

2013

Greening the Building Code: an Analysis of Large Project Review Under Boston Zoning Code Articles 37 and 80

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**GREENING THE BUILDING CODE: AN ANALYSIS OF LARGE PROJECT
REVIEW UNDER BOSTON ZONING CODE ARTICLES 37 AND 80**

A Thesis Presented

by

SANDY J. BEAUREGARD

Submitted to the Graduate School of the
University of Massachusetts Amherst in partial fulfillment
of the requirements for the degree of

MASTER OF SCIENCE

May 2013

Environmental Conservation

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ACKNOWLEDGMENTS

I would like to thank my advisor Simi Hoque for her support and patience throughout this process. I would also like to thank my committee members Paul Fiset and Ben Weil for their support and suggestions that greatly improved this work. I am also thankful for the opportunity to work as a Teaching Assistant under all of my committee members; it was an invaluable experience.

I thank John Dalzell at the Boston Redevelopment Authority for taking the time to meet with me and to continue answering my questions and providing resources throughout my research. I would also like to thank Katie Pederson at the Boston Redevelopment Authority and Maura Zlody at the Boston Environment Department.

I owe many thanks to all of the building professionals that participated in this study and shared their insight and experiences.

I thank Naka Ishii, Science Librarian for assistance in finding Article 37 records and news coverage of the policy. I thank Barbara Morgan, Law Reference Service Librarian for her perseverance in identifying City contacts and finding Article 37 records.

This work was supported by the McIntire-Stennis Grant and the Healey Endowment Grant.

ABSTRACT

GREENING THE BUILDING CODE: AN ANALYSIS OF LARGE PROJECT REVIEW UNDER BOSTON ZONING CODE ARTICLES 37 AND 80

MAY 2013

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In 2007, Mayor Thomas Menino and the Boston Redevelopment Authority (BRA) implemented an amendment to the Boston Zoning Code Article 37 (Green Buildings) requiring new construction approved under Article 80B (Development Review and Approval: Large Project Review) be designed and built to meet the United States Green Building Council's Leadership in Energy and Environmental Design (USGBC LEED) certification. This amendment is intended to promote green building practices in the city and reduce the environmental impacts of buildings larger than 50,000 square feet. Article 37 does not require that the buildings actually achieve LEED certification, but they need to be LEED certifiable as determined by an interagency review committee and with the endorsement of a LEED Accredited Professional.

This study examines how environmental goals have been translated into policy and how this policy has affected building practice in the City of Boston. The Green Buildings amendment was enacted to help curb greenhouse gas emissions by reducing the energy consumption of the building stock and is expected to help achieve the City's goal of reducing carbon emissions by 25% by the year 2020 and 80% by the year 2050. This is not

possible without a shift in the current building and construction paradigm. Through interviews with building professionals we assess whether this building code amendment has resulted in any necessary changes in practice and whether or not those working under the standard of LEED certifiability believe it to be an effective policy.

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CHAPTER 1
INTRODUCTION

Buildings, Energy, and Climate

In the United States, the building sector accounts for 51% of all energy consumption, 74% of electricity use, and 49% of greenhouse gas emissions (Architecture 2030, 2010; U.S. Energy Information Administration, 2010). The energy demands of a building include the energy required to produce and transport building materials, energy for operations and maintenance over the lifetime of the building, and demolition after the useful life of the building. Several studies analyzing the full life cycle energy use of buildings have shown that operations are responsible for 80-90% of the energy consumption while production, transportation, and demolition account for approximately 20% (Keoleian, Blanchard, & Reppe, 2000; Scheuer, Keoleian, & Reppe, 2003; Utama & Gheewala, 2008). As can be seen in Figure 1, space heating and cooling, lighting, and water heating are the dominant operational energy loads. While there may be regional variations in the relative proportion of each end-use, these four uses are the dominant loads across residential and commercial buildings in the United States.

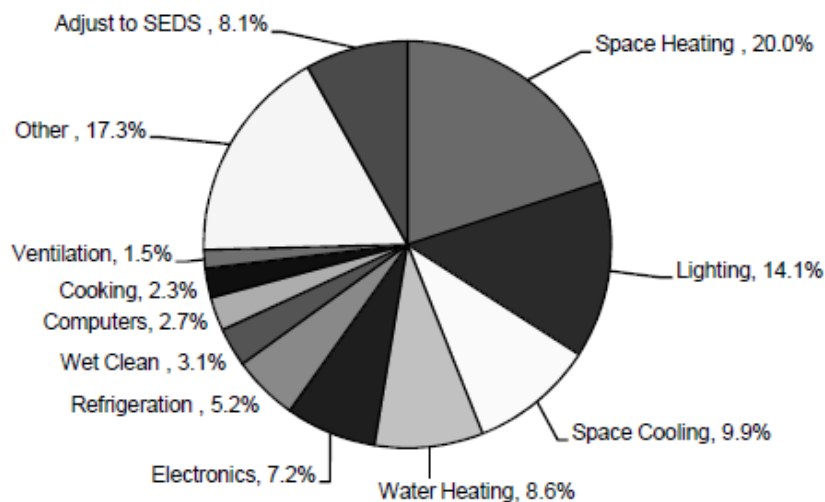


Figure 1: 2010 U.S. Building Energy by End-Use (Buildings Technology Program, 2009)

The Intergovernmental Panel on Climate Change (IPCC) has projected that to curb global warming and mitigate its effects, developed nations must reduce emissions to 25-40% below 1990 levels by 2020 and 80-95% below 1990 levels by 2050 (Architecture 2030, 2010). In its 4th Assessment Report, the IPCC also found the energy saving potential of the building sector is greater than that of any other economic sector and that by employing energy efficient techniques in commercial and residential buildings, significant emissions reductions could be achieved at a net negative cost. The greatest and most cost-effective savings can be achieved by new buildings (Barker et al., 2007; Levine et al., 2007).

Climate Action in Boston

In 2000 Mayor Thomas Menino began positioning Boston to be a leader in confronting the challenges of climate change by joining the Cities for Climate Protection Campaign, a program run by the International Council for Local Environmental Initiatives (ICLEI), which serves to facilitate governmental networking and support climate change initiatives at the local level. By enrolling in the program, Mayor Menino committed the City to becoming a leader in the fight against climate change and to develop a local action plan to curb greenhouse gas emissions. In accordance with this commitment, Mayor Menino appointed an Energy Advisory Committee in 2001 and, in 2003, established a Green Building Task Force (GBTF) to better understand the role of the building sector in greenhouse gas emissions and how sustainable building strategies could help the City achieve its climate change goals (City of Boston, 2007, 2013).

Furthering the City's commitments to climate change mitigation, Mayor Menino adopted the U.S. Mayors Climate Protection Agreement in 2005, pledging that the city would attempt to meet the greenhouse gas (GHG) reduction targets outlined in the Kyoto Protocol. This relatively modest goal of a 7% reduction from 1990 levels by 2012 served as the impetus for the more ambitious reduction goals that Mayor Menino outlined in his 2007 Executive Order Relative to Climate Action in Boston, which committed Boston to reducing GHG emissions by 80% below 1990 levels by 2050 (Menino, 2007). In addition to establishing this target, the executive order outlined policy guidelines to help achieve this goal including the creation of a Community Climate Action Task Force and requiring that the City review and update its Climate Action Plan every three years.

In 2007, Mayor Thomas Menino and the Boston Redevelopment Authority (BRA) implemented an amendment to the Boston Zoning Code Article 37 (Green Buildings) requiring new construction approved under Article 80B (Development Review and Approval: Large Project Review) be designed and built to meet the United States Green Building Council's Leadership in Energy and Environmental Design (USGBC LEED) certification. This amendment is intended to promote green building practices in the city and reduce the environmental impacts of buildings larger than 50,000 square feet. Article 37 does not require that the buildings actually achieve LEED certification, but they need to be LEED certifiable as determined by an interagency review committee and with the endorsement of a LEED Accredited Professional.

Problem Statement, Implications, and Applications

Since the savings of high-performance, LEED certified buildings have been shown to outweigh the additional costs of the certification process (Kats, et al. 2003), it is

unclear why the Boston Redevelopment Authority has chosen not to actually require LEED certification for new construction.¹ According to John Dalzell, Senior Architect at the BRA, “the misalignment of the timing of LEED Certification and building permitting is the paramount reason why [they] do not require USGBC Certification” and that, while “one could raise other considerations such as how to link City project approval to a third party approval,” he does not believe that Mayor Menino’s GBTF explored these issues (Dalzell, 2012). However, James Hunt III., Chief of Environmental and Energy Services for the City of Boston, was quoted at the time describing the LEED process as “lengthy, onerous in documentation, and costly” and stated that the city did not want to rely on a third party such as the USGBC (Palmer Jr., 2006).

Because compliance with Article 37 is determined during the course of permitting, there is no evaluation mechanism in place to determine whether or not LEED certifiable buildings actually perform as well as buildings that have undergone the certification process. Since Article 37 does not include any sort of building performance evaluation or commissioning, the real cornerstone of this Green Buildings amendment is the assumption that this policy encourages, or even forces, project teams to implement integrated design strategies. Therefore, the expected outcomes are also predicated on the widespread belief that an integrated design process essentially guarantees better buildings.

This study has two distinct objectives. The first is to better understand how environmental goals have been translated into policy and practice by exploring and

¹ The savings of LEED certified buildings occur over the lifetime of the project and are largely due to increased worker productivity and reduced absenteeism. Whether or not LEED certified buildings save money through reduced energy consumption is unclear. This issue is discussed in the Background and Literature Review chapter.

illuminating the experiences of those working under the policy. Reading the policy language and procedural documents allows us to understand only part of story. These demonstrate the intentions and goals of those who enacted the policy and show how the policy should work, in theory. By telling the stories of those who have firsthand experience working with the new zoning requirements, we can understand what this policy actually looks like in practice and how it is perceived by those working within its constraints. A policy cannot truly be good if people, especially those it affects directly, do not believe in it. The architects that are charged with carrying out Article 37 are in the best position to serve as advocates for this policy among others in the building industry and ensure that it is as effective as possible.

The second objective is to determine whether or not the policy has had any influence on practice. The Green Buildings amendment to the Zoning Code was enacted with the intent of achieving something; it is not meant to be merely symbolic action, it is meant to create change. The City of Boston aims to reduce carbon emissions by 25% by the year 2020 and 80% by the year 2050 and to be successful there needs to be a shift in the current building and construction paradigm. Tenants need to elevate their expectations about what a building can and should provide, which translates into shifting market values that those in the real estate business will need to learn to recognize and value. The materials and services industries will need to adapt to the growing demand for sustainable products and technologies. Developers that are used to the current quick and dirty approach to building will need to reconsider their responsibilities in delivering high performance buildings. These types of changes are just a small sample of those that will need to occur in order to achieve a sustainable building paradigm and action will need to be taken on multiple fronts to

facilitate this evolution. Article 37 was enacted to help achieve the City's goals by changing the way we build and the way that buildings impact the environment. This study assesses whether or not that is happening by looking specifically at whether it has created any change in architectural practice.

Social science defines practice as “recurrent categories of talk or action” and considers social practices to be one of the smallest units of a social setting (Lofland & Lofland, 1995). The activities that constitute practice are “by definition, one the participants regard as unremarkable and as a normal and undramatic feature of ongoing life. It is only the analyst who, by collecting instances of it and dwelling on it, singles it out as something remarkable” (Lofland & Lofland, 1995). By extension, architectural practice can be considered as “the embodiment, indeed the expression, of the practitioner's everyday knowledge” (Cuff, 1991) and the degree to which the values of the green building movement have been disseminated by Article 37 can be evaluated by examining whether any change in practice has occurred since it was enacted.

The insights gained through interviews with building professionals practicing in Boston provide valuable feedback to the City of Boston and the BRA about the effectiveness of this policy, allowing them to better understand what the experiences of those working under Article 37 have been and how they believe this policy could be improved. This would provide the City an opportunity to amend the policy as necessary or to at least consider changes that could make it more influential and understandable. This same knowledge is also beneficial to other municipalities that might be considering or have adopted similar regulations and inform the discussion of the benefits and drawbacks of this type of green building policy. The field of green building policy and codes is relatively new

and as more and more municipalities and states adopt their own policies, they may be looking for examples to follow. This research has been conducted in the interest of improving the body of literature about various policy options and providing these other governments with valuable information as they make these important decisions.

CHAPTER 2

GREEN BUILDING AMENDMENTS TO THE BOSTON ZONING CODE

Article 37: An Overview and History

Recognizing that addressing energy consumption in buildings would play a critical part in meeting the City’s climate and greenhouse gas goals, Mayor Menino convened the Green Building Task Force (GBTF) in 2003. The Task Force was asked to “explore the subject of green building and to recommend actions through which the City of Boston can most effectively foster an increase in green building and become a national leader in this field” (Conway et al., 2004). To best achieve this goal, the Task Force members represented all aspects of the building industry including experts in community and economic development, affordable housing, architecture, public health, real estate, property development, property management, climate and energy law, and finance. In addition to being comprised of a diverse group of professionals, the GBTF also worked closely with advisors from The Green Roundtable and all of the relevant City organizations and departments including the Mayor’s Office, Boston Redevelopment Authority, Capital Construction, Boston Housing Authority, Boston Neighborhood Development, and Boston Public Schools. This comprehensive team provided the GBTF with guidance on key questions and assisted with the development and enactment of their recommendations (Conway et al., 2004; Dalzell, 2012).

The twenty-two-member Task Force met monthly for one year before releasing their findings in November of 2004. The first several meetings explored national practices in regards to green building and the last seven meetings each had a specific theme. Each of these themes became focal points in the Task Force report and specific

recommendations were developed for each. Based on the recommendations under each of these categories, the Task Force identified the “Next Steps for Boston— A 10 Point Action Plan” which detailed ten specific actions the Task Force believed the City must take to achieve its goals (Appendix A).

The Task Force recognized that “the lack of awareness about the benefits and opportunities of green building may be the single greatest challenge” (Conway et al., 2004) and within the topic of Education, Awareness, and Training developed several recommendations to disseminate information about the benefits of green building and best practices. They also encouraged training for City staff and recommended that the City support education programs in academia, the building profession, labor unions, and other industry labor. Another major challenge identified by the Task Force was that, while green buildings can significantly lower operational costs, many aspects of green buildings require greater initial capital investments. This is an issue of particular importance for developers that plan to sell shortly after the project is completed. To address this mismatch, the Task Force developed two different types of recommendations under the categories of Incentives and Capital and Operating Finance. They believed the best incentives would “accelerate the adoption of green building strategies and practices, such as integrated design” and also proposed several direct financing mechanisms to ease the burden on developers. This idea of integrated design was considered to be so important by the Task Force that it not only appeared in several categories, but it also earned consideration of its own under the topic of Building a Green Team. The Task Force developed five recommendations specific to encouraging or requiring integrated design and development practices through City policies and awards programs.

The Task Force also recognized that the onus for improving the built environment does not fall entirely to the building industry and that the goals of the City, and even of individual buildings, could not be achieved without a strong support network. Recommendations developed under the topic of Sustainable Planning and Leadership were intended to assist green buildings through utilities programs, branding and marketing, legislation, and City development review policies. In addition to requiring support, the Task Force acknowledged that green buildings could not succeed if green building materials were not actually available and recommended City interventions to ensure that “the necessary materials and services be cost competitive and locally available to the market”(Conway et al., 2004).

Finally, the Task Force understood that “clear standards are essential if Boston is going to commit to green building and to maintaining a level playing field” (Conway et al., 2004). Under the heading of Standards, Measurement, and Verification the Task Force recommended that the City adopt the USGBCs LEED building rating system, recognizing LEED as setting a higher standard for buildings while being “mainstream” enough to not be a competitive liability. The Task Force recommended that LEED standards be incorporated into City facilities, City-sponsored development, and large private projects.

Implementation of the Green Buildings Amendments

The Green Building Task Force (GBTF) developed a total of 38 recommendations in the seven focal categories discussed in their report. From these 38 recommendations, the Task Force selected ten specific action points they believed were necessary steps for the City of Boston. Four of these ten actions were drawn from the section of the report

that addressed Standards, Measurement, and Verification. The first three detailed how the City should incorporate LEED standards into their policies while the fourth called for the City to draft a work plan describing how to fully implement the three preceding actions within the next three years. The Task Force recommended that the City of Boston require all new construction or major renovations of City facilities be certified LEED Silver. For City-supported projects and private developments, the Task Force recommended the City mandate a standard of LEED “Certifiable” meaning that these projects should be required to meet the standards of LEED certification and that completing the USGBC LEED certification process “should be encouraged but not required” (Conway et al., 2004).²

On December 19, 2006, Mayor Menino announced a proposed change to the Boston Zoning Code at a public meeting held by the Boston Redevelopment Authority (BRA), which is the agency responsible for planning and development activities (City of Boston, 2006). Following the recommendations of the GBTF, it was proposed that the Boston Zoning Code be amended to include Article 37 (Green Buildings), which would require that any project approved under Article 80B (Large Project Review) be designed and built to meet the United States Green Building Council’s Leadership in Energy and Environmental Design (USGBC LEED) certification. Although the GBTF had recommended that the LEED Certifiable requirement be applied to both large and small projects reviewed under Article 80 of the Zoning Code, the proposed amendment only applied to large projects (those 50,000 square feet and larger). After hearing comments

² The Green Building Task Force Executive Summary is the only available record of their work. Although the Executive Summary states that a more detailed explanation of their findings and recommendations can be found in the committee’s full report, no such report seems to exist. Upon contacting the City to request this document, I was informed that the Executive Summary is the only report from the GBTF. Because of this, it is unclear how consensus formed regarding the standard of LEED certifiable or whether other policy options were considered.

from the public, the BRA Board of Directors voted to approve the amendment and on December 21, 2006 sent a memo to Mark Maloney, Director of the BRA at the time, requesting that “the Director be authorized to petition the Boston Zoning Commission to adopt Article 37 of the Code and to approve an amendment to Article 2 and 2A of the Code and Article 80B-3.2, 5.2 and 6.2, relative to Green Buildings” (Miller et al., 2006).

The Boston Society of Architects (BSA) also voiced support for the amendments in a memorandum to the BRA in which they “warmly applaud[ed] the City of Boston for introducing new standards to achieve sustainability in major new and renovated buildings in the city, through the Article 80 review process of the zoning code;” the BSA also believed that the actions taken by the Mayor and the BRA constituted “an event of enormous importance not only for the city, but also for Massachusetts and the country” (Boston Society of Architects, Murray, & Wickersham, 2006) In addition to praising the efforts of the City to achieve their climate goals, the BSA made recommendations regarding the implementation of the zoning amendments, specifically that the City include the ability to achieve credits for green buildings that address Boston-specific issues that may fall outside the scope of the LEED standards (Boston Society of Architects et al., 2006).

After receiving statements of support from both the BRA and the BSA, the Boston Zoning Commission, which is a sub-department of the BRA, held two public hearings on the proposed changes. The first was a notice of the pending zoning amendment; after allowing for a public comment period the Zoning Commission voted to approve the recommended changes to the Zoning Code at the second hearing held and the

amendments regarding green buildings were officially adopted as of January 10, 2007 (Boston Redevelopment Authority, 2007a, 2007b, 2007c, 2007d; Dalzell, 2012).

In their final form, the green building amendments included the addition of Article 37 to the Zoning Code as well as changes to Articles 2, 2A, and 80B. Article 37 established the certifiable standard and created Boston Green Building Credits, which addressed city-specific situations and goals. Development teams can earn up to four points toward the LEED certifiable calculations by achieving these specific measures in the areas of Modern Grid, Historic Preservation, Groundwater Recharge, and Modern Mobility (Boston Redevelopment Authority, 2007c; Miller et al., 2006). Article 2 of the Zoning Code defines terms used in the Code and Article 2A contains definitions specific to Neighborhood Districts and Article 80 (Development Review and Approval). The amendments to these two Articles enacted with Article 37 added definitions for the USGBC, LEED, and green buildings. According to these amendments, the term green buildings specifically means “structures and their surrounding landscape designed, constructed, and maintained to decrease energy and water usage and costs, to improve the efficiency and longevity of building systems, and to decrease the burdens imposed on the environment and public health” (Boston Redevelopment Authority, 2007b; Miller et al., 2006). Article 80B addresses development review requirements and procedures for large projects, which is defined as any development 50,000 square feet or greater. The amendments to Article 80B required that large projects comply with Article 37 and outlined how this would integrate with the existing review procedures (Boston

Redevelopment Authority, 2007d; Miller et al., 2006).³ The full text of Article 37 is presented in Appendix B.

There is no journalistic evidence of any opposition to the green buildings zoning code amendments, nor could any be found among official documents or records of the meetings held regarding the change. According to Mr. Dalzell, other than statements of support, the only public commentary was a suggestion that the City require green roofs as is done in Chicago (Dalzell, 2012). The seemingly unanimous support for these additions to the Zoning Code may be due to the close working relationship between all of the stakeholders during the course of the GBTFs effort. It appears that any issues were dealt with prior to going public, and the Mayor was able to publicly present a proposal that had been drafted with input from all sides and had already received full support. I was unable to find any documentation of the discussion that may have occurred during the exploration phase and, according to Mr. Dalzell, there are no records of the preliminary drafts of the zoning amendments that may have been circulated and edited internally (Dalzell, 2012).

Article 37 Procedures

The following is a description of the official version of the Article 37 process according to the procedural documents provided by the BRA and as described during meetings with BRA staff (Boston Redevelopment Authority, n.d.; Dalzell, Pederson, & Zlody, 2011). Any discrepancies between these two official versions, as well as any differences between the official version and the experiences of the building professionals

³ The full text of Article 80 is available on the BRA website at: <http://www.bostonredevelopmentauthority.org/pdf/ZoningCode/Article80.pdf>

interviewed, indicate a misunderstanding of the policy and possibly a problematic aspect of its administration. As such, these issues will be discussed in the following chapters.

This amendment is intended to promote green building practices in the city and reduce the environmental impacts of large buildings. Article 37 does not require that the buildings actually achieve LEED certification, but they need to be LEED certifiable as determined by an interagency review committee and with the endorsement of a LEED Accredited Professional (Boston Redevelopment Authority, 2007c). The determination of whether or not a project is LEED certifiable is made during the permitting process. The Article 37 review takes place within the context of Large Project Review, as mandated through Article 80 of the Boston Zoning Code. The following descriptions focus on the Green Buildings components of the review procedures, but it is important to note that the documents submitted at each stage to fulfill the Article 37 requirements are only parts of the larger documents required by the Article 80 procedures. Other factors that must be addressed by the project team during the review process include Transportation Impacts, Environmental Protection, Urban Design, Infrastructure Systems, Historic Resources, Site Plan, and Tidelands (Boston Redevelopment Authority, 2007d). Numerous City agencies are involved in the development review process and are responsible for compliance within these categories; determining compliance with the Article 37 component of the review process is the specific responsibility of an Interagency Green Building Committee (IGBC).⁴

⁴ The Interagency Green Building Committee is defined as “an interdisciplinary committee consisting of at least one (1), but not more than two (2) representatives of city agencies including but not limited to, the Boston Redevelopment Authority, the Boston Environment Department, the Boston Transportation Department, the Inspectional Services Department and the Mayor’s Office.” (Boston Redevelopment Authority, 2007c)

Prior to submitting any documentation to the BRA, the project team is expected to convene and identify which LEED standard (Homes, New Construction, Core and Shell, Commercial Interiors, or Healthcare) best matches their proposed project and identify potential LEED points and Boston Green Building Credits they plan to achieve. Once the LEED standard and possible points have been selected, the full project team, including the architects, engineers, and the LEED Accredited Professional (AP) that will oversee the project, must have a pre-submission meeting with members of the Interagency Green Building Committee (IGBC). The purpose of this meeting is to allow review and discussion of the proposed LEED and Boston Green Building credits, but it is also intended to provide City officials with an opportunity to ensure that the project team is working together and encourage them to pursue an integrated design strategy. After this initial meeting with City officials, the project team submits a letter of intent outlining their green building strategies, integrated design approach, and whether or not the project will actually pursue LEED certification.

The next document that must be submitted to the BRA is the Project Notification Form which, despite its name, is a 100-plus page document that includes a completed LEED checklist, a narrative detailing how each point will be achieved, and the credentials of the team members.⁵ This is distributed to members of the IGBC, who review the green building components and submit feedback to the BRA project manager regarding any questions about how credits will be achieved and whether any changes to the checklist or narrative are necessary. A Scoping Session is then held, which allows the

⁵ A sample LEED checklist is provided in Appendix C.

project team to receive feedback from the public as well as from the IGBC and other City departments.

With this input from the public and feedback from City officials, the project team then submits a Draft Project Impact Report that will include an updated LEED checklist. Once this is reviewed by the IGBC and other City departments, the project has received sufficient approval to warrant investment in design and engineering. The project team then makes any necessary changes before submitting a Final Project Impact Report that includes an updated LEED checklist and completed construction drawings. Throughout this Design Review phase of the permitting process, multiple meetings are held between BRA staff and the project team to ensure compliance with all aspects of Articles 37 (Green Buildings) and 80B (Large Project Review). Before signing off on the design, the BRA makes sure that the project is positioned to receive a signed cooperation agreement, meaning that it has successfully cleared all other permitting review processes such as transportation planning.

For Final Design Approval, the project team must submit a Green Building Report that includes the final LEED checklist, final construction drawings, a narrative detailing how each credit will be achieved (with specific references to the construction drawings and specifications), and a Letter of Design Certification. The Letter of Design Certification must be signed by the LEED AP or “other BRA recognized professional” certifying that, to the best of their knowledge, the project has been planned and designed to meet the certifiable standard by achieving the points identified in the checklist. Based on this documentation, the BRA makes the final determination that the project is in full compliance with the regulations of Article 37 and issues a building permit so construction

can begin. If there are any changes during construction that would lower the point score, the project architect is expected to notify the BRA. The Article 37 procedures do not specify what would happen if, due to changes during construction, a project no longer meets the certifiable standard nor do they include any mechanism or process to assess compliance after the building permit has been issued. Once construction is complete, the LEED AP must submit another letter certifying that, to the best of their knowledge, the project is in compliance with the Green Building Report. Any projects that actually pursue LEED certification must also submit their USGBC documentation.

CHAPTER 3

BACKGROUND AND LITERATURE REVIEW

Green building policies are being implemented at federal, state, and local levels throughout the country. The first LEED-based public policies were enacted in 2000 by the cities of Seattle, WA, Austin, TX, and Santa Monica, CA (Koski, 2010). According to the USGBC, LEED has now been adopted or referenced in public policies by 384 cities and towns, 58 counties, 34 state governments, and 14 federal agencies or departments (U.S. Green Building Council, 2011). This count includes legislation, ordinances, executive orders, resolutions, and incentive programs. In addition to Boston, the list contains six regulations that specifically use the term “certifiable” and more than 35 policies that require or encourage a LEED checklist be submitted but do not actually require LEED certification (U.S. Green Building Council, 2011).

In an analysis of how this policy diffusion took place, Koski found that by 2008, 119 U.S. Cities had implemented LEED-based policies with adoption happening at a rate of 15 or more new City policies each year from 2004 and 2008 (Koski, 2010). At the same time, a body of criticism was mounting against the LEED rating system, with many researchers focusing on the issue of energy savings of LEED certified buildings. One study of 100 LEED certified commercial buildings found that, on average LEED certified buildings saved energy compared to traditional buildings but, 18-35% of the buildings actually use more energy (Newsham, Mancini, & Birt, 2009). Another study using the same data found that while smaller LEED certified buildings saved energy, larger buildings were able to achieve LEED certification without any demonstrable energy savings, refuting the findings of Newsham, Mancini, & Birt (Scofield, 2009).

Furthermore, studies have also shown that the energy performance predicted at the time of certification is often unrelated to the post-occupancy performance of these buildings. In 2008 the New Buildings Institute evaluated the performance of 112 LEED certified commercial buildings and found that approximately half of the buildings met or exceeded the predicted energy performance while the other half failed to meet expectations. A full 25% of the buildings had energy use intensities that were significantly lower than the design projection (Turner & Frankel, 2008). In another post-occupancy study of 11 LEED certified buildings one building exceeded its predicted energy use by 300% because of HVAC and lighting systems control issues. While 6 of the buildings in this study actually exceeded expectations, none were within 20% of the design performance (Turner, 2006).

In response to research and evaluation that have identified flaws in the certification system the USGBC is continuously reviewing and revising the LEED protocols. For example, the newest version accounts for regional differences, for example a building in a hot, arid climate will be awarded more points for innovative water-conservation techniques than a building in a wetter climate where water efficiency is less important. While changes like these can improve the rating system, it also means that public policies using LEED have established a constantly moving target. This is one of many issues raised by a growing body of literature in the legal community that questions the legality and wisdom of using a private standard in public policy (Keller, 2012; Prum, Aalberts, & Del Percio, 2012; Schindler, 2010; Wolf, 2011).

Knowledge of LEED's shortcomings and problems extend beyond the building industry as criticisms of LEED have been prominently featured in national publications

including USA Today, the New York Times, and on NPR (Cater, 2010; Frank, 2012; Navarro, 2009). In spite of this, the number of municipalities adopting LEED-based policies has increased threefold since 2008. Although this study does not focus on the value of the LEED rating system and whether it can appropriately be used in public policy, it is important to note that its merits, which continue to be debated, had been seriously challenged by the time Boston elected to use it as the foundation for their green building regulations.

While LEED-based policies have seen rapid, widespread adoption across the United States, scholarly examinations of these policies has remained limited. The literature focuses primarily on the types of green building policies being implemented, policy implementation strategies and, as cited above, the legality of LEED mandates. There have been no studies of the policy outcomes, perhaps deferring to the literature regarding LEED itself to address these concerns.

In a 2007 study of state-level green building policies for public sector projects, researchers surveyed 9 of the 11 existing policies and conducted interviews with officials at the corresponding government agencies. They identified and compared three types of policy options for the public sector and developed four criteria for evaluating the likelihood of success of a policy (Pearce, DuBose, & Bosch, 2007). The three types of action considered in this research were: instituting a formal policy to require or encourage green building; developing programmatic interventions such as training, guidance documents, and capacity building; and creating or adopting evaluation mechanism like building performance monitoring, reporting requirements, and third-party certification programs. In this study, success was considered from the perspective of a

public official or agency and was focused on the ability to implement a green building policy, suggesting “implementability” as well as the potential social, environmental and economic impacts as criteria that should be used to evaluate a proposed policy. This research did not evaluate any specific policies, nor did it address attendant policy outcomes. Although it does not offer a “systematic evaluation of the pros and cons of these policy options,” it provides valuable guidance for public officials working to develop a green building policy by outlining and explaining policy types to consider and criteria that can be used to determine whether they will be able to actually implement the policy.

The same research team utilized the survey and interviews to explore the conditions that created the impetus for implementing green building policies (DuBose, Bosch, & Pearce, 2007). Based on the experiences of officials within nine of the eleven states that had state-level policies at the time, the researchers developed a framework for policy implementation to describe how green building policies evolved within public agencies. They found four key phases of policy development: inspiration, motivation, implementation, and evaluation. This study focused on state-level policies for public sector projects and defined “success” as achieving the implementation of a policy. Since the states considered in this study were early-adopters of green building policies, the experiences captured in this research can provide guidance for other public agencies moving forward.

A 2008 study explored the green building policies that had been implemented at the local, state, and federal levels throughout the country (Sentman, Del Percio, & Koerner, 2008). The researchers organized the policies into several categories at each

level of government. At the local level, they identified mandates for public projects, incentives for private construction, and mandates for private construction. The policy in Boston was noted as being the “most interesting” private mandate because of the controversial LEED certifiable standard. According to this study, there are no state- or federal-level green building mandates for private construction, but there are incentive programs such as property tax abatements and income tax credits. There are several state-level mandates for public projects and at the federal level, mandates have been adopted by numerous agencies and departments but there is not a comprehensive mandate. This study found that the majority of green building policies at all levels of government are LEED-based. However, it did not provide an account of policies that used LEED compared to those that did not. And, the study did not include all of the green building policies that had been enacted at the time. This research simply characterizes the green building policy environment in the United States.

Boston has elected to incorporate their green building policy into the zoning ordinance. While claiming to be the “first in the nation” to do so, the city is not alone. A 2009 study examined how the LEED building rating system had been incorporated into planning regulations (Retzlaff, 2009). Retzlaff identified 60 cities and counties that had LEED-based green building policies at the time (October 2007) and, using available policy documents as well as a survey sent to policy administrators (n=34), examined the details of the policies as well as the opinions of the administrators for 55 jurisdictions. The study showed that three-quarters of the cities and counties had policies for new construction of public buildings and two-thirds of these had a size- or cost-based trigger for the policy rather than applying it to all construction projects. The policies mandated

that the buildings actually achieve certification from the USGBC in all but four of the jurisdictions. Twelve of the cities in the study had LEED mandates that applied to private developments. None mandated LEED for all private construction, but typically made the determination based on zoning district or project size. In addition to the LEED mandates, there were 18 policies establishing incentives for private developments to pursue LEED certification including density bonuses (6), an expedited permitting process (4), property tax abatements (4), fee waivers (2), and grants for the cost of certification (2). Retzlaff found that the majority of the jurisdictions adopted LEED verbatim and that only five had made modifications. For the majority of the jurisdictions (64%) the green building policies were administered by the planning department, whereas only 24% of the policies were the responsibility of the building department. Retzlaff suggests that the planning department is more appropriate for these regulations than the building department because green building policies include aspects such as landscaping, siting, and transportation or connectivity that are outside the realm of building materials and construction. Retzlaff also found that on average, cities with a LEED mandate only for public buildings, built 3.06 LEED certified building under the policy while those that had policies in place for private construction averaged 25 certified buildings under the ordinance. Another interesting finding of this study was that, although administrators gave specific reasons for implementing a green building policy, none could offer any specific reasons for choosing LEED over any other certification program. This research differs from the previous studies in that it goes beyond classifying types of policies, and looks specifically at the technical details and makes an assessment of the policy outcomes.

The enactment of Article 37 in Boston sparked a controversy regarding the use of the LEED certifiable as a green building standard rather than requiring LEED certification. From a legal perspective, it was noted that the tactic could help the City avoid potential lawsuits that would result from mandating a private standard (Inside Green Business, 2007). From the perspective of an engineer and building scientist, Simi Hoque characterized the certifiable standard as a missed opportunity and a weak dilution of the rigorous LEED certification process (Hoque, 2008). She argued that “certifiable” has no clear definition and that, due to the lack of a clear determination process, it is unverifiable. Other press regarding Article 37 or the certifiable standard concluded that it was a reasonable compromise considering the legal and political challenges associated with mandating LEED certification for private construction (Palmer Jr., 2006; Pollack, 2007; Wendt, 2008; Zezima, 2006).

While there is a massive body of literature regarding LEED certification, scholarly research regarding the LEED certifiable standard is entirely nonexistent. A search simply for the term “LEED” in Academic Search Premier generates over 35,000 articles yet the same search for any iterations of “LEED certifiable” turns up no results. In addition, there is no research addressing the outcomes of green building policies, whether they be based on LEED or otherwise. In cases where LEED has been mandated, perhaps it is reasonable to defer to studies addressing LEED certified buildings, but there are a significant number of policies that have modified LEED in some way or do not actually require certification. As the number of such policies continues to grow, it is critical to assess the effects of these policies and determine whether they are truly a desirable course of action.

CHAPTER 4

RESEARCH METHODS AND PROCEDURES

The Qualitative Paradigm

Quantitative studies aim to report the number of observations in a particular category or the relationship between two categories and their findings are able to be presented as a table of numbers (Weiss, 1994). Quantitative research is valued for its ability to test hypotheses and generate numerical observations that can be replicated by another researcher (King, Keohane, & Verba, 1994). Alternately, qualitative research is often regarded as unscientific because it does not typically generate numerical data that lends itself to such statistical analyses; however, qualitative research methods are able to produce rich descriptions of events and experiences and often uncover considerable amounts of knowledge and understanding about particular phenomena (Weiss, 1994).

There are several reasons why a qualitative investigation is particularly well suited to the aims of this research project. First, I am interested in developing a detailed description of the work being done under the requirements of Article 37 (Weiss, 1994). Since I am not conducting this work myself, I can be considered an outside observer to the inner workings of architectural practice in Boston. By conducting interviews with architecture practitioners I am able to gain an understanding of the policy outcomes from the unique perspective of those on the inside. Secondly, the interviews allow us to integrate multiple perspectives into our understanding of the policy outcomes (Weiss, 1994). A flexible interview format is critical to collecting this information as each informant will respond differently to a certain question. Treating the interview as a conversation rather than a survey, allows for follow-up questions and a deeper, more holistic insight into the informants' experiences and opinions. Qualitative interviews

provide access to a breadth and depth of information that data from a single source could never provide. Also, I have argued that it is the opinions and experiences of those working under Article that will determine if the policy succeeds. The research interview uniquely allows us to understand how Article 37 has been interpreted by its intended audience (Weiss, 1994).

Data Sources

Public Records and Public Officials

Information gained through meetings with officials at the Boston Redevelopment Authority as well as conversations carried out through email were invaluable to this research and helped to form understanding of the history and implementation of the green building amendments to the Zoning Code. In addition, BRA staff was able to provide several procedural documents, project documentation, and memoranda that could otherwise not be located among the official records available online. Other documents, records, and press releases were easily found on the BRA website. Building Permit records located at the Inspectional Services Department in Boston were used to identify large developments in Boston and to quantify the number of projects that had been completed under Article 37. Although quite limited, newspaper accounts of the policy helped to frame the discussion and public opinion of the zoning amendments and were located by using ProQuest Newspapers database to search the archives.

Identifying Informants

A project architect often serves in a managerial role and functions as the interface between the client and other members of the project team such as engineers and contractors. Ensuring compliance with relevant zoning and codes often falls under their scope of

responsibility which, in the case of Article 37 of the Boston Zoning Code, means the project architect determines and endorses the LEED certifiable status of the building. This uniquely positions the architect to understand the policy and to speak to how it is affecting their practice as well as the influence it might be having on their clients and colleagues in other related disciplines. It could be argued that the developers are those most directly affected by the policy, but since it falls to the architect to interpret and administer policy for their clients, it is this perspective that is explored here.

A qualitative approach to assessing Article 37 allows for a broader view of the effects this policy has had on the building industry in Boston. While it is certainly valuable to quantify how it has affected building performance, it is also necessary to understand the more subtle and perhaps more complex influences that this change to the zoning code has had on building professionals and the building industry in the City of Boston. Article 37 seeks to create a semi-prescriptive path for creating high-performance buildings, but also tries to achieve this by compelling project teams to implement a more integrated approach to design and construction. The conviction that integrated design is essential to producing good buildings is widespread among experts in the field of green building and is certainly held by the members of Mayor Menino's Green Building Task Force, as was evident in several of their recommendations. In this study, data collection was done through semi-formal, qualitative research interviews with building professionals; consequently, the information presented here is inevitably a subjective reality informed by the experiences of those interviewed. While subjectivity is generally considered an unwelcome bias in scientific research, in this case understanding that

reality is crucial, as it is the opinions and beliefs that have been wrought from these experiences that will determine whether this policy succeeds.

Selecting Informants

While quantitative research relies on probability sampling methods, non-probability sampling is often better suited to the goals of a qualitative research project. In this study, informants were selected using purposive sampling, meaning that they were selected based on my own understanding and judgment about who would be able to provide valuable information with regards to the purposes of this research (Babbie, 2001). To assist with selecting interview subjects, a file containing all of the large projects that had been approved since Article 37 was implemented was obtained from the BRA (Kowalcky, 2011). This was used in conjunction with the Certificate of Occupancy (CO) records maintained by the Inspectional Services Department to identify completed projects that had undergone the Article 80 review process. At the time this study was undertaken, only ten projects that met the new Green Buildings requirements had been issued a CO.

After completed projects were identified, any available project documentation (obtained from BRA officials or the BRA website) was used to identify firms that had worked on a completed Article 37 project. This approach is likely to have captured many of the architecture firms that had experience working with the Green Buildings requirements. However, some projects may have been initiated but not yet received any permits from the City which would exclude them from the results of this search. In an effort to capture these as well, a simple internet search was used to determine the names of architectural firms that work on large projects in the City of Boston. The website of

each firm was then used to identify a specific person at the firm that is responsible for sustainability measures or who was known to be the architect on one or more of the previously-identified large projects. When this information could be ascertained, an email was sent directly to this person inquiring if they would be interested in participating in this study. In cases where the appropriate individual could not be identified, an email was sent to the contact email address provided on firm's website.

The emails contained a brief introduction, description of the project, and an explanation of what would be expected if the recipient wished to participate; a more in-depth explanation of the study was provided in an information sheet included in the email. In addition to the purposive method of identifying interview subjects, I utilized snowball sampling and concluded each interview by asking if the participant could suggest any other professionals that might be interested in participating (Weiss, 1994). Overall, 20 firms were contacted and interviews were arranged with nine individuals at seven different firms.

Data Collection

The primary research method utilized in this study is the qualitative research interview. The interviews conducted were semi-formal in that an interview guide was used to facilitate discussion but a fixed set of questions was not answered by each informant. This style of research interview differs from questionnaires and survey interviews in several important ways. A questionnaire typically has fixed questions and fixed responses, whereas a survey interview may allow for open responses but still requires that the same questions be asked of all respondents. The flexible format of a semi-formal interview allows the interviewees "to speak freely in their own terms" and

can also be thought of as a “guided conversation” (Lofland & Lofland, 1995). Steiner Kvale uses the term “semi-structured life world interview” to characterize these interviews that enable us to “understand themes of the daily lived world from the subjects’ own perspectives” (Kvale, 2007).

Whenever possible, the interviews were conducted in person but when scheduling conflicts made this prohibitively difficult the interviews were conducted over the phone. Interviews with four of the firms were conducted over the phone while the other three were in person. The interviews were intended to be open-ended and as conversational as possible so, while a prepared a list of questions was used to facilitate discussion, the participants were encouraged to discuss whatever aspects of building practices in Boston were of interest and any issues or ideas that might surface during the interview. With the permission of the participant, each interview was digitally recorded and was later transcribed manually.

Data Analysis

Quantifying Interview Responses

The analysis of the interview texts focused primarily on understanding and interpreting the meaning of the experiences of the interviewees. Initially, I utilized meaning condensation and categorization, two methods of content analysis, to quantify the subjects’ responses and understand the overarching themes of each interview (Kvale, 2007). To complete the meaning condensation, long statements from the interview text were condensed into shorter sentences and then rephrased to capture the essential meaning of the interviewee’s response. The transcripts of each of the seven interviews were coded in this way and then the responses to be categorized based on whether they

expressed positive or negative experiences or opinions of Article 37 (Babbie, 2001). This allowed the number of positive and negative expressions to be quantified, as well as the number of interviews that described the same opinion or experience. Because this coding scheme was relatively simple, it was all completed by hand rather than using a qualitative analysis computer program.

Qualitative Methods of Analysis

Epistemologically, qualitative research can typically be viewed through the lens of one of two metaphors where the interviewer can be seen as either a miner or as a traveler (Kvale, 2007). In the miner metaphor, it is the role of the interviewer to uncover knowledge in the form of “objective real data or as subjective authentic meanings.” This viewpoint parallels scientific thinking that knowledge already exists as an objective reality waiting to be discovered. The traveler metaphor sees the interviewer as a visitor or outsider engaging in conversations and collecting stories from those he or she encounters. This view is based on a postmodern understanding of knowledge as a social construct, subjectively influenced by personal experiences and beliefs (Babbie, 2001; Kvale, 2007). This study relies on the synthesis of information from multiple sources including interviews, news articles, personal communication, and official documents. Following the metaphor of a traveler, new knowledge is gained from this synthesis and a deep and critical interpretation of meaning (Kvale, 2007). Although interpretation is the primary method of analysis, it cannot be captured in a standard process and is often characterized as an art as much as a science (Babbie, 2001; Kvale, 2007). Because this study is concerned with the impact of Article 37 on architectural practice the unit of analysis in this study is the firm, represented by an interview rather than the interviewee. Each

interview can be thought of as a case study and the findings of this study constitute a cross-case interpretation of their experiences and perspectives.

Validity and Generalization

Qualitative interviews are often criticized as being an invalid research method because of the inherent subjectivity and the findings are frequently dismissed as being specific to a small number of subjects that cannot be generalized to a larger population (Kvale, 2007). In many ways, social researchers can only rely on the quality of their interviews and their ability to check, question, and theorize throughout the study to ensure the validity of the material (Kvale, 2007; Weiss, 1994). However, there are also several tactics available to examine and address potential sources of invalidity, including checking for representativeness, checking for researcher effects, and replicating the findings (Kvale, 2007; Miles & Huberman, 1994). Most relevant to this study is the issue of representativeness and replication.

While the sample in this study is largely one of convenience (Weiss, 1994), it is likely to contain a representative from nearly all of the firms that had experience with Article 37 at the time the interviews were conducted. Development, particularly of large projects, was so limited during the economic recession that followed the enactment of Article 37 that there were very few firms that had worked under the new Zoning requirements, meaning that there was a very small subset of architects from which to sample. In this case, many members of the subset were able to be identified, but it would have been nearly impossible to identify all of them (Babbie, 2001). Not only are many of the firms captured in this study, but the informants span a range of specialties and of corporate and personal philosophies regarding sustainability. Because of this, I argue that

the experiences described in these interviews are representative of the impacts that Article 37 has had in the first several years it has been in place.

In quantitative research, a study is considered replicable when the described methods can be followed to reproduce identical data and results. In qualitative research, replicability is also desired but must be considered through a slightly different lens. If another researcher were to attempt to replicate this study it is not likely that they would reproduce the exact interview texts despite utilizing the same methods, interview guide, and interview subjects. However, this researcher might draw many of the same conclusions when presented with the interview texts that have already been generated. It is in this sense that a qualitative research study can be considered replicable (King et al., 1994).

In this particular study, each interview represents an individual case. By considering these cases in relation to each other we are able to identify many instances of similar experience or opinion that support the validity of the findings (Miles & Huberman, 1994). For example, if one respondent reported that he or she was not required to sign an affidavit stating the project was in fact LEED certifiable, it is reasonable to question whether this had actually occurred or if perhaps the informant simply forgot about the requirement since some time had passed. However, when the same experience is described by multiple informants with different levels of and/or more recent experience with Article 37, it can be concluded that this actually indicates an administrative issue with the policy. Conducting comparisons between cases and identifying similar results in multiple cases, which is known as triangulating, provides

corroboration of the findings and further evidence of their validity (Miles & Huberman, 1994).

Addressing questions of validity and reliability of the findings allows for confidence in the generalizability of this research. Since there are more than 40 municipalities that require private construction meet some standard of LEED certifiability, it is important to assess the degree to which the findings regarding Boston's policy extend to these similar policies. In qualitative studies such as this, we cannot make statistical generalizations about the findings but instead use reasoned judgment to develop an analytical generalization (Kvale, 2007). While practitioners operating under another similar policy may not report the exact same opinions, it is likely that their experiences are reflected in the results of this study. The experiences described herein are also relevant to other jurisdictions in that they constitute the educated opinions of experts in the field of architecture and represent the only exploration of the after-effects of a green building policy.

Ethical Considerations

The primary ethical concern when conducting social research is to ensure that research participants are not harmed (Babbie, 2001). Although, the potential for harm is relatively low in this study since participants were not asked to divulge or explore sensitive or deeply personal information, several steps were taken to ensure that interviewees would not be negatively affected by their participation in this study.

Before an interview was conducted, each subject signed a form agreeing to participate in the study, to have the interviews transcribed and archived, and expressed whether they consented to having their name used or if they preferred to remain

anonymous. Although some subjects agreed to be identified by name in transcripts, publications, or presentations resulting from this research, every effort was made to mask the identities of all of the participants in order to best protect the identities of those who requested confidentiality. This guarantee of anonymity allowed participants to speak more openly and critically, without fear of retribution or damage to their professional reputation, about a first-in-the-nation policy of which the City is very proud. Therefore, the names of the building professionals and firms discussed in this research are fictional and any resemblance to a real person or firm is entirely unintentional.

This research protocol, including the consent form and study information provided to the interviewees, was approved by the University of Massachusetts Institutional Review Board (IRB) for the Protection of Human Research Subjects and adhered to the IRB guidelines and ethical standards for Human Subjects Research. All of the researchers successfully completed the Collaborative Institutional Training Initiative (CITI) Program for Social Behavioral and Education Research Investigators and Key Personnel.

CHAPTER 5

POSITIVE POLICY OUTCOMES

Introduction

The architects that I interviewed have a range of experience working on certifiable and LEED certified projects. Their portfolios span all types of development, and their personal interest in sustainability varies widely. The common thread among them seemed to be that, overall, they believe that Article 37 was a good thing for the city to do. Here I present the positive commentary they gave in regards to Article 37 as well as provide background information on each firm and individual architect. Through the interviews and information provided on company websites, I was able to better understand the philosophy of each firm in regards to sustainability, their size, and the scope of their influence on the Boston building industry. The professional training, certifications, and experiences of each architect help to provide context for their opinions and analyses of Article 37 and the building culture in Boston.

Grant Engineering

Grant Engineering is a firm of 350-400 employees with a large portfolio in the Boston area that includes institutional buildings, data centers, convention centers, manufacturing facilities, interior fit-ups, and several other building types. Their services include electrical, mechanical, and plumbing engineering (MEP); building commissioning; building simulation; benchmarking; LEED administration; power engineering; and energy management. While Sustainable Design Leader Elizabeth Simmons is unsure of Grant's annual buildout, she estimates that it is millions, if not billions, of square feet. Grant considers sustainability to be one of their core principles

and believes that an integrated approach to design is the best way to successfully create high-performance buildings; they implement integrated design strategies for all of their projects. Grant was one of the first MEP firms to sign the AIA 2030 Challenge and Commitment; they have completed more than 50 projects that have achieved LEED certification and are currently working on 80 more projects that are projected to be LEED certified. They also have experience working with Energy Star, Labs21, the Green Guide for Health Care, and Green Globes. This commitment to sustainability and integrated design has positioned Grant ahead of regulations that have been enacted in the city and their experience with LEED and other building rating systems has made the requirements of Article 37 fairly easy to meet.

Simmons is a LEED Accredited Professional as well as a Professional Engineer. She has approximately 15 years of experience working in the building industry and currently specializes in building performance analysis and facilitating sustainability efforts throughout the company, including the certification process for projects that are pursuing LEED. She has served as a project manager on numerous projects with all levels of LEED certification and has worked on new construction as well as renovations for a large range of building types including healthcare, commercial, K-12 schools, residential, and mixed-use. As a consultant, she helped clients develop an integrated design process and organized many workshops focused on sustainable design. At Grant, she continues to organize training sessions to improve communication between the architects and engineers, improve Grant's own design process, keep employees informed about the always-evolving green building and design practices, and facilitate the exchange of ideas across disciplines. Throughout her career, Simmons has also been involved in green

building policy work in several cities, including Boston, and continues to be involved with her local building committee. Simmons' extensive professional experience with both the technical and regulatory aspects of the sustainable building industry leave her well-positioned to provide valuable insights into the efficacy of Article 37 and the impacts it is having on the building industry in Boston.

Simmons believes that a paradigm shift is necessary to realize greenhouse gas reduction and sustainability goals and, although the role of Article 37 in achieving this has yet to be seen, she believes it does have the potential to move the sustainability agenda forward. Although Simmons highlighted some problems with Article 37 being based on LEED standards, which will be discussed later, she finds that the LEED foundation ensures that the breadth of sustainability issues are addressed whereas other regulations such as the recently-adopted stretch code only focus on single issues such as energy consumption.⁶ Based on her experiences working with Article 37, she believes it is most beneficial in that it forces people who otherwise would not consider energy-efficient strategies to engage with sustainability. It allows people who would never have been sustainability advocates to step into that role as they go through the Article 37 process and learn more about sustainable building strategies and technologies.

In this same vein, Simmons has seen many clients realize that some sustainability measures do not cost any more than traditional practices; because these measures can actually improve the clients' bottom line through operational savings, they decide to specify these measures on all future projects regardless of the regulatory environment.

⁶ The stretch code is an energy efficient building code that is available to be adopted by municipalities in Massachusetts. It requires buildings to achieve 20% reduction in energy consumption compared to the base energy code. A summary of the stretch code can be found in Appendix D. As of January 8, 2013, 143 municipalities have adopted the stretch code (Massachusetts Department of Energy Resources, 2013).

Because Article 37 has connected the standard of certifiability to permitting, it forces the consideration of sustainability early enough in the design and construction process to successfully incorporate sustainable strategies. This is especially beneficial with those reluctant clients who would not otherwise adopt sustainable measures or those who might decide later in the project that they would like to incorporate some green features, once the design process is too far along to make any meaningful changes.

The economic recession that began in 2007 stalled many large projects across the country but the climate for development is now improving. In Boston, developers are beginning to move forward with projects that were initiated prior to the recession but projects that filed paperwork with the BRA prior to the Green Buildings amendments to the Zoning Code are exempt from the regulations. One grandfathered client that Simmons worked with elected to meet the requirements in order to remain competitive despite not being required to do so, believing that a new building that failed to meet the certifiable standard would not be as appealing to potential buyers or lessees. Although she is only aware of this one such case, Simmons believes it is likely that other developers with grandfathered projects will come to the same conclusion about the marketability of buildings that have not received the designation of LEED certifiable.

DesignHouse Architects

DesignHouse Architects is an architecture and engineering firm with approximately 180 employees; they also provide planning, permitting and interior design services as well as sustainable design consulting. As an interdisciplinary firm, DesignHouse inherently utilizes an integrated design process and considers this collaboration to be a critical piece of the firm's identity. DesignHouse is occasionally

hired only as the project architect; however, they prefer to serve as the architects and engineers and do so on the majority of their projects. Because of this, they are able to implement integrated design strategies in all of their work regardless of whether the project is large enough to trigger Article 37, is a smaller project, or is actually pursuing LEED certification. Prior to the enactment of Article 37, DesignHouse had considerable experience working with LEED and approximately 70% of their current project load will apply for LEED certification.

Lisa Norbert, the Director of Sustainable Design at DesignHouse Architects, has 20 years of experience as an architect and has been with DesignHouse for more than 12 years. She is a member of the American Institute of Architects and is a LEED Accredited Professional. Norbert coordinates sustainable design practices for DesignHouse and is responsible for ensuring that these practices are incorporated throughout the architecture and engineering disciplines. She is regarded as the sustainability expert within the firm and serves as the chairperson of the sustainable design group which provides clients with LEED certification management, lifecycle cost analyses, energy and daylight modeling, greenhouse gas emissions assessment, and post-occupancy evaluations. She has worked in green building policy at both the state and federal level and has been involved with the development and implementation of voluntary standards with a particular focus on green schools and net zero energy buildings. Her expertise is widely respected in the field and she has written many articles about sustainable design and has been an invited speaker at conferences throughout the US and Canada.

Norbert believes that Article 37 has been a very effective policy and that it has already led to some important positive changes in Boston. Considering the challenges

associated with a municipality requiring certification, she believes the standard of certifiability is a “nice compromise” that allows the city to actually make progress toward their sustainability objectives without getting snared in controversy. In her experience, people tend to build to code and are often reluctant to go beyond what is required. With Article 37 in place, the minimum acceptable standards have been raised so all large construction projects are now better than they would have been had this regulation not been implemented. In addition, she has found that Article 37 is the first trigger for clients to consider energy efficiency and has often provided enough incentive to convince them to actually pursue LEED certification. Even with clients that already had some sustainability goals, Norbert believes Article 37 played a large part in the decision to go further and achieve certification. With Article 37 in place, Norbert has seen DesignHouse clients become increasingly open to sustainability measures and energy-efficiency strategies. She believes that Article 37 has not only served to educate clients, but it has also transformed the real estate market in Boston by giving green and LEED certified buildings a greater competitive advantage and encouraging the development of more LEED certified projects in the city.

Reese Architecture

Reese is an architecture firm with 35 employees that specializes in mixed use and residential developments. In addition to their extensive residential work, Reese’s portfolio also includes libraries, academic buildings, dormitories, arts facilities, affordable housing, and urban planning. Sustainability is a key corporate principle and much of their work is focused on urban infill development, adaptive reuse, and historic preservation. Reese is also committed to supporting several local non-profit and charity

organizations through the 1% program of Public Architecture, an organization dedicated to using architecture to serve the public good. Reese President Peter Lexington estimates that they complete 600-700 units of housing in Boston each year. Reese prides themselves on their sustainable designs and touts the green features of each of their projects on their website; they have won numerous awards for design, planning, and preservation. According to Lexington, Reese has enough experience with LEED that the Article 37 process is relatively easy. They are able to bring knowledge gained through the LEED certification process to all of their certifiable projects and use the same standards for construction, products, and materials on certifiable projects as they would specify on a certified building.

Lexington is a Fellow of the American Institute of Architects and a LEED Accredited Professional. He has over 20 years experience as an architect and has designed and managed numerous award-winning projects, particularly mixed-use and affordable housing developments. His primary professional focus is sustainable urban development with an emphasis on community-building and providing high quality housing for the low-income market.

Lexington believes that Article 37 “was a great thing for the city of Boston to do” and that it has significantly altered the conversation about development in Boston. He believes sustainability must be regulated in order to achieve results, particularly since the current economic climate does not permit people to spend more than necessary on construction projects. A major factor in the success of Article 37 is that it has raised the bar and leveled the playing field, forcing those who would otherwise not address sustainability in their developments to incorporate green features. It is also works well in

conjunction with other regulations that deal with specific aspects of sustainability, such as the stretch energy code, because it addresses all facets of sustainability since it is based on LEED. Lexington characterizes Article 37 as a fair and effective policy and says that, given the market conditions during this recession, the certifiable standard is particularly appropriate. Reese works with a range of clients including market developers and affordable housing developers; according to Lexington, even the affordable housing developers who receive a lot of subsidies and incentives cannot afford the additional costs of LEED certification at this time.

ArtTech

ArtTech is a large architecture firm of approximately 1500 employees worldwide with 60-65 employees in their Boston office. ArtTech has a very strong commitment to sustainable design as signers of AIA 2030 Challenge and Commitment and view it as a central tenet of their corporate philosophy, striving toward regenerative design principles. Design professionals at ArtTech are required to pursue a LEED Green Associate within six months of hire and take the specialized exam to become a LEED Accredited Professional in the following six months. As a result of this policy, more than 1,000 ArtTech employees are LEED Accredited Professionals. ArtTech is known as one of the industry's top sustainable design firms and the Boston office carries the same reputation for its commitment to environmental and social responsibility.

Margot Keene is a Principal at ArtTech and Managing Director of the Boston office. She is a LEED Accredited Professional and has 30 years of architectural experience. Her portfolio includes a broad range of building types, but she specializes in educational and healthcare facilities. Senior Associate Leonard Whalen is a member of

the American Institute of Architects, a LEED Accredited Professional, and has 35 years of experience as a planner and architect in the Boston area. He serves as the Sustainable Design Leader for the Boston office and also specializes in healthcare planning and design, master planning, and site design. His expertise is widely respected in the field and he has written many articles about sustainable and regenerative design and has been an invited speaker at conferences throughout the US.

While ArtTech has chosen to position themselves as sustainability advocates, both Keene and Whalen believe strongly that sustainability should be legislated. Whalen said that it needed to be attacked on all fronts and at all levels of government and Keene agreed that the more legislation and the more organizations that are enforcing sustainability regulations, the bigger impact they will have. Whalen has found that addressing it through zoning requirements has made sense and that Article 37 has elevated awareness about sustainability issues, particularly among clients that are reluctant to incorporate such measures. Whalen also believes that Article 37 plays an important role in addressing problems such as stormwater management and site-specific issues that are not addressed in other regulations.

GDM Partners

GDM is a firm of approximately ten employees that specializes in retail development. Principal Carmen Brewer was unsure of their annual buildout but estimated that they gross \$1.7-\$2 million dollars in fees each year. While retail comprises the majority of GDM's portfolio, their work also includes institutional, industrial, residential, and office-space development. In addition to architectural services, GDM also provides civil, structural, and mechanical engineering; plumbing and electrical work; and kitchen

design. GDM is recognized as one of the strongest retail-architecture firms in Massachusetts and has won two awards for historical rehabilitation and preservation and has also received several PRISM (Prestigious Results in Sales and Marketing) Awards from the Builders Association of Greater Boston.

Brewer has 30 years of experience in the design and construction industries and is a member of the American Institute of Architects as well as the Boston Society of Architects. She specializes in design, construction, and construction administration. Her portfolio includes numerous prominent retailers as well as several industrial and institutional projects.

Prior to the enactment of Article 37 and their first certifiable project which was completed in 2010, GDM did not have any experience with the LEED certification process. Because Article 37 was, in many ways, their first experience working with green building, the process helped them to change their design process to include a more integrated approach. Brewer said that since Article 37 is tied to the permitting process, the design team had to form sooner than on other projects. Making sure that all members of the team were working from the same LEED checklist and understood their responsibilities associated with the design goals meant that the team met and communicated more frequently. Brewer found this to be particularly beneficial as it meant that people with different areas of expertise were able to identify points they would be able to achieve; because these ideas were brought to the table early enough in the design process they were easier to incorporate.

Following their experiences with Article 37 and other projects that have achieved LEED certification, GDM now specifies more environmentally-friendly products such as

low VOC paints and sealants on all of their projects and ensures that, whenever doing any demolition, that the demolition products are segregated and sent to appropriate recycling facilities. This has helped them to educate their clients about the benefits of green design and show them that, just by being more thoughtful about the process and materials selected for a project, incorporating green building features does not have to cost more. Brewer sees this client education as a major benefit of Article 37, especially because many of GDM's clients are developers who will not occupy the space themselves or retail companies. According to Brewer, these types of clients are often uninterested in creating better buildings and just want to do the minimum that is required to ensure a quick and easy permitting process; the sooner the building opens, the sooner they start making money. Because of the amendments to the Zoning Code, these clients have become more willing to implement sustainable features since it will help with the approval process.

GDM also works with many clients that have a national presence; according to Brewer, these clients are often continuing to apply what they have learned through Article 37 to projects around the country. She also sees developers of large projects like this having an even greater impact than most people might realize. Large Project Review involves several community meetings where the developer wants to look intelligent about green ideas and green initiatives; Brewer believes this gets even more people interested and that this community outreach is an important piece of the impact that Article 37 has had.

Hands Together

Hands Together is an architecture firm that has completed several market-rate projects but specializes in affordable housing development. Their projects range from 10-

20 housing units to several hundred. In a slower year, they complete about 150 housing units and in a good year may have more than 500 units in various stages of design and construction. Principal Penelope Williams is a member of the American Institute of Architects and has been with Hands Together for her entire career as an architect, which spans 25 years. Associate Cynthia Tucker is a LEED Accredited Professional, a member of the Boston chapter of the USGBC, and a member of the American Institute of Architects. She has been with Hands Together for 16 years and serves as the LEED expert within the firm.

According to Williams and Tucker the philosophy of sustainability is a perfect match with the social philosophy and mission of their clients. Williams and Tucker believe that the majority of their clients would really push the envelope of sustainability if they could; however, they are often working within serious financial restraints and aim to do as much as possible with the available resources. Although Tucker and Williams do not have a lot of experience working with private developers, they both see Article 37 as having the biggest impact on this sector as it sets a minimum standard. They believe that, within the affordable development community, Article 37 has simply made official an intent that already existed.

They found that Article 37 has added another layer of discussion with the developer or owner in terms of how the sustainability features will impact the budget and their normal operation and maintenance practices. Tucker also said it has helped her design process to become more integrated and forced her to think about aspects of the building that are not necessarily related to the architecture. Williams believes the greatest benefit of Article 37 is that it, like all government regulations, has raised the level of

consciousness of everyone in the building industry. It has forced people to consider issues they otherwise would not have; particularly the developers must evaluate what was being done before, what needs to be done now, why things need to be done differently, and how to best go about implementing these changes.

Architecture Innovations

Architecture Innovations is a large, integrated architecture and engineering firm. While the size and complexity of their projects span a wide range, Principal Skyler Kensington says they are most well known for large, complicated buildings such as data centers and laboratories. Architecture Innovations completed their first LEED certified project in 2002 and are signers of the AIA 2030 Challenge and Commitment. Regardless of whether a project will pursue LEED certification, a LEED AP is assigned to each project and employees strive to educate clients about their corporate philosophy, which views sustainability as an integral part of the design process. Their dedication to sustainability, paired with the nature of being an AE firm, means that Architecture Innovations have always utilized a well-integrated design process.

Kensington is a LEED Accredited Professional and member of the American Institute of Architects. He has worked in the field of architecture for 20 years and has been an invited speaker at numerous conferences and industry meetings throughout the country, with a particular focus on Building Information Modeling (BIM), project management, and how both can best be utilized to achieve sustainable building goals.

Kensington believes that the Article 37 amendment to the zoning code is an important step forward and that it will continue to evolve over time to become an even more effective policy. He thinks that Article 37 has set a minimum standard that forces

reluctant developers to consider sustainability issues and has also raised the public awareness of issues surrounding sustainability and the built environment. Kensington also sees developers adopting green building practices more quickly in order to accelerate the approval process. For Architecture Innovations, the greatest benefit is that Article 37 has forced clients to decide sooner whether or not they want to approve LEED certification and how high they would like to reach.

Because of the nature of developing in an urban environment, Kensington believes a lot of points seem to be achieved by default; however, he does not believe it is possible to ethically sign off on a project as being certifiable without going through the rigorous documentation process to prove that those points have actually been achieved. This philosophy, paired with the regulatory requirements, has allowed Architecture Innovations to persuade their clients to pursue LEED certification. According to Kensington, every one of their projects that meets the threshold for Large Project Reviews since Article 37 was implemented has actually gotten LEED certified. The same is true for the projects they are just beginning now. Kensington does not believe that any of their clients would have pursued LEED simply because they want to be 'good'; rather, he believes that the requirements of Article 37, in conjunction with other regulatory requirements such as the stretch code, provide a great enough incentive to convince clients to get certified. He also sees Article 37 as working well in conjunction with other regulations by addressing sustainability issues that might not otherwise be covered. Because LEED is a more holistic approach to building, incorporating this into the zoning code through the certifiable standard ensures that the multiple facets of sustainability are all regulated to some degree.

Non-Interview Observations

The Article 37 procedure requires multiple meetings between the project team, BRA, and Interagency Green Building Committee (IGBC). This level of interaction creates many opportunities for City officials to provide feedback regarding the design process and green building strategies. According to BRA staff, the Article 37 process was scripted to be efficient and to change the thought patterns of the development team by making them actually come together as a team rather than work independently on various aspects of the project. In addition to the regulatory requirements, the BRA is able to use these meetings to actively encourage a more integrated approach. As a “relevant City department” representatives from the Environment Department are also typically present at these meetings. Where the BRA is expected to serve as a neutral party, the Environment Department is better able to advocate for achieving a higher number of LEED points and encourage teams to pursue more energy efficiency credits.

Concluding Remarks

The building professionals interviewed overwhelmingly believe that sustainability must be legislated and that, despite any shortcomings, the amendments to the Zoning Code represent a step in the right direction for the City of Boston. The greatest impacts of Article 37 have been that it forces reluctant participants to engage in sustainability and allows the architects, designers, and engineers to act as green building advocates and educate developers about the benefits of sustainable building practices and technologies.

The majority of those interviewed had experience working with LEED prior to the enactment of Article 37 and found that compliance was easier because they were working within a familiar framework. Another benefit of using LEED as the basis for regulation is

that LEED addresses a breadth of sustainability issues rather than focusing specifically on energy or another singular environmental goal. For those that had not been through the LEED certification process before the zoning code adopted the certifiable standard, the regulation forced them to think more holistically about the project, added another level of discussion to the design process, and facilitated a more integrated approach.

Because the compliance is determined during the permitting process, some participants have found that sustainability issues are now addressed earlier in the design process, the project team forms earlier than it otherwise would, and the client decides earlier whether or not they will pursue LEED certification. All of these changes essentially front-load the design process, ensuring that decisions are made early enough to have an impact on the project. Several participants believe that, without the influence of Article 37, their clients would not have elected to complete the LEED certification process. They see the regulation not only providing a direct incentive for certification but also improving the market value of green buildings in the City.

A summary of the positive policy outcomes reported by each of the firms is presented in Table 1. Information from the interviews has been condensed and coded following the methods described in the Quantifying Interview Responses section of the Research Methods and Procedures chapter. This allows lengthier statements from participants to be captured by a succinct phrase such as “incentivizes LEED certification.” These have been further grouped into the larger categories of outcomes that include Change in Practice, Education, Legislating Sustainability, and LEED-based Policy. This table only captures the interview responses and does not include any of the non-interview observations described in the previous section.

Table 1: Positive policy outcomes by firm. A checkmark (✓) indicates that the outcome was reported by that firm.

		Grant	Design House	Reese	ArtTech	GDM	Hands Together	Architecture Innovations
LEED-based Policy	Addresses breadth of sustainability issues	✓	.	✓	✓	.	.	✓
	Incentivizes LEED certification	.	✓	.	.	.	.	✓
	Using LEED framework is good (familiar)	.	.	✓	.	.	.	✓
Legislating Sustainability	Should legislate sustainability/ step in right direction	✓	✓	✓	✓	✓	✓	✓
	Forces reluctant to engage with sustainability	✓	✓	✓	✓	✓	✓	✓
Education	Educates developers/others in industry	✓	.	.	.	✓	✓	✓
	Influences market value of green buildings	.	✓	.	.	.	.	.
	Increased client openness to sustainability	.	✓	.	.	✓	.	✓
Change in Practice	Led to more integrated design process	.	.	.	.	✓	.	.
	Caused architect to consider think more holistically	.	.	.	.	.	✓	.
	Forced earlier consideration of sustainability	✓	.	.	.	.	.	.
	Project team formed earlier in process	.	.	.	.	✓	.	.

CHAPTER 6

ADVERSE EFFECTS AND EXPERIENCES

Introduction

Through my interviews with architects, research at the BRA and Inspectional Services Department, communication with City officials, and examination of Article 37 documents, I discovered numerous adverse aspects of the Green Buildings amendments to the Zoning Code. These include issues with procedural aspects of policy implementation, discrepancies between the official version of events and the experiences of the architects that I interviewed, differences in interpretation and practice, as well as evidence that for some firms the design process has not been influenced by Article 37 in any way. Particularly problematic are matters regarding the ability of the BRA to enforce and ensure compliance with the Green Buildings amendments to the Zoning Code and with the certifiable standard, itself. Here I present these issues as they were discussed during interviews and those that I was able to identify by examining the interviews in the context of official documentation and communication.

Grant Engineering

Although Grant Engineering has considerable experience with the LEED rating system, Elizabeth Simmons was unsure how many of the firm's projects fell under the scope of Article 37. She estimates that Grant has worked on only one or two projects that were required to be LEED certifiable. According to Simmons, the recession has caused work on many large projects to be delayed until the economic conditions improve; there simply have not been many developments of 50,000 square feet or greater in Boston since 2007. This means that most firms, including Grant Engineering, have not had as

much experience with the Article 37 procedure as might be expected five years after the policy was implemented.

The recession was already on the horizon when Mayor Menino's Green Building Task Force was working to develop the recommendations that formed the basis of the amendments to the Zoning Code. One of the key considerations of that process was ensuring that any policy would not stall development in the City by imposing overly stringent regulations. A large part of the conversation involved educating developers and soliciting their input as well; according to Simmons, once it was understood that meeting the standards for the lowest level of LEED certification was not particularly challenging, the developers supported the regulations. Simmons believes that to achieve this level of LEED, especially without needing to go through the certification and verification process, a project only needs to incorporate simple changes that can be easily drawn into the specifications, the type of changes that obviously make sense and will save money over the lifetime of the project. She also believes that a lot of the points are achieved by default, simply by the nature of developing in an urban environment. Essentially, to satisfy the green building requirements of the Boston Zoning Code, a developer needs only to address the low-hanging fruit.

Although using the LEED framework as a foundation for regulation force developers to consider various aspects of sustainability, the ease with which these targets are met seriously limits the impact of Article 37. Simmons believes that the potential impact is further complicated by the fact that LEED is not intended to be used in this way. Typically, clients that choose to pursue LEED certification strive to achieve the highest level of certification possible. In this way, LEED is designed to classify the

“upper echelon” of sustainable buildings, not all buildings. It is intended to set the highest standard for construction and performance, not to serve as the minimum requirement. Simmons also believes that other regulations, particularly the stretch code, are more aggressive and will do far more to advance the Mayor’s climate change and energy agenda.

Simmons has found that the green building requirements of the Boston Zoning Code do not set a very high standard for sustainable building practices in the City. However, the lack of clarity in the ordinance is even more problematic because the term “certifiable” is poorly defined and even less well understood. Particularly among the general public, it is difficult to determine what is meant by the term when comparing a certifiable building to a LEED Certified building or even whether the two buildings are comparable.

This lack of clarity further extends to building professionals and is exacerbated when those professionals have little experience with the LEED rating system. In Simmons’ experience, a person may believe that they will achieve certain LEED points on a project, but in reality they fall short. In order to comply with Article 37, a person new to LEED is likely to read a short description of the possible credits and not delve into the more nuanced and detailed steps that are necessary to achieve the points on the checklist. People may be counting points with good intentions and never realize that the project actually fails to achieve what they believed it would.

It is this lack of verification that most impedes the ability of Article 37 to bring about real change in the building industry in Boston. While Simmons understands that there are staffing and budgetary challenges, she believes that the policy should

incorporate verification and measurement components to prove that a project has actually achieved the points that are claimed in the documents submitted to the BRA during the permitting process. According to Simmons, it is this verification procedure that makes LEED such a powerful tool. Without that component, the standard of certifiable is largely meaningless. Furthermore, if the City does not adopt some sort of measurement and verification procedure, the City will never be able to understand how or if Article 37 is helping to achieve climate goals and can certainly not quantify its effect.

DesignHouse Architects

According to Lisa Norbert, 70% of the current project load at DesignHouse will pursue LEED certification so they have very few projects that will need to follow the guidelines of Article 37. Since DesignHouse is an architecture and engineering firm with significant experience working with LEED, they already utilize an integrated approach to design and use the same approach for all projects, whether they will apply for LEED certification or not. For DesignHouse, the primary difference between a certified and a certifiable project is the level of documentation. Since the Zoning Code does not require additional evidence that the credits are being achieved, any verification for a certifiable project stops at the design phase once the LEED checklist and narrative have been submitted to the BRA.

For DesignHouse, the typical process for LEED certified and certifiable buildings includes several workshops and charrettes early in the design process to assess the project goals and determine what sustainable design measures will be pursued to achieve these goals. After the goals have been outlined, the team then looks at the LEED checklist to determine how the pre-established goals substantiate the checklist. Norbert expressed that

establishing goals first is best way to create a high-performance, sustainable building and she believes strongly that people should not simply be chasing points to achieve a certain LEED rating or the certifiable standard. However, she believes that Article 37 encourages an approach where the project team is very dependent on the LEED checklist for guidance rather than using it as a design tool.

According to Norbert, the greatest factor in determining whether one building is better than another in terms of building performance is operations. How a building is operated governs the energy use of that building. Although Norbert believes that Article 37 has led to better buildings, she acknowledges that the Boston Zoning Code does not address building performance so one cannot be certain that the buildings being constructed under the new requirements are better-performing than those that were built previously.

Reese Architecture

Reese Architecture had experience working with LEED prior to the enactment of Article 37 and, according to President Peter Lexington the firm was able to utilize this familiarity when completing projects that needed to meet the standard of LEED certifiable. Lexington believes that any knowledge gained has come through completing the LEED certification process when the credits are actually measured and verified. According to Lexington, as a firm Reese has not learned anything new through compliance with the Boston Zoning Code.

Reese's experience with LEED has provided them with a strong knowledge base about the LEED points and categories so, for certifiable projects, the checklist is generally filled out during design team meetings. Lexington reported that the same level

of documentation is not maintained to prove the certifiable standard has been met as would be required by the USGBC to assure that LEED credits have been achieved. Because there is less documentation and fewer people involved, the design process for a certifiable project has fewer meetings and is less integrated than the design process for a LEED certified project.

While experience with LEED has made it easier to complete the checklists for certifiable projects, developing in an urban environment has also simplified the process. According to Lexington, many points are achieved by default for proximities and walkability. Site Selection credits are particularly easy to achieve in an urban area, especially when redeveloping a brownfield site. Once these automatic points have been tallied, Reese consults the mechanical engineer on the project for some tweaks to the mechanical systems and then asks the landscape architecture to calculate water usage, open space, and canopy cover. Once these steps are complete, the certifiable standard has been met. In this way, Lexington believes that Article 37 does not drive innovation. When a client chooses to become LEED certified, they typically want to strive for the highest possible level of certification; those not pursuing certification simply want to meet the minimum necessary to be certifiable.

Peter Lexington's greatest criticism of the amendments to the Boston Zoning Code is that they lack any sort of verification. Lexington believes it is far too easy to believe that you will achieve some points, only to find out during the verification process that you have actually failed to reach the target. Even at Reese, where the employees have considerable experience working with LEED, Lexington has seen this happen. His colleagues at Reese often expect to hit LEED Platinum on a project and then find that

they have fallen short. According to Lexington, people do not understand how difficult it is “if they haven’t gone through the process of actually verifying the points.” This is especially problematic when a firm does not have as much experience with LEED and they might believe their project will be LEED Platinum when, in reality, the project does not achieve anywhere near the number of points required for a Platinum certification.

Given how easy it is to believe a LEED standard will be met prior to the verification process, even for companies as experienced as Reese, Lexington believes it would be beneficial to incorporate more post-occupancy monitoring or commissioning into the zoning requirements. Lexington says that “because we don’t monitor after the fact and commission it, I say that we did our best to meet certifiability, we produced the point chart. In the end some of the more difficult part of the LEED certification process is the final cross check that gets done and some of the air testing and monitoring that, because the projects only have to be certifiable, we don’t go through with.” Even with the best intentions, no one can be certain that a project is actually LEED certifiable without a rigorous verification mechanism in place.

ArtTech

ArtTech has only completed one project that was required to meet the certifiable standard of the Zoning Code. Given this limited experience Margot Keene and Leonard Whalen find it difficult to comment on the impact that the zoning amendments have had; however, they believe that the firm philosophy regarding sustainability and ArtTech’s commitment to the 2030 Challenge have a greater influence on their own design process than Article 37. For the one project that they have completed, they did not maintain the same level of documentation as they do for projects pursuing LEED certification.

Other than the one project that fell under the scope of Article 37, Whalen spoke about another project that was bordering on 50,000 square feet. The client asked ArtTech to ensure the building was just less than 50,000 square feet to avoid triggering the green buildings requirements under large project review. Whalen believes that Article 37 does not do enough by only legislating sustainability for one segment of construction because so many buildings smaller than 50,000 square feet are built and that “if the City is really serious...they’re going to have to go deeper than just the large projects.” He thinks that, while residential construction requires a different approach, smaller commercial projects of 10,000 or 20,000 square feet should need to meet green buildings standards as well.

Both Margot Keene and Leonard Whalen believe that Article 37 “doesn’t have enough teeth.” Filling out a checklist as is required by the Zoning Code is easy while completing the documentation to ensure that you have actually achieved the credits requires another level of commitment and involvement. Without any verification mechanism in place, Keene and Whalen agree that it is possible to fill out a checklist and then intentionally not implement the strategies or fail to achieve points that one might expect to achieve. One example of this is the belief that a project will automatically achieve credits for public transportation although it is possible to be outside the required distance from a rapid transit station even within an urban neighborhood. Oversights of this sort are particularly significant when the project owner is not committed to sustainability.

According to Whalen and Keene, no one from the City ever visited their Article 37 construction site to assess whether or not the submitted LEED checklist was being followed. Other agencies that ArtTech works with, including the Massachusetts

Department of Public Health, verify compliance throughout the process rather than at the time of permitting as is done under Article 37. Whalen believes that a similar verification process should be adopted for the green building requirements of the BRA. He also questions whether the BRA is the best agency to administer this policy. Because enforcement mechanisms are already in place for compliance with the building code, he believes the Inspectional Services Department might be better equipped to govern the green buildings standards in the city.

GDM Partners

Overall, Carmen Brewer of GDM Partners has had positive experiences working with Article 37 and has learned a lot by going through the review process. However, she has found that the stretch code has a greater influence when determining which points to pursue and believes that it will do more to help Boston achieve their greenhouse gas reduction goals than the Zoning Code. It is the stretch code that requires energy efficiency measures, whereas it is possible to meet the standard of LEED certifiable without achieving any of the LEED energy points.

The first time that GDM went through the LEED certifiable review process, Carmen Brewer asked multiple times whether or not someone would be coming from BRA or ISD to inspect the project to ensure compliance with the Green Buildings requirements of the Zoning Code. The answer was the same every time: “no, we don’t have anyone that can do that.” Brewer believes that without some sort of verification process, people can not only miss points they believe they have achieved, but they may not even implement the measures to achieve LEED credits that they described during the permitting process. Brewer believes that if the City is going to continue requiring that

large projects be certifiable, they should hire several staff members that visit the projects to monitor compliance and ensure that everything is being implemented properly. Even if the staff could only do spot checks for a couple of measures, Brewer believes it would be better than the complete lack of verification that exists now.

Hands Together

Hands Together has completed one project under Article 37 and is currently working on a second project that will meet the LEED certifiable standard. Because their work is primarily affordable housing developments, the energy efficiency and green building requirements of the supporting agencies largely overshadow eclipse the requirements of the Zoning Code. Cynthia Tucker is a LEED AP and has been responsible for regulatory compliance on both Hand Together projects that have fallen under the scope of Article 37. According to Tucker, Hands Together does not need to do anything extra to meet the certifiable standard. After tallying the LEED credits achieved by default, through developing in an urban area, and ensuring that the requirements of the affordable housing funding agencies have been met, the certifiable standard has been achieved. Penelope Williams reported that the funding agencies they work with, such as the Boston Department of Neighborhood Development, also require inspections throughout the construction process and hire an architect or engineer to independently verify that all of their requirements, including sustainability and energy efficiency measures, are being fulfilled.

Tucker also reported that the first time she completed the Article 37 process she was not asked to sign an affidavit stating that the design would achieve the LEED credits as submitted to the BRA. However, she has been informed by the BRA that such a

document will need to be submitted for the current project under Large Project Review. Article 37 has always required that a LEED AP sign a “Letter of Design Certification” so it unclear why Hands Together was not required to do so on the first project that they completed under the Green Buildings amendments to the Zoning Code.

Architecture Innovations

In some ways, Skyler Kensington believes the discussion about the impact of Article 37 is no longer worth having now that the stretch code has been enacted. According to Kensington, by raising the energy benchmark “the delta between what [one] would have done before and what [one] would have done for LEED certification just shrank hugely.” When other regulations such as those for transportation planning and stormwater management are taken into consideration, to deem a building certifiable is easy because compliance with all of the regulations already put a project at that level. Similarly, Kensington believes that the Zoning requirement sets a low standard and thinks, not only that the stretch code has a greater impact, but that “the legislation to ban comingled dumpsters from the landfill probably does more.” He places part of the blame for that on the USGBC for not adjusting the LEED rating system quickly enough. While he appreciates that the City has adopted a framework and language that people understand, he believes they could have implemented a more ambitious standard than LEED certifiable.

Another issue that Kensington identified is that the Zoning amendments are largely untested because of the market conditions. Large construction projects came to a halt with the economic recession and are just beginning to resume. He believes that many of the problems with the regulations are so far unseen but expects that a lot more issues

will arise as more developments undergo the review process with the Green Buildings requirements.

Kensington believes that the amendments to the Zoning Code are not aggressive enough and does not foresee them having a great impact on the building culture and practices in Boston. The target of LEED certifiable is easy to achieve without doing anything extra. Simply complying with other City regulations is enough to achieve the standard. He also believes that the term certifiable is meaningless and, without a clear process for determining whether or not a building is certifiable, it is also indefensible. Whereas a LEED certified project could be audited and get the same result, this is not true for a LEED certifiable project as there is no process for measurement and documentation. The City has essentially put the burden on the architect to certify that a project is certifiable and Kensington has seen what he believes to be a lot of dubious claims in this regard. The BRA does not have any method of enforcement in place to address such issues so the regulation has no teeth; in Kensington's view, "green building regulations right now are an honor bar."

Kensington questions how it is possible for a professional to come to the conclusion that a building is certifiable without going through the verification process and especially without completing an energy model. He believes that ethically it cannot be done. It is too easy to think you have achieved LEED credits when you actually fail to do so. Without completing the measurement and verification that is required by the USGBC, it is impossible to know whether or not a building actually meets the LEED certifiable standard. This is why LEED certification is awarded after construction is completed; it is not intended to be applied during the permitting process.

Non-Interview Observations

A meeting with BRA officials revealed additional issues including several discrepancies between the official Article 37 procedural document and the process as described by BRA officials, differences between what is required in each stage of review and what is actually submitted by the project teams, as well as some observations from the officials regarding the policy. According to BRA officials, few project teams pursue any credits relating to energy, green power, or indoor air quality. Given the current market conditions, many of the projects are rentals so the developer does not have the incentive to pursue energy savings opportunities. In addition, the incentives to reduce operating costs are eliminated when the project will have sub-metered utilities, is being built to exact buyer specifications, or when the developer plans to immediately sell the building. The officials also observed that, despite efforts to encourage integrated design, it did not appear that energy and mechanical systems were being considered early enough in the process to be included in the green building strategies.

The procedural discrepancies are problematic because they indicate that the policy is not being applied exactly as intended and is perhaps being applied unevenly. Where the official review regulations stated that the Letter of Intent should include a description of the proposed green building and integrated design strategies, officials at BRA reported this document is very preliminary and may not include any discussion of the Article 37 requirements. They stated that it typically serves to notify the BRA of a plan to develop and provides the project address and building type. The pre-submission meetings between the project team, BRA, and IGBC is intended to review the selected LEED standard and point score including LEED and Boston Green Building Credits. However, the BRA

officials said that this meeting serves as an opportunity for them to encourage the project team to consider the Article 37 requirements and integrate them into the design process from the beginning. The Explanatory Narrative component of the Project Notification Form should describe how the LEED credits will be achieved, but often the project team simply reiterates the intent of the credit rather than provide project-specific details. According to the BRA the project Scoping Session, where the contents of the Project Notification Form are presented, provides an opportunity for the public to provide feedback yet few community members actually attend.

The interviews with architects revealed some issues regarding the documents that are required to be submitted to the BRA as part of the Article 37 review process. According to Leonard Whalen at ArtTech, the BRA only required that a LEED checklist be submitted and did not ask for an explanation of how the project team planned to achieve the LEED credits. Cynthia Tucker at Hands Together completed her first certifiable project in 2009 and was just beginning the process for another. She reported that she did not have to sign the Letter of Design Certification for the first project, but had been told by BRA that she would need to do so this time. Similarly, Peter Lexington at Reese Architecture seemed not to have been required to sign the Letter of Design Certification on previous projects, explaining in the context of the city adding verification procedures that “it was suggested to [him] last week that there might be affidavits that the architect and the engineers might need to sign certifying that ‘yes, to the best of my knowledge we could have met LEED.’” Article 37 not been amended since it was implemented and the Letter of Design Certification has always been a required component of the review

process. These contradictory experiences indicate that the policy is being applied inconsistently across projects and time.

Some issues I discovered during the course of my research came through meetings and correspondence with City officials at the BRA. When asked, BRA officials were unable to produce or even locate the documentation for projects that had been permitted under Article 37. Rather than asking for digital submissions, the development team is asked to submit a document that is several hundred pages long. These are apparently not stored in a specific location and only some could be located. When they were given to me, the official that brought them to the meeting did not even want to shake my hand because his/her hands were so dirty from handling the dusty documents.

Through my research at the Inspectional Services Department (ISD), I was able to identify ten developments that had undergone Large Project Review since 2007 and had received a Certificate of Occupancy. The officials that I met with at the BRA, the same officials that are responsible for administering the Zoning Code, were unable to confirm that this was the correct number of projects that had gone through the Article 37 process. This disorganization and poor record keeping extends beyond the BRA and the administration of the Zoning Code. While researching the enactment of these amendments, I went through a long process of attempting to track down any official records or meeting minutes that would have informed the discussion about how the certifiable standard was determined and whether there were any objections to the amendments. After failing to find any records on my own, two UMass librarians intervened, only to be bounced between City officials and were also finally unable to locate official minutes.

Concluding Remarks

Facilitating an integrated design process is one of the primary objectives identified by the Green Building Task Force; however, in the experience of those interviewed, Article 37 has not had that effect. Certifiable projects have a less integrated design process than projects pursuing LEED certification. There are fewer meetings, fewer people involved, less interaction, and there is less documentation and measurement. This has also led to a design process where people are chasing points rather than holding meetings and charrettes to determine the sustainability goals of a project.

The certifiable standard also sets a low bar and many believe it should be a more aggressive and ambitious regulation. It is too easy to be LEED certifiable without having to do anything extra. This is due in part to the fact that Article 37 has been surpassed by other regulations such as the stretch code, but also because many points are automatic when developing in an urban area. Any credits that are not earned by default or by complying with other regulations are easy to achieve simply by addressing the low-hanging fruit.

These interviews with building professionals have revealed that, despite positive feelings about the amendments to the Zoning Code, many of those interviewed believe that the regulation is deeply flawed. The primary issue is that without measurement and verification, as is required during LEED certification, it is impossible to know if the targeted points have actually been achieved. It is far too easy to believe that credits have been earned, when in fact the project fails to meet the requirements. Because approval has been tied to the permitting process, there is no enforcement mechanism in place to

ensure that the submitted LEED checklist is being adhered to during construction. Officials report that they were told directly that no one from the City would ever inspect the project to determine whether or not it is actually in compliance with the Green Buildings requirements.

Another issue identified in these interviews is that the LEED standard is not intended to be used in this way. A building is either certified or it is not, the term certifiable is meaningless. Some even expressed surprise that the USGBC allows regulators to anoint buildings as “LEED certifiable,” believing that such an ambiguous standard tarnishes the value of the certification.

A summary of the adverse effects and experiences reported by each of the firms is presented in Table 2. Information from the interviews has been condensed and coded following the methods described in the Quantifying Interview Responses section of the Research Methods and Procedures chapter. This allows lengthier statements from participants to be captured by a succinct phrase such as “not aggressive enough.” These have been further grouped into the larger categories of outcomes that include Procedure, Change in Practice, Too Easy to Achieve, and Not as Good as LEED. This table only captures the interview responses and does not include any of the non-interview observations described in the previous section.

Table 2: Adverse effects and experiences by firm. A checkmark (✓) indicates that the outcome was reported by that firm.

		Grant	Design House	Reese	ArtTech	GDM	Hands Together	Architecture Innovations
Not as Good as LEED	"Certifiable" is meaningless, unclear	✓	.	.	.	.	.	✓
	LEED not intended to be used in this way	✓	.	✓	.	.	.	✓
	Lacks verification, enforcement	✓	✓	✓	✓	✓	✓	✓
	Easy to think points achieved when have not	✓	.	✓	✓	✓	.	✓
	Lacks measurement (performance, commissioning)	✓	✓	✓	.	.	.	✓
Too Easy to Achieve	Do nothing extra to meet standard	.	.	.	.	.	✓	✓
	Many LEED credits achieved by default	.	✓	✓	.	.	✓	✓
	Not aggressive enough	✓	.	✓	✓	.	.	✓
	Surpassed by other legislation	✓	.	.	.	✓	.	✓
Change in Practice	No impact on design process	✓	✓	✓	✓	.	.	✓
	Design process less integrated than Certified projects	.	✓	✓	✓	.	.	✓
	Leads to point-chasing	.	✓	.	.	.	.	.
Procedure	Discrepancies in submission requirements	.	.	.	✓	.	✓	.

CHAPTER 7

DISCUSSION OF FINDINGS

All of the informants expressed positive opinions regarding the green building amendments to the Zoning Code. Everyone seems to believe that legislating sustainability was the right thing for the City to do and are pleased that action was taken to address sustainability in the building industry. While the informants described themselves as being happy with the policy in a general sense, the number of critical or negative expressions about the new policy far outweighs the number of positive comments. As can be seen in Figure 2, this is true for all but two of the firms.

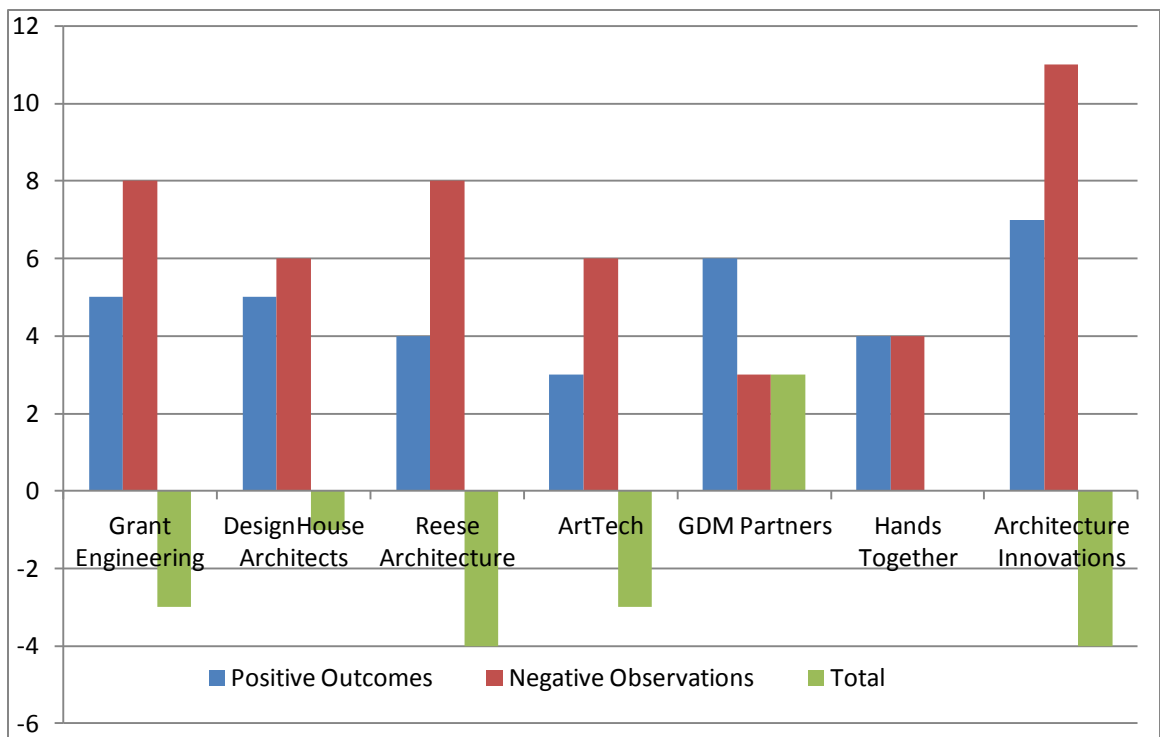


Figure 2: Positive and negative observations by firm. The total is calculated by subtracting the number of negative observations from the number of positive observations (Positive – Negative = Total).

To better understand the characteristics of the firms that might contribute to differences in experience with and opinion of Article 37, I created a measure of “greenness” of each

firm that allows for a quantitative comparison. As can be seen in Table 3, several indicators of “greenness” were used to calculate a “greenness score” for each firm. These included the number of years the firm had been a member of the USGBC divided by the number of years that LEED has existed, whether the firm adopted the 2030 Challenge, whether the firm addresses sustainability in its profile or philosophy, whether the firm is an integrated firm or explicitly uses an integrated design process for all projects, the percentage of staff with LEED credentials, and whether the firm had experience with LEED prior to their experience working with Article 37.

Table 3: “Greenness” of each firm

	Years USGBC/ Years LEED ⁷	Architecture 2030 Challenge ⁸	Sustainable Corporate Philosophy ⁹	Integrated Design Firm ¹⁰	% Staff LEED Credentials ¹¹	Previous LEED ¹²	Greenness Score
		(binary)	(binary)	(binary)		(binary)	(sum)
Grant Engineering DesignHouse Architects	0.92	1	1	1	0.19	1	5.11
Reese Architecture	0.23	0	1	0	0.23	1	2.46
ArtTech	0.85	1	1	1	0.72	1	5.57
GDM Partners	0.00	0	0	0	0.09	0	0.09
Hands Together	0.23	0	0	0	0.13	1	1.36
Architecture Innovations	0.69	1	1	1	0.15	1	4.84

⁷The year each firm joined the USGBC was obtained from the USGBC directory (U.S. Green Building Council, 2013). The years as a member is considered to be from the year joined (x) to 2011, when the interviews were conducted (Years USGBC = 2011-x). LEED was introduced in 1998 (Years LEED =2011-1998).

⁸ From the directory of adopters of the 2030 Challenge (Architecture 2030, 2011).

⁹ Based on information presented on the company websites and LinkedIn profiles.

¹⁰ Based on information presented on the company websites and LinkedIn profiles.

¹¹ Number of staff was determined using company websites, LinkedIn profiles, and interview responses. Number of staff with LEED credentials is from an online directory of LEED professionals (Green Building Certification Institute, n.d.)

¹² Based on interview responses and information presented on company websites.

As can be seen Figure 3, those with positive opinions of Article 37 are the least green of the firms while those with more green credentials have more negative opinions. As a firm becomes “greener” they have more experience and understanding of the issues and are better-positioned to develop a well-informed, critical opinion about the regulation. Those who are not very green are those that see the greatest benefit from the regulation. This is primarily due to Article 37 leading to a more integrated design process for these firms as they were not previously utilizing any degree of an integrated approach. The City of Boston believes they are leading the way with Article 37, when in reality they are only pushing up from the bottom. This policy would be much stronger and influential if it had an impact on firms at both ends of the green spectrum.

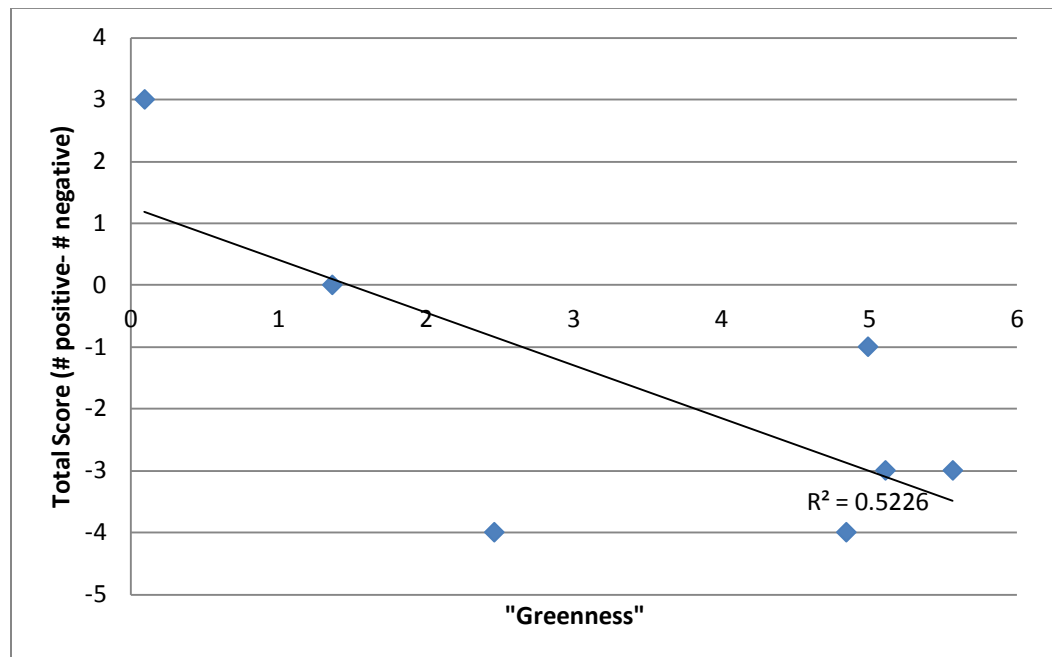


Figure 3: Total interview score vs. “greenness” of firm. Total score is calculated as the number of negative observations subtracted from the number of positive observations.

The imbalance between the number of positive and negative outcomes and observations indicates that those interviewed think sustainability does need to be legislated and want to see the City regulate development in this regard, but do not

necessarily believe that the specific requirements of Article 37 and the LEED certifiable standard were the best way to achieve this. It is helpful to building professionals that the City implemented a policy based on LEED, which is the most common building rating system in the U.S. and is now familiar to most in the industry, rather than creating an entirely new Boston-specific standard. However, this decision also brings a number of difficulties and has left the City policies entangled with all the criticisms that have been levied against LEED. It is unclear whether Boston considered any other type of green building policies for private construction, but perhaps another course of action such as performance-based codes or prioritizing specific LEED credits would have been more appropriate and certainly could alleviate some of the concerns expressed during this study.

The most prevalent criticism of the policy was that it lacks any sort of enforcement mechanism. It seems quite significant that those affected by the policy are actually asking for more stringent regulation. The informants in this study range from being minimally involved with sustainability issues to being at the forefront of the movement, yet every single one of them advocates for stronger enforcement mechanisms for green building policies in Boston. Despite having varied approaches to compliance, all of the interviewees believe that they are doing the right thing and that their projects are fully in compliance with the letter and intent of Article 37. All of them also question whether others are carrying out the task so faithfully and some have seen projects that they believe blatantly fail to meet the certifiable standard. There seem to be two major factors at play here. The first is that there is no verification mechanism in place and no threat of consequences if the building fails to achieve the points agreed upon during the

approval process. The Article 37 review procedures states that the BRA must be notified of any design or construction changes that would reduce the LEED point score, but there are no consequences for failing to do so and, without any follow-up or site inspections no one will ever know if the building fails to achieve the pre-determined credits. Without such enforcement procedures, a less scrupulous project team may choose not to implement the green building strategies required to earn the points. The second issue is that there is no way to determine if the credits have actually been met without the level of documentation and verification that is required by LEED but not by the BRA. Architects in some of the leading sustainable design firms have expected to achieve a much higher level of certification for a project only to find during the verification process that they missed a number of points that they believed they had earned. If even the most experienced professionals are susceptible to this error, than those with little experience with LEED are certainly overestimating the points achieved as well. This potential for both accidental and intentional failure to achieve the anticipated and approved LEED credits is a serious weakness in the green building regulations and introduces ambiguity into the standard. Implementing more stringent enforcement and verification procedures would improve the policy outcomes in terms of building quality and would demonstrate to building professionals and the public that LEED certifiable is a meaningful and defensible standard.

Currently, the BRA seems to address this issue by requiring the project LEED AP sign a Letter of Design Certification during the review process and a Letter of Construction Certification when construction is completed. These affidavits certify that the project was designed and built to achieve the agreed upon LEED credits with a

minimum point score equal to that needed to be LEED Certified. While the BRA and IGBC provide feedback to project teams about how they plan to achieve the credits and work to ensure that the design is sufficient, these affidavits essentially leave it up to the LEED AP to make the final determination that the project is in fact certifiable. Without any sort of verification mechanism, this becomes an exercise in professional ethics more than anything else and allows all parties involved to abdicate responsibility. It seems that the primary function of these affidavits is to remove any liability in case an evaluation of LEED certifiable buildings constructed under Article 37 revealed that they actually fail to meet the LEED standards. The City is now able to shift blame to the project team that swore the project actually achieved the required number of LEED credits. The signatory LEED AP can use the language of the affidavits, which emphasize that the project meets the standard *to the best of their knowledge*, to avoid being held accountable. This game of liability hot potato would best be avoided if the City implemented a rigorous verification procedure to ensure that the projects truly are LEED certifiable.

Of primary concern is that achieving the level of LEED certifiable is just too easy. In many cases, nothing extra needs to be done. Part of this is due to the nature of developing in a dense urban area with a strong public transportation system. Another key factor is that other regulations including stormwater management policies, the ban on comingled dumpsters, and especially the stretch energy code contribute so many LEED credits that the certifiable standard is achieved automatically. If the City truly wanted to be innovative and change the way development happens in Boston, they must set a higher standard. A target that is largely achieved automatically will certainly do nothing to change the building culture in Boston or improve the quality of the built environment. It

becomes a symbolic policy that only serves to add more paperwork to the development review process. The City of Boston has mandated that public projects achieve LEED Silver certification. Why not ask the same of private developers?

A similar issue is that Article 37 has had little effect on the design process for the majority of firms. The greatest impact has been with those who had little or no experience with LEED prior to working on a certifiable project. For those firms, the LEED checklist and credits were new and much of the learning occurred through gaining a familiarity with LEED. There was already a shift in the building community toward a more integrated approach prior to the enactment of Article 37. Many of the participants in this study already utilize an integrated design process because they are an integrated architecture and engineering firm, because of requirements of funding agencies, or because they always strive to achieve high performance buildings. Others reported that the process for an Article 37 project is slightly more integrated than a typical project but much less integrated than for a LEED certified project. This is because a lot of the integration that occurs during the LEED process is not only a function of required design charrettes, but also because the stakeholders need to work together to ensure that all of the necessary documentation is maintained and will be available for submission to the USGBC. Since Article 37 does not require this level of documentation, the project team does not need to work together as closely. That mechanicals and energy are typically not included in the LEED checklists submitted for review provides further evidence that Article 37 has not led to a more integrated design process. If teams were truly taking an integrated approach, the engineers would have been involved in all stages of the project

and more efficient mechanical systems could be considered early enough to be specified for the project and contribute to the LEED point score.

Instead of facilitating an integrated design process, Article 37 seems to encourage a checklist based approach that is more akin to chasing LEED points. As several of the interviewees described, when a client elects LEED certification, they typically want to strive for the highest level they can achieve. This leads to a process where sustainability goals are established and then the design team determines how to substantiate those goals using the LEED checklist. The checklist is meant to be a design tool, not as the primary design mechanism. Article 37 has established LEED as a minimum standard rather than as an aspiration. This changes the design process to a point and checklist driven approach. Rather than working with pre-established performance goals, the goal is now simply to earn the 26 points needed to be LEED certifiable. In this process, the first step is to determine how many points are achieved by default or by compliance with other regulations and assess how far away the project is from the requisite 26 points. Then the checklist can be consulted again to identify which credits would be easiest to achieve to fill in the gap. If the project only falls short by a couple of points, no more is needed than to specify some zero-VOC paint and a bike rack and the certifiable standard has been achieved. This checklist-driven design process does not require significant levels of project team integration and has minimal impact on the building outcomes.

Mayor Menino's Green Building Task Force (GBTf) believed that "clear standards are essential if Boston is going to commit to green building" and proposed the requirements of Article 37 as a solution (Conway et al., 2004). However, LEED certifiable seems to be a standard that is clear only to the members of this task force. The

participants in this study found the standard to be ambiguous at best and some even believed it to be completely meaningless. Article 37 does not require any energy modeling, commissioning, or performance monitoring so these critical activities are not being done for the majority of the projects unless they actually seek LEED certification. Without any evaluation of the buildings after construction is complete, there is no way to determine how certifiable buildings compare to those that have achieved certification or to those that were built prior to the enactment of this policy. This, in addition to the lack of verification and documentation, creates a murkiness surrounding the term certifiable and what it means in terms of building performance and sustainability. Design professionals are unable to find clear meaning in the term and the general public is left to assume that certifiable and certified are synonymous although there is no evidence to confirm this.

Although the City has described the LEED certification process as too great a burden, they cite timing as the primary reason to use certifiable rather than mandate LEED certification. However, other municipalities have found solutions to this issue. San José, California, which is a larger city than Boston, requires developers to pay a Green Building Refundable Deposit before issuing a building permit and then returns the money once LEED certification has been achieved. Babylon, New York and Chamblee, Georgia have similar policies requiring payments up to \$0.03 per square foot when the project is completed and a temporary Certificate of Occupancy is issued. This fee is refunded with proof of certification and the final COO is issued. If a project does not achieve certification, the payment is forfeited as a penalty for failure to comply. Perhaps a true LEED mandate for private construction was politically untenable in Boston, or perhaps

there was a lack of political will. Examples from other cities demonstrate that it can be done and such action would truly establish clear standards for the City of Boston and eliminate the ambiguity of certifiable projects.

The difficulty defining and defending the certifiable standard is further exacerbated by poor record keeping. When asked, no one at the BRA could provide the project documentation for development approved under Article 37 or even give a simple count of the number of projects that had undergone the review process. All of these records are considered public information and should be readily available on request, but it seems that no one is actually keeping track of them. Without access to the project documentation, I am not even able to cross-check reports from the informants against the records that should be maintained by the BRA. This poor record keeping stymies external scrutiny and makes any internal evaluation of the policy impossible. Perhaps the BRA should consider requiring electronic submissions so the documents can be organized and archived and to ensure that policy information is easily accessible.

The green building policy picture in Boston is not entirely bleak; Article 37 has had some positive impacts. For those with more limited experience with sustainability and the LEED process, undergoing the Article 37 review process can be beneficial. Most importantly, these professionals have been able to identify cheap, easy to implement actions that improve building performance. They are then able to specify these same measures on future projects as a matter of practice. Some of the building professionals that are slower to adopt sustainable building practices would eventually come around and catch up, but others need this regulatory push to engage with sustainability at all. This is particularly important for those who do not plan to occupy or own the building and so

don't see direct incentives to implement green building strategies. Eventually the market might push this, but Article 37 can speed up adoption for those that are really reluctant. Similarly, for architects that are not working in an integrated environment, Article 37 helps to ease that classic communication problem between architects and engineers as the architect must consider other aspects of the building while working through the LEED checklist. It seems that in these situations, the learning really comes from engaging with LEED for the first time through the Article 37 process. It seems likely that everyone in the building industry will eventually be confronted with a client that wants to seek LEED certification voluntarily and thus would undergo this same learning process at that time. The extent to which Article 37 has accelerated this introduction to LEED is unclear.

The participants in this study have found that Article 37 has increased the openness of their clients to sustainability measures, particularly among the more reluctant developers. The clients do not want to see any delays in permitting or construction so they are less resistant to green features since these measures will facilitate compliance with the new regulatory requirements. Some architects have also found that Article 37 provides a great enough incentive that they are more easily able to convince the clients to seek LEED certification. At the very least, the requirements ensure that the decision of whether to seek certification is made in the beginning of the design process.

The greatest benefit of Article 37 is that it raises awareness and signals that green building is an important issue. As more agencies regulate sustainability, it becomes a higher priority. Article 37 has made green building a more salient issue and that it is not just the concern of those in affordable housing development or for far-left environmentalists. Even if the policy does not have a real impact by other standards, it

shows that green building and the sustainability of our built environment are everyone's responsibility.

While Article 37 has raised awareness about green building and forced reluctant participants engage with sustainability, it seems that these same positive outcomes could have been achieved by another green building policy that does not carry the same criticisms as Article 37. Forcing reluctant developers to consider sustainability measures is certainly an admirable goal, but could certainly be achieved by any number of regulatory frameworks and would be even more effective if it was mandated by a policy that included some sort of enforcement mechanism or penalty structure. Article 37 sends a message to the development community that City officials care about green building, but it seems to allow them to address the concern by simply paying lip-service to sustainability initiatives.

If the standard of LEED certifiable is as easy to meet as these informants have described, then the policy is essentially large-scale greenwashing. Implementing this policy gave Boston a greener image and the appearance of being very cutting edge and forward-thinking. In reality, the policy requires little beyond what is already being done and has had almost no impact on the design process. I began these interviews with an interview guide that focused on integrated design and whether or not Article 37 had led to a more integrated approach. I quickly found that, for most respondents, these questions were irrelevant as they had been using this paradigm for years. In some cases this can specifically be attributed to other regulatory or funding requirements, but is often the result of a corporate philosophy that embraces and advocates for sustainability. As several respondents expressed, this legislation really just codified an intent that already

existed in the design community. So, while Boston has been advertising their “first in the nation” policy, it is actually a policy that does little to advance the green building agenda and simply paints typical construction with a green brush. If the real goals of the policy are to reduce greenhouse gas emissions and energy consumption, Article 37 is not a success. Even BRA staff admit that no one is pursuing these measures under the policy requirements. A counterargument may be that the stretch code addresses this issue and negates the need for Article 37 to mitigate climate change. If it is true that Article 37 has been superseded by other regulations, then there is no need to continue to enforce a largely symbolic policy.

By not mandating LEED certification for private development, the City has retained control over the approval process and making the final determination that the policy requirements have been met. If LEED certification were actually required, this power would shift to the USGBC and Green Building Certification Institute (GBCI). The standard of LEED certifiable is seen as a way to use the USGBC's standard without actually engaging with the USGBC or ceding any control over development in the City. It is understandable that Boston would like to have the final decision over whether or not a project will be approved, but this creates an issue where the expertise of City staff is not equal to that of the GBCI. THE USGBC and GBCI are the experts on LEED and what can be done to achieve LEED credits; they literally wrote the book on it. This gap in knowledge is another mark in favor of certified buildings being better than certifiable. While it would be undesirable to develop a new building rating system specific to Boston, it does not seem to make sense to implement another organization's standard and then not utilize their expertise assessing whether the standard has been met. If the City

has particular goals that they hope to achieve by mandating LEED certifiable, perhaps they could be better met by identify the particular aspects of LEED that would address those issues and developing mandates specific to those credits or to at least prioritize those credits during the review process. There are a lot of building regulations that have very specific targets and these would be no different. They would still allow for flexibility in meeting the requirements but the determination of whether or a project was in compliance would be much easier and transparent. If the City feels that LEED is truly the best way to achieve their sustainability goals, it seems that LEED certification is a clear standard with a defensible validation and verification procedure. Rather than compromise by mandating and ambiguous certifiable standard, it would be better to incentivize LEED certification or to enforce certification as has been done in other municipalities.

Summary of Findings

Article 37 is a step in the right direction: Everyone can agree that sustainability should be legislated. Article 37 represents positive action to improve the building industry and reduce the environmental impacts of the built environment. Article 37 has also been successful in forcing the reluctant to engage with sustainability and take some action.

LEED-based is good: Because Article 37 is based on the LEED rating system it addresses a range of sustainability issues rather than focusing on a single issue. The LEED framework also includes components of better buildings that are difficult to address through other regulations. It is helpful that the policy uses LEED because it is the most prevalent building rating system and is familiar to most in the industry. Utilizing a known process is preferable to forcing professionals to learn and perfect a new, Boston-

specific program. Another positive aspect of a LEED-based policy is that architects are able to use the work being done under the requirements of Article 37 as leverage to encourage clients to pursue LEED certification.

Article 37 has educational benefits: Article 37 can be effective in teaching those that are unfamiliar with green building options about practices and technologies that can save money while providing environmental benefits. This educational benefit seems to be greatest for developers who would otherwise not be exposed to these ideas and practices.

LEED certifiable is not equal to LEED certified: While the City aimed to create a clear standard by using the LEED framework as the foundation for this policy, the meaning of the term LEED certifiable is unclear. Without the verification procedures that are part of the LEED certification process, it is impossible to know whether certifiable buildings actually achieve all of the credits that are expected to be achieved during the permitting process. This problem is compounded because there is no mechanism in place to check for compliance after the permit has been issued, which means Article 37 is unenforceable. This also reduces the educational benefits of the policy as much is learned by completing the verification process and providing documentation proving that each credit has been achieved.

Limited impact on building practice: Change in building practice toward a more integrated design process was only seen in the absence of previous LEED experience. A more integrated design approach is required by the LEED certification procedures. While those who have not gone through this process before adopt a more integrated approach than they were previously using, this process is less integrated than for a LEED certified project.

Certifiable is too easy to achieve: Many LEED credits can be achieved by default, either by nature of developing in an urban area or through other regulatory requirements. Little, if any, extra needs to be done in order to meet the requirements of Article 37, which means these are the same buildings that would have been constructed in the absence of this policy. In terms of creating high-performance buildings, Article 37 will have little impact compared to other regulation such as the stretch energy code.

Few projects pursue energy credits: Mechanical systems and energy-saving features are not considered early enough in the design process and are not included in the LEED point score for Article 37 projects. The policy does not provide any incentives to pursue these credits and there are no market incentives to do so for rental or sub-metered properties.

Article 37 has some procedural problems: There are discrepancies between the official procedure guidelines, the procedural requirements as described by the BRA, and the experiences of those interviewed. It is unclear whether this indicates problematic policy administration or if these issues will diminish as the requirements become more familiar.

City records are poorly maintained: The lack of organized record-keeping by City agencies is a serious impediment to internal policy evaluation and external scrutiny.

CHAPTER 8

CONCLUSIONS AND FUTURE RESEARCH

Boston was right to legislate sustainability and develop green building policies for the private sector. However, as implemented, the amendments to the Zoning Code do little to help the City achieve its sustainability goals because it lacks verification and enforcement mechanisms and only affects those who would otherwise do nothing. Unfortunately, few policies include evaluation timelines and mechanisms, but given Mayor Menino's genuine commitment to climate change mitigation, perhaps the city will implement an evaluation and review procedure for Article 37. It is my hope that the findings presented here will inform the discussion and provide valuable insight to the City of Boston and to other government entities that have adopted similar legislation.

When this study was originally formulated, I had planned to conduct a building performance analysis of certifiable projects to determine whether certifiable buildings were comparable to certified buildings. Because there were so few completed projects at the time, this was not feasible, but would be valuable to consider as more projects are approved under the requirements of Article 37. One potential obstacle is that certifiable projects are not required to monitor building performance so the data may be difficult to obtain or unavailable. It would also be informative to analyze the project documentation that has been submitted to the BRA to determine exactly which LEED credits are being pursued on certifiable projects. This would allow for a more complete understanding of the extent to which these buildings differ from those that were constructed prior to the enactment of Article 37. It would be important to ground-truth the projects and determine whether or not the credits proposed in the permitting documents were actually implemented during construction.

This particular study could be expanded to include a large number of participants by using the knowledge gained from these interviews to develop a survey instrument to be distributed to building professionals in the City of Boston. This could include different perspectives such as that of developers, building owners, tenants, and building managers. Interviews provide a deep understanding of the experiences under Article 37, but a survey based approach would allow for statistical analyses and capture a greater number of opinions and experiences.

Overall, there needs to be a greater focus on green building policy evaluation to facilitate the adoption of efficient and effective policies on all levels. While this research addresses one particular type of policy, there are many variations to be assessed and the current literature falls far short in meeting the demand.

APPENDIX A

NEXT STEPS FOR BOSTON – A 10 POINT ACTION PLAN

(Conway et al., 2004)

LEED by example: The City of Boston should adopt LEED Silver as the design and construction standard for the renovation and new construction of all City facilities including USGBC Certification, thereby building on the success of its three existing high performance green buildings.

Require LEED Certifiable for City-supported projects: The City of Boston should require LEED Certifiable as the design and construction standard for all new construction and major renovation projects receiving City funding or land, including land disposition and RFPs. USGBC LEED Certification should be encouraged but not required.

Amend Article 80 to require LEED Certifiable: The City of Boston should amend Article 80 of the Boston Zoning Code to require LEED Certifiable as the design and construction standard for all projects undergoing large and small project review. USGBC LEED Certification should be encouraged but not required.

Craft a three year implementation work plan: To allow for public notice, staff development, and changes in professional and industry practice, the Task Force recommends that the City develop a work plan that brings these goals into full implementation within three years.

Provide training for City employees: The City of Boston should make Green Building LEED training available for City employees across nine different departments, including the BRA, DND, ISD, Schools, Mayor’s Office, and Environment. This will allow these employees, and the City as a whole, to better assess and assist projects at every stage in the planning, design and review process.

Provide technical assistance: The City of Boston, in partnership with the Green Roundtable, should offer technical assistance to projects in order to help developers make good decisions at the earliest stages of planning their projects.

Provide predevelopment funding: The City of Boston should create a Green Building Pre-development Loan Fund to promote green project design and planning. Loans should be repaid at construction finance closing, and the program should sunset once common practice has shifted.

Residential assistance: The City of Boston should initiate efforts to bring the benefits of green building to both newly constructed and existing residential buildings by creating a “Green House Doctor” program to provide technical assistance to homeowners and residential contractors.

Residential recognition: The City of Boston should initiate efforts to increase public awareness about the benefits of high performance green building for residential buildings by establishing a signature City of Boston “Green Home” standard to recognize best practices and design innovation in residential construction and renovation.

Distributed generation: The City of Boston should support legislation requiring local utilities to meet new interconnection standards that allow projects to incorporate distributed generation such as photovoltaic cells and onsite combined heat and power generation units. The City should continue to work with the Distributed Generation Collaborative and with the Commonwealth's Department of Telecommunications and Energy to develop consensus on these standards and the role of distributed generation in the distribution of electric power.

APENDIX B

ARTICLE 37 OF THE BOSTON ZONING CODE

(Boston Redevelopment Authority, 2007c)

^ARTICLE 37

GREEN BUILDINGS

(^Article inserted on January 10, 2007)

SECTION 37-1. Statement of Purpose. The purposes of this article are to ensure that major building projects are planned, designed, constructed, and managed to minimize adverse environmental impacts; to conserve natural resources; to promote sustainable development; and to enhance the quality of life in Boston.

SECTION 37-2. Definitions. For the purposes of this article only, the following words and phrases when capitalized shall have the meanings indicated.

1. “Applicant”, any person or entity having a legal or equitable interest in a Proposed Project subject to the requirements of this article, or the authorized agent of any such person or entity.

2. “Boston Green Building Credits”, Credits identified in this article that may be included in the calculation toward achieving a LEED Certifiable project under the provisions of this article.

3. “Boston Interagency Green Building Committee”, an interdisciplinary committee consisting of at least one (1), but not more than two (2) representatives of city agencies including but not limited to, the Boston Redevelopment Authority, the Boston Environment Department, the Boston Transportation Department, the Inspectional Services Department and the Mayor’s Office. Such Committee will advise the Boston Redevelopment Authority on Proposed Project’s compliance with the provisions of this article.

4. “LEED Certifiable”, a structure that is planned, designed and constructed to achieve the level “certified” using the LEED building rating system most appropriate for the Proposed Project.

5. “Proposed Project”, the erection, extension, rehabilitation, alteration, or substantial demolition of any structure or part thereof, or the change of use of any structure or land, for which the Applicant is required to obtain a building or use permit.

SECTION 37-3. Applicability. Any Proposed Project which is subject to or shall elect to comply with Section 80B of this Code, Large Project Review, shall be subject to the requirements of this article. The following Proposed Projects, however, shall be exempt from the provisions of this article:

1. Any Proposed Project for which application to the Inspectional Services Department for a building or use permit has been made prior to the first notice of hearing before the Zoning Commission for adoption of this article and for which no Zoning Relief is required.

2. Any Proposed Project for which appeal to the Board of Appeal for any Zoning Relief has been made prior to the first notice of hearing before the Commission for adoption of this article, provided that such Zoning Relief has been or is thereafter granted by the Board of Appeal pursuant to such appeal.

3. Any Proposed Project or site for which application for approval of a development impact project plan or planned development area development plan, has been submitted to the Boston Redevelopment Authority prior to the first notice of hearing before the Commission for adoption of this article, provided that such development impact project plan or planned development area development plan, has been or is thereafter approved by the Boston Redevelopment Authority pursuant to such application, whether or not such application or such development impact project plan or planned development area development plan is thereafter modified or amended.

SECTION 37-4. Green Building Requirements. Any Proposed Project subject to the provisions of this article shall be LEED Certifiable under the most appropriate LEED building rating system. Up to four (4) of the required points may be obtained from the Boston Green Building Credits identified in Appendix A.

SECTION 37-5. Procedures. Any Applicant subject to the provisions of this article shall provide to the Boston Redevelopment Authority a completed LEED scorecard, including any Boston Green Credits that the Proposed Project will achieve. The Applicant shall demonstrate that the Proposed Project will meet the requirements of this article with appropriate supporting documentation and by certification from a LEED Accredited Professional and/or other expert recognized by the Boston Redevelopment Authority. The submissions shall be in accordance with the provisions of Section 80B.

Within five (5) days of its receipt of a completed LEED submission, the Boston Redevelopment Authority shall transmit a copy of the submission to Boston Interagency Green Building Committee.

SECTION 37-6. Regulations. The Boston Redevelopment Authority may promulgate regulations to administer this article.

SECTION 37-7. Enforcement. The Commissioner of Inspectional Services shall not issue any building permit or use permit for a Proposed Project that is subject to the provisions of this article unless the Director of the Boston Redevelopment Authority has issued a Certification of Compliance pursuant to Section 80B-6.

SECTION 37-8. Severability. The provisions of this article are severable, and if any such provision or provisions shall be held invalid by any decision of any court of competent

jurisdiction, such decision shall not impair or otherwise affect any other provision of this article.

APPENDIX A to ARTICLE 37 Boston Green Building Credits

Any Proposed Project subject to the provisions of this article may obtain a maximum of four (4) of the required points from the Boston Green Building Credits which will be included in the calculation toward achieving a LEED Certifiable project under this article. One point may be awarded for each of the following four categories: Modern Grid; Historic Preservation; Groundwater Recharge; and Modern Mobility. In order to be eligible for the Boston Green Building Credits, a plan must be submitted to the Boston Redevelopment Authority to meet the following Boston Public Health Commission prerequisites:

- a. Retrofit of all diesel construction vehicles, from the United States Environmental Protection Agency approved retrofit technologies, as applicable, or contribution of a comparable amount to the Air Pollution Control Commission Abatement Fund;
- b. An outdoor construction management plan including provisions for wheel washing, site vacuuming, truck covers and anti-idling signage; and,
- c. Integrated pest management plan.

1. Modern Grid

One point will be awarded if a Proposed Project qualifies as a Distributed Generation/Combined Heat and Power (DG/CHP) project that provides useful “congestion relief” in locations where the Boston Redevelopment Authority and Boston Environment and Energy Services determine that electricity distribution load constraints exist. In order to earn this point the Proposed Project must include an on-site combined electrical power and heat generation system that provides for ten percent (10%) or more of the total building energy use. Eligible systems include combustion engine driven generators, fuel cells and micro turbines that utilize clean fuels including natural gas and biodiesel.

This provides value in reducing both transmission and distribution-level costs.

2. Historic Preservation

This point will be awarded if a Proposed Project involves the historic renovation of an existing structure and recognizes the importance of preserving Boston’s historic assets. In order to earn this point the Proposed Project must include the historic renovation of an existing structure which complies with the applicable historic preservation regulations and design guidelines including building and site materials and features. Structures must be located in a historic district or listed in the National Register of Historic Places, the State Register of Historic Places, or the Inventory of Historic and Archaeological Assets of the Commonwealth.

3. Groundwater Recharge

a. In areas subject to Article 32, Groundwater Conservation Overlay District, one point will be awarded for Proposed Projects that provide fifty percent (50%) greater recharge than required under Article 32-6 (i.e., *capturing within a suitably-designed system a volume of rainfall on the lot equivalent to no less than 1.5 inches across that portion of the surface area of the lot to be occupied by the Proposed Project*); or

b. For Proposed Projects in areas not governed by Article 32 and located in areas of filled land, one point will be awarded for Proposed Projects that capture a volume of rainwater on the lot equivalent to no less than one inch across that portion of the surface area of the lot to be occupied by the Proposed Project, or provide measures that otherwise result in on-site infiltration of rainwater including landscape irrigation. Applicants must demonstrate how combined building systems will meet this standard including area absorption/retention calculations.

4. Modern Mobility

This point will be awarded for Proposed Projects that meet all of the Transportation Demand Management (“TDM”) Prerequisites and implement the required actions from the menu of TDM Options as set forth below:

a. Prerequisites. The following prerequisites must be met for all Proposed Projects. The Applicant must specify commitment to these measures prior to the filing of the Project Notification Form:

- (1) Designate an On-Site Transportation Coordinator in the management office;
- (2) Post information about public transportation and car-sharing options;
- (3) Provide transit, bike and pedestrian access information on building website;
- (4) Provide on-site, external bicycle racks for visitors and covered secure bicycle storage for building occupants. The capacity is to be sized as follows: fifteen percent (15%) or more for residential buildings and five percent (5%) or more for all other building uses;
- (5) Comply with Boston Transportation Department district parking ratios; and
- (6) join a Transportation Management Association (for commercial, hotel and mixed use projects).

b. TDM Options

- (1) For residential projects (meet at least three):
 - (a) Provide a fifty percent (50%) subsidy for monthly T pass purchases, one for each dwelling unit for the tenants first full year of occupancy.
 - (b) Provide preferred parking spaces for a car-sharing service capable of serving 1% of the building occupants.
 - (c) Provide shuttle service to public transit stations (applicable to projects located more than ¼ mile from a public bus or rail station).
 - (d) Price and allow the purchase of deeded parking spaces separately from dwelling units. Parking spaces required by zoning may only be purchased and used by building tenants/unit owners.
 - (e) On-site electric charging plug-in stations for plug-ins capable of serving one percent (1%) of the building occupants.

- (f) On site ATM, dry cleaning drop-off/pick-up & other amenities that reduce short car trips.
- (2) For educational or medical institutions (meet at least eight):
 - (a) Provide on-site sales of semester T passes for students.
 - (b) Pre-tax payroll deduction and distribution for T passes for all on-site employees.
 - (c) Fifty percent (50%) transit pass subsidy for all on-site employees.
 - (d) Provide garage occupancy information by installing electronic monitors at entry/exits.
 - (e) Provide parking cash out program for employees using public transit
 - (f) Provide covered secure bicycle storage with convenient changing/shower facilities for five percent (5%) or more of building occupants.
 - (g) Provide shuttle service to public transit stations (applicable to projects located more than ¼ mile from a public bus or rail station).
 - (h) Provide preferential parking spaces for carpools and vanpools capable of serving five percent (5%) of the building occupants.
 - (i) Provide preferential parking for alternative fuel or high efficiency vehicles capable of serving one percent (1%) if the building occupants.
 - (j) On-site electric charging plug-in stations for plug-ins capable of serving one percent (1%) of the building occupants.
 - (k) Provide an on-site ATM and direct deposit of paychecks
- (3) For office or retail projects (meet at least one high-value and four basic):
 - (a) High-value (meet at least one):
 1. Provide shuttle service to public transit stations (applicable to projects located more than ¼ mile from a public bus or rail station).
 2. Parking cash out program for employees using public transit.
 3. Fifty percent (50%) transit pass subsidy for all on-site employees.
 - (b) Basic (meet at least four):
 1. Provide garage occupancy information by installing electronic monitors at entry/exits.
 2. Pre-tax payroll deduction and distribution for T passes for all on-site employees.
 3. Provide covered secure bicycle storage with convenient changing/shower facilities for five percent (5%) or more of building occupants.
 4. Provide an on-site ATM and direct deposit of paychecks.
 5. Provide preferential parking spaces for carpools and vanpools capable of serving five percent (5%) of the building occupants.
 6. Provide preferential parking for alternative fuel or high efficiency vehicles capable of serving one percent (1%) if the building occupants.
 7. On-site electric charging plug-in stations for plug-ins capable of serving one percent (1%) of the building occupants.

- (4) For hotels (meet at least three):
- (a) Fifty percent (50%) transit pass subsidy for all on-site employees.
 - (b) Free weekend or multi-day pre-loaded T-passes for hotel guests.
 - (c) Provision of transit and pedestrian information to guests before arrival.
 - (d) Pre-tax payroll deduction and distribution for T passes for all on-site employees.
 - (e) Provide garage occupancy information by installing electronic monitors at entry/exits.
 - (f) Parking cash out program for employees using public transit.
 - (g) Provide covered secure bicycle storage with convenient changing/shower facilities for five percent (5%) or more of building occupants.
 - (h) On-site car rental service.
 - (i) On-site electric charging plug-in stations for plug-ins capable of serving one percent (1%) of the building occupants.

(5) For mixed use projects (meet at least three from each of the appropriate use categories above)

APPENDIX C

SAMPLE LEED-NC CHECKLIST

(U.S. Green Building Council, 2009)



LEED 2009 for New Construction and Major Renovations Project Checklist

			Sustainable Sites	Possible Points:	26
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Y	?	N			
Y			Prereq 1	Construction Activity Pollution Prevention	
			Credit 1	Site Selection	1
			Credit 2	Development Density and Community Connectivity	5
			Credit 3	Brownfield Redevelopment	1
			Credit 4.1	Alternative Transportation—Public Transportation Access	6
			Credit 4.2	Alternative Transportation—Bicycle Storage and Changing Rooms	1
			Credit 4.3	Alternative Transportation—Low-Emitting and Fuel-Efficient Vehicles	3
			Credit 4.4	Alternative Transportation—Parking Capacity	2
			Credit 5.1	Site Development—Protect or Restore Habitat	1
			Credit 5.2	Site Development—Maximize Open Space	1
			Credit 6.1	Stormwater Design—Quantity Control	1
			Credit 6.2	Stormwater Design—Quality Control	1
			Credit 7.1	Heat Island Effect—Non-roof	1
			Credit 7.2	Heat Island Effect—Roof	1
			Credit 8	Light Pollution Reduction	1

			Water Efficiency	Possible Points:	10
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Y	?	N			
Y			Prereq 1	Water Use Reduction—20% Reduction	
			Credit 1	Water Efficient Landscaping	2 to 4
				<input type="checkbox"/> Reduce by 50%	2
				<input type="checkbox"/> No Potable Water Use or Irrigation	4
			Credit 2	Innovative Wastewater Technologies	2
			Credit 3	Water Use Reduction	2 to 4
				<input type="checkbox"/> Reduce by 30%	2
				<input type="checkbox"/> Reduce by 35%	3
				<input type="checkbox"/> Reduce by 40%	4

			Energy and Atmosphere	Possible Points:	35
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Y	?	N			
Y			Prereq 1	Fundamental Commissioning of Building Energy Systems	
Y			Prereq 2	Minimum Energy Performance	
Y			Prereq 3	Fundamental Refrigerant Management	
			Credit 1	Optimize Energy Performance	1 to 19
				<input type="checkbox"/> Improve by 12% for New Buildings or 8% for Existing Building Renovations	1
				<input type="checkbox"/> Improve by 14% for New Buildings or 10% for Existing Building Renovations	2
				<input type="checkbox"/> Improve by 16% for New Buildings or 12% for Existing Building Renovations	3

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 4	Recycled Content	1 to 2
				10% of Content	1
				20% of Content	2
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 5	Regional Materials	1 to 2
				10% of Materials	1
				20% of Materials	2
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 6	Rapidly Renewable Materials	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 7	Certified Wood	1

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Indoor Environmental Quality	Possible Points: 15
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Y	?	N			
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Prereq 1	Minimum Indoor Air Quality Performance	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Prereq 2	Environmental Tobacco Smoke (ETS) Control	
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 1	Outdoor Air Delivery Monitoring	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 2	Increased Ventilation	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 3.1	Construction IAQ Management Plan—During Construction	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 3.2	Construction IAQ Management Plan—Before Occupancy	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 4.1	Low-Emitting Materials—Adhesives and Sealants	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 4.2	Low-Emitting Materials—Paints and Coatings	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 4.3	Low-Emitting Materials—Flooring Systems	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 4.4	Low-Emitting Materials—Composite Wood and Agrifiber Products	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 5	Indoor Chemical and Pollutant Source Control	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 6.1	Controllability of Systems—Lighting	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 6.2	Controllability of Systems—Thermal Comfort	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 7.1	Thermal Comfort—Design	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 7.2	Thermal Comfort—Verification	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 8.1	Daylight and Views—Daylight	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 8.2	Daylight and Views—Views	1

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Innovation and Design Process	Possible Points: 6
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Y	?	N			
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 1.1	Innovation in Design: Specific Title	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 1.2	Innovation in Design: Specific Title	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 1.3	Innovation in Design: Specific Title	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 1.4	Innovation in Design: Specific Title	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 1.5	Innovation in Design: Specific Title	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 2	LEED Accredited Professional	1

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Regional Priority Credits	Possible Points: 4
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Y	?	N			
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 1.1	Regional Priority: Specific Credit	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 1.2	Regional Priority: Specific Credit	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 1.3	Regional Priority: Specific Credit	1
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Credit 1.4	Regional Priority: Specific Credit	1

<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	Total	Possible Points: 110
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Certified 40 to 49 points Silver 50 to 59 points Gold 60 to 79 points Platinum 80 to 110

APPENDIX D

SUMMARY OF THE MASSACHUSETTS STRETCH CODE

(Massachusetts Department of Energy Resources, 2011)

Summary of the Massachusetts ‘Stretch’ Energy Code

Appendix 115.AA of the Massachusetts building code, known as the ‘stretch’ energy code, was adopted by the Board of Building Regulations and Standards in May 2009, as an option for towns and cities interested in more energy efficient building standards than the state ‘base’ energy code. The stretch code amends the MA base energy code (IECC 2009), to achieve approximately a 20% improvement in building energy performance.

Residential

New residential buildings 3-stories or less are required to meet an energy performance standard using the Home Energy Rating System (HERS). The HERS index rates each home on a scale where 0 is a zero-net-energy home, and 100 is a typical new home built in 2006. The HERS index has been in use for many years in programs such as: Energy Star homes, LEED homes, and by the Federal IRS to qualify homes for tax credits and energy efficient mortgages. HERS ratings are performed by a ‘HERS rater’, an independent certified building energy professional, working with the home builder. HERS ratings are submitted to the local building code official in draft form at plan review and final form on building completion.

Stretch code exceptions:

The stretch or base energy code is not triggered in the following situations:

- Storm windows added to existing windows
- Window repairs to an existing sash and frame
- Reroofing or residing over uninsulated roofs or walls where the sheathing is not exposed.

Requirements: New homes

- 3,000 ft² or larger: HERS index of 65 or less
- less than 3,000 ft²: HERS index of 70 or less

In multi-unit buildings, the unit size determines the HERS score needed.

In addition:

- Mandatory requirements of the base energy code (IECC 2009)
- Builders and HERS raters must complete the Energy Star Homes Thermal checklist.

Requirements: Existing home renovations and additions

Home additions and renovations have two options to meet the stretch code:

Option 1) Performance path: whole house - HERS rating option

- Existing homes 2,000 ft² or larger: HERS index of 80 or less
- Existing homes less than 2,000 ft²: HERS index of 85 or less
- Home additions less than 3,000 ft²: HERS index of 70 or less
- Home additions 3,000 ft² or larger: HERS index of 65 or less

In addition:

- Mandatory requirements of the base energy code (IECC 2009)
- Builders and HERS raters must complete the relevant portions of the Energy Star Homes Thermal checklist.

Option 2) Prescriptive path: partial house option (HERS rater not required)

- Any portions of a building modified by renovation must be brought up to code, or insulated to fill open wall/ceiling/floor cavities whichever is less.
- Any new windows, doors or skylights must meet Energy Star 5.0 standards.
- Any new ducted heating or cooling systems outside the insulated space must be tested and meet a maximum of 4% leakage to outside.
- Builders must complete the relevant portions of the Energy Star Homes Thermal checklist.

Commercial Buildings

The stretch code applies to new commercial buildings and additions over 5,000 ft²

Exemptions:

- New commercial buildings smaller than 5,000 ft²
- Existing commercial building renovations,
- “Specialty” buildings – supermarkets, laboratories, and warehouses – less than 40,000 ft², due to their widely differing energy needs.

These ‘stretch code exempt’ buildings remain subject to the base MA commercial energy code (IECC 2009 or ASHRAE 90.1-2007 with MA amendments).

New large commercial buildings (over 100,000 ft², and “specialty” buildings over 40,000 ft²)

These buildings are required to meet a „performance“ standard set at 20% below the base energy code. This is based on predicted energy use compared to the commonly used ASHRAE 90.1-2007 standard. This method is also used by buildings applying for LEED energy certification.

New medium-sized commercial buildings (between 5,000-100,000 ft²)

These buildings have two options. They can either use the large building „performance“ standard or use a ‘prescriptive’ path: a modified version of the base energy code (IECC Chapter 5). The ‘prescriptive’ path adds incremental efficiency improvements to the base energy code primarily through:

- Building envelope elements (better walls, roofs, windows, insulation, etc.)
- Commissioning tests to ensure that building energy systems operate as designed
- More efficient lighting power densities and improved lighting controls
- One of three options: high efficiency HVAC equipment, further lighting energy reductions, or on-site renewable energy.

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