The Relationship Between the Massachusetts' Building Code and Construction Cost Escalation

by

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Submitted to the Program in Real Estate Development in Conjunction with the Center for Real Estate in Partial Fulfillment of the Requirements for the Degree of Master of Science in Real Estate Development

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ABSTRACT

Over the last twenty years in Massachusetts, there has been significant focus on a shrinking labor supply and material cost escalation as they relate to rising construction costs. However, there are other factors attributing to increased construction costs that are often overlooked. In these twenty years, four editions of the Massachusetts building code have been released; Massachusetts is currently governed by the 9th edition. Since the 6th edition was released in 1997, the code has expanded to include increased seismic requirements, improved fire prevention, and the energy stretch code. However, code changes are rarely included in the industry discussion when trying to explain rising costs.

According to The Greater Boston Housing Report Card from 2015, "... the cost of developing urban projects in the Commonwealth increased by nearly 40 percent more than overall inflation" (Bluestone) since 2011. This suggests there is more at play than simply a high volume of work; and while there is no disputing the cyclic nature of the real estate market and the sheer economics of supply and demand, this conversation needs to be expanded to include regulatory influence – specifically building code.

The building code in Massachusetts is reviewed and amended by a qualified, volunteer board of industry professionals called the Board of Building Regulations and Standards ("BBRS"). There is a public review process for code changes and avenues for the average person to request a variance or submit suggested amendments. However, this service is severely underutilized by the commercial industry.

The intent of this paper is to analyze the relationship between the development and regulatory industries through the primary filter of cost management. Through this lens, I will look at the role of code ambiguity, the layers of regulatory enforcement, and the distribution of liability and the impact on construction cost. Based on interviews with industry professionals, I have identified the primary inefficiencies in the interactions between the two industries and developed three viable solutions to address some of the criticism. These solutions address the misalignment of interests between parties, the subjective assignment of liability, and the opaque, intimidating processes surrounding code variances and appeals.

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Chapter One: Why Do We (Developers) Care?

There is no debate on the cyclicity of development in any sophisticated market. When the economy is strong, lenders or investors alike are interested in pushing their money out and development happens. Subsequently, construction happens. This same cause and effect exists on the flip side as well; when the economy is struggling, all parties are more cautious and there is a smaller supply of free cash to be invested. Subsequently, construction slows.

The construction industry is often labeled as the biggest exploiter of this cycle. With construction costs as the far-away largest line item in a development budget, they (rightfully so) receive the most scrutiny. Turner Construction Company (Turner) publishes a quarterly Construction Cost Index for the Boston market which measures all non-residential construction cost. When describing their own index, Turner referenced this phenomenon directly, saying "[our] second quarter building cost index reflects a busy construction market, which continues to drive [the] increase in construction costs" ("Turner Building Cost Index" 2018); insinuating that a busy market automatically means increased construction costs. The criticism of this trend being that contractors profit immensely in these up-markets but the fundamental cost of the "brick & mortar" has not increased dramatically. However, I would challenge these critics to find an industry where this cycle is not present. For example, look at the tropical destination resort. Their pricing, along with airline pricing, quite literally peaks during their high demand season and bottoms out during hurricane season. Should a tropical resort not benefit from the increased demand to help them through the off-season? The answer is no. Supply and demand are the backbones of a free economy and as long as a development project is still profitable (based on pricing, investment demand, available cash, etc.) it will proceed regardless of any construction pricing premium.

Nonetheless, this supply and demand analysis of the market cannot be generalized as the whole story. There are several other factors at play that create cyclicality within construction pricing; one, often-ignored factor, being the influence of building code on the cost of construction. Construction pricing is an integral part of the local economy. It effects the ability to develop new projects, which in turn, effects everything; housing stock, the expansion of the Commercial Business District, the inflow of new businesses, tourism, community development, institutional expansion, schools – the list could continue.

In the past, regulatory solutions to increasing construction costs were never pursued because of the misperception that anything involving a governing or regulatory board would be slow, confusing, time-consuming, and ultimately not result in decreasing costs as that is not the regulatory industry's focus. Subsequently, developers have lived within the confines of a cumbersome review process and an ever-changing building code, BUT this lack of communication has created fatal inefficiencies between the two industries that do not benefit either side of the equation.

As noted above, new development projects – or redevelopment projects – have a tangible effect on most aspects of community progress. Therefore, it is the best interest of everyone to encourage development and embrace the relationship between regulatory standards and the built environment. However, existing inefficiencies created by an uneven distribution of power, the assignment of liability, and miscommunications between the regulatory and development industries will eventually start to stall this progression. Throughout this thesis and the surrounding research, I will attempt to unpack the existing conflicts and their impacts on construction pricing within Massachusetts and I will offer some simple, cost effective solutions to start addressing these inefficiencies.

Chapter Two: What is the MA Building Code and Where Does it Come From?

The concept of a Building Code dates all the way back to The Code of Hammurabi in 3000 B.C. where the founder of the Babylonian Empire dictated specifically what would happen to a "builder" if a home collapsed ("History of Building Codes" 2018). Through centuries of refinement and, unfortunately, many fatal tragedies building code has evolved all over the world and now represents one of the greatest lists of "lessons-learned" in history.

Building Code is essentially a governing list of standards and regulations, that can be enforced by law, on how to design and construct all structures including high rises, single family dwellings, bridges, commercial properties, etc. While code is typically created and enforced at the local government level, those versions of building code are often adapted from a larger, more universal code.

Massachusetts has had a state-wide mandated building code since the 1st edition was released in 1975 ("Past Editions of the MA State Building Code" 2018). Prior to this, each municipality created their own code by pulling sections from various existing national recommendations but there was significant variance from town to town. Today, Massachusetts bases it's building code on an adapted version of the International Building Code (IBC) and the International Residential Code (IRC), which was first published by the International Code Council (ICC) in 1997 ("International Building Code" 2018). Since the first edition of the MA Building Code was released, there have been 8 additional versions released for an average of one new code every 4-5 years. However, it is important to note, that between releases of full editions of the code, there can be small amendments or clarifications enacted. Because of this, the MA

Building Code is constantly updating and growing, making professional review of the code an imperative part of public safety.

With this brief history as our foundation, over the course of this next chapter, I will try to unpack some of the mystery behind *where, how, and by whom* code is developed in Massachusetts to help set the stage for a discussion on potential developer involvement later on.

1.) Who is the "BBRS"?

While every state approaches code creation and enforcement slightly differently, Massachusetts relies on the knowledge and experience of industry professionals. These industry professionals serve on the Board of Building Regulations and Standards, more commonly known as the BBRS, and are the sole decision makers and driving force behind the code changes in Massachusetts. These individuals serve as volunteers, appointed by the Governor, and have typically had long, independent (public or private sector) careers prior to their involvement in the BBRS. Their backgrounds range from engineering to city planning to general contractors and they often have some specific expertise in a niche subject.

The BBRS is comprised of roughly 10-12 members and with a Chairman and typically 1-2 Vice Chairs. They also have one board member who is paid by the state of Massachusetts. This board member is responsible for the day-to-day responsiveness of the BBRS and works diligently on research of open items or items of concern that arise at meetings. The board meets on a monthly basis and primarily uses meeting time to review open appeals, variances, and proposed amendments. It is

important to note for the context of this thesis, that these are public meetings that can be attended by anyone and the agenda of topics is posted in advance.

The BBRS breaks down further into subcommittees to often address a specific aspect of the code in greater detail and the members serve as the experts when these items are discussed or revised. The subcommittees invite industry professionals, who are not able to vote as part of the BBRS committee, to weigh in on issues and provide professional guidance, opinion statements, and act as researchers on emerging industry topics ("Board of Building Regulations and Standards (BBRS) Members, Advisory Committees, and Working Groups" 2018).

2.) *What does the BBRS do?*

It is widely known that the BBRS is the regulatory board that reviews, creates, modifies, and enacts new building code in the state of Massachusetts. But they have significant other responsibilities as well.

For starters, the board can grant variances for existing code on a case-by-case basis. Variance applications are reviewed during regular formal meetings and often individuals come in to speak in defense of their proposal. They also have the ability to rule when sections of the code contradict each other – but they work hard to find all these weak points in the text and correct them.

In addition to creating and enacting code, the BBRS also has some control over enforcement. As a board, they are responsible for issuing the Construction Supervisors License, which allows an individual to oversee the construction of a building and have the responsibility of ensuring the construction complies with all

applicable laws on behalf of a General Contractor. The BBRS also has the ability to certify Building Commissioners and Local Inspectors who are responsible to review phased and completed construction for compliance with the drawings and code as a representative of the municipality. City and Town Inspectors are ultimately the entity who will issue a Certificate of Occupancy for a structure and certify that the building, if constructed to the plans and specifications, meets code ("Building Code Enforcement Official Certification" 2018).

3.) *What is the process to get code change?*

a. Code Overhauls

Massachusetts is currently governed by the 9th edition of the building code. As mentioned above, the Massachusetts building codes are based on the codes produced by the International Code Council (ICC). The ICC releases new code roughly every 2 years and has a large research and development team that develops this new code ("Code Development Archives" 2018). The BBRS for Massachusetts then takes this new international code and pares it down – or adds to it – so that it is applicable and relevant to actual Massachusetts building conditions. This new code is then rolled out in the industry for review. The general public has the opportunity to review, comment, and propose changes. After this period, it is voted into law by the BBRS and approved by the Secretary of State's office. There is typically a concurrency period for projects or projects that are very far along in design under the previous code. For the last two editions, the BBRS has given a 6-month concurrency period where either the old or new

code can be used, and then after a specific date all new projects that submit for a building permit must be designed under the current governing code.

b. *Public Amendments & Official Interpretations*

Individuals are also able to submit recommendations or suggestions, which are reviewed continuously through the year at monthly BBRS meetings. Typically, these submissions consist of clarifications where the code is vague about a subject or if the two sections of the code contradict themselves. If a proponent is simply looking for judgement or clarification of a section, the BBRS will issue an Official Interpretation which can be found on their website and simply clarifies the intent of a code section. Truly, a large percentage of code updates are derived from quality assurance checks from the general public who are trying to unpack, understand, and design to meet code. Because of this, the Massachusetts' Building Code is constantly updating or issuing amendments. These amendments or clarifications are then rolled into the next full code overhaul for simplicity of keeping the building code a single, self-contained document without too many external references.

However, the responsiveness of the BBRS to address these immediate amendments and concerns creates the NECESSITY of a code consultant on most large-scale projects since it is simply too fluid for a design team to continuously monitor. For example, the 8th edition was released 2010 but the 9th edition of the building code did not take effect until 2017 ("State Code Status: Massachusetts" 2018). During these seven years, countless versions of Official Interpretations and

amendments were issued that an already-stretched design team would not have been able to keep up with.

4.) The Public Meeting

After attending the BBRS June meeting, I can confidently say it is similar to any other public review process. There was a scribe, the Chairman moderated the meeting, and the audience was mostly there in an observation capacity. The attendance was roughly 30 people, other than the 12 board members, and the crowd was mostly building inspectors, trade organization representatives, or individuals with a specific item of interest on the agenda. Notably missing from the room - developers.

Verbiage throughout the meeting included phasing like "integration into existing code", "confirming the tone of the code", "what is the intent of this section?" Individual contractors and trade organizations with a financial stake in a particular proposal – whether the goal was to get it approved or declined- were vocal in advocating for their specific amendment and deliberate in spelling out the financial implications of a specific change. By far and away, as it should be, the loudest voice at the BBRS committee table, was the representative from Fire Prevention. The representative was vocal in responding to every issue and extremely focused on allowing recognized, external boards to review proposals and provide feedback on changes. Like any board, there were disagreements on how to proceed on some items, which often sparked spirited debates among the board members.

Interestingly, the board mentioned a concern for cost several times during the actual meeting. However, all references were directed at the individual home owner rather than a larger scale developer. If the board was concerned that a simple change would create an increased cost for homeowners, these points were often denied or modified. For example, there was a proposal to require residential pool contractors to be licensed by the state in order to install inground pools ("Board of Building Regulation and Standards Notice of Meeting" 2018). However, the BBRS felt that requiring licensed pool contractors might decrease the market share of viable contractors and drive up pricing. While there was no immediate resolution, there was a lively discussion around the cost implications of this change.

5.) The Relationship between NAIOP and the BBRS

While developers may not be interested in attending these BBRS meetings themselves, NAIOP Massachusetts – The Commercial Real Estate Development Association serves as the greatest advocate for developers in these meetings. While code consultants may attend the BBRS meetings in order to keep their personal skills sharp, NAIOP attends these meetings as a true voice for the development industry. As proposals and agendas for discussions are released to the public, NAIOP reviews these documents and when relevant, issues written comments on behalf of the development industry if they think a particular change could be damaging (or beneficial) to economic development projects. NAIOP maintains a Government Affairs Committee, whose primary focus is to follow regulatory and legislative changes on a wide range of topics including – zoning,

energy policy, climate change, land use, etc. – and help advocate for the development industry. In my interview with Tamara Small, the Senior Vice President of Government Affairs at NAIOP Massachusetts, she explained that NAIOP's primary stance on most of these regulatory issues is to allow the market to drive some of these changes. She used the example of repeated proposals that would mandate Electric Vehicle charging ports as part of the commercial and residential codes. Her argument is that these changes, while progressive and great for the environment, are not demand driven and therefore, should not fall to the BBRS to decide (Small). Furthermore, she made the point that proposals favoring a certain technology are in conflict with Massachusetts General Law c. 143 §95 (2006), which outlines out the BBRS' main objectives as a board. MGL c. 143 §95 states that the BBRS should look to adopt any "…modern technical methods, devices and improvements which may **reduce the cost of construction and maintenance over the life of the building** without affecting the health, safety and security of the occupants or users of buildings" as well as eliminate the any "restrictive, obsolete, conflicting and unnecessary building regulations and requirements which may **increase the cost of construction and maintenance over the life of the building**". Small believes that this proposal for requiring Electric Vehicle Charging Stations is in direct conflict with this law as it provides both an increase in construction costs and preferential treatment to a specific type of technology and adds to construction cost without value or a direct impact on health and safety.

After observing the BBRS meeting personally, the entire process felt approachable and manageable - for a regulatory process. I believe the disconnect with the development industry comes from the timeline required to engage the BBRS. Their meetings are monthly, and often issues don't get resolved in one meeting. They typically require additional research, input from an advisory board, or the BBRS committee is split and they choose to put an issue aside in the interest of continuing the meeting. Therefore, developers cannot rely on the decisions of these meetings to keep a project moving forward. Asking for an appeal or an Official Interpretation simply introduces too much time risk into a development's design schedule. As stated above, the entire board is comprised of seasoned industry professionals; so while they absolutely understand the necessity of efficiency and quick decisions, they were appointed to serve the greater public, not developers, and sensitivity to timelines is less important than the public safety and benefit.

Chapter Three: Construction Cost Influences & Misconceptions

One of my initial goals for this thesis was to evaluate on a square foot basis the average financial impact on construction costs every time a new code edition is released. Preliminary research showed me that this specific task is virtually impossible due to all the "noise" in the construction industry. Over a dozen initial interviews with a wide range of architects, engineers, construction managers, code consultants, and developers, quickly showed me the varying opinions and misconceptions that exist within the industry. It also highlighted the incredible number of variables within construction pricing; eventually negating my initial theory that there is an actual hard cost that can be directly attributable to code changes. In this chapter, I will

explore the sources of this "noise" and debunk misconceptions regarding how Building Code fits within this pricing puzzle.

1.) Volume of Work

At the most basic fundamental economics level, there is always a cost premium when demand is stronger than supply. In the current economy, there is an overwhelming amount of foreign capital and major institutional interest in investing in Boston real estate (Spearance, 2017) This demand instantly drives up construction pricing for developers since most construction managers and subcontractors in Boston are currently busy. The sheer volume of development happening in the city can create an artificial bump in pricing that is not attributable to code changes and when comparing construction cost escalation to code changes over the last few years, these cost peaks – and equally importantly, these cost valleys – do not exclusively mirror code changes. Remember the supply and demand example of the tropical island vacation discussed earlier?

2.) Material and Labor Escalation

While Bureau of Labor Statistics has the annual inflation rate at roughly 2.1% for the first half of 2018 ("Bureau of Labor Statistics Data" 2018), the Turner Construction index has construction costs rising at 5.63% over that same timeline, leaving a delta of 3.53% to be explained ("Turner Building Cost Index" 2018). In Chapter One and Section (i) of Chapter Three, I referenced the premium that contractors charge during a strong market. Boston is currently experiencing an incredibly strong development cycle, so the next question becomes what percentage of this 3.53% is attributable to the premium

associated with an increased demand versus what percentage is attributable to the fact buildings are fundamentally more sophisticated and expensive as code changes?

Massachusetts, like most states, has also experienced a decrease in a skilled, technical labor force over the last few years (Salsberg, 2017). A construction boom, coupled with the beginning of a labor shortage, instantly creates another layer of murkiness that can drive up hard costs and make it impossible to accurately parse out the effect of code changes.

Finally, there is a global influence to be considered as well when trying to unpack changes in material cost escalation relative to inflation. Material tariffs, oil prices, customs timelines, etc. all play a vital role in influencing hard costs and cannot be ignored as part of this discussion.

3.) Influence of Company-Specific Business Practices

The other major flaw in understanding the black box of construction pricing is that it is not uniform. All project have different designs, locations, and final uses. Couple that with the differences between construction managers - immediate availability, employee talent pools, product-type preferences, areas of expertise, safety standards, profit and overhead requirements, etc. This list could go on indefinitely. Simply because there is a strong development market, does not mean that every single contractor is at peak capacity and often some projects are more appealing than others due to the specific business strategies of a contractor. If you ask a mainly residential contractor to price a high-end life sciences laboratory building, they would build in some security premium above the straight material and labor costs to account for their lack of knowledge and

efficiency. Therefore, as code is released, even if it priced by 5-6 construction managers, the chances of variability in pricing is high and that variability just increases as those changes are incorporated into drawings and the same 5-6 construction managers price the drawing set allowing their specific business models and experiences to influence the pricing.

Furthermore, the current capacity of a company can create the largest swing in pricing between contractors. If 100% of their manpower is out in the field, they may add a steep premium to the pricing of any new project simply because they would have to hire to meet the staff demand. The reverse of this is true as well. If a large project is ending, a contractor may take a new project at cost or a very slim margin in order to win the work and not lay off employees.

Since contractors have complete autonomy over their pricing, they may lower fees to win a project or take a project at cost in order to build relationships with architects or clients. In a discussion with Chris Brinser, Chief Estimator for Turner Construction here in Boston, he noted that there can be a true cost impact – good or bad - if a construction manager and its' subcontractors have familiarity with a specific project or project team (Brinser). As a very rough example, if there is a college campus with (3) new identical dorm buildings to be built in three phases, the final tower will be either the cheapest or the most expensive comparable to the first two (ignoring inflation) due to the predictability of the project and the efficiencies or inefficiencies assumed by all the subcontractors after having completed the first two. Compare this to the renovation of a historical stone church where the unknowns outweigh the certainties; there will be an inherent premium for the unpredictability of the project (Brinser).

4.) Layers of Relationships

Adding to the complexity of pricing is the vast depth of vertical relationships in any construction project. While a construction manager may be the top of the pyramid, they will have a huge range of subcontractors working for them, followed by a layer of installers, drafters, consultants, etc. who are reporting into the subcontractors, followed by equipment and material vendors who could also have a whole myriad of shipping companies, 3rd party testing agencies, labor companies, etc. working for them. Each of these layers is entitled to a profit margin and has its own layer of outside influences acting on its pricing. This alone makes understanding fiscal impacts of code incredibly opaque.

Combined, these factors ultimately make it incredibly difficult to look at cost impacts due to code changes as the sole delta between rising construction costs and inflation rates. Too often though, this list of influences is referenced by the development industry as the end-all, be-all list of factors of construction costs when in fact, this rationale ignores the documents on which all other aspects of the construction industry rely – building code.

Chapter Four: The Roles of Liability and Ambiguity within the Code

It is impossible to have this discussion about the relationship between the regulatory industry and the development industry without including a discussion about the room for interpretations within the code and assignment of liability; they are fundamentally intertwined. Revisiting a topic from Chapter Two, the BBRS has an actual existing system to address ambiguity within the code - Official Interpretations. This is where the paid staff member formally issues responses to

questions and issues opinion statements on how to read and digest confusing sections of code. While incredibly beneficial to the design teams who use these official interpretations, and commendable that the BBRS acknowledges these conflicts exist, it adds substantial proof to the fact that the code remains too abstruse for quick, easy digestion.

The code is intended to serve as a guide and it is the responsibility of the Architect and Engineer of Record to ensure that their design meets, not only the intent of the code, but is safe for the public. The ambiguity exists to prevent the BBRS from "engineering" a building and creating liability for themselves. If (and when) the code gets too prescriptive, it starts to shift the onus of the design off of the design team. As a result, the BBRS (following the example of the ICC) is careful to leave flexibility of interpretation within the code. However, this creates a heavy burden on the design team who is now incentivized to limit their liability and design to the strictest interpretation of any vague or ambiguous regulation; yet, there is rarely actual value added by doing this.

The ambiguity within code also leaves a design team vulnerable to multiple interpretations. If they review the code and create a design based on their interpretation, there is always the opportunity for the plan reviewers, the building inspector, or any Authority Having Jurisdiction (to be discussed further in Chapter Eight) to disagree and require a re-design. For example, when Boston Global Investors was building their current office building in the Seaport, during the city review process, they were asked to add a public safety amplifier which is intended to increase radio communication in an emergency event throughout the building. The design team was surprised by the request as their understanding of the code was that this was only required in high-rise new construction and their 4-story, 13,500 SF building would not qualify (Hynes). However, the Boston Fire Department had issued an amendment in 2014 (Brooks, 2017) stating

all new buildings would have to comply with this requirement. Therefore, based on the city in which their drawings were getting reviewed, the design team's interpretation of the 8th edition building code was overruled and additional cost was incurred to not only install the amplifier but to perform regular maintenance and testing as part of the building's operating budget. These types of interpretations make predicating regulatory impacts incredibly difficult. While no one would argue the legitimacy and benefit of the requested amplifier, there should be a discussion around the fairness of the continuously changing expectations and interpretations of municipalities.

Often, the design team can avoid a full re-design or significant change, like the amplifier noted above, by drafting a memo or creating a report that details why their interpretation is acceptable and meets the safety expectations and intent of the code. However, this documentation further shifts the liability onto the design team – and notably off of the BBRS and the developer. One very interesting tangent during my conversation with Don Contois from RW Sullivan's Code Group was surrounding this topic. He joked he "feels like a lawyer some days" due to all the careful wording and code analyses he is asked to produce for clients (Contois). Don is incredibly well-read when it comes to all things code and has prepared hundreds of these explanations of interpretations throughout the years. However, that does not change the fact that creating these memos for clients adds to the perceived liability of his team and will naturally influence the engineers to adhere to the strictest interpretation of the code possible. I would speculate that Don and his team, or any design team, would be wary to appeal the example above and argue the lack of necessity to add an amplifier – rightfully so – due to the sheer liability this would create on their license. If a developer's risk is financial, an engineer's risk is design liability.

Beyond just assignment of liability, ambiguity within the code adds significantly to the impossible task of quantifying the financial impacts of code changes. As another example, the 9th edition increased the fresh air requirements for all habitable spaces, such as hotels and multifamily housing. Different interpretations of this code change could mean that either the developer pays for dedicated, ducted, fresh air into each individual unit or they simply increase the operable windows at the perimeter of the units. Both meet the intent of the code and supply fresh air to the inhabitants. However, there is a great pricing delta between these two solutions and depending on the location and layout of the building, either option may not be feasible. These types of interpretations make pricing an entire new code edition incredibly difficult because there is a significant pricing differential between these two solutions.

Chapter Five: Establishing Proof of Financial Impact

While pricing within the construction industry has an incredible amount of influences, at the micro level it is possible to establish an estimated per SF impact of some of these changes. The ability to do this relies on clarity of code and attainability of material pricing. However, when these smaller, quantifiable changes arise that can be assigned a per SF value, they serve as an example of the financial impacts of code revisions. Joe McCoy of Gilbane Building Company provided the best example of this using an under-slab insulation that was introduced in the first version of the energy code by the ICC in 2009 and adopted in Boston that same year. Originally, the building code just required slab insulation at the perimeter; however, this revision required insulation underneath the entire first floor slab. McCoy estimated this change at roughly $1.75/SF at the time it was introduced (McCoy). To truly highlight this, let's use a fictional 1-

story 200,000 SF manufacturing building. The adoption of this new code change would add roughly $350,000 to the total cost of construction. If I assume a budget of roughly $75/SF to build the core and shell of this building in 2008 then this would be only a 2.3% increase of construction costs; however, this is only one of potentially hundreds of small changes enacted by that same code. While all the pricing may not be compounded, it could certainly add significant real dollars to the cost of a project. Chris Brinser, Chief Estimator for Turner Construction here in Boston, referred to this as "death by a thousand paper cuts", meaning no single change would move the needle, but all the changes combined can create a great fiscal impact (Brinser).

When asking developers and engineers to revisit what code changes have felt the most impactful, all groups returned the same answer – the Stretch Code. Even though the stretch code was first released in 2008, its adoption was voluntary at the municipality level. Boston was one of the first Massachusetts cities to embrace the stretch code and it was formally adopted in 2009 ("State Code Status: Massachusetts" 2018). The Stretch code was the first "above-code" appendices to the building code that prescribed energy requirements and goals roughly 20% above existing code requirements. Revisiting my conversation with Joe McCoy, he speculated that something as minor as requiring energy recovery on all equipment added around a $1/SF of the entire building cost. While this might seem manageable initially, this is simply one of potentially hundred small changes implemented by the Stretch Code. McCoy also recalled that the first edition of the 2009 Stretch Code eliminated Electric Heat, which caused an initial spike in mechanical pricing of anywhere between $1-$2/SF since electric heat had been the most economical source for years (McCoy). Using the same 1-story, 200,000 SF building from the previous example, these two small examples would create in aggregate a 9.6% increase in cost

over the original budget of $75/SF. These examples make the impact of the Stretch Code on the cost of construction within Massachusetts truly undeniable over the last ten years.

One of the most interesting tangents I had was with Glenn Allen of Elkus Manfredi; we explored the fact that not all code increases cost. He remarked that some code changes actually eliminate the "squishy" aspect and help to clarify, refine, or lower requirements (Allen). These revisions are often sparked by technology advancement, societal changes in usage, etc., and can eliminate cumbersome requirements that are no longer useful within the code. This concept of cost neutralization or reduction was further reinforced by Fran Coffey of WB Engineers, who remarked that a simple change like calculating the CFM requirements of mechanical equipment off the occupant density in a space versus a flat CFM requirement per person, can actually lower the required CFM slightly and cause all equipment sizes to be proportionally smaller. A small change in wording of a mechanical calculation, otherwise undetectable, translates into real nominal savings for end users (Coffey).

Often, new editions of the code are simply language refinement, minor specification adjustments, or clarifications on intent of various sections. These minor edits do not tip the scale enough to impact project feasibility on their own, but the aggregate of these edits can have an actual cost impact of a few dollars per square foot on the construction budget.

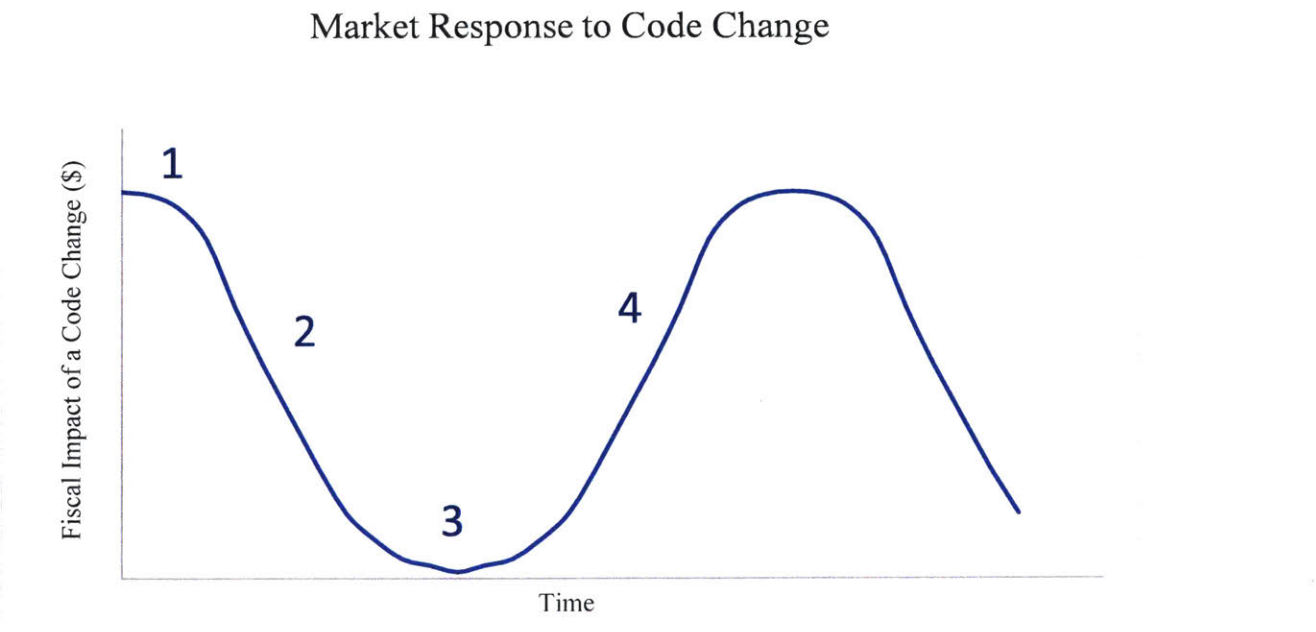
Chapter Six: The Lifecycle of the Building Code Financial Impacts

As stated, code is continuously evolving in order to keep up with changing technologies and latest available research. This continuous evolution has created a cyclical pattern of 1.) cost spikes, 2.) market acceptance, and eventually 3.) market absorption of cost. The overwhelming

theme in every conversation I had throughout my research, has been that code impacts are the absolute highest immediately prior to a code switch and immediately following its release, BUT the market eventually responds and adjusts. As highlighted in Chapter Three, it is incredibly difficult – if not impossible – to carve out the nominal value of these impacts but deeper understanding and analysis of events post-code change make it easy to recognize this rise and fall of both soft and hard costs. Furthermore, this cyclic market response to a code change supports my original theory that code changes create a tangible additional cost of construction or there would not be such an immediate subcontractor response to code changes.

Below is a figure representing the cycle of escalation that occurs in response to code changes. This graphical representation ignores all the outside factors detailed in Chapter Three and focuses specifically on financial impacts of code as if they were in a market vacuum.

Figure 1:



In Figure 1, the numbers correspond with an event, detailed below, and the market response during this time frame.

1.) After new code is released, fiscal impact of code change is the highest. Engineers and Code Consultants alike are working to unpack the changes and learn what products, systems, and previous designs are still code compliant. All interpretations of the code are the strictest at this time and there is often a lack of material or equipment that meets the new thresholds limiting supply and causing a bottleneck for a design teams when specifying products.

2.) After the code has been out for some time, design teams gain familiarity and discover the most cost-efficient ways to comply with the new standards. Vendors and manufacturers have improved their processes to increase the number of available products and equipment that meet the new requirements. This opens up the specification and re-introduces market competition; ultimately starting to deflate the initial hard cost impact of the new code.

3.) Hard costs return to some relative baseline – less any escalation in material or labor costs and all the other market factors as discussed in Chapter Three: Construction Cost Influences & Misconceptions.

4.) There are two major factors at play that cause costs to rise again. First, enforcing agencies and inspectors alike have digested the new code and are starting to enforce nuances that were previously overlooked; this concept is explored further in Chapter Eight: Authorities Having Jurisdiction. Second, is the anticipation of a new code release. Virtually every developer, engineer, and code consultant interviewed for this thesis agreed unanimously that prior to starting any new development project or design effort,

> the team sets a design timeline and *choses* which version of the code they will design under, knowing if their project spans a code change, they will have to incorporate it anyway. For this reason, prior to any new edition of code becoming law, it has already had some level of fiscal impact on the industry because project teams have started designing to the new code before it is enacted as law. Scott Summers from Boston Global Investors explained that for any large-scale development there is roughly 2 years of design, a year of permitting (at best), and 3 years of construction so with code being released every 4-5 years in Massachusetts, virtually every project of scale will span a code change and this needs to be accounted for at the start of each project (Summers).

It is important to note, that the time units of this graph are intentionally not labelled because it truly adjusts on a case by case basis. For example, Chris Brinser of Turner Construction Company recalls that when the 7th edition was released, there were significant impacts to seismic design of high rise buildings. Within a year, all structural systems for high rises in Boston went from being steel-framed to having concrete cores for the seismic load with structural steel frames built out from these cores to accept the building's dead load. Initially, this created a massive spike in construction costs – almost making high-rise construction cost prohibitive – because the concrete subcontractors in Boston did not have the technical skill to create these vertical cores with any sort of efficiency. Overtime, they learned and the initial spike deflated and construction costs returned to some relative baseline (Brinser). However, the timeline for this market absorption would be significantly longer than a similar curve for the simple absorption of an equipment specification change; which would only be a few months for another manufacturer to redesign and meet the code change. Therefore, this market absorption

curve detailed in Figure 1 should be considered on an individual change level, rather than the absorption of entire edition of the code.

Chapter Seven: The Proof is in the Soft Costs

Standard development budgets divide all expenses into two primary buckets – hard and soft costs. Hard costs are defined as anything tangible or the cost of the physical building such as concrete, steel, drywall, etc. These are the costs that are most often discussed as price drivers. Soft costs are defined as virtually everything else or all the intangibles on a project such as design costs, financing costs, legal fees, etc. In order to complete a project, soft costs are essential; yet they are often overlooked when discussing budget concerns. When a project is over budget, the first attempt to reduce costs is to examine the hard costs or the scope of the project and try to bring down the cost of the "tangibles".

When I first started thinking about the impacts of building code changes on construction pricing, I immediately started thinking about a direct per square foot impact of hard costs. However, as my research and industry conversations progressed, I realized there was a half of this discussion that was being completely overlooked – soft costs. Soft cost impacts can be anything from an accelerated design period in order to "beat" the roll out of a new code edition to hiring a dedicated code consultant on every project to maintain compliance with the everchanging list of amendments to the building code. These actions have direct impact on the financials of a project but are never discussed as cost drivers. Additional examples of code related soft costs would include preparation expenses to apply for a variance, a premium for redesign of a large project after a major code change, carrying costs for a property while

variances or permit applications are reviewed, and finally, the most unexpected but impactful soft cost is any money associated with developing, testing, or certifying new code compliant equipment and materials.

This last example of a soft cost was one I had not considered until my interview with Glenn Allen from Elkus Manfredi, a large well known architectural firm. He raised the point to me initially by detailing the role of Fire Safing and Fire Stopping vendors in helping the architectural community with code compliance of wall assemblies. He used Hilti and STI as examples because they are leaders in their field but the concept is applicable across any trade or vendor. He remarked that vendors have a financial incentive to be "one stop shopping" and therefore, are the first to review new or proposed code changes and spend significant money in research and development – adding to the soft costs of a code change - to certify their new products meet code (Allen). A product vendor, like a Hilti, will spend significant money to create various wall assembly details – using their code compliant products – and pay to have them tested so that an architect does not have to "recreate the wheel" but can simply specify the entire rated and tested assembly. This is brilliant on the part of the vendor, as it guarantees that their products will continue to be specified by architects, and therefore purchased and installed by contractors.

This expenditure of "soft" money is one that is often overlooked when discussing potential impacts of a new code editions but should be a consideration. Each time code is released, it impacts either a minimum requirement, or a rating, or a certification of a piece of equipment or a product and there is a cost associated with improving that product, testing it, and remarketing it. Those soft costs fall to the player with the largest incentive to absorb them – the suppliers. Essentially, as code changes, the entity with the largest financial incentive is the initial

reactor to these changes and helps to drive the education of the rest of the industry on these specific changes.

This role of soft costs permeates all the other discussion threads of this thesis. It contributes to the opaque nature of pricing that makes parsing out an estimated dollar per SF impact of code changes near impossible. It falls perfectly into the discussion on the lifecycle of code cost impacts, where pricing is the absolute highest before architects and engineers have a chance to react and "open up" a specification to increase competition between vendors. And finally, the majority of the cost stemming from the liability and ambiguity of building code can be found within the soft costs of a project – code consultants.

Chapter Eight: Authorities Having Jurisdiction

It is a well-known fact that Real Estate derives its value from the fact that no two properties are the exactly the same. Because of this, rigid code and text cannot possibly address every single feasible scenario when developing or renovating a building; the possibilities are endless. To combat this problem in the physical world, the code empowers local authorities as the final decision maker on a substantial amount of these ambiguous decisions. These empowered decision makers are called "Authorities Having Jurisdiction".

An Authority Having Jurisdiction, or an AHJs, is simply the entity that is responsible for the enforcement of the governing regulations and code at a local level (Guidry, 2017). For example, a building inspector or fire marshal would be considered an AHJ in the municipality where they worked. These authorities need to exist in order to enforce the decisions and regulations passed down by the BBRS. While drawings are certified by an engineer and approved by inspectional

services to obtain a building permit, there is the inherent field risk that exists during construction that a building will not be constructed per the design and subsequently, not to code. AHJs exist to enforce the code in order to combat this. They are essentially the eyes and the ears of governing agency on the project and ultimately the last safety measure between the new construction and the general public.

However, these authorities have extensive leeway to interpret the code in whatever way they see fit and due to their obligation to the general public, above all else, often adhere to the strictest interpretation possible. This can add substantial cost to a project when completing any sort of walk through or final inspection since often AHJs will ask for additional changes above the recommendations of the project engineers, code consultants, or construction managers. This is ultimately un-forecasted cost at the end of the project and directly attributable to the power granted to these authorities by the building code. This is arguably one of the most important, and most controversial aspects of any project. No one would dispute the necessity of this role and the value an extra set of eyes can create but incurring substantial cost that is essentially non-negotiable and imperative in order to open the building (and starting revenue generation) seems like a risk that should be able to be managed-away.

One of the best examples of this type of AHJ interference was offered by Boston Global Investors as part of the Yotel Project at 65 Seaport Blvd in Boston. In order to obtain their Certificate of Occupancy, the team is required to have a Life Safety walk-through with the Boston Fire Department. During this inspection, the Fire Chief asked them to add approximately (40) additional exit signs, exterior horn strobes for the rooftop bar, and better signage at all Fire Extinguisher Cabinet locations. This work, at the very end of the project, resulted in roughly a $55,000 change order from their Fire Alarm Contractor (Loukas). What is obvious, is that no one

would argue the legitimacy of these changes. If there was any sort of Life Safety concern, there is really no price that is too high. However, the drawings for the building must be reviewed by the Boston Fire Department and Inspectional Services prior to issuing a building permit and are also designed and certified by both a code consultant and fire alarm engineer; that is roughly 4-5 layers of review before the project is built certifying that it is designed to code. But alas, AHJs will always have the final review and approval since they are the ones to physically see, touch, and inspect the final product before occupancy. This type of "unknown" is one of the greatest cost drivers of code-related hard costs on any given development project.

Regulatory influence and the power of AHJs has expanded beyond the finished building and has started to include construction means and methods as well. Specially, *NFPA 241: Standard for Safeguarding Construction, Alteration, and Demolition Operations* focuses on ensuring certain life safety measures are enforced throughout construction. While some version of this statue has been a part of the Fire Prevention Code since 1968 ("NFPA 241 Standard for Safeguarding Construction, Alteration, and Demolition Operations" 2018) its enforcement has been minimal over the last 80 years. A recent string of construction fires in Massachusetts is changing that and all local officials are stepping up enforcement of this statute (Verzoni 2017). Matt Zuccaro, an estimator for John Moriarty and Associates, mentioned in our interview that he now always includes cost for a temporary standpipe, so there is accessible water on all floors in case of a fire, as well as a temporary emergency generator for the life safety systems within a building during construction (Zuccaro). These are not cheap inclusions and while this statute has existed in the code for decades, the recent enforcement by AHJs has created a pricing bump for construction means and methods. Like all life safety impacts discussed to date, no one would

argue the legitimacy of these changes. However, their irregular or unpredictable enforcement and the role of the changing AHJ makes quantifying these impacts virtually impossible.

Chapter Nine: Additional Regulatory Considerations

When I set out explore this topic, I wanted to only focus on building requirements *under the law*. I realized quickly, as with many other aspects of this topic, it is impossible to isolate the building code from the rest of the factors at play when designing a new building. The list of potential considerations for a new development is daunting and often subjective at the mercy of the municipality. Because of this, developers consider most city requests or inquiries as law long before they are incorporated into code. There is also a public benefit and marketing aspect to some of these initiatives that ultimately increase the value of a property and can return more than they cost making them profitable after a certain threshold.

The most widely-known example on the list of additional regulatory considerations would be the decision to pursue a LEED rating or a WELL building standard. Both of these 3rd party accreditations are external signifiers that a developer – and municipality – have a commitment to environmentally friendly infrastructure. There is also a rent premium associated when leasing a green building that office tenants and residential tenants will most likely pay if it fits with their ideology. However, as LEED becomes more stringent, the building code follows suit by slowly incorporating dated LEED standards into baseline building code. Because of this, superseded versions of LEED are becoming the new baseline for MA building code. In theory, this progression is positive and pushing the entire industry towards environmentally sustainable

practices. Nevertheless, eventually this new baseline of building code will become cost prohibitive and ultimately slow development if LEED is "assigned" rather than voluntary.

As mentioned above, LEED and WELL buildings are 3rd party accreditations and they are not cheap. For a project to even be considered, there is an initial fee calculated based on the square footage of the project, which can be as high as $50,000, ("LEED Certification Fees | USGBC") and is required for the United States Green Building Council (USGBC) to even review your application, but accreditation is not a guarantee. While I understand the economics of the USGBC needing funding to run a professional business and requiring money to remain at the forefront of the Green community research, it is hard to dispute the high cost of even coming to the metaphorical LEED table. It seems that these monies would be better spent actually improving building quality – not just certifying it. Simply apply this ideology to public schools or affordable housing; it would make more sense to achieve some of the more relevant LEED standards that directly impact health and wellness rather than blindly applying a LEED certification to the entire project. This way, the team can apply some of the earmarked LEED origination fees to additional building scope for the project. Alas, the perception of LEED has become increasingly valuable in this changing world, which ultimately means that as long as demand exists, LEED will continue to certify buildings and lead the industry in environmental research. The problem with this particular cycle is Massachusetts building code continues to ride the heels of this privatized, for-profit - but incredibly environmentally beneficial – building "standard".

Another emerging regulatory topic, in all Massachusetts waterfront municipalities, is resiliency; often noted in lockstep with the LEED and sustainability discussion mentioned above. Even at the independent home owner level, towns are encouraging owners to proactively respond

to our changing climate and plan for a different level of weather event than what is currently mandated by law. While certain resilient measures are not required by code, they can be required by the local planning board; bringing us back to Chapter Seven: Authorities Having Jurisdiction. These local requirements or "asks" from the planning board are intended to help protect property owners and the town alike, but often add real cost to any new or redevelopment project. In Boston, this topic has been the forefront of the Boston Planning and Development Agency (BPDA) agenda. As new projects are introduced, the immediate response is how this will affect the neighborhood's resiliency and what large scale developments can do to mitigate impact. Developers have started responding to this regulatory "trend" with all sorts of immediate project mitigation offers. John Hynes, a Project Manager for Boston Global Investors, referenced that when they developed Parcel H in the Seaport, BGI choose to raise the entire *block* by roughly 6" over the required flood plain as an added resiliency measure (Hynes). Initially intended as a good-faith act to the BPDA, BGI learned the positive economic impacts to their building by lowering their insurance premium significantly.

Due to the sheer format of the plan review process, and the influence of a municipality over the future of a project, developers have an obvious upfront motivation to over-cooperate with any requests or suggestions by the governing municipality. However, imposing these additional considerations on every type of project is not an effective planning methodology. Eventually, these requests make certain projects cost prohibitive and only certain high-end developments can afford to absorb the cost, and ultimately affecting the range of projects coming online. These additional regulatory considerations should be voluntary undertakings by the project proponent and as such, costs incurred by the decision to pursue these would be a self-inflicted rather than adding to the tension surrounding regulatory review.

Chapter Ten: A Summary of Industry Inefficiencies and Proposed Solutions

When I started this thesis, my goal was to prove my hypothesis that the delta between actual construction escalation versus material and labor escalation could be directly attributable to changes in the building code. I was determined to find a way to parse out an estimated per SF value or range to be expected with each new code iteration in order to help developers forecast, anticipate, and budget future projects. I felt there was a lack of understanding around the code changes among the party that had the greatest financial stake in understanding them and that all research and interpretation was being made at the consultant level. However, my findings instead show a much broader picture on the impact and influence of building code. Ultimately, my conversations revealed that the financial impacts of new code editions – while relevant – are only a small example of the inefficiencies that exist between the development and the regulatory industries as they relate to building code.

As discussed in this thesis, there are issues with liability and ambiguity in the code that create an impression of building code as being difficult to navigate, opaque, time-consuming, and subject to the mercy of the AHJs. Simple, cost effective solutions would address a lot of these concerns and empower developers and owners to proactively participate in the development, implementation, and regulation of building code. These proposals would also offer a solution to the largest driver of code related cost; uncertainty surrounding different interpretations of the code.

Below, I have outlined three major changes that I would argue are relatively inexpensive, easily implemented and intentionally undisruptive to the current system so implementation could be gentle.

1.) Create a streamlined review process for code clarifications and interpretations

The majority of feedback I received from developers during my research insinuated that they had never pursued a variance due to the time and resource risk of being denied. Ultimately, they adhered closely to all regulatory feedback they were given in order to not jeopardize their project being delayed or denied. The financial gain from a variance or an appeal could not compete with the financial benefits of getting a project to market. However, as noted above, the code is open to so much interpretation, the entire industry could benefit from quick resolutions.

With a slight increase in the quantity of BBRS paid staff, recouped by the agency with charging the developer a fee for the BBRS could act as a 3rd party reviewer in any disagreements or discrepancies on code interpretation between a project team and a municipality official. As it stands now, a plan reviewer or building inspector within a town has complete autonomy to enforce the code; however, they have interpreted it and a developer may appeal this decision – but this appeal offering is rarely pursued. This is an unfair assignment of power and liability to both the town officials as well the public they serve. Adding a mediator or 3rd party review aspect to the BBRS would shift some of the liability and provide an easy, predictable path to resolution. In an instance where a municipality official and a developer disagreed, EITHER (or both) could initiate a 3rd party review by the BBRS staff and have a definite decision within a set number of days – say 10 for ease of understanding. Within 10 days, the BBRS official could review both sides, meet with the two groups, offer alternative solutions, opinions, and ultimately help the team reach the best solution for public and the project. The key to the success with this process, would be finding a way to destigmatize challenging a town official on a

code related item and encouraging the open flow of opinions and interpretations. Most developers would willingly accept any changes imposed by the regulatory process instead of challenging the building inspector that holds the key to final occupancy. For this suggestion to be viable, there would need to be a change in the climate within the industry.

2.) *Engage a team to retroactively review and quantify value of code changes*

As mentioned in Chapter Four, revisions in code also have the ability to decrease hard costs when they tighten or refine specific parts of the Building Code. However, this is talked about significantly less often than cost increases. Investing in some post-implementation analytics would greatly benefit the BBRS and the entire industry's appreciation for adhering to the building code. Generally speaking, code is issued and it remains part of the building code until there is a reason for reform. However, the BBRS could invest in tracking these changes and watching their integration into the market, thereby, providing some real feedback on the success of the changes and their ability to decrease energy usage, decrease operating costs, and increase employee health and wellness. Not only would this act as great public relations for the entire built-environment industry, but it could also be used to continuously improve code by validating changes, keeping the code lean, and proving its value to the entire industry. Some form of this may already exist within the BBRS but it is absolutely not advertised or public and would benefit all parties greatly.

3.) Tiered Class System to Dictate Regulatory and Code Obligations for Each Project

While the building code currently has use groups, these use groups are too broad and do not account for the project sponsor or intent. This means a renovation of a non-profit community center and a large for-profit gym – both with similar recreational uses – would follow the same prescribed building code standards if they had the same number of users. If the state were to enact some version of a tiered system that would allow for project sponsors to specify and commit to a specific level, then they could follow the building code prescribed by that commitment. Implementation of the tiered system is made even easier by the fact that real estate is already referenced in a Class system – Class A, B, C. These assignments are not actually tied to any regulatory standards and are simply based on perceptions of a property. This proposal would allow project sponsors to financially commit to their anticipated reputation of the building. Most importantly, this tiered system would not impose cumbersome impossible standards on some of the smaller, socially beneficial projects such as schools, community centers, and affordable housing.

a. Description of the Proposed Tiered System

As noted above, the tiered system would assign a letter "grade" to each development or construction project and this assignment would indicate what path that project would follow through the Building Code. This letter assignment would not be tied to a specific Use Group; these would remain as they are currently listed in the code – i.e., a R-2 Residential project would not change but now it would be referred to as a Class B R-2 Residential project.

This letter assignment would prescribe the quality of the project and therefore, the level of regulatory influence.

Class A would be the highest tier and this designation would require compliance with all sorts of municipality initiatives depending on the location of the project within Massachusetts. This list could include requiring all Class A projects to be LEED certified up to a certain level, designing for a more stringent version of the existing Stretch Code, developer contributions to municipality resiliency efforts, a strong focus on alternative energy sources or sustainability, financial efforts from the developer to minimize impacts on the existing town resources etc. The underlying point being this list is slightly more subjective per municipality than the other two tiers. A Class B project would be more middle of the road in terms of regulatory "asks" – predictable, following a more baseline energy code, less stringent resiliency and sustainability standards, etc. This would be the majority of the projects developed in a suburban or urban fringe location. Finally, a Class C project would be the lowest tier and often would be a subsidized development of some sort. These projects could receive municipality waivers of requirements as necessary excluding anything that impacted life safety or the health and wellness of occupants.

However, it's important to highlight that this designation would be each project proponent's choice. When they submit their project for municipality approval, they would specify on their application package what Class project they are pursuing; with some minor regulatory checks to confirm the project is

filed under the correct tier and developers cannot sneak by the regulatory requirements by simply mis-registering their project. This would ensure proper forecasting of costs and clear understanding between both the developer and the municipality about the relationship on that project.

b. *Why a Voluntary Tiered System Would Work*

A self-assigned tiered system would force developers to pay for the quality of the project they were building. A developer building a Class A property would be choosing to commit to this high level of socially conscious design and construction and the financial impacts that come with it, clearly assuming that the extra financial impacts would be offset by the market demand for the high-end product type.

However, this same idea would enable more Class C affordable development in the city. This could include anything from public buildings to affordable housing. While the safety and wellness aspects of the code between Class A and Class C building would not change, the additional stringent energy codes, resiliency, etc. would be less for a Class C project and municipal employees would understand and acknowledge the different tiers of the various projects. Ultimately, putting less financial pressure on the Class C building.

Class B would remain the catch basin for all project in between. However, the increased burden on Class A projects would lighten some of the regulatory load on the Class B projects. This would allow projects that are considered "middle of the road" but are incredibly socially impactful, such as neighborhood redevelopment, market rate housing, renovated neighborhood retail, development

of small office, or increased municipality services to proceed without being weighed down by the regulatory concerns.

c. *Societal Benefits*

The greatest benefit of the tiered system is proportional distribution of fiscal commitments by a project sponsor based on the type of project. This stratification happens naturally as is, but a formal, regulated tier system would distribute the requirements imposed on each project and developers self-assigned choice of letter grade would represent a true understanding and assurance on the quality of the project based on the financial understanding of that classification. The Boston housing market is absolutely in need of Class B housing and shifting some of the heavy requirements imposed by the sheer needs of the city to Class A luxury housing would enable more developers to see the potential upside in Class B developments.

Each of these above proposals would address the fundamental efficiencies discovered through my research. Below, is a summary recap of the three proposals and their direct impact on the concerns detailed in this thesis.

1) Enacting a third-party review by the BBRS directly addresses some of the liability and ambiguity within the Building Code. It would eliminate a large portion of the time-risk associated with regulatory review for appeals or variances and it would provide a less stigmatized review of appeals, eliminating some of the overdesign risk from engineers; ultimately, lowering both hard and soft costs for project developers.

2) A retroactive review of enacted code would address some of the reputational risk associated with the code currently – cumbersome, difficult to unpack, etc. It would slowly reduce ambiguity within the code as this review board sorted through the valuable text versus the redundant text. A review team would directly impact some of the rising hard cost concerns as changes would be evaluated for value-added and either proven to be effective or… eliminated.
3) A tiered system to establish market quality of a project would challenge a developer to be fiscally responsible for some of these large regulatory commitments. A tier system encourages development projects of all scale, size, and quality, which becomes a necessary part of a healthy economy. It also helps to address the concerns of rising hard and soft costs as well as liability and ambiguity since it could be more prescriptive on the requirements of each tier rather than vague in order to encompass all projects.

My primary take-away after all of this research is simply that each code overhaul or new edition is truly in the best interest of the public and society, BUT there are fundamental inefficiencies in the way that the development industry and the regulatory industry interact. Most of these inefficiencies stem from liability and subsequently, a misalignment of interests. A few small bureaucratic changes could easily improve the interactions between the regulatory and development industry. As stated previously, development impacts all other aspects of society; the health, happiness, and success of a population (and its economy!) depends on the ability to develop all types of housing, schools, hospitals, recreational spaces, functional retail, etc. Eliminating the risk of the unknown, detailed throughout this thesis, between the development and regulatory industry would allow construction pricing to eb and flow – as with any other

pricing market – and respond naturally to the growing needs of the robust Massachusetts economy, expanding and contracting with each new version of Building Code.

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