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Author:	Michael Deane, Operations Manager, Turner Construction
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Michael Deane, LEED AP

Operations Manager, Sustainable Construction, Turner Construction Company, 375 Hudson Street, New York, NY 10014

mdeane@tcco.com

Biography

Michael Deane is the Operations Manager for Sustainable Construction at Turner Construction Company and a LEED Accredited Professional. His responsibilities at Turner include developing and implementing sustainable policy, training, green project setup, operational oversight, sales and acting as liaison to the US Green Building Council at the National and Chapter levels.

Michael has 20 years of construction management and administrative experience as both an owner and builder. He has managed a wide range of projects from program inception through project closeout. He has worked in the public and private sectors with for-profit and non-profit institutions. Holding an MS in Historic Preservation from Columbia University, Michael has considerable experience in the renovation of landmarked structures. His experience includes work with sustainable tall buildings in the commercial and office sectors, libraries, cultural institutions and hospitality.

Michael is a founding Board Member of the New York Chapter of the US Green Building Council, and served as Board Chair from November 2003 until January 2006. In December 2005, Michael was elected to the USGBC National Board of Directors. He continues to serve as an advisor to the New York Chapter.

Delivering Sustainable Tall Buildings

Michael Deane, LEED AP

Operations Manager, Sustainable Construction, Turner Construction Company, 375 Hudson Street, New York, NY 10014

Abstract

This paper will cover the role of the builder in delivering sustainable tall buildings. Using projects completed by Turner as examples and citing data from Turner Construction's Green Market Barometer Surveys, it will discuss the high degree of misperception on the part of decision makers about the true costs and benefits of green buildings which has until recently slowed the adoption of green buildings in the commercial market. It will discuss the importance and the limits of the builder's role during the pre-construction, procurement, construction and post-construction phases of a project and the construction manager's ability and obligation to inform the client by providing current and accurate information on costs and benefits of green building. It will discuss progress in both raising the bar for what is possible (and at what cost) as well as raising the floor for what constitutes acceptable minimum performance in terms of legislation, regulation and market demand. It will pose questions to the design / construction / development community about how and if tall buildings individually and as part of the larger urban fabric can be truly sustainable and if it is possible to take tall buildings from sustainable to restorative.

Keywords: Sustainable, Green, Tall Buildings, Turner

1.0 Introduction

There has been a remarkable shift in the design and construction industry in the last few years - a seismic shift in how we think about buildings and our awareness of the impact buildings have on human health and the health of our planet. People are increasingly aware of the earth as a finite, closed-loop system that is rapidly running out of space and fundamental resources. The building industry can contribute to delivering buildings that at the very least minimize the negative impacts on the environment, and at most contribute to a built environment that is not only sustainable but restorative.

1.1 The Builder's Role

Over the course of the 20th century, the building industry has evolved and developed means and methods to facilitate ever taller and more complex structures and has had much to add to the discussion of tall buildings and sustainability.

The traditional design-bid-build process is linear – often envisioned as a series of "silos" – with an owner engaging an architect, the architect making plans that are passed on to engineers for their input, the plans revised as necessary to conform to the owner's budget and program, and finally delivered to a builder for execution.

In this traditional model, builders are facilitators, typically brought in at the end of the design process to execute completed plans. The builder works in service to the owner/developer and the designer team.

Typically, builders are handed plans and specifications and asked to build what has been designed in the shortest possible time and for the lowest possible first cost. All other considerations flow from this model.

Put bluntly, real estate development is a bottom line business. Owners want the quickest build-out at the lowest first cost in order to occupy space and generate revenue as soon as possible. Anything that slows this process is considered an unaffordable luxury.

In this model, even something as fundamental as life safety does not always get the attention it deserves on the jobsite. Building design is largely a function of code requirements and market demand and first cost. Luxury tends to be superficial and market driven and must show an immediate return. The builder is not typically encouraged to make suggestions that will result in re-design or product substitution, even if it will result in a better finished product, for re-design takes time and costs money.

What is lost in this linear model is the knowledge and experience that the builder can bring to the design process, which, if incorporated early enough, can result in a better product without necessarily increasing project cost or duration.

On the other hand, the preferred design model for delivering a sustainable building, often referred to as the integrated design process, seeks to include all involved

parties - the owner, the developer, the designers, the builder, the tenant and the facility operator - in the process from the beginning.

The integrated process begins with a review of the program, plans, specifications and budget to identify possible sustainable features and then develop a cost-based, program-based strategy to incorporate the desired level of sustainability into the project.

This process, if embraced fully, takes the various areas of expertise, interests and points of view of all the participants into account and not only allows but requires that they learn from one another. The result is a better building.

1.2 30 Hudson Street

Figure 1. 30 Hudson Street, Jersey City, New Jersey

Between 1995 and 2000 Turner Construction had constructed a handful of projects that were in some way considered sustainable, including at least one project that was certified as a LEED V1.0 pilot project, and by 2000 was working on several others. In that year Turner began work on 30 Hudson Street, a 1.5 million square foot, 42-story high-rise building in Jersey City, New Jersey, for Goldman Sachs

Goldman Sachs wanted the building to be LEED Certified, which in 2000 was a new idea and was seen as an expensive and risky proposition. The LEED rating system was brand new and had only been used on a handful of buildings, none of them remotely as big or as tall as 30 Hudson Street.

The design team, including the builder, was first rate, but had done few if any LEED projects, and the team was trying to determine how, and indeed, if, the project could meet the requirements for LEED Certification. To their credit they employed the integrated design process and were truly learning from one another during the preconstruction phase. Because the LEED system was so new, they were in many instances literally making it up as they went along.

There was at that time serious discussion in the design and construction community about whether the LEED rating system, designed for low-rise, suburban, commercial office buildings, was even applicable to a high-rise building in a dense urban environment, and 30 Hudson Street was the first project of such magnitude to seek certification. 30 Hudson Street was completed and LEED Certified, with the minimum number of points required. After it was completed the building was criticized in some circles for not being truly sustainable, and indeed the LEED system itself was criticized, primarily because at that time a building could be certified without achieving any energy efficiency beyond the LEED prerequisite, compliance with ASHRAE 90.1-1999.

This seems an unfair criticism on two levels. First, LEED addresses many aspects of sustainability in addition to energy efficiency which 30 Hudson Street did achieve. Second, the achievement of even the minimum level of LEED certification by a project that started design in 2000 and in a building of this scale (still the largest LEED Certified project to date) was and is a considerable achievement. In retrospect it was perhaps the best that a commercial project of its size and time could have realistically achieved for anything near a commercially competitive cost. The design and construction of 30 Hudson Street was also, importantly, a learning experience for the entire team.

Turner was also engaged during this time in a residential project for the Albanese Organization in Battery Park City, New York. That project, the Solaire, designed by Rafael Pelli, would become the first high-rise residential project in the world to achieve LEED Certification. And it did so with a flourish, achieving a LEED Gold rating and exceeding the Battery Park City requirement of LEED Silver. The Solaire, which established that it was possible for a high-rise residential

building not only to achieve LEED certification, but to do so at a high level, was another successful learning experience for all parties.

1.3 The Solaire

Figure 2. The Solaire, New York, New York

The story of the Solaire is well known but it is worth mentioning here the role played by the Battery Park City Authority in driving the market to a place that it might not have gone on it's own, and in so doing, convincing many in the New York real estate community that it was not only possible but profitable to build to the LEED standard. These developers were quick to recognize a replicable model and began to develop LEED projects in other cities around the country.

The Battery Park City Guidelines are modeled on the LEED system, but are prescriptive rather than elective. In their first iteration, they essentially required a building to achieve the equivalent of LEED Silver, considered a high standard in 1999. The significance of the Guidelines is that they established a requirement for sustainable design and construction in a real estate market in which developers at the time would not have pursued LEED certification unless compelled.

Luckily in Battery Park City a sufficient market demand existed that developers were willing to invest the additional time, effort and money required to comply with the standard. By establishing this requirement for all developers, the Battery Park City Authority created a level playing field at a higher standard than would otherwise have existed.

Potential tenants were quick to recognize the increased value and benefits of the Solaire and it leased more quickly than normal for the market and at higher rents and with higher renewal rates. Even with a first cost construction premium of 14% (compared to a hypothetical non-green mid-range rental building in Manhattan), the Solaire is able to charge a 10% rent premium compared to comparable non-green buildings and achieve an acceptable payback.

Turner, Albanese and Pelli have subsequently completed a second LEED Gold project in Battery Park City, the Verdesian, and are presently working on a third, the Visionaire, which is targeted to achieve a LEED Platinum rating.

1.4 The Hearst Tower

Figure 3. The Hearst Tower, New York, New York

By 2004, when Turner was engaged to construct Lord Norman Foster's Hearst Tower, the company had gained considerable experience with LEED projects, including several high-rise buildings. By that time more building products and equipment with sustainable

features were available at increasingly competitive prices and thus with increasingly attractive pay back periods, and more designers were experienced with sustainable strategies. The Hearst Tower benefited from an excellent design as well as an owner who understood the benefits of synergies in sustainable design and was interested in a high level of achievement. The eventual cost premium for the project was less than 2% and the Hearst Tower was awarded a LEED Gold rating.

2.0 Surveying the Building Community

Turner was aware of an increase in the number of building projects with green features and, wanting to know more about this emerging market, commissioned the first of a series of Green Market Barometers – surveys of perceptions in the real estate community about green buildings.

The findings of the first survey, conducted in the summer of 2004, were significant. The survey found a wide belief held among decision makers across the real estate community that green buildings were better buildings on a wide variety of indicators, including health and well being of occupants, return on investment, higher rents and higher occupancy rates.

However, in spite of this positive perception about the benefits of green buildings, the study also noted a perception of obstacles to implementing green building – in particular that green buildings had significantly higher first costs. A subsequent survey in 2005 validated these results with similar findings.

At this time at least two other significant surveys had been conducted on the costs and benefits of green buildings (Kats, 2003 and Langdon, 2004) While the Turner survey respondents believed the first cost premium for a green building to be 15% - 18%, the studies by Greg Kats and Davis Langdon Associates had shown that the true cost premium for green buildings was closer to 2%.

3.0 Changing Misperceptions

What was gleaned from the Market Barometer surveys, when taken in combination with Turner's growing experience with green building construction and data from the Kats and Davis Langdon studies, was that while in reality first costs were reduced to near par with comparable "non-green" buildings, the perception remained among decision makers that green buildings cost significantly more. In other words, the perceptions of the decision makers were wrong.

The message that Turner took from this disconnect between perception and reality was that the builder, as part of the integrated team, and with particular attention to those areas where the builder had expertise – estimating, procurement, and execution – had an opportunity and indeed an obligation to inform clients about the true costs and benefits of green buildings.

3.1 Supporting the Demand for Green

This widely held misperception about first costs has slowed the adoption of green buildings in the commercial market. It has only been in the last year (2007) that major commercial tenants have stated clearly enough that they wanted green buildings for the broker community to hear and pass the word along to developers.

By 2007 the development community, beyond the early adopters, clearly recognized that tenants were interested in LEED certified buildings, indeed demanded them, in part because of operating cost savings but also because of the their perception that these buildings were healthier environments in which to live and work and would result in a more productive work force, reduced absenteeism and reduced incidence of illness. And with an increasing awareness of the negative environmental impacts of non-green buildings, they would leave a lighter environmental footprint.

However, even when working for an informed and motivated client, builders face challenges in implementing sustainable practice. The builder is in the end a service provider working for a client, limited in their ability to influence owners and developers who are not already committed to building sustainably, or designers who have not incorporated sustainable features and strategies in their designs.

In addition, the building industry is not known for rapid technological change and innovation – the nature of building is evolutionary, not revolutionary, and even when building the most technologically advanced and sustainable projects, the means and methods used have for the most part, changed slowly, if at all, for many years.

To keep pace with and support the changes demanded by sustainable design and construction, builders too must change their ways and implement sustainable practice in every aspect of their operations, from waste management to erosion and sedimentation control to indoor air quality management during construction, to the selection of green cleaning products, as well as knowing enough about the rapidly changing market for green products and equipment to know what to procure, where to procure it and what it should cost – all of which can change rapidly.

Builders also need to improve record keeping and documentation to be able to verify that specified materials and systems have been installed as required. And while builders do not typically function as commissioning agents on LEED projects, which requires the commissioning agent to be an independent third party, they must understand the commissioning requirements in

order to be able to facilitate the process in a timely and cost efficient manner.

Even assuming an experienced and integrated team, what specifically can the builder do that is different and better to facilitate the sustainable project during the major phases of a project: preconstruction, procurement, construction and post construction?

3.2 Preconstruction

During pre-construction, the builder's value is in providing information on logistics, constructability, estimating and procurement. During the procurement phase, bid documents must be written to include detailed sustainability requirements and products must be specified and procured with an understanding of the sustainable options inherent in each choice.

The builder must review the site conditions, water and energy use requirements, materials selection and MEP system requirements and propose alternatives as appropriate, including procurement strategies that incorporate energy and water efficiencies, maximum recycled content, local/regional sourcing (including locally harvested materials) and low VOC (Volatile Organic Compound) materials.

The builder should make value-engineering suggestions considering first cost, life cycle costs and LEED credit impacts. This could result in a recommendation to purchase a product with a higher first cost, if the net result is an overall life cycle cost savings. The final decision, of course, will rest with the owner.

The builder will review the bid documents to provide for clarity and completeness with regard to "green" requirements and can pre-qualify subcontractors before making the award to be confident that they are experienced with the requirements of the project. The builder will also thoroughly review subcontractor bids prior to award to verify that all green requirements are understood and included in the bid price.

3.3 Construction

During construction the builder manages all site activity, including (at a minimum) plans for Construction Activity Pollution Protection, Indoor Air Quality Management during Construction, and Construction Waste Management. The builder monitors the work in the field for compliance and will support the Owner's Commissioning Agent as they monitor progress.

The builder should develop techniques to maximize the sustainable aspects of any project and to institute sustainable practice on every project, including forms to track and certify that all materials comply with requirements for recycled content, local sourcing and acceptable levels of volatile organics; spreadsheets to plan and track sustainable procurement goals, waste management goals and indoor air quality during construction; and to routinely include requirements in trade subcontracts to support commissioning activities as standard practice.

Additionally, the builder should hold regular LEED progress meetings with Owner and design team as well as the trades to monitor progress and compliance.

These simple and seemingly obvious practices can make the difference between fully realizing a well designed project and missing opportunities to do so.

3.4 Post Construction

During the post-construction activities, the builder works with the Owner, Project Manager and Commissioning Agent to provide subcontractor compliance and assistance with start-up and commissioning activities.

The construction industry has reached a point where being able to plan and execute a sustainable project can no longer be considered a value-added service, but must be seen as a core competency for any builder that expects to be considered in the first rank.

Likewise, developers can no longer expect that the market will accept a building that is not LEED certified as a Class A building. Major corporate tenants are increasingly demanding it, appraisers are recognizing and quantifying the added value of LEED certification and the banking and insurance industries are beginning to offer products with preferred rates for LEED certified buildings. The Turner Market Barometers of 2004 and 2005 predicted this shift and it is now being realized at an even greater rate than predicted.

4.0 LEEDing the Way

LEED has become the recognized standard that the market understands, accepts and values, as well as a tool to guide the design and construction process toward sustainable goals.

Significant progress has been made since the introduction of LEED in both raising the bar for what is possible (while reducing or eliminating first cost premiums) as well as raising the floor for what constitutes an acceptable minimum standard of performance in terms of energy and water efficiency, indoor environmental quality and site selection. These standards have spurred materials and equipment manufacturers and suppliers to provide more sustainable products at increasingly affordable prices.

In 2001, just a few years ago, only a brave and committed client set out to achieve even the basic level of LEED certification. In 2007 owners and developers are regularly embarking on projects whose goal is to achieve LEED Platinum status or even to go "beyond Platinum"

perhaps without knowing even what that will mean. But whatever it turns out to mean in terms of physical building fabric, it is clear that more than a few visionaries are reaching for levels of achievement in sustainable performance that is beyond even the "new norm" established by LEED and beyond what may have been thought possible a few years ago.

The question now becomes where does the industry go from here? Where will the designers lead us, where will the market push us and how can builders get us there?

5.0 Tall and Sustainable

This finally brings us to the discussion of tall buildings and the meaning of sustainability and whether these two concepts are compatible. Just as there was doubt even a few years ago that it could be possible to achieve a LEED certified building in a dense urban environment, it can strain reason to consider a tall building, individually or as part of the larger urban fabric, as truly sustainable. Can a building truly be not only a benign force causing no harm, but a positive force actively improving the environment?

The design and construction community is striving to create "net zero energy" buildings and will soon succeed on a commercially viable scale. But even net zero energy buildings are not truly sustainable. To be truly sustainable, tall buildings must in fact be restorative and net positive, not only for energy, but for water, waste, materials and environmental quality, both within the building and outside of it.

5.1 Environmental Quality

The essential value of Indoor Environmental Quality (IEQ) for human health and productivity is well understood. When considering true sustainability, the quality of the environment outside the building must also be considered. A building that provides excellent IEQ only through the use of energy intensive mechanical systems run on fossil fuels does so at the expense of the outside environment. This is the antithesis of sustainability.

To be truly sustainable, two other options exist – eliminating mechanical systems (unlikely in the tall building) or utilizing alternative energy sources. The opportunity exists for tall and super-tall buildings to make a positive impact on the outside environment through the discharge of water and air that is cleaner than they take in.

The idea has been put forward by the architects Richard Cook and Robert Fox that their project One Bryant Park in New York City, functions as a huge air filter for its immediate neighborhood because the air that is discharged from the building is actually cleaner than the air that is taken in (Cook, 2007).[2] This is a truly restorative idea that if successfully applied to other building systems could result in an overall improvement to environmental quality not only within the building but to the outside environment as well.

Implemented at scale in tall and super-tall buildings, this would result in an improvement of air and water quality, rather than degradation. Coupled with renewable energy systems based on other than fossil fuels (an essential component of this idea), this could indeed be a restorative model. Entire buildings and entire cities could become "living machines."

5.2 The Triple Bottom Line

David Owen has noted the paradox that large, dense cities can be sustainable and has discussed the unintended sustainable consequences in the urban environment that result from efficiencies created by infrastructure, mass transit and availability of services. (Owen, 2004)[3] However, the modern urban environment can still be a harsh one in which to live – especially for individuals of limited means.

When thinking about urban context from the perspective of the "Triple Bottom Line" (Economic, Social and Environmental Sustainability), we must consider the overall quality of life both in and around tall and super tall buildings. What sort of urban environments do they create or attract? Will the services required to support these structures drain the surrounding environment in terms of natural resources, energy and human capital?

What if the tall building comes first and the city grows around it? Will it attract the necessary complexity and richness to create a sustainable and healthy urban environment? Can these individual icons, even if not sustainable on their own, be considered environmental loss leaders, built to attract and anchor a larger socio-economic system that may in fact be sustainable? Or must each tall building be truly sustainable on its own, able to exist as its own system - a living building - disconnected from the grid?

6.0 The Connection to Nature

One beneficial characteristic of the sustainable building is a connection to nature. Does living 100 stories above the ground connect us to nature?

At a conference on green building held at the California Science Center in June of 2006, the architect Sym Van Der Ryn argued that the development of mechanical systems has served to separate people from the cycles of nature by enabling us to create artificially controlled environments. However, by virtue of their size, super tall buildings may help us re-connect to nature. The need for self-contained systems creates an opportunity to include natural elements not possible on a smaller scale – mini ecosystems, micro climates, etc. No longer is the tall building the tower in the park, it has

the potential to be the park within the tower.

As buildings have become ever larger building technology has become global, employing similar structural and mechanical systems without regard to location or climate. As a result we have experienced a loss of local / regional character that results from the use of regional materials and responds to local climate. In the past, local climate and availability of materials determined typology. Now a common technology and materials palette is used to create geographically anonymous structures that typically do not reflect place. As buildings become interchangeable, one modern urban skyline becomes indistinguishable from the next. Few can distinguish Pittsburgh from Chicago or Dallas from Denver. The modern city is as non-site-specific as the shopping mall. Now a common typology is used to create iconic structures that define place. Big Ben is London. The Eiffel Tower is Paris. The Space Needle is Seattle. The Burj Dubai is Dubai. Rather than the place defining the icon, the icon defines the place. Height has become identity.

7.0 Conclusion

Historically, as cities have become ever larger and more dense, the negative consequences of urban environments (overcrowding, disease, inadequate infrastructure, etc.) became manageable only as society identified and solved specific problems through the creation of regulations and codes for sanitation, fire and life safety, the supply of clean water and energy, etc. As a planet, we now face the challenge of growing increasingly urban at an ever larger scale. But we now have the technology to build in a way that can result in a more livable environment for us as individuals, as a society and as a species.

Designers and builders must strive to create tall buildings that are part of the solution and not just part of the problem. The intelligence, drive, ambition and foresight that can imagine tall and super-tall buildings must be harnessed to create cities that are transformative – with economic, social and environmental capital in the form of restorative systems.

To become truly sustainable we must not use technology simply to build higher and denser for economic growth or ego, for there will be no business to be done on a dead planet. We must use the tall form to restore the health of the system. Designers and builders must re-imagine the urban system as restorative. We must change the process and the product so that both become sustainable.

The builder works in service to the owner, designer and developer. But the builder's art is in service to the building and those who live in and around them. The builder can improve the process and the product through participation on the integrated design process, and through implementation of sustainable practice in the field, but builders execute plans largely created by others. The integrated team, including the builder, must respond to the growing demand for sustainable buildings for our long term health and well being, the health and wellbeing of our children and the well being of the planet.

Builders can not solve these problems alone. Nor can architects, engineers, owners or occupants. Only when all the participants in the process work together will we realize the vision of sustainable tall buildings.

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