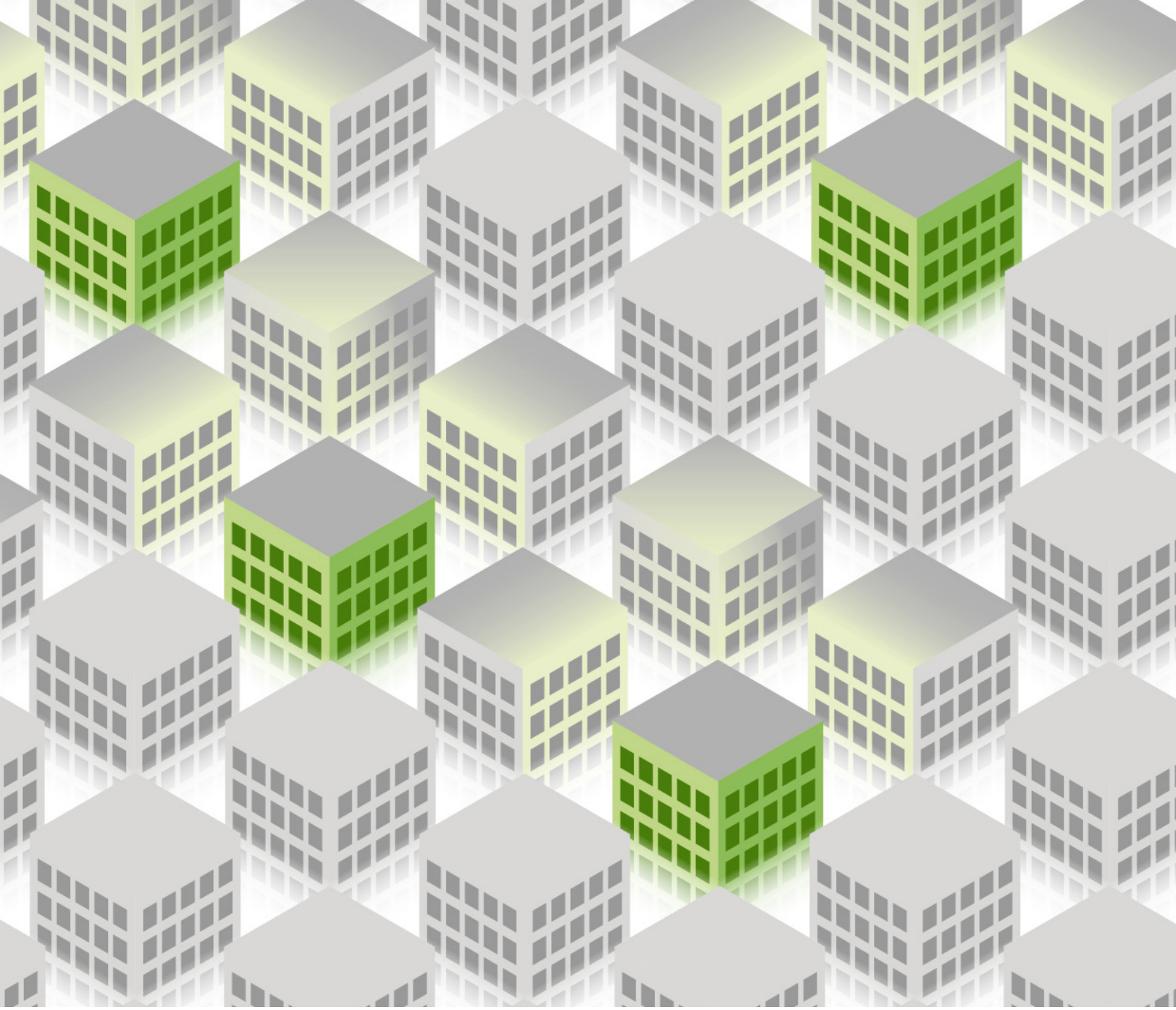

Turning Old into New, Improved and Decarbonized

Larry Jones, Atelier Ten

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At Atelier Ten, through our influence and knowledge of buildings, we help to design and create spectacular, newly constructed buildings – from cultural, institutional to the once-in-a-lifetime, unique buildings. However, one of the most interesting and challenging typologies are in fact those buildings that have been with us for decades. These buildings often require a bit of “love” to maintain, or more importantly, to keep relevant. The challenge here is, to which degree do we alter? How can we ensure these structures maintain their fit within the context of a campus, town, or city? How do we keep the sense of nostalgia while preserving the history and character of our neighborhoods? How do we accomplish all of these things while increasing environmental efficiency and well-being?

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Why are existing buildings important to us in our battle against climate change?

In 2019, the UN General Assembly warned there are only 11 years left to prevent irreversible damage from climate change. The Assembly set a goal for 2020 to be the final year that human activity will result in increased carbon emissions. The UN Intergovernmental Panel on Climate Change (IPCC) further urged for global climate emissions to reach net-zero by 2050 to prevent irreversible change to our planet. In the United States, buildings account for approximately 40% of the total greenhouse gas emissions. These same buildings use approximately 40% of the electricity generated in the United States. Because about 30% of our electricity is generated from coal-burning power plants, the effect on climate change is rather extensive. Further, as our infrastructure ages, the efficiency of this existing building stock, continues to decrease as well.

These facts raise the common argument, for any existing building, of whether to invest in maintaining it (in any form) or raze and build anew. Let's explore a bit further; the majority of the residential building stock in New York City was built between 1930 and 1960, compared to the majority of the commercial building stock that was built between 1960 and 1980. If the goal were to replace 1% of buildings from these decades, only 30% of the total would be replaced and these newly built structures would have very little impact at slowing or reducing carbon emissions by 2050. The 70% that remains would be the existing buildings that we are living and working in today. In short, to truly make an impact, the focus should be on adaptation and renewal of our largest building stock.

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PROPOSED RENEWAL OF 550 MADISON (THE OLAYAN GROUP, CHELSFIELD, RXR REALTY)

The Challenge

Existing buildings, although interesting, can be complex. They reflect how architectural and engineering designs have evolved over decades through layers and layers of improvements. For example, with the introduction of air conditioning came a major change in how our existing buildings started to appear from the exterior and feel on the interior. With the invention of the curtain wall in the early 20th century and its popularity becoming more wide-spread post WWII, our buildings became more transparent and "glassy." The introduction of mechanical systems to condition our buildings led to better controls in the form of variable frequency drives, etc. in the 1990s. At the turn of the century, efficient lighting was introduced with even more control options. As these technologies evolved, new ideas were applied to replace end of life systems, to modernize, and to keep the buildings relevant and competitive in their associated markets.

The challenges of maintaining and rehabilitating an existing building are multifold. Existing buildings are composed of multiple systems that have varying lifespans. For example, a structure built in 1930 is a layering of various systems since day one. A 1930s building is likely to have had its façade updated at least once (fenestration and/or masonry/cladding), its mechanical systems updated at least twice, and lighting replacements at least 3-4 times. None of these upgrades were likely done simultaneously, by the same designer or under the same ownership. In result, we have a patchwork of systems that are once again outdated and cannot meet the stringent requirements of the ever-increasing energy codes furthering the efficiency of our buildings.

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FLAT IRON BUILDING, 1920

How do we improve our existing buildings?

Before you can take a step forward it is important to know where you started from. Similarly, with existing buildings, it is critical to understand what the current performance of the building is before any decisions can be made on what type of improvements are necessary. Creating a baseline generates a picture of the performance of a building's energy consumption, water use, and carbon emissions. Knowing the type and amount of fuel used to condition the building gives us the energy and subsequently the operational carbon data (utilizing appropriate carbon factors), while water meters provide a picture of whole building water usage. Next, understanding the age and condition of the systems helps to complete the overall picture and begins to generate ideas of what and how to improve performance.

How aggressive should these improvements be? The incentive(s) for improvement can weigh differently if the building is owner-occupied versus tenant-occupied. As the owner, when these systems approach their end of life, an opportunity arises to invest in new and improved ways to rehabilitate their buildings. The overall goal, ideally, would be to extend the life of the building another 50-100 years for future generations to experience. But the common error is making these system upgrades as "one-offs" rather than as a part of a more comprehensive plan or roadmap working towards a given goal/target.

External drivers such as codes and local laws create a "forced" incentive to continually improve these buildings,

where owners are no longer able to prolong their improvement timelines. As of 2019, the City of New York enacted Local Law 97 (LL97) which requires buildings of a certain size to maintain specified carbon thresholds that gain stringency over time. This applies to over 50,000 buildings within the five boroughs of New York City. On the West Coast, California generally uses energy as its main metric for driving change. However, the state does have strong carbon requirements in the form of energy generation and is progressing forward. California has set goals where all state-owned buildings and 50% of private existing buildings are to be net -zero energy by the year 2030 and 100% of energy generated to be carbon- free by the year 2045.

It is recommended for owners to identify and fully map each constraint against viable improvements. Commonly asked questions include: 'Are tenant lease terms preventing me from implementing major changes holistically?, 'Do I have the means (economically) to invest in these improvements?', 'Could I pursue financing strategies to overcome initial capital constraints?'. This level of investment should be evaluated to identify the full value-added as well as the opportunity to extend its asset value. It is also a great opportunity to enhance its asset value beyond energy/carbon improvements by focusing on wellness, resiliency, productivity, and health.

Knowing one's baseline metrics starts the process of goal setting. Similarly, to designing anew, goal setting for an existing building is equally as important because this will open the door for more aggressive strategies that could be implemented over time. Code and local laws often set the minimum target for energy consumption and carbon emissions therefore, it is important to investigate the benefits of integrated strategies including the benefits of passive design – How much can the building do on its own? Can the thermal comfort be improved upon with minimal mechanical assistance? Depending on its original construction, it could reintroduce basic building principals that preexisted in an earlier era. This examination of basic building principles can reduce energy consumption while at the same time, create comfortable spaces for the occupants.

Atelier Ten are experts at applying the right analysis tools to explore various paths to make the most effective decisions environmentally and economically. Therefore, we recommend an owner to use these tools to explore opportunities to implement alternative ventilation, conditioning, and control strategies. Constructing a new building emits two main types of carbon, operational and embodied. One of the greatest benefits of maintaining these existing buildings is the preservation of embodied carbon located within the structure. Conducting analyses to compare the embodied carbon of a new building versus maintaining an existing in association with the amount of operational carbon savings that could be achieved will give a complete picture of the building's carbon story. This approach will allow for owners to make confident decisions while keeping ahead of ever-changing local laws and codes. By testing these strategies against one another and cumulatively via parametric analyses, the owner can understand which will have the greatest effect on the building, as well as what the potential return on investment may be. Exploring and testing these scenarios will create a process via a roadmap/timeline toward improvement and will ultimately allow an owner to meet the targets previously established.

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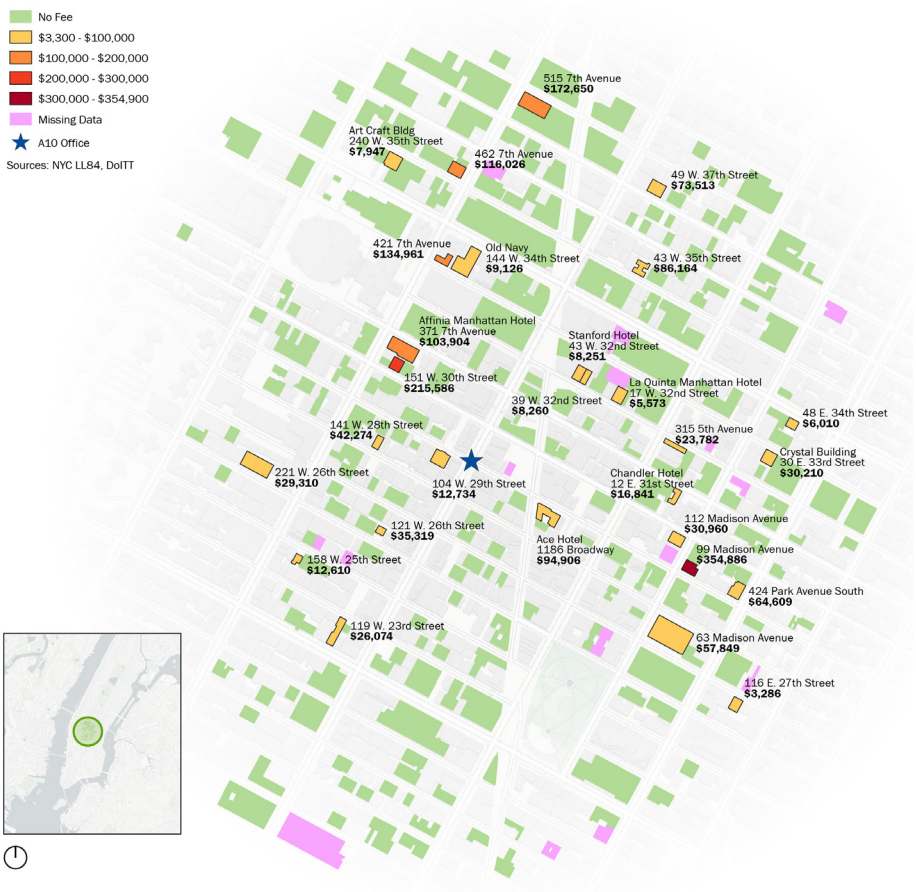

LOCAL LAW 97 ESTIMATED FEES FOR BUILDINGS OVER 25,000 SF WITHIN A ½ MILE OF ATELIER TEN'S MIDTOWN NEW YORK OFFICE

Where do we go from here?

Given the timeline proposed by the UN IPCC and the ever-changing codes in our cities and states, our existing buildings need to take center stage. The effect that they have on climate change is more apparent now than ever. We love them because of the familiarity, their history, and the character they bring to our campuses, neighborhoods, and cities. Therefore, it is important to preserve them for as long as we can. However, it is equally important to evaluate their current condition against the specified targets and what strategies it will take to meet and exceed those targets. Here are a few takeaways when thinking of improving your existing building:

1 Metrics Matter

When comparing energy cost versus energy consumption versus carbon, understand that each will lead to a different outcome. Targets set by your local municipality or organization may help choose which metric will guide your decision making, however, note that creating a low carbon building cannot be achieved using energy cost savings alone.

2 Embodied Carbon Counts

Realizing that it is no longer just about operational carbon anymore, but that the “other” piece of the carbon pie is just as significant. Existing buildings hold a lot of embodied carbon in their structure, so preserving it can be highly effective. However, when taking the façade into account, it is highly recommended to analyze the benefit of replacement versus preserving. A well thought out efficient façade can pay back in carbon rather quickly, so do not hang onto underperforming subsystems.

3 Keep Comfort in the Equation

Remember that your occupants can determine the success (or failure) of your building. The combination of performance and wellness is the secret sauce to giving our existing buildings new life – decreasing its negative impact on the environment while increasing its environmental aspects (to give the occupants a quality place to work or live).

4 Go Big or Go Home

To make a significant impact, integrated approaches such as increasing envelope integrity, improving daylighting where possible, highly efficient ventilation and heat recovery systems, exploring the natural ventilation potential in spaces and reducing fossil fuel use, to name a few, should be seriously investigated, studied and implemented if it makes sense.

5 Stay Ahead of the Curve

The strategies you implement now will not be the last during the life of the building. Codes are continuously evolving. Anticipate a rapidly changing regulatory, utility and resiliency setting in response to the climate crisis. As we become more innovative in our approaches, legislation soon catches up and ups the ante. Try to look at the environmental issue (impacts) of the building more holistically. By creating a process that will routinely look at how the building is performing against various metrics, a path to continuous improvement will be created.