The Proof Is Performance

How Does 4 Times Square Measure Up?

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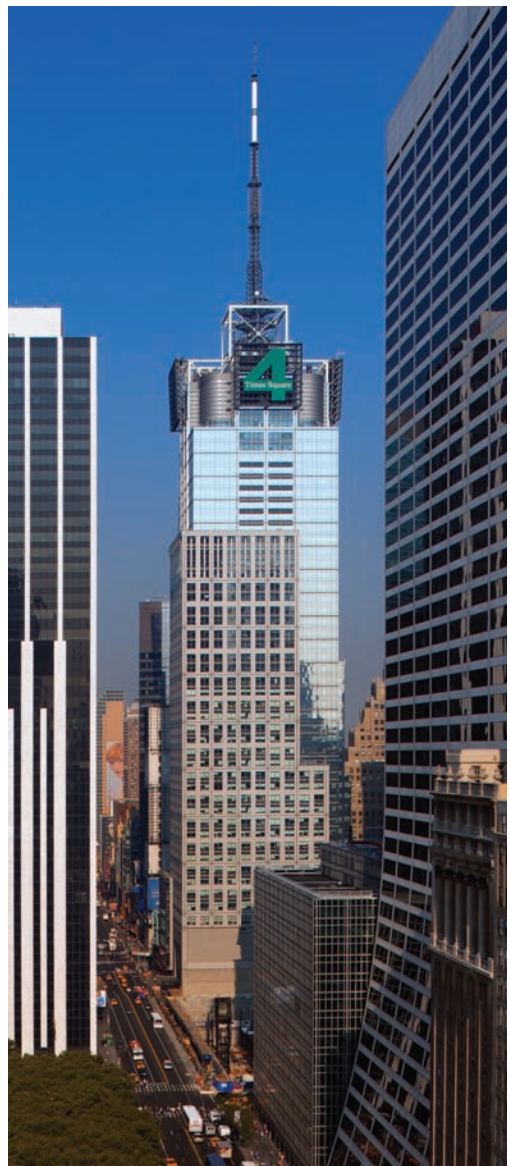
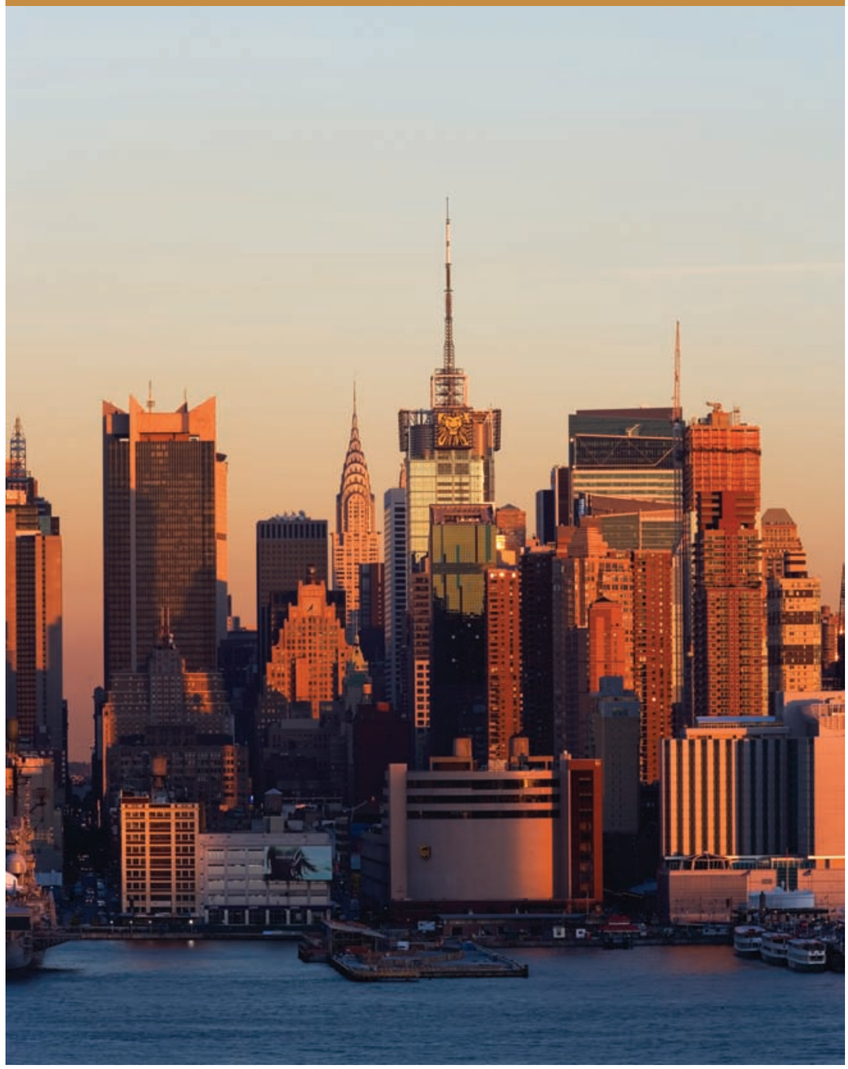
The road to high performing buildings is paved with high expectations—but, ultimately, it is measured performance that shows how energy efficient a building really is. As owners and managers of more than 8 million ft² of Class A office space in midtown Manhattan, including the Condé Nast Building at 4 Times Square, The Durst Organization understands this concept well.

From this perspective, we've experienced firsthand the all-too-common frustration of a building's energy performance not meeting design expectations, particularly a new building's energy savings projection that overstates actual performance. Across the high performing building industry, these unrealistic energy performance goals have come from (among other things) inadequate modeling practices, failure to include operations staff in goal setting or accurately communicate the design intent to the staff and lack of adequate budgets for commissioning, evaluation and ongoing benchmarking.

As more actual energy performance data become available on high performing buildings, clearer and more realistic expectations will help to establish confidence within the building design and construction industry about costs and savings. By providing some of our data, observations and experience working through design, construction and operation of high performing buildings, specifically using the 4 Times Square building as an example, we hope to encourage others to share actual energy performance operating results and lessons learned earlier,



Condé Nast Building at 4 Times Square.



The Times Square redevelopment district requires a specified amount of exterior signage and lighting.

rather than later; this helps everyone avoid making the same mistakes as the high performing building movement gains momentum.

Defining and Measuring Energy Performance

Energy performance in buildings can mean many different things. Energy intensity, or energy use per unit of floor area, is one common measure of building energy performance. The U.S. Environmental Protection Agency (EPA) ENERGY STAR® building program, with its *Portfolio Manager* rating system, measures and compares building energy performance through adjusted energy intensity.

However, energy intensity must be balanced against other performance criteria and project requirements—for example, a building with no lights, air-conditioning or mechanical ventilation will have extremely low energy intensity, but will not adequately serve the needs of building occupants.

Building energy performance can also be measured as compared to a threshold, usually with respect to an energy code or standard. While this is the most common metric used for new building energy performance, a building that has been designed to perform at a significant reduction below the energy code may not compare well to a similar building where performance is measured by energy intensity.

In addition, many earlier codes and rating schemes did not take process energy into consideration, defined in ANSI/ASHRAE/IESNA Standard 90.1-1999, *Energy Standard for Buildings Except Low-Rise Residential Buildings*, as "energy consumed in support of a manufacturing, industrial, or commercial process other than conditioning spaces and maintaining comfort and amenities for the occupants of a building."

For example, many design teams will gather energy performance data for energy-efficient buildings by comparing only the systems that the design team controls—such as envelope insulation value, percentage glazing, solar shading, chiller and boiler efficiency, fan and pump motor efficiency, installed lighting power density, and system selections. This excludes the process energy elements, some of the biggest end users in new buildings, such as server rooms, lab equipment, cooking or restaurant equipment, security systems, building control systems, fire safety systems, computers, printers, copiers and some plug loads.

Many of these excluded loads operate 24/7; so while an energy savings calculation will state significant energy savings, the real energy use of a new building may be much higher. These details need to be considered when setting goals and reporting both projected and actual energy performance.

The Condé Nast Building at 4 Times Square

An early, high-profile building that is often cited as being one of the pioneers in the high performing building movement is our Condé Nast Building at 4 Times Square in New York City. In response to growing interest in the measured energy performance of green buildings, as well as increased interest from tenants about relative energy use/costs as energy prices have risen dramatically over the last several years, we reviewed energy use at 4 Times Square and compared it to other buildings in our portfolio as well as the broader population of peer buildings in New York.

Table 1 shows how the 4 Times Square energy intensity, in kBtu/ft² per year, compared with other Durst buildings, and with what the EPA ENERGY STAR® *Portfolio Manager* calculates to be the annual site energy intensity for an average-rated building (50th percentile) with the use characteristics of 4 Times Square. *Source energy* includes the energy consumed at the building itself—or the *site energy*—plus the energy used to generate, transmit and distribute the site energy.

TABLE 1 COMPARISON OF 4 TIMES SQUARE ENERGY PERFORMANCE TO BENCHMARKS

	kBtu/ft per year	
	Source Energy	Site Energy
4 Times Square	244	120
Best Durst Building	213	76
Durst Fleet Average	239	107
50th percentile per ENERGY STAR® (with the use characteristics of 4 Times Square)	366	180

The table demonstrates that 4 Times Square is significantly more energy efficient than the median New York City office building, but that it is not the lowest in energy intensity among the Durst portfolio. Some of the reasons for higher energy intensity at 4 Times Square relative to other Durst buildings include:

- Significantly higher amounts of outside air (twice the prior New York City industry standard practice) are delivered to the tenant floors by a dedicated outside air system. This additional outside air requires additional fan and chiller energy use to deliver and condition the air. In addition, the outside air is filtered to a higher level (85%) than older buildings with the additional filter resistance, adding to fan energy consumption.
- The Times Square redevelopment district requires a specified amount of exterior signage and lighting as the minimum, process energy that was not taken into consideration while setting performance goals. This lighting consumes substantial additional energy.
- The principal tenants of the building, a publishing house and a law firm, both have significant after-hours operations, often until 1 a.m. The building is available for tenants 24/7.
- A broadcast antenna atop the building with transmitter facilities for radio and television stations uses significant process energy. Some of these facilities operate 24/7 and require continuous operation of the building cooling plant.
- Two corporate cafeterias with commercial kitchen facilities use significant amounts of process energy.
- Finally, direct gas-fired absorption chillers, selected by the design team primarily for their lack of impact on the electrical grid, favorable operating costs, and lack of harmful refrigerants, are not the most efficient choice with respect to overall net site or source energy use. If the building had been built with electric chilling, the site energy intensity would be substantially lower.

Creating Cost Effective Green Environments

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BUILDING AT A GLANCE

Building Name Condé Nast Building

Location 4 Times Square, New York City

Size 1.6 million ft^2

Started 1996

Completed 1999

Use Office space

Cost $270 million

Distinctions The first green high-rise in the United States.

BUILDING TEAM

Owner The Durst Organization

Architect Fox & Fowle Architects

Mechanical Designer Cosentini Associates

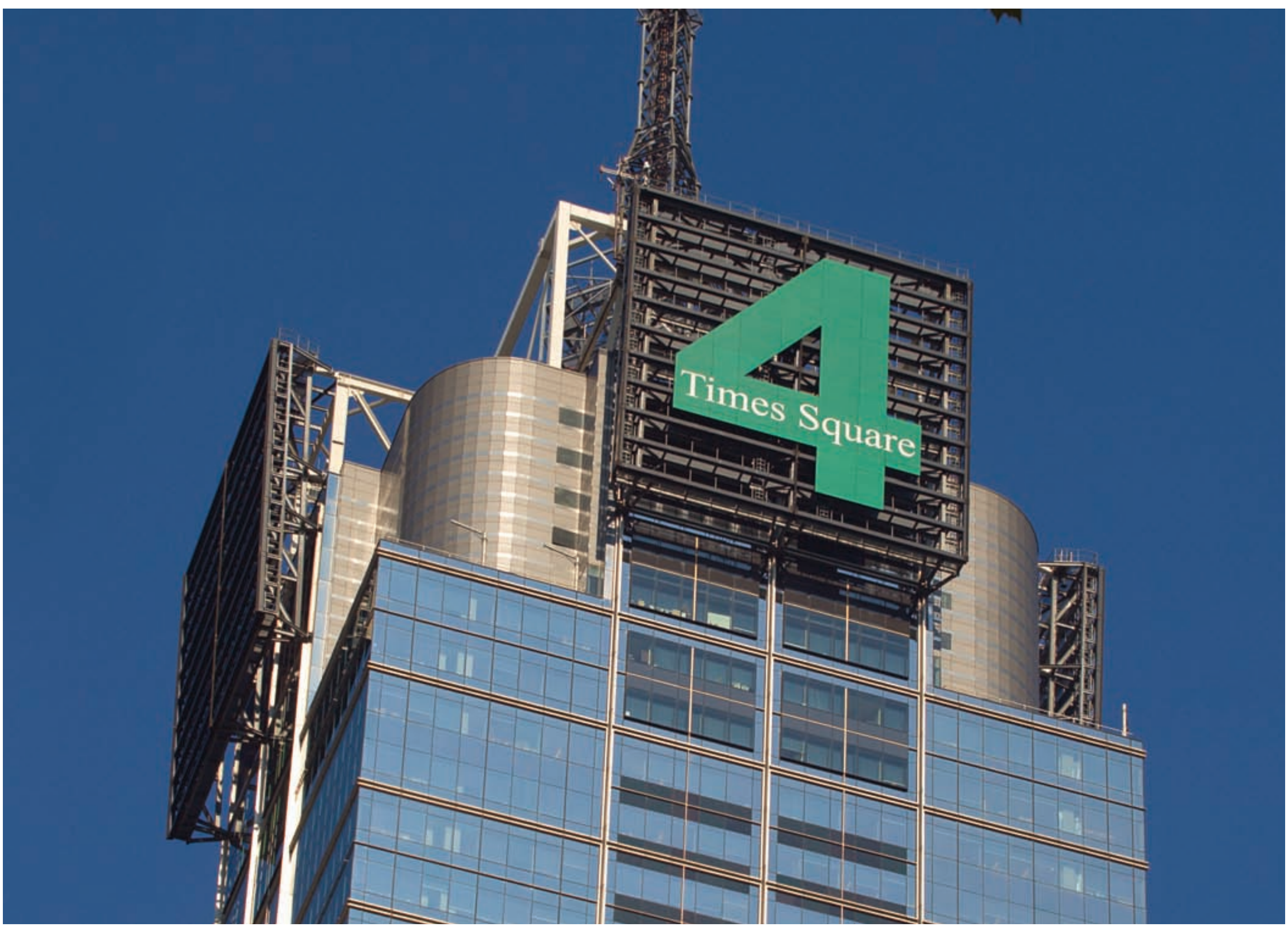
Other Key Players Tishman Construction

Managing Energy Performance Expectations

In any rapidly growing industry, performance expectations are reported at a rate that outpaces publication of actual results, and are often inflated. In the case of green buildings and actual operating performance, potential savings are being oversold in some instances.

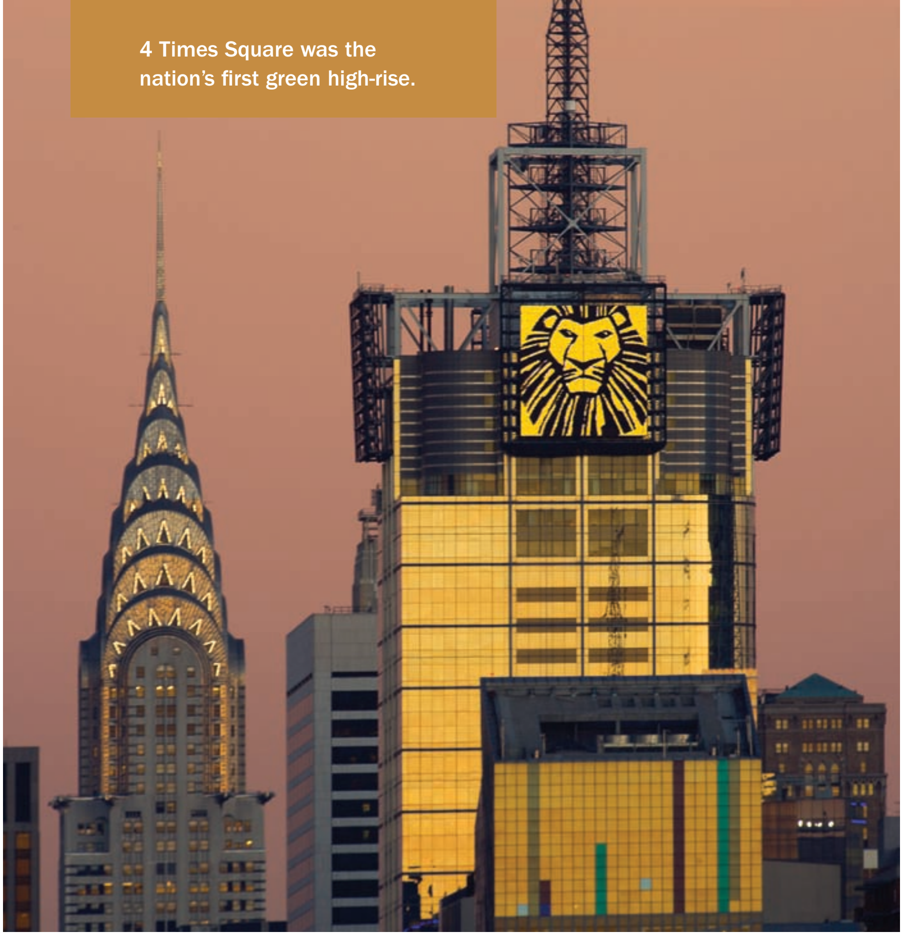
Modeling can be one major issue in understanding why energy expectations are not being met. Potential inaccuracies of energy modeling are well known, nonetheless common errors persist. Most energy modeling tools are very good at modeling standard HVAC systems, but it can be more of a challenge for less experienced modelers to predict the energy use of advanced green building components such as natural ventilation, atria, displacement ventilation, chilled beams, and double façades, among others.

Another element that can result in low building performance is a disconnect between design and operation—at the time of design and modeling predicted energy performance, optimal control strategies and schedules often



are assumed that do not occur in operation. For example, daylighting strategies might assume that artificial lighting is dimmed or turned off, while operators or occupants often do not understand the control systems and so do not use them as intended. Also, lack of commissioning can result in systems that are not operating as designed, frustrating operators and occupants. To manage expectations for energy performance, the design team must understand operational expectations from the beginning of the project.

In one recent example, the new



LESSONS LEARNED

Based on our experience with the 4 Times Square building, a variety of changes have been made in the design of our next project, the Bank of America Tower at One Bryant Park, currently under construction and expected to be completed in 2008. From the lessons learned at 4 Times Square, a number of things are being done differently at this new 2 million ft^2 tower being built on the same block.

Fuel Cells The 4 Times Square design includes two 200 kW natural gas-powered phosphoric acid fuel cells. The cells currently produce about 10% of the annual electric energy used in the building.

After the building was operational and actual production results could be recorded, we realized that, though fuel cells work, from a fiduciary standpoint this application and design was not the best use of the technology. The two fuel cell units consume a large amount of space that is out of proportion to the actual amount of power being produced. In midtown Manhattan, the price of this office space is at a premium. Also, the units have turned out to be very maintenance intensive, and installation costs were much higher than expected. Finally, the waste heat recovered from them is low-grade and not very useful.

At One Bryant Park, instead of a fuel cell, a gas turbine is being used to achieve energy production goals in a more dramatic way. The turbine is the first installation of its kind at a commercial office building and is expected to produce 4.6 MW, providing about 70% of the building's annual energy needs. In addition, the waste heat from the turbine will be used to heat and cool the building.

Photovoltaics A similar series of problems occurred with the building-integrated photovoltaics installed at 4 Times Square. After seeing that installation costs were much higher than expected and that production rates were much lower than expected due to the vertical orientation of the photovoltaics in the building's façade, we realized that this technology was not best applied in a Manhattan high-rise office building. At One Bryant Park, we resisted the desire and pressure to include building-integrated photovoltaics.

Commissioning and Owner Involvement
At 4 Times Square, commissioning played an important but limited role in identifying shortcomings in the design, along with construction deficiencies. This allowed the building to become fully operational much earlier following completion than other buildings in the Durst portfolio. But, because the team was engaged during the final stages of construction, the process was less efficient than it could have been.

At One Bryant Park, we engaged the commissioning team much earlier during the design process and before construction began. This was to ensure that the building will operate to design intent and efficiency level from day one. As an additional benefit, early involvement allows the commissioning agent access to systems that would normally be inaccessible and hidden by the time the typical schedule would commence. The commissioning team is also much larger than the team at 4 Times Square, allowing for increased system testing, surveillance and inspection. Partly due to the commissioning process, we (as owners) have also been much more involved in establishing design intent and goals and have had much more oversight during the design and construction process.

Waste heat from a gas turbine will be used to heat and cool the Bank of America Tower.

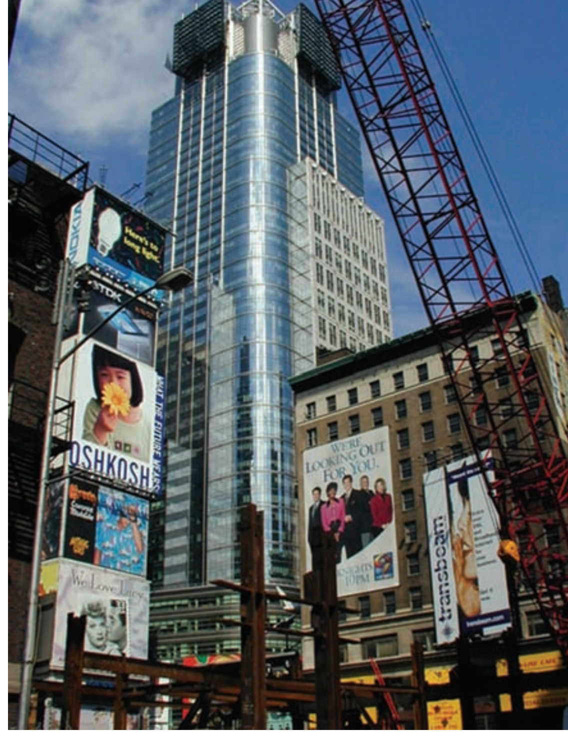
Seattle City Hall, which received a U.S. Green Building Council (USGBC) LEED® Gold rating in 2003, became front-page news in the *Seattle Post-Intelligencer*: "Seattle's New City Hall is an Energy Hog: Higher Utility Bills Take the Glow Off Its 'Green' Designation" (*Seattle Post-Intelligencer*, July 5, 2005).

The new city hall does use more energy than the old city hall, but for a variety of valid reasons including much greater ventilation levels, different uses between the two buildings, and vacancy levels in the old city hall. This press coverage clearly indicates the need to better manage expectations to avoid damaging news stories. This type of out-of-context information can erode confidence in the industry and discourage other owners and managers of high-profile high performing buildings from releasing actual energy performance data.

Conclusion

High performing buildings need to provide healthy, productive and safe places in which to live and work. Clients require energy efficiency, improved indoor environment, and innovative design, and it is an undeniable fact that there are trade-offs between these performance demands. Clearly the most effective way of advancing the building construction industry towards a sustainable balance is through rational analysis of the actual performance.

By continuing to disclose performance data and lessons learned about projects, such as the 4 Times Square Building, we can help to move each other forward on the road to high performing buildings—with good intentions and high performance. ●



THE DURST ORGANIZATION

The Durst Organization owns and manages nearly 8 million ft² of Class A office space in midtown Manhattan, including the Condé Nast Building at 4 Times Square. This 1.6 million ft² building, which opened in 1999, was the nation's first green high-rise.

Currently, Durst is building the Bank of America Tower at One Bryant Park, a new 54-story, 2.1 million ft² crystalline structure that aims to be a LEED® Platinum skyscraper. Additionally, Durst has recently completed two green high-rise residential towers in Manhattan—the Helena (LEED® Gold) and the Epic (targeted to be LEED® Silver).

Durst has been an EPA ENERGY STAR® partner since 2002 and regularly tracks energy performance through EPA's *Portfolio Manager*.

ABOUT THE AUTHORS

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