LEED for Retail, 72-73.
[310] Lovely.

all building materials, as determined by cost. For the purposes of this credit, rapidly renewable materials are defined as those generally produced from plant materials typically harvested on a ten-year cycle or less.[311]

While it is known that Wal-Mart incorporated linoleum flooring, a rapidly renewable material, into the McKinney and Aurora stores, little is mentioned of other renewable materials at McKinney. However, numerous bio-based renewable materials, including bamboo flooring, millwork, and furniture, cork tack boards, and wheat-based wainscoting, were used at Aurora.[312] Given the number of sustainable practices and elements common to both stores, and that the stores were designed by the same team, it is possible, and logical to assume, that renewable materials similar to those at Aurora were also used at McKinney, though this is undocumented. The number of rapidly renewable materials used at Aurora will likely satisfy the 2.5% minimum requirement, earning a point under MR Credit 6.

MR Credit 7 – Certified Wood

MR Credit 7 is intended to encourage sustainable forestry techniques and management by rewarding projects using lumber and wood products which have been certified by the Forrest Stewardship Council (FSC). To earn a point under this credit, projects must use FSC certified wood and lumber products to account for a minimum of 50% of all permanently installed and non-rented temporary wooden materials.[313]

Here again, no specific information has been found which would indicate a significant use of FSC certified wood products at either the McKinney or Aurora stores.

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[311] Green Building Rating System: LEED for Retail, 74.
[312] "Aurora Experimental Wal-Mart: Materials & Resources".
[313] Green Building Rating System: LEED for Retail, 75.

Table 5.5: Indoor Environmental Quality Credits (EQ).[314]

LEED FOR RETAIL: NEW CONSTRUCTION INDOOR ENVIRONMENTAL QUALITY (EQ)				WAL-MART EXPERIMENTAL STORES						
				Location:	McKINNEY, TX			AURORA, CO		
				Type:	Large Format Retail			Large Format Retail		
				Size:	206,000 sf			206,000 sf		
				Completed:	July 2005			July 2005		
Credits				**Available**	**Points**					
Number		**Description**			**L**	**P**	**U**	**L**	**P**	**U**
Prereq	1	Minimum IAQ Performance		Required						
Prereq	2	Environmental Tobacco Smoke (ETS) Control		Required						
Credit	1	Outdoor Air Delivery Monitoring		1	1			1		
Credit	2	Increased Ventilation		1			1			1
Credit	3.1	Construction IAQ Management Plan: During Construction		1			1			1
Credit	3.2	Construction IAQ Management Plan: Before Occupancy		1			1			1
Credit	4	Low-Emitting Materials		4	4			4		
		Adhesives & Sealants	(1 Point)		*			*		
		Paints & Coatings	(1 Point)		*			*		
		Flooring	(1 Point)		*			*		
		Composite Wood & Agrifiber Products	(1 Point)		*			*		
		Furniture	(1 Point)							
		Ceiling & Wall Systems	(1 Point)							
Credit	5	Indoor Chemical & Pollutant Source Control		1			1			1
Credit	6	Controllability of Systems: Lighting & Thermal Comfort		1			1			1
Credit	7.1	Thermal Comfort: Design		1			1		1	
Credit	7.2	Thermal Comfort: Employee Verification		1			1			1
Credit	8.1	Daylight & Views: Daylight 75% of Spaces		1	1			1		
Credit	8.2	Daylight & Views: Views for 90% of Spaces		1			1			1
Points: L = Likely, P = Possible, U = Unlikely, * = Indicates Option Pursued			**TOTALS:**	**14**	**6**	**0**	**8**	**6**	**1**	**7**

Therefore, it must be assumed that neither location shall meet the requirements of this credit.

Indoor Environmental Quality Credits (EQ)

Indoor Environmental Quality Credits (EQ) are designed to protect the health and comfort of building occupants. Comprised of two prerequisites and eleven credits, this section accounts for fourteen of the seventy possible points that make up the LEED for Retail: New Construction rating system. These credits promote healthy indoor air quality (IAQ) through the reduction of harmful chemicals including volatile organic compounds

[314] Table created by author.

(VOC's) and tobacco smoke. These credits also place an emphasis on other factors contributing to occupant well-being such as thermal comfort, proper ventilation, and lighting quality. Point totals for the McKinney and Aurora stores in this category are listed in Table 5.5.

EQ Prerequisite 1 – Minimum IAQ Performance

This prerequisite is intended to increase the comfort and well-being of building occupants by establishing minimum IAQ performance standards for building systems. EQ Prerequisite 1 requires mechanical and ventilation systems within a project to meet the minimum requirements of ASHRAE standard 62.1-2004, sections 4-7. For the purposes of this credit, projects must follow the Ventilation Rate Procedure of the aforementioned standard, or applicable local codes, whichever is more stringent.[315] No documentation has been found which supports or disproves compliance with this prerequisite for either the McKinney or Aurora stores. However, should Wal-Mart decide to follow through with certification of these stores at some point in the future, this requirement would have to be met. Regardless of the total points received by any project, failure to comply with even one prerequisite would disqualify a project for certification by the USGBC.

EQ Prerequisite 2 – Environmental Tobacco Smoke Control

EQ Prerequisite 2 requires, as the title would suggest, that measures be taken to control exposure to tobacco smoke. Compliance with this prerequisite can be achieved by following one of two options; the simplest of which is to prohibit smoking within the building while providing designated exterior smoking areas which are a minimum of 25 feet from entrances, operable windows, or outdoor air intakes. EQ Prerequisite 2 may

[315] Green Building Rating System: LEED for Retail, 76.

also be achieved by providing designated smoking rooms within the building. However, these spaces must be isolated from all non-smoking areas of the building, including ventilation systems. These areas must be separated from other spaces by air-tight partitions extending from the floor slab to the roof deck, vented directly to the outdoors, and be vented sufficiently to create a negative air pressure within the room compared to adjacent areas when all doors into the room are closed.[316]

Once again, no specific documentation has been found addressing this prerequisite. However, this requirement is exceptionally simple to achieve retroactively. By following the first option mentioned, a change in store policy, placement of additional signage, and the provision of a few exterior cigarette receptacles would satisfy this requirement.

EQ Credit 1 – Outdoor Air Delivery Monitoring

This credit is intended to improve indoor air quality by monitoring outdoor ventilation rates and carbon dioxide (CO_2) levels. In order to achieve this credit, a permanent monitoring system providing an alarm to building operators through an automation system, or a visual or audible alarm to building occupants when ventilation conditions vary by 10% or more from design parameters. For mechanically ventilated areas, this system must monitor CO_2 levels in a zone 3 feet - 6 feet above the building floor in densely occupied spaces. In non-densely occupied areas the system must also monitor the rate of outdoor ventilation with an accuracy of 15% above or below the design standards established in EQ Prerequisite 1.[317]

[316] Green Building Rating System: LEED for Retail, 77.
[317] Green Building Rating System: LEED for Retail, 78.

Both the McKinney and Aurora stores are likely to receive a point toward their respective totals under EQ Credit 1. Ventilation systems at both locations are carefully monitored and are equipped with multiple CO_2 sensors. Information gathered from these sensors is used to adjust ventilation rates within the buildings as necessary to maintain proper carbon dioxide levels.[318, 319]

EQ Credit 2 – Increased Ventilation

This credit is designed to improve indoor air quality by providing increased ventilation and fresh air. In order to earn a point under EQ Credit 2, mechanically ventilated projects must increase outdoor air ventilation in all occupied spaces by 30% above the rates established in ASHRAE Standard 62.1-2004 in EQ Prerequisite 1.[320]

The ventilation systems at both the McKinney and Aurora stores are controlled by carbon dioxide monitors which adjust ventilation rates based upon current indoor air conditions. This system is specifically designed to conserve energy by eliminating unnecessary mechanical ventilation.[321, 322] Therefore, it is unlikely that either store would earn points under EQ Credit 2.

EQ Credit 3.1 and 3.2 – Construction IAQ Management Plan

EQ Credits 3.1 and 3.2 are intended to reduce indoor airborne contaminants resulting from the construction process. Projects may earn one point under EQ Credit 3.1 by developing a construction phase IAQ management plan which will: meet or exceed the control measures established in the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) IAQ Guidelines for Occupied Buildings under

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[318] "McKinney Experimental Wal-Mart: Energy".
[319] "Aurora Experimental Wal-Mart: Energy".
[320] Green Building Rating System: LEED for Retail, 79.
[321] "McKinney Experimental Wal-Mart: Energy".
[322] "Aurora Experimental Wal-Mart: Energy".

Construction, 1995, Chapter 3; protect absorptive materials either stored or installed on site from moisture; and, dictate the use and exchange of quality filtration media in all air handling and HVAC equipment which is operational during construction. Projects may earn a point under EQ Credit 3.2 by developing an IAQ management plan which designates that all spaces be flushed with outside air to a total volume of 14,000 cubic feet per square foot following the completion of construction, yet prior to occupancy. Alternatively, a point may be earned under EQ Credit 3.2 by developing an IAQ management plan which designates that indoor air must be tested in accordance with the United States Environmental Protection Agency Compendium of Methods for the Determination of Air Pollutants in Indoor Air within fourteen days of initial occupancy. Under this option, spaces with test results containing pollutant levels exceeding those defined in EQ Credit 3.2 of the LEED for Retail: New Construction rating system must be flushed with outside air and retested until pollutant levels are within acceptable ranges.[323]

These credits are, once again, considered unlikely to be achieved by either the McKinney or Aurora stores due to a lack of information regarding IAQ management plans or flush-out procedures.

EQ Credit 4 – Low-Emitting Materials

EQ Credit 4 is intended to reduce malodorous, irritating, and harmful airborne contaminants typically resulting from the release of volatile organic compounds by building finishes. Much like SS Credit 4, there are multiple options available in which to meet this credit; any combination of which can accrue to earn a project up to four points. These options include reducing the VOC content for building products including

[323] Green Building Rating System: LEED for Retail, 80-82.

adhesives and sealants, paints and coatings, flooring, composite wood and agrifiber products, furniture, and ceiling and wall systems. VOC limits for each of these materials are established within the LEED for Retail: New Construction rating system in the form of tables and/or reference standards.[324]

Adhesives and sealants applied on-site and inside the building must meet a number of standards in order to earn a point under EQ Credit 4. All non-aerosol adhesives, sealants, and sealant primers must comply with South Coast Air Quality Management District (SCAQMD) Rule 1168, as amended January 7, 2005, and effective July 1, 2005. Aerosol adhesives, on the other hand, must meet the requirements of Green Seal Standard for Commercial Adhesives GS-36 which are in effect as of October 19, 2000. VOC limits corresponding to these standards are listed in a table under EQ Credit 4, Option A of the LEED for Retail: New Construction Rating system.[325]

Projects may also earn a point for applying similar reference standards to paints and coatings used within the project. All architectural paints, coatings, and primers are required to meet the specifications established in the first edition of Green Seal Standard GS-11 as of May 20, 1993, while anti-corrosive and anti-rust paints must conform to the second edition of Green Seal Standard GC-03, effective January 7, 1997. Clear wood finishes, floor coatings, stains, and shellacs must also not exceed the VOC limits established in SCAQMD Rule 113, effective January 1, 2004.[326]

Reduction of VOC's within flooring materials will potentially add another point to the project's total under EQ Credit 4. To achieve this point, all carpets and padding, where applicable, must meet the requirements of the Carpet and Rug Institute's Green

[324] Green Building Rating System: LEED for Retail, 83-89.
[325] Green Building Rating System: LEED for Retail, 83.
[326] Green Building Rating System: LEED for Retail, 84.

Label program, while any hard surface flooring must be certified, by an independent third party, as meeting FloorScore standards. Any adhesives used during the installation of flooring materials, including tile setting adhesives and grout, are required to comply with the previously listed standards for adhesives and sealants, and any finishes applied to flooring materials must follow SCAQMD Rule 113, as mentioned above.[327]

Composite wood and agrifiber products used to comply with EQ Credit 4 must not contain urea-formaldehyde resins or any laminating adhesives, whether applied on-site or during manufacturing, containing urea-formaldehyde. These products, as well as those previously mentioned under EQ Credit 4, (with the exception of furnishings) will qualify for this credit if they comply with the testing and product requirements established in the California Department of Health Services Standard Practice for the Testing of Volatile Organic Emissions From Various Sources Using Small-Scale Environmental Chambers, including 2004 addenda.[328] This standard is also the only requirement for ceiling and wall systems used to earn a point under EQ Credit 4.[329]

The use of furnishings, including displays and shelving, containing low-VOC or zero-VOC materials may also earn a point under EQ Credit 4. In order to earn this point, adhesives, sealants, paints, coatings, composite wood, and agrifiber products used within the furniture must comply with the applicable standards set forth for individual materials in EQ Credit 4. All furnishings must also be Greenguard Indoor Air Quality Certified or meet the "calculated indoor air quality concentrations that are less than or equal to those established in Table 1 [under EQ Credit 4, Option E of the LEED for Retail New Construction rating system] for furniture systems and seating determined by a procedure

[327] Green Building Rating System: LEED for Retail, 85-86.
[328] Green Building Rating System: LEED for Retail, 87.
[329] Green Building Rating System: LEED for Retail, 89.

based on the U.S. Environmental Protection Agency's Environmental Technology Verification (ETV) Large Chamber Test Protocol for Measuring Emissions of VOC's and Aldehydes (September 1999) testing protocol conducted in an independent air quality testing laboratory."[330]

Both of Wal-Mart's experimental supercenters are likely to earn the maximum of four points each under EQ Credit 4. The company expressly states that both low-VOC and zero-VOC materials were used in both stores, specifically mentioning paints, adhesives, flooring, and furniture in reference to the Aurora store.[331, 332] Also in an effort to improve indoor environmental quality, Wal-Mart greatly reduced and eliminated, where possible, the use of polyvinyl chloride (PVC) based plastics throughout the projects.[333, 334] While these efforts are not recognized in the standard list of EQ Credits, each store will likely receive a point for these measures as an Innovation & Design Process Credit which will be discussed later.

EQ Credit 5 – Indoor Chemical and Pollutant Source Control

EQ Credit 5 is intended to limit the exposure of building occupants to particulates and hazardous chemicals. In order to achieve this credit, projects are required to install permanent entryway systems at all entrances from the outdoors which are designed to capture particulate contaminants and limit their introduction to the building's interior. Projects are also required to ventilate interior spaces where hazardous chemicals are used or stored such that a negative air pressure is created within the space when compared to adjacent areas with all doors between the spaces closed. Lastly, projects pursuing EQ

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[330] Green Building Rating System: LEED for Retail, 87-89.
[331] "McKinney Experimental Wal-Mart: Indoor Environment".
[332] "Aurora Experimental Wal-Mart: Materials & Resources".
[333] "McKinney Experimental Wal-Mart: Materials & Resources".
[334] "Aurora Experimental Wal-Mart: Materials & Resources".

Credit 5 must provide high efficiency filtration media for all supply air directed to regularly occupied spaces prior to occupancy.[335]

The information available at the writing of this thesis is insufficient to accurately determine the accomplishment of the requirements for this credit. It is therefore assumed that neither the McKinney nor Aurora stores will earn points under EQ Credit 5.

EQ Credit 6 – Controllability of Systems: Lighting and Thermal Comfort

This credit is designed to ensure the comfort of building occupant through the provision of user controls for lighting and thermal comfort systems. Projects may earn a point under EQ Credit 6 by providing individual lighting control capabilities to 90% and individual thermal controls to 50% of all employees working in the project's office and administrative areas, allowing occupants to adjust these parameters to suit individual task and personal requirements.[336]

As previously mentioned, most all Wal-Mart facilities are automated to some extent, particularly within the publicly occupied areas. However, insufficient information exists to determine the controllability of environmental systems within the administrative areas of the McKinney and Aurora experimental supercenters. For these reasons, it must be assumed that both locations are unlikely to receive points under EQ Credit 6.

EQ Credit 7.1 – Thermal Comfort Design

This credit is intended to "provide a comfortable thermal environment that supports the productivity and well-being of building occupants."[337] In order to meet the intent of this credit, a project's HVAC systems and building envelope must be designed

[335] Green Building Rating System: LEED for Retail, 90.
[336] Green Building Rating System: LEED for Retail, 90.
[337] Green Building Rating System: LEED for Retail, 92.

to meet the requirements set forth in ASHRAE Standard 55-2004.[338] This standard is used to establish standards based upon psychometric values, including temperature humidity and airflow, which affect the perceived comfort of building occupants.

EQ Credit 7.1 is one of the few credits in the LEED for Retail: New Construction rating system that applies only to the Aurora store. Though many of the experiments being conducted by Wal-Mart are repeated at both stores, there are HVAC technologies that are unique to Aurora, and require specialized psychometric design, the most notable of which is the use of an indirect evaporative cooling system that capitalizes on the hot dry air that is typical of the Aurora climate. The design of this system, as well as the displacement air distribution system found at both stores, required the evaluation of psychometric values such as wet-bulb and dry-bulb temperatures (factors which account for both air temperature and humidity) as well as air flow velocity in order to ensure the comfort of building occupants.[339]

EQ Credit 7.2 – Thermal Comfort Verification

EQ Credit 7.2, the last notable opportunity for an "extra credit," is intended to ensure the thermal comfort of building occupants over time. In order to meet this credit, projects are required to implement an anonymous survey of building employees with regard to their thermal comfort. This survey should be initiated within 6-18 months of occupancy, and assess overall satisfaction with the buildings thermal performance, and identify any temperature related issues. A plan to resolve any issues should be developed if more that 20% of those surveyed are dissatisfied with the buildings temperature. This

[338] Green Building Rating System: LEED for Retail, 92.
[339] "Aurora Experimental Wal-Mart: Energy".

plan is also required to measure environmental variables in accordance with ASHRAE Standard 55-2004, should any problem areas be identified.[340]

Though there is insufficient information to know if this procedure occurs at either the McKinney or Aurora stores, this credit could essentially be achieved at either location by simply asking employees if their work areas are too hot or too cold.

EQ Credit 8.1 – Daylight 75% of Spaces

EQ Credit 8.1 is intended to provide a visual connection between indoor and outdoor space by providing access to natural light and views. This credit can be achieved by providing daylighting and/or views for 75% of regularly occupied spaces as documented through design calculations, building simulation, or measurements taken from within the constructed project. Projects qualifying for this credit by the calculation method must provide a minimum glazing factor of 2% for 75% of spaces, as calculated by the formula (Window Area in SF / Floor Area in SF) x (Window Geometry Factor) x (Actual T_{vis} / Minimum T_{vis}) x (Window Height Factor) = Glazing Factor. A computer simulation being used to achieve this credit must demonstrate a minimum illumination level of 25 horizontal foot-candles at a height of 30 inches above the floor for 75% of regularly occupied spaces when simulated under clear sky conditions at noon on the equinox. Lastly, projects attempting to earn this credit may prove daylight illumination levels of at least 25 horizontal foot-candles for 75% of spaces when measured on a 10 foot by 10 foot grid with reading documented at corresponding points on the floor plan. Projects for which adequate daylight levels cannot be practically achieved through

[340] Green Building Rating System: LEED for Retail, 93.

vertical windows may also earn a point under EQ Credit 8.1 by providing skylights equating to 3%-6% of the roof area covering applicable spaces.[341]

This credit is easily achieved not only by both the McKinney and Aurora stores, but with nearly all modern Wal-Mart facilities. Wal-Mart has been incorporating skylights as a standard component in new store construction for years, particularly since the development of their "Eco-Mart" in Lawrence, KS in 1993.[342] This practice is expanded upon with both experimental stores which include the incorporation of standard skylights and clerestory windows at McKinney,[343] while Aurora uses a saw-tooth roof design providing multiple expanses of clerestory windows as well as active, solar-tube, and conventional skylights to bring daylight into the store.[344] [See Figure 5.7] According to Don Moseley, Wal-Mart's director of experimental stores, the skylights at both stores are equal to approximately 3%-5% of the total floor area.[345]

EQ Credit 8.2 –Views for 90% of Spaces

EQ Credit 8.2 is intended to provide building occupants with a visual connection to the outdoors by providing daylight and exterior views to 90% of all occupied spaces. Projects may earn a point under this credit for providing a direct line of sight from the majority of interior spaces to vision glazing located in a zone from 2'6"-7'6" above the finished floor.[346]

As mentioned in EQ Credit 8.1, both the McKinney and Aurora stores use numerous daylighting strategies. However, glazing which could provide exterior views is

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[341] Green Building Rating System: LEED for Retail, 94-95.
[342] Wann, Deep Design: Pathways to a Livable Future, 161-162.
[343] "McKinney Experimental Wal-Mart: Energy".
[344] "Aurora Experimental Wal-Mart: Energy".
[345] "Wal-Mart: Every Day Low ... Impact?".
[346] Green Building Rating System: LEED for Retail, 96.

Figure 5.7: Active skylights and white membrane roofing at Aurora, CO.[347]

located only within clerestories placed above the heights defined as meeting the requirements of EQ Credit 8.2. Therefore, it is unlikely that either facility will earn points under this credit.

Innovation & Design Process Credits (ID)

These credits are intended to reward projects which go above and beyond the basic requirements of other credits within the rating system, as well as those which demonstrate innovative performance using techniques and/or technologies not addressed by other credits or categories. These credits are meant to be flexible, allowing project teams to explore new options while still receiving points toward their project's totals. In

[347] "Wal-Mart Opens 2nd Experimental Supercenter"

Table 5.6: Innovation & Design Process Credits (ID).[348]

LEED FOR RETAIL: NEW CONSTRUCTION INNOVATION & DESIGN PROCESS (ID)			WAL-MART EXPERIMENTAL STORES						
			Location:	McKINNEY, TX			AURORA, CO		
			Type:	Large Format Retail			Large Format Retail		
			Size:	206,000 sf			206,000 sf		
			Completed:	July 2005			July 2005		
Credits			Available	Points					
Number		Description		L	P	U	L	P	U
Credit	1.1	Innovation in Design - Pre-Approved Option D (Both Stores)	1	1			1		
Credit	1.2	Innovation in Design - Acres for America Program (Both Stores)	1	1			1		
Credit	1.3	Innovation in Design - Elininate or Reduce PVC (Both Stores)	1	1			1		
Credit	1.4	Innovation in Design - West Wall Ceramic Paint (McKinney) Innovation in Design - Above & Beyond MR Credit 4.2 (Aurora)	1		1			1	
Credit	2	LEED Accredited Professional	1	1			1		
Points: L = Likely, P = Possible, U = Unlikely		**TOTALS:**	**5**	**4**	**1**	**0**	**4**	**1**	**0**

order to achieve these credits, up to a maximum of 5 points, projects may follow a set of pre-approved options, or may propose their own means of compliance. For proposed ID Credits, the project team must identify the intent of the innovation, propose requirements for achievement, document compliance, and list a design approach which might be used to meet the proposed requirements. See Table 5.6 for likely point distribution in this category for both stores.

ID Credit 1.1 – Pre-Approved Option D

ID Credit 1.1 Pre-Approved Option D is one of four methods designated by the USGBC which will automatically allow a project to earn points in the ID category. This option encourages the use of LEED projects as a method of teaching building visitors and occupants about green technologies and the impacts buildings have upon the environment. In order to achieve a point for this option, projects must incorporate an actively instructional educational program into the design of the building which must

[348] Table created by author.

include at least two of three potential educational strategies. Projects may choose to post informational signage throughout the project which describes green techniques and technologies being used, as well as the benefits of green building; or to develop a manual, guideline, or case study based upon the successes of the project which will be made available to the USGBC and be used to inform the design of future projects. Project teams pursuing this option may also choose to incorporate an educational outreach program or guided tour into the project, using it as an example of sustainable living.[349]

Both the McKinney and Aurora stores meet the qualifications necessary to earn a point under ID Credit 1.1 Option D. Each store has educational kiosks placed throughout the building which include interpretive and non-interpretive signage and computer monitors which display information regarding the building experiments, their benefits, and real-time performance data. Signs and take-home brochures designed to complement the educational kiosks are also placed throughout the stores,[350, 351] which also provide guided tours to building visitors.[352]

ID Credit 1.2 – Acres for America Program

This is one of two proposed ID Credits which apply to both experimental stores. Much like SS Credit 5.1, this credit is intended to preserve wildlife habitat, encourage biodiversity, and reduce the impact of development upon the environment through conservation. However, rather than conserving on-site habitat, this credit would be based upon Wal-Mart's Acres for America program, introduced in 2005, which seeks to

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[349] Green Building Rating System: LEED for Retail, 99.
[350] "McKinney Experimental Wal-Mart: Team & Process."
[351] "Aurora Experimental Wal-Mart: Team & Process".
[352] Gunther.

preserve at least one acre of priority wildlife habitat for every current and future acre of land developed for company use.

This program is a partnership between Wal-Mart and the National Fish and Wildlife Foundation (NFWF) in which Wal-Mart has committed $35 million over the next ten years for the conservation of habitat. This money will be donated to the NFWF for use to purchase and conserve, at their discretion, lands they deem to be priority wildlife habitat. Under this program, the NFWF will "identify key habitats throughout the country working in partnership with the nation's local, state, and national conservation organizations and public land management agencies."[353] This program was expected to conserve a minimum of 138,000 acres during the initial ten year period; however, the first grants announced under this program which will conserve lands in the Catahoula National Wildlife Refuge in Louisiana, the North Rim of the Grand Canyon in Arizona, and the Downeast Lakes Forestry Partnership in Maine, among others, will permanently reserve over 321,000 acres.[354]

In order to meet the USGBC's requirements for ID Credits, requirements for achieving this credit, which would likely include the donation of funds to a nonprofit wildlife conservation organization, such as the NFWF, for the express purposes of purchasing and conserving an area of priority wildlife habitat equivalent to, or larger than, the total site area, would have to be established. Achievement of these requirements, which would also serve as a method of compliance, would likely have to be documented in the form of receipts or other proof of the donation, plus copies of the deed(s) or lease(s) for the conserved habitat.

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[353] "Wal-Mart Pledges One Acre for Every Acre Developed".
[354] "Wal-Mart Pledges One Acre for Every Acre Developed".

ID Credit 1.3 – Eliminate or Reduce PVC

This credit, which is again proposed for both stores, is intended to reduce environmental pollutants resulting from the manufacture, use, and disposal of chlorine based plastics which pose potential hazards to project occupants and the environment at large. Potential requirements for meeting this credit could be modeled after Materials Credit 7 of the Green Building Council of Australia's Green Star Office Design v3 rating system. The Green Building Council of Australia and their Green Star program are the Australian equivalents of the USGBC and LEED, which provide a set of voluntary rating systems that encourage and recognize sustainable building practices in Australia. Green Star Materials Credit 7: PVC Minimisation provides an opportunity for a project to earn two points under their rating system; one for reducing the cost of PVC content by 30% through replacement with alternative materials, and a second for a 60% reduction.[355]

For the purposes of a LEED ID Credit, which is worth a maximum of one point, a logical requirement would be to follow the 30% reduction in cost of PVC content. PVC content value could be determined by calculations based upon those discussed in MR Credit 5.2 in which the proportion of PVC content weight to the weight of other content is multiplied by the unit cost for a given material. These calculations could be performed for both typical materials and the implemented reduced-PVC/zero-PVC materials in order to document the required reduction. Continuing with USGBC Requirements for ID Credits, potential strategies for achieving this credit would be to substitute alternative materials such as linoleum flooring and EPDM roofing for PVC-based materials like vinyl flooring and vinyl roofing membranes.

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[355] Green Building Council of Australia, Green Star - Office Rating Tools v3.

As mentioned earlier, Wal-Mart has taken steps to reduce or eliminate the use of PVC at both the McKinney and Aurora stores. As Wal-Mart's director of experimental stores stated, "There's a lot of debate about the off-gassing to make and dispose of these products, so we put forth an enormous effort to avoid chlorine-based plastics."[356] At McKinney, the company specifically used EPDM roofing and linoleum flooring as opposed to PVC-based products.[357] At Aurora, however, this was taken even farther by reducing or eliminating PVC content from not only roofing and flooring, but also from "irrigation systems, cart bumpers, wire and cable insulation, ceiling tiles, metal and fiberglass trim, and cooler doors."[358]

ID Credit 1.4 – West Wall Ceramic Paint

This credit, which specifically addresses the McKinney experimental store, is similar in intent and scope to SS Credit 7.4 which is aimed at reducing the urban heat island effect through the use of high reflectance materials. In this instance, however, rather than focusing on the project's roof, attention is being given to the western building façade. By increasing the reflectance of the west-facing wall, this credit would mitigate the intensive thermal effects resulting from exposure to the harsh afternoon sun.

Likely requirements for this credit would include the use of materials and/or finishes having a Solar Reflectance Index (SRI) of similar requirements to those specified for steep sloped roofing materials in SS Credit 7.4. As building facades have a vertical orientation which is typically within a few degrees of perpendicular to the ground plane, they share more characteristics with sloping rather than flat roofs. This orientation, again similar to sloping roofs, also increases the likelihood of generating glare when given a

[356] Lovely.
[357] "McKinney Experimental Wal-Mart: Materials & Resources".
[358] "Aurora Experimental Wal-Mart: Materials & Resources".

relatively high reflectance. A balance these factors, as well as aesthetics, would logically support a minimum SRI of 29. Documentation requirements and potential strategies for this could also be modeled from those set forth in SS Credit 7.4.

At McKinney, the western building façade was coated with a special ceramic paint which has a high reflective value. This is expected to reduce solar gains within the building and to have overall effects similar to the white EPDM membrane used on the building's roof. Wal-Mart estimates that the thermal gains prevented by the reflective coating on the west wall alone will reduce cooling loads, saving approximately 7,000 kilowatt-hours of electricity each year.[359] As the actual SRI of the material used is unknown, prudence would dictate that the achievement of this credit must be listed as possible rather than likely.

ID Credit 1.4 – Above and Beyond MR Credit 4.2

For the Aurora store, ID Credit 1.4 should be considered for the possibility that the extensive use of recycled content materials throughout the project would exceed the 20% requirement of MR Credit 4.2. This credit would share the intent, documentation requirements, and potential strategies of achievement found in MR Credit 4.2, but would have an increased requirement for recycled content. As the threshold of achievement increases from 10% recycled content in MR Credit 4.1 to 20% in MR Credit 4.2, a logical requirement for this credit would be another 10% increase to a total of 30% recycled content. The possibility that the Aurora Store would meet this 30% requirement is based upon the number of recycled materials used at the store, and their relatively heavy weight as discussed under MR Credits 4.1 and 4.2.

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[359] "McKinney Experimental Wal-Mart: Energy".

ID Credit 2 – LEED Accredited Professional

ID Credit 2, which is intended to support and encourage design integration and a streamlined certification process for LEED projects, simply requires the inclusion of a LEED Accredited Professional (LEED AP) as a principal member of the project team.[360] This credit is arguably the simplest and most likely to be achieved by any project because, logically, persons and companies interested in green buildings, and especially those interested in pursuing LEED certification, tend to seek out firms with sustainable and/or LEED experience. This is, in fact, evidenced by Wal-Mart when they hired LPA and the Turner Corporation, both of which specialize in green projects, to be the architectural and construction firms in charge of both the McKinney and Aurora stores.[361] Given that both of these firms specialize in green projects, it is highly likely that one, if not multiple, LEED AP's were among the project team that developed both of the company's experimental supercenters.

Bringing Home the Gold

The analysis of the sustainable practices and technologies undertaken at Wal-Mart's experimental supercenters in McKinney, TX and Aurora, CO, the results of which can be seen in Table 5.8, indicate that both stores would likely receive some level of certification under the second pilot version of the LEED for Retail: New Construction rating system. More specifically, the sum of the previously discussed credits which were determined to be "likely earned" by each store would yield a score of 28 points for McKinney, attaining a level of LEED Certified, while Aurora would receive 34 points, or

[360] Green Building Rating System: LEED for Retail, 100.
[361] Yoder, 6.

Table 5.7: Project Totals – Current.[362]

LEED FOR RETAIL: NEW CONSTRUCTION PROJECT TOTALS - CURRENT		WAL-MART EXPERIMENTAL STORES						
		Location:	McKINNEY, TX			AURORA, CO		
		Type:	Large Format Retail			Large Format Retail		
		Size:	206,000 sf			206,000 sf		
		Completed:	July 2005			July 2005		
Category		**Available**	**Points**					
Prefix	**Description**		**L**	**P**	**U**	**L**	**P**	**U**
SS	Sustainable Sites	16	5	3	8	6	2	8
WE	Water Efficiency	5	3		2	3		2
EA	Energy & Atmosphere	17	10	4	3	10	4	3
MR	Materials & Resources	13		3	10	5	1	7
EQ	Indoor Environmental Quality	14	6		8	6	1	7
ID	Innovation in Design	5	4	1		4	1	
Points: L = Likely, P = Possible, U = Unlikely	**TOTALS:**	**70**	**28**	**11**	**31**	**34**	**9**	**27**

LEED FOR RETAIL: NEW CONSTRUCTION -- CERTIFICATION LEVELS							
Point Range	**Certification Level**	**TOTALS**	**Likely Certification**				
0-26	No Certification		**28**	**LEED Certified**	**34**	**LEED Silver**	
26-32	LEED Certified						
33-38	LEED Silver		**Possible Certification**				
39-51	LEED Gold		**39**	**LEED Gold**	**43**	**LEED Gold**	
52-70	LEED Platinum						
Likely Certification = Σ(L) Possible Certification = Σ(L) + Σ(P)							

LEED Silver. The further addition of credits deemed "possible" to each store's total would yield a maximum score of 39 and 43 points for the McKinney and Aurora stores respectively, giving each a certification level of LEED Gold.

As mentioned previously, there are some credits within the LEED for Retail: New Construction rating system which have not been pursued by the McKinney or Aurora stores, yet could be achieved with minimal effort. This group of credits, which includes alternative transportation, green power, and thermal comfort verification, could be incorporated into most projects, either initially or retroactively, with relatively minimal effort. Totaling up to six points, the pursuit of these credits may help a project reach a

[362] Table created by author.

Table 5.8: "Extra Credits".[363]

LEED FOR RETAIL: NEW CONSTRUCTION "EXTRA CREDITS"			WAL-MART EXPERIMENTAL STORES						
			Location:	McKINNEY, TX			AURORA, CO		
			Type:	Large Format Retail			Large Format Retail		
			Size:	206,000 sf			206,000 sf		
			Completed:	July 2005			July 2005		
Credits			Available	Points					
Number		Description		L	P	U	L	P	U
SS Credit 4		Alternative Transportation	4	4			3		
		Public Transportation Access (1 Point)		*					
		Bicycle Storage and Commuting (1 Point)		*			*		
		Low Emitting & Fuel Efficient Vehicles (1 Point)		*			*		
		Incentives (1 Point)		*			*		
EA Credit 6		Green Power	1	1			1		
EQ Credit 7.2		Thermal Comfort: Employee Verification	1	1			1		
Points: L = Likely, P = Possible, U = Unlikely, * = Indicates Option Pursued		**TOTALS:**	**6**	**6**	**0**	**0**	**5**	**0**	**0**

higher certification level than would have otherwise been possible. A summary of these credits can be found in Table 5.8.

If each of these projects were to retroactively implement the so called "extra" credits, this would add another six points to McKinney's total, and another five to Aurora. This would bring the stores' likely totals to 34 and 39 points, achieving LEED Silver and LEED Gold for the McKinney and Aurora stores respectively. This would raise each store to a higher level of certification than they are currently likely to achieve. When these points are added to the stores' possible totals, they are raised to 45 and 48 points respectively. This would increase each store's point totals, however it would not increase their current possible certification level beyond LEED Gold. See Table 5.9 for more detail.

Do these results prove that both stores would receive LEED Gold certification were they to be submitted to the USGBC? Quite simply, no; nor are they intended to. As

[363] Table created by author.

Table 5.9: Project Totals – with "Extra" Credits.

LEED FOR RETAIL: NEW CONSTRUCTION PROJECT TOTALS - WITH "EXTRA" CREDITS		WAL-MART EXPERIMENTAL STORES						
		Location:	McKINNEY, TX			AURORA, CO		
		Type:	Large Format Retail			Large Format Retail		
		Size:	206,000 sf			206,000 sf		
		Completed:	July 2005			July 2005		
Category		**Available**	**Points**					
Prefix	**Description**		**L**	**P**	**U**	**L**	**P**	**U**
SS	Sustainable Sites	16	5	3	4	6	2	5
WE	Water Efficiency	5	3		2	3		2
EA	Energy & Atmosphere	17	10	4	2	10	4	2
MR	Materials & Resources	13		3	10	5	1	7
EQ	Indoor Environmental Quality	14	6		7	6	1	6
ID	Innovation in Design	5	4	1		4	1	
Varies	"Extra" Credits	6	6			5		
Points: L = Likely, P = Possible, U = Unlikely	**TOTALS:**	**70**	**34**	**11**	**25**	**39**	**9**	**22**

LEED FOR RETAIL: NEW CONSTRUCTION -- CERTIFICATION LEVELS							
Point Range	**Certification Level**	**TOTALS**	**Likely Certification**				
0-26	No Certification		**34**	**LEED Silver**	**39**	**LEED Gold**	
26-32	LEED Certified						
33-38	LEED Silver		**Possible Certification**				
39-51	LEED Gold		**45**	**LEED Gold**	**48**	**LEED Gold**	
52-70	LEED Platinum						
Likely Certification = Σ(L) Possible Certification = Σ(L) + Σ(P)							
Shading indicates effects of "extra" credits.							

mentioned earlier, only the USGBC can determine the points achieved by any project and subsequently confer certification. These results do, however, indicate that it is likely that each store would achieve some level of certification, especially if any number of the "extra" credits were retroactively pursued. This conclusion is bolstered by the fact that Wal-Mart did reference the LEED system during the development of the stores,[364, 365] and that the company is considering submitting the stores for certification at the conclusion of the three year monitoring period.[366] These results also indicate that it is possible to construct a big box retail supercenter, in excess of 200,000 square feet, that is capable of

[364] "McKinney Experimental Wal-Mart: Team & Process."
[365] "Aurora Experimental Wal-Mart: Team & Process".
[366] Yoder, 7.

achieving LEED certification. Knowing that this achievement is indeed possible furthers the proposition that with the proper commitment and development, the roll-out of a nationally reproducible, LEED certifiable Wal-Mart supercenter is a likely eventuality.

CHAPTER 6

THE "TRIPLE-BOTTOM-LINE"

As of this point, Wal-Mart has stated a goal of developing a high efficiency, low impact national prototype, and they have demonstrated that they can indeed build a LEED certifiable, 200,000 square foot supercenter. But what reasons do they have for actually following through with such an unprecedented commitment? For a complete paradigmatic shift in the way the company's stores are developed? For the nation's largest retailer, as with the entire retail industry, the bottom line is, well, the bottom-line.

In this case, however, there is actually a triple-bottom-line that must be considered. As discussed earlier, sustainable development must include a balance of environmental, social, and economic benefits, particularly for a company such as Wal-Mart. According to Margaret Montgomery, a sustainable advisor at NBBJ, a Seattle-based firm specializing in the design and construction of sustainable retail facilities, "Without economic sustainability, a practice will obviously not continue; without environmental sustainability, the planet will not support it; and without social sustainability… it won't continue."[367] In fact, Wal-Mart's sustainable building program must go beyond reducing the company's environmental impact. While this may be the best, and in the eyes of many environmentalists should be the only, reason for going green, it should be considered that the retail industry is a business, and that businesses must make money in order to continue to operate. Therefore, sustainable building practices must at a minimum be economically feasible, if not economically beneficial.

[367] Roy, 32-34.

Also, for a company that is often seen as being "in a race to pave the planet,"[368] a sustainable building program must also provide some level of social benefit in order to be truly effective. Fortunately, Wal-Mart has taken these factors into consideration, and has realized just how beneficial the development of a high efficiency, low impact prototype could be. The company has realized that they "could improve [their] image, motivate employees, and save money by going green."[369]

Everyday Low Impact

The development of a high efficiency, low impact Wal-Mart prototype would take great steps toward reducing the company's environmental impact. This prototype, if designed to meet the company's stated goals, would reduce energy consumption and greenhouse gas emissions by 25%-30%.[370] Given that the average supercenter uses 1.5 million kilowatt hours of electricity per year,[371] and that the company has an estimated greenhouse gas emission rate which accounts for 0.2% of total U.S. emissions, or approximately 16.8 million metric tons,[372] these goals would have profound effects. The development of a high efficiency prototype would account for an annual savings of 450,000 kilowatt hours of electricity per store, and prevent company-wide emissions of approximately 5 million metric tons of carbon dioxide into the earth's atmosphere each year.

Further environmental benefits can clearly be seen in the results of measures taken at the McKinney and Aurora stores. Through special attention to site features, including bioswales, constructed wetlands, and rainwater retention ponds, and the use of

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[368] Gunther.
[369] Gunther.
[370] Sustainability Fact Sheet.
[371] Gunther.
[372] "Wal-Mart: Every Day Low ... Impact?".

native plant materials, each of these facilities has encouraged biodiversity and preserved wildlife habitat. These measures also eliminate water pollution and stream degradation by filtering stormwater runoff and capturing sediments. These features also account for a reduction in potable water demand for irrigation, which, at the McKinney store, is to the tune of some 5 million gallons per year.[373]

Energy efficient measures incorporated into these stores, which could be implemented in a national prototype, have also made great impacts. The use of skylights and other daylighting features combined with high efficiency T5 fluorescent lighting fixtures are expected to reduce annual energy demands at the McKinney and Aurora stores by a minimum of 300,000 kilowatt hours each.[374, 375] Simple measures such as replacing open-air refrigeration cases for items such as deli meats and cheeses with units having doors can reduce cooling demands and refrigeration energy by 68%.[376] High performance parking lot lighting systems used at these stores not only result in a 12% energy savings as compared to typical fixtures,[377, 378] but also prevent light pollution and trespass, reducing impacts on nocturnal habitats.

Other measures including the reduction and/or elimination of materials containing volatile organic compounds (VOC's) and polyvinylchloride (PVC) reduce the emission of toxic compounds which are hazardous to humans, wildlife, and the general environment. These emissions are prevented at all stages of the products' lifecycles including manufacture, off-gassing during use, and pollution resulting from disposal. At

[373] "McKinney Experimental Wal-Mart: Overview".
[374] "McKinney Experimental Wal-Mart: Energy".
[375] "Aurora Experimental Wal-Mart: Energy".
[376] "Aurora Experimental Wal-Mart: Energy".
[377] "McKinney Experimental Wal-Mart: Energy".
[378] "Aurora Experimental Wal-Mart: Energy".

the same time, the use of post industrial and recycled materials at each store has diverted numerous tons of material from disposal in landfills and reduced demands on raw materials. Each store uses approximately 800 tons of flyash in the buildings' foundation systems,[379, 380] while the Aurora store uses over 16,000 tons or nearly 10,000 cubic yards of recycled concrete throughout the project, which would have otherwise found its way into local landfills.[381] The Aurora store also recycled approximately 300 tons of construction debris, thereby diverting it from disposal.[382]

Each of these measures has a direct and quantifiable positive effect upon the environment. For every kilowatt of electricity that is saved or every pound of raw material that is conserved the environment benefits through the reduction of impacts resulting from mining, manufacturing, transportation, and disposal of goods, services, and byproducts. However, beyond the purely environmental, these benefits have implied and associated social connotations which are also incentives for pursuing sustainability.

Social Psychology

As discussed earlier, issues relating to social equity, including the health and well-being of occupants and employees, are an integral part of sustainability. Due to the inherent balance of these environmental, social, and economic benefits, retailers like Wal-Mart are discovering that going green can not only improve the health of the planet, but the health of their employees, customers, and sales as well. Improvements in air quality and indoor environmental conditions common to green buildings, which result from reductions of VOC's and pollutants or improved lighting quality from skylights,

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[379] "McKinney Experimental Wal-Mart: Materials & Resources".
[380] "Aurora Experimental Wal-Mart: Materials & Resources".
[381] Lovely.
[382] "Aurora Experimental Wal-Mart: Materials & Resources".

make building occupants more comfortable. According to Dr. Johnson, these conditions result in increased worker productivity, reduced employee absenteeism, and increased retail sales. His paper reports a 6% increase in worker productivity at a sustainably constructed US Post Office as well as a 15% reduction in absenteeism at green buildings constructed by Lockheed Martin and ING Bank. Dr. Johnson also describes a study sponsored by Pacific Gas and Electric which found that retail stores having adequate daylighting systems demonstrated a 40% increase in sales over stores only having artificial lighting.[383]

These results are confirmed by observances at Wal-Mart's Eco-Mart which was built in Lawrence Kansas in 1993. The benefits of daylighting were particularly evident as the Eco-Mart only had skylights in one half of the building's roof. Through sales records, the company discovered that departments located under the skylights showed significantly higher sales per square foot than departments located in other areas. Not only that, employees in other departments routinely argued that they should be relocated to the daylit portion of the building.[384] Customers in the Eco-Mart also found the daylighting to be extremely popular, and gave occupants a sense of well-being.[385] This sense of well-being and comfort experienced by shoppers encourages them to spend more time in the store, rather than simply "do my shopping as quickly as possible and get out," as stated by David Wann, author of Deep Design: Pathways to a Livable Future.[386] The more time a customer spends in a store, particularly a green store, the more likely they are to make a notice this sense of well-being, affecting not only their likelihood of

[383] Johnson, 8.
[384] Romm and Browning, Greening the Building and the Bottom Line, 11.
[385] Panchapakesan.
[386] Wann, 160.

making a purchase and increasing revenues, but also the likelihood that they will form a more positive opinion of the retailer.

This can become a distinct advantage; especially as Wal-Mart has image problems, particularly in terms of the company's environmental activities. Critics view the company as having little regard for the environment and are often quick to support their views by referencing EPA imposed fines and Clean Water Act violations which Wal-Mart has incurred over the years. Also mentioned earlier, these views have affected the company's relationships with suppliers, some of which equate doing business with Wal-Mart to selling their souls to the devil, as well as with customers, approximately 8% of which have stopped patronizing the retailer due to its reputation.[387] Having realized they were taking substantial amounts of social criticism, top company executives and board members, along with environmental consultants, realized that the company "could improve its image, motivate employees, and save money by going green."[388]

For a company such as Wal-Mart, a full-scale shift toward sustainability would provide the retailer with an opportunity to begin to redefine their corporate identity. Demonstrating their commitment to sustainability through the implementation of a high efficiency, low impact store prototype would go a long way toward helping the company combat its negative environmental reputation. As Sree Roy, Associate Editor of *Display & Design Ideas*, states in a 2005 article, "Retailers that go green can reap many advantages, [including a] respectable sense of ethics and an enhanced public image."[389] This would also allow Wal-Mart to redevelop their brand image with sustainability as a

[387] Gunther.
[388] Gunther.
[389] Roy, 32-34.

key component as other companies including Monsato, Patagonia, The Body Shop, Smith and Hawken, and Ford Motor Company have done.[390]

By taking the extra effort to have stores built from this high efficiency, low impact prototype certified under the USGBC's LEED program, Wal-Mart could add increased credibility to their efforts and disseminate their redefined corporate image to the masses. As mentioned earlier, LEED certification would add critical verification and credibility to the company's environmental efforts through the so called "signaling" benefits discussed in the paper by Corbett et al,[391] and provide multitudes of marketing opportunities. As discussed in a white paper by Dr. Scott D. Johnson, Ph.D. entitled *The Economic Case for ~~"Green Buildings"~~ "High Performance Buildings,"* "A sustainable design project can be positioned to generate substantial positive press coverage. Such press coverage can be valuable to firms wishing to create or improve name recognition, to be seen as forward-looking, and to be perceived as bringing value to their community."[392] Dr. Johnson also states that "… there is a logical, common-sense linkage that is enough to convince most companies of the value of marketing and [public relations]. So too should companies perceive the potential value of a more sustainable approach to facilities development. Customers, neighbors, and governments alike will notice."[393]

By redefining their corporate image and promoting their new greener ways, Wal-Mart can also capitalize upon this increased attention. According to Robert P. Corman, president of the Partnership for Social Enterprise, "Regardless of motivation –

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[390] Johnson, 10.
[391] Corbett and Muthulingam, 7.
[392] Johnson, 10.
[393] Johnson, 10.

which is largely marketing – companies are moving in environmentally responsible directions and they're being rewarded by consumers who want to see it happen."[394] This is further evidenced by Dr. Johnson, who also states, "There are many studies that indicate consumers will either pay more for green products or will choose the environmentally-preferable option when provided a choice."[395] This would allow the company to bring back at least a portion of that 8% of customers that were lost due to its negative reputation, and would potentially open the door to new suppliers.

Another benefit of this improved corporate image comes in the form of reduced resistance to new store location. The company routinely encounters resistance when expanding into new communities from organizations like Wal-Mart Watch, which suggests that citizens and legislators "faced with the prospect of a Wal-Mart moving into their city or town", should "arm themselves with information."[396] In fact, stores attempting to build in new locations, including the suburbs of Los Angeles, San Francisco, and Chicago are routinely blocked by opponents of the company.[397] However, again according to Dr. Johnson, "Development projects which consider long-term sustainability issues are less likely to counter community resistance."[398] As mentioned earlier, Wal-Mart has already experienced this effect when constructing their experimental supercenter in Aurora, CO, which encountered a streamlined permitting process as a result of xeriscaping within the landscape.[399] Also previously discussed,

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[394] Fitzgerald.
[395] Johnson, 10.
[396] It's Not Easy Being Green: The Truth About Wal-Mart's Environmental Makeover.
[397] Gunther.
[398] Johnson, 10.
[399] "Aurora Experimental Wal-Mart: Team & Process".

projects pursuing LEED certification are eligible to receive a growing list of incentives from state and local governments.[400]

The public relations and marketing opportunities that would arise from a LEED certified national prototype would benefit more than just Wal-Mart. With the opening of each new store, thousands of new shoppers, employees, and members of the surrounding community would be exposed to the LEED system, the USGBC, and the benefits of sustainable building. They would have the opportunity to learn about the impact of buildings upon the environment, and would be able to see first-hand how a LEED building minimizes these effects. Through Wal-Mart's other sustainability initiatives, such as their commitments to sell energy saving products such as compact fluorescent light bulbs,[401] and concentrated products that require less packaging,[402] shoppers at these new stores would also have the opportunity to buy environmentally friendly products, and possibly incorporate at least some sustainable practices into their daily lives.

Saving Green

As Wal-Mart continues on the path toward sustainability, the company has come to the realization that the benefits of their actions are two-fold. Whether a particular sustainable practice acts to save the environment, or to improve the company's social image, these practices can also save the company money or increase their revenues. Wal-Mart has discovered that each of their environmental policies can have a significant environmental impact, as well as greatly reduce corporate costs. When they eliminated excess packaging from their private-label line of toys, the company was able to save one

[400] Yudelson Associates, 7.
[401] "Wal-Mart Announces Goal".
[402] Sustainability Fact Sheet.

million barrels of oil, nearly 4,000 trees, and $2.4 million annually in shipping costs.[403] By installing auxiliary power units in the company's fleet of 7,200 trucks, Wal-Mart reduced fuel consumption;[404] thus, saving the company approximately $36.9 million at current prices of $3.55 per gallon. Even the previously discussed sandwich balers, which have become a standard fixture at the company's stores, have diverted recyclable waste from landfills and have saved the company approximately $28 million.[405]

These same economic benefits hold true for sustainable buildings as well. Every gallon of water or kilowatt of electricity that would be saved as a result of implementing a LEED certifiable prototype results in lower costs. Wal-Mart estimates that the 300,000 kilowatt hours of energy saved by efficiency measures at the McKinney store alone will reduce operating costs by a minimum of $100,000 per year.[406] Cost savings of this nature have also been experienced by other retailers at all scales. The owner of an Ace Hardware store in Martinez, California estimates that the installation of an active skylight system, similar to the one implemented at Wal-Mart's Aurora experimental store, has reduced his operational costs by approximately $1,000 per month.[407]

These economic benefits do not come without some additional cost, though they far exceed these burdens. Typically, the initial cost of a LEED certifiable building is approximately 1%-3% higher than that of a conventional building. However, according to a 2003 study by the California Sustainable Building Task Force estimates that, "a [2%] increase in initial construction costs to build a green property averaged [20%] savings in

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[403] Gunther.
[404] Gunther.
[405] Gunther.
[406] "McKinney Experimental Wal-Mart: Overview".
[407] "Growing Pains".

energy and other costs over the life of the building."[408] The long term economic benefits of sustainable buildings can also increase the real estate value of the property. Dr. Johnson's paper once again states that "based on a standard building market capitalization rate of 10%, that yearly savings on [operations and maintenance] costs for a building translated to a factor of 10 increase in the value of the building. Thus, a $100k/year savings in [operations and maintenance] would increase the value of a building by $1 million."[409]

Beyond property values, revenues would also increase as a result of an increased number of shoppers visiting each store. As mentioned earlier, adopting a LEED certifiable national prototype would likely improve Wal-Mart's corporate image, and encourage the patronage of shoppers who are seeking sustainable alternatives. This has been evidenced by other retailers including the Body Shop, which has been very successful at "[making] it easy, convenient and pleasurable for consumers to act environmentally responsible."[410] If Wal-Mart could experience the same effect, the company could potentially recover the approximate 8% of its customer base that was lost due to their negative reputation. At approximately 138 million shoppers per week,[411] this would translate into an addition of more than 11 million weekly shoppers. If each of these new shoppers were to purchase a single five-dollar item, they would increase the company's weekly revenues by approximately $55.2 million.

While the total environmental, social, end economic benefits of constructing a high efficiency, low impact structure have been evidenced by Wal-Mart's McKinney and

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[408] Choi, 22.
[409] Johnson, 7.
[410] Fitzgerald.
[411] "Wal-Mart: Every Day Low ... Impact?".

Aurora stores, the true benefits of adopting a LEED certifiable national prototype must be considered at the scale of the entire company. As the largest retailer in the world, Wal-Mart constructs a staggering number of new stores each year. The company budgeted $17.5 billion for capital expenditures during their 2007 fiscal year, which includes the construction of 270-280 supercenters among numerous other domestic and international facilities.[412] If benefits seen at McKinney, which include a $100,000 energy savings and a 50,000 pound annual reduction of CO_2 emissions,[413] were reproduced at this scale, it would save the company over $27 million on energy and reduce greenhouse gas emissions by 13.5-14 million pounds. Also, if each new supercenter employs approximately 450 associates, as does the McKinney store,[414] this would directly expose approximately 125,000 employees, along with millions of customers, to the benefits of green buildings and the LEED system. At this scale, Wal-Mart has the opportunity to have a greater positive impact on the environment, make sustainability and green building more accessible and more familiar to more people, and to receive greater economic benefits from going green than potentially any other retailer. This opportunity, nor the necessity to act upon it, has not gone unnoticed to the company's CEO, who, in a sustainability meeting with some 800 corporate employees posed to the audience: "What other company in the world could do this? This company is uniquely positioned. But we will not be measured by our aspirations. We will be measured by our actions."[415]

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[412] Building Smiles: Wal-Mart 2006 Annual Report.
[413] "McKinney Experimental Wal-Mart: Overview".
[414] "The Machine Goes Green".
[415] Gunther.

CHAPTER 7

IN SUMMATION

As amply documented, Wal-Mart has numerous critics who are quick to declare Wal-Mart's aspirations of bringing sustainability to the masses and greening the company's daily operations to be no more than corporate green-washing. These critics dismiss the company's numerous sustainability initiatives and policies as mere bloviating and empty rhetoric, while citing past environmental infractions as proof of the company's wanton disregard of all things green. As the old saying goes, "actions speak louder than words;" and, Wal-Mart's CEO Lee Scott knows that his company will always be measured by its actions.

However, it is precisely the company's actions which have placed Wal-Mart at the forefront of the sustainability movement within the retail industry. Over the past decade and a half, the company has built a series of stores which were designed to help them understand their impact upon the environment and their responsibility to become a better steward and citizen of the communities they serve, demonstrating a considerable history of sustainable exploration. Throughout this history, the company has built upon the lessons learned from each of the previous experiments and incorporated the successful measures into their national prototypes. Through major design changes such as the use of daylighting, or relatively simple modifications like the installation of sandwich balers, Wal-Mart has consistently sought measures to improve efficiency and reduce the impact of their stores.

Beyond the company's history of environmental buildings, Wal-Mart has been a leader in sustainability through making other commitments aimed at reducing their impact. The company has committed to working with suppliers to reduce packaging and encourage sustainable practices. They have also committed to make sustainable products such as organic produce and clothing made from organic cotton available to consumers nationwide. Wal-Mart was also the first retailer to offset its entire development footprint through conservation grants. But, most importantly, these commitments have the backing of top-level executives including the company's CEO, H. Lee Scott, Jr. and the Chairman of the Board of Directors, S. Robson Walton, son of the company's founder, the late Sam Walton. Having the commitment of top corporate decision makers ensures that these initiatives are priorities for the company, and greatly increases their chances for success and longevity when compared to lower-level programs that eventually fall by the wayside.

Having top executives committed to these initiatives ensures that the programs will receive the resources they require, especially considering the resources Wal-Mart has at its disposal. As the world's largest company, Wal-Mart has annual revenues exceeding $300 billion. Of these revenues, the company spends approximately $17.5 billion on capital improvements, including the construction of new stores, and they have committed $500 million in annual funds for the research and development of sustainable technologies and innovations. With these resources, and the level of influence the company possesses, Wal-Mart has the ability to not only explore new technologies, but to make them both accessible and affordable on a market level.

Wal-Mart's resources allow the company to not only explore new sustainable technologies, but to implement them as well. It is the company's vast financial resources and executive level commitment to sustainability that made the development and construction of the McKinney, TX and Aurora, CO experimental supercenters possible. These stores, each of which has the possibility of achieving up to LEED Gold certification, represent the "cutting edge" in terms of sustainable retail construction, and clearly demonstrate that the construction of a high efficiency, low-impact, 200,000 square foot Wal-Mart supercenter is indeed possible.

The possibility that both stores would receive LEED Gold certification, nearly the highest level possible under the LEED system, demonstrates that the company can replicate these results in different locations. As discussed earlier, McKinney, TX and Aurora, CO were chosen as sites for Wal-Mart's experimental supercenters so that the sustainable technologies being tested, most of which were common to both stores, could be evaluated in differing climates. The number of technologies common to both stores, and the possibility that each store would receive the same level of LEED certification, also demonstrates the viability of a high efficiency, low-impact national prototype.

The actions Wal-Mart has taken during their history of exploring sustainability are precisely the kinds of actions that consumers are beginning to expect from retailers. As previously mentioned, factors such as ozone depletion, global warming, and rising fuel costs have placed sustainability at the forefront of the American lexicon. When sustainability has become so engrossed in daily conversation and mainstream media that a documentary on global warming wins an Academy Award, it becomes clear that sustainability is an issue that is in universal demand, and those who heed this call are

likely to be rewarded. Despite the conspicuous lack of green retail, shoppers are voicing their support for sustainability through purchases, and are actively seeking sustainable retailers to patronize. Consumers are seeking retailers who have not only committed to the pursuit of sustainability, but have acted upon their commitments.

This is where the adoption of a sustainable retail prototype and LEED certification can become major assets to a retailer. LEED certification sends a clear signal to consumers and shareholders alike that the company they are patronizing has not only constructed a sustainable facility, but they have sought independent third-party verification in order to prove it. LEED certification also provides numerous public relations and marketing opportunities, allowing the retailer to attract the ever-growing population of environmentally conscious consumers; a benefit that a retailer such as Wal-Mart is unlikely to overlook.

Denouement

As of this point, this thesis has shown: that Wal-Mart has a considerable history of developing environmentally friendly buildings; that the company is committed to greening their daily operations; that the company has the resources necessary to investigate and encourage the development of sustainable building technologies; and that they have already built at least two supercenters capable of achieving LEED certification. This thesis has also shown that corporate shareholders, consumers, and the public at large are increasingly concerned with the environment, making this an opportune time for a retailer to embrace sustainability at a corporate level. These findings overwhelmingly support the conclusion that Wal-Mart will meet their stated goal of developing a

nationally reproducible, high-efficiency, low-impact prototype which will be the company's standard in new store development.

However, if Wal-Mart is to fully capitalize upon the benefits of their actions, each store built from this new prototype should be submitted to the USGBC, potentially through their upcoming Portfolio Program, for LEED certification. While retroactively pursuing certification for the McKinney and Aurora stores, which should occur, would verify their ability to construct sustainable facilities, the company's critics would easily dismiss these stores as isolated incidents and write them off as further examples of green-washing. Making LEED certification a standard of new store construction, on the other hand, would provide the company with the full signaling benefits associated with LEED, demonstrate Wal-Mart's commitment to sustainability, and make great strides toward improving the company's reputation.

Though some level of LEED certification should be attained by stores built from the company's new prototype, these stores do not necessarily have to achieve a rating as high as the McKinney and Aurora stores in order to benefit the company. These stores were designed to test as many sustainable techniques and technologies as possible, and to produce the maximum effect, regardless of typical budget concerns. However, a store designed from this new prototype, as with any sustainable development, must balance environmental, social, and economic benefits in order to be viable. Stores built from this new prototype must meet the company's goal of reducing energy consumption and greenhouse gas emissions by 25-30%, attain some level of LEED certification in order to be socially beneficial, and also be cost effective; making a certification level of LEED Certified or LEED Silver the likely denouement of this complex balancing act.

Post Hoc, Ergo Propter Hoc

While research for this thesis effectively concluded on February 29, 2008, Wal-Mart has continued to make advancements toward the development of a nationally reproducible, sustainable prototype. Following the construction of the McKinney and Aurora stores, the company has developed three series of high-efficiency supercenter prototypes which serve as intermediate steps between individual experimental stores and a full-scale national prototype. These prototypes allow the company to test successful technologies from previous experimental stores on a larger scale, evaluating their performance in preparation for a national roll-out. Each series of prototypes is intended to build upon the successes of the previous series and provide increased performance.

The first of these series, the HE.1 stores, began development approximately one year after the completion of the McKinney and Aurora experimental supercenters, and is the company's first prototype expected to use 20% less energy than a typical store. The HE.1 series stores, the first of which opened January 19, 2007 in Kansas City, MO, were specifically designed to reduce energy consumption within the facilities' HVAC and refrigeration systems. These stores incorporated other sustainable practices including daylighting, automated high efficiency conventional lighting, and closed door refrigeration cases illuminated by high efficiency LEDs.[416] A total of three HE.1 series stores were opened in 2007.[417]

[416] "Wal-Mart to Open First High-Efficiency Store; Supercenter Expected to Use 20 Percent Less Energy".
[417] Wendt, "Wal-Mart Introduces Second Generation of High-Efficiency Stores".

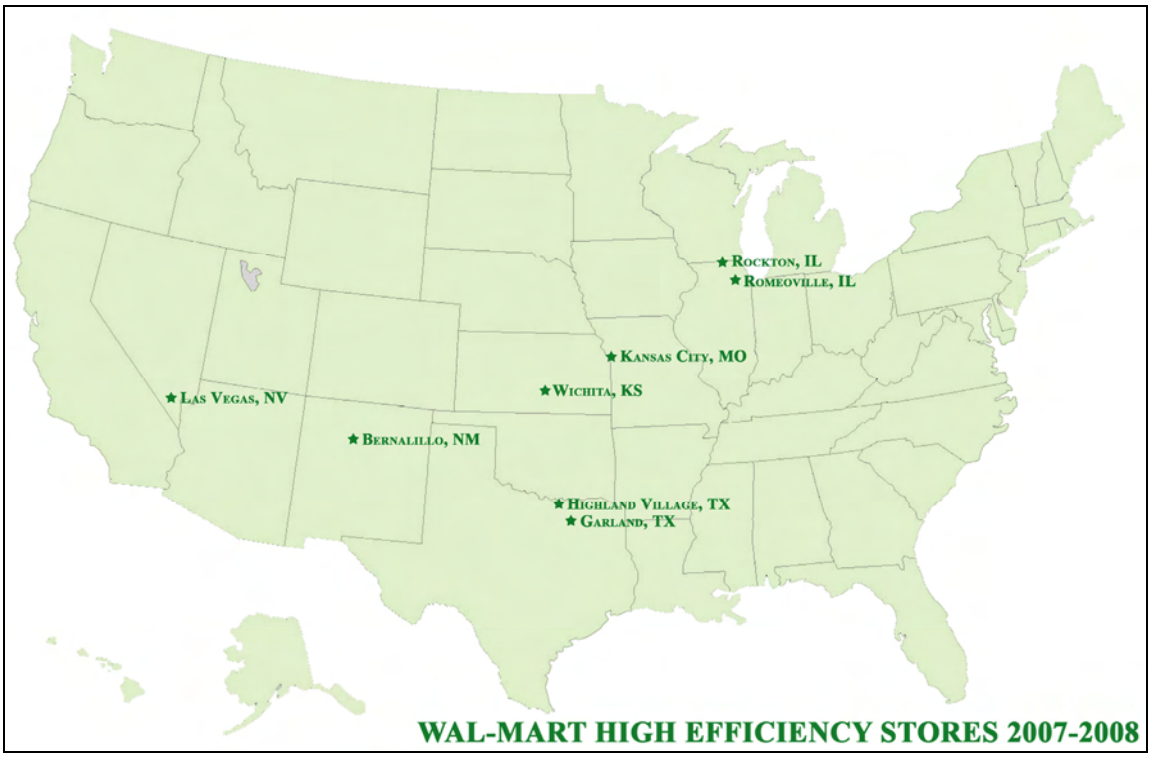

Figure 7.1: Wal-Mart's High Efficiency (HE Series) Stores.[418, 419]

Wal-Mart opened the first of four second-generation high-efficiency stores on January 23, 2008 in Romeoville, IL.[420] The HE.2 series stores build upon the successes of the previous series by incorporating additional sustainable practices in order to improve efficiency. These stores, all of which are planned to open in 2008,[421] incorporate technologies "such as white roofs, low-flow bathroom faucets, LED signage and a secondary loop refrigeration system," according to remarks given at the National Retail Federation by Leslie Dach.[422] The use of these technologies, most of which were initially

[418] Graphic created by author.
[419] "Garland Supercenter Focuses on Local Preferences"
[420] Wal-Mart, "Wal-Mart Opens 25 Percent More Efficient Supercenter in Northern Illinois".
[421] Wendt.
[422] Dach, "Making Sustainability Sustainable: Lessons We've Learned".

Figure 7.2: Wal-Mart's newest HE.2 Series supercenter in Garland, TX.[423] This store, which opened May 7, 2008, was designed to be environmentally friendly as well as to reflect the culture of the local community.[424]

tested at the McKinney and Aurora experimental stores, make the HE.2 series prototype 25% more efficient than the company's typical supercenter.

Continuing Wal-Mart's rapid advancement toward the development of a sustainable national prototype, the company opened the first of their newest high-efficiency series, the HE.5, in Las Vegas, NV on March 18, 2008. This series of stores, unlike the HE.1 and HE.2 prototypes, is designed specifically for use in western climates. While the HE.5 prototype incorporates many technologies from the previous series, it will only be deployed in regions where the stores' advanced cooling technologies will be

[423] "Photos & Images: Supercenters"
[424] "Garland Supercenter Focuses on Local Preferences"

most advantageous. In the proper climate, these stores' cooling systems are expected to make this prototype 45% more energy efficient than a baseline supercenter.[425] According to Richard Bourne, associate director of the Western Cooling Efficiency Center and the University of California, Davis, "We believe this is the most efficient cooling system implemented in a major retail facility. This project recognizes the very significant opportunity to integrate advanced natural cooling features in dry climates, thereby reducing the need to build new peak power generating plants."[426]

These stores, along with the previous HE series prototypes, represent some of the most efficient retail facilities in the world. Continuing Wal-Mart's fifteen year history of exploring sustainable building technologies, the rapid pace at which these prototypes have been developed further exemplifies the company's commitment to developing a sustainable national prototype which reduces energy use and greenhouse gas emissions by 25-30% over the company's 2005 model stores. The advancements made with the HE series stores, and the efficiency ratings they have achieved, would indicate that the company is in a position to achieve this goal by 2009.

The Future of the Retail Industry?

As discussed earlier, there are many who believe the retail industry is poised for an environmental renaissance, and that the lack of a proper catalyst is all that is preventing it. If Wal-Mart achieves their goal of producing a sustainable, national prototype by 2009, as it seems they will, what implications will this have for other retailers? If Wal-Mart goes green, will other retailers have to follow suit? Could Wal-Mart's sustainable prototype be this catalyst?

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[425] Wal-Mart, "Wal-Mart Introduces Its Most Energy Efficient U.S. Retail Store".
[426] "Wal-Mart Introduces Its Most Energy Efficient U.S. Retail Store."

Retailers seldom like to be the first to undertake the unfamiliar, and sustainability is far from the status quo in retail construction. However, if Wal-Mart were to develop a high-efficiency, low impact prototype, and if they were to incorporate sustainability into their daily operations, they would set the precedent for others in the industry. By going green, Wal-Mart would give other retailers a basis for comparison, proving that economics and environmental responsibility do not have to be competing interests. In fact, Al Gore, former Vice President of the United States, Nobel Laureate, and international champion of all things green, stated in an address to some 800 Wal-Mart employees at their corporate headquarters in Bentonville, Arkansas, "As Wal-Mart embarks on a far-reaching plan to adopt business practices that are better for the environment… the world will learn that 'there need not be any conflict between the environment and the economy.'"[427]

Wal-Mart's high-efficiency, low impact, national prototype would also reduce the costs of sustainable technologies. As the world's largest retailer, Wal-Mart has the resources, and influence, based solely upon the number of stores they construct each year, to purchase environmentally friendly technologies and materials in such quantities as to benefit from economies of scale. However, as Wal-Mart increases the market for sustainable building products, these technologies will become more common, thereby reducing prices and making sustainable construction more affordable for other retailers.

Not only would Wal-Mart's sustainable prototype make sustainable construction more affordable, it would also encourage other retailers to go green as a result of competition. As discussed earlier, most retailers like to observe the actions of their competitors and then apply the successes to their own operations. This prototype would

[427] Gunther.

allow other retailers to see the environmental benefits, improved reputation, and reduced operating costs inherent to sustainable construction, leaving them unwilling to allow Wal-Mart to reap these benefits alone. As is typically the case, whatever Wal-Mart does, Target is usually quick to follow, and vice versa…

Wal-Mart's roll-out of a sustainable prototype would set a precedent for other retailers, lower the costs of sustainable construction, and encourage competition; but, will it be enough to bring sustainability to the retail industry? Would this have the ability to bring about such a paradigmatic shift? Does Wal-Mart's sustainable prototype represent the future of the retail industry? Only time will tell. However, as, Kurt Barnard, a prominent retail consultant states, "Wal-Mart does things well, and everyone in retailing will be watching…"[428]

[428] Fitzgerald.

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