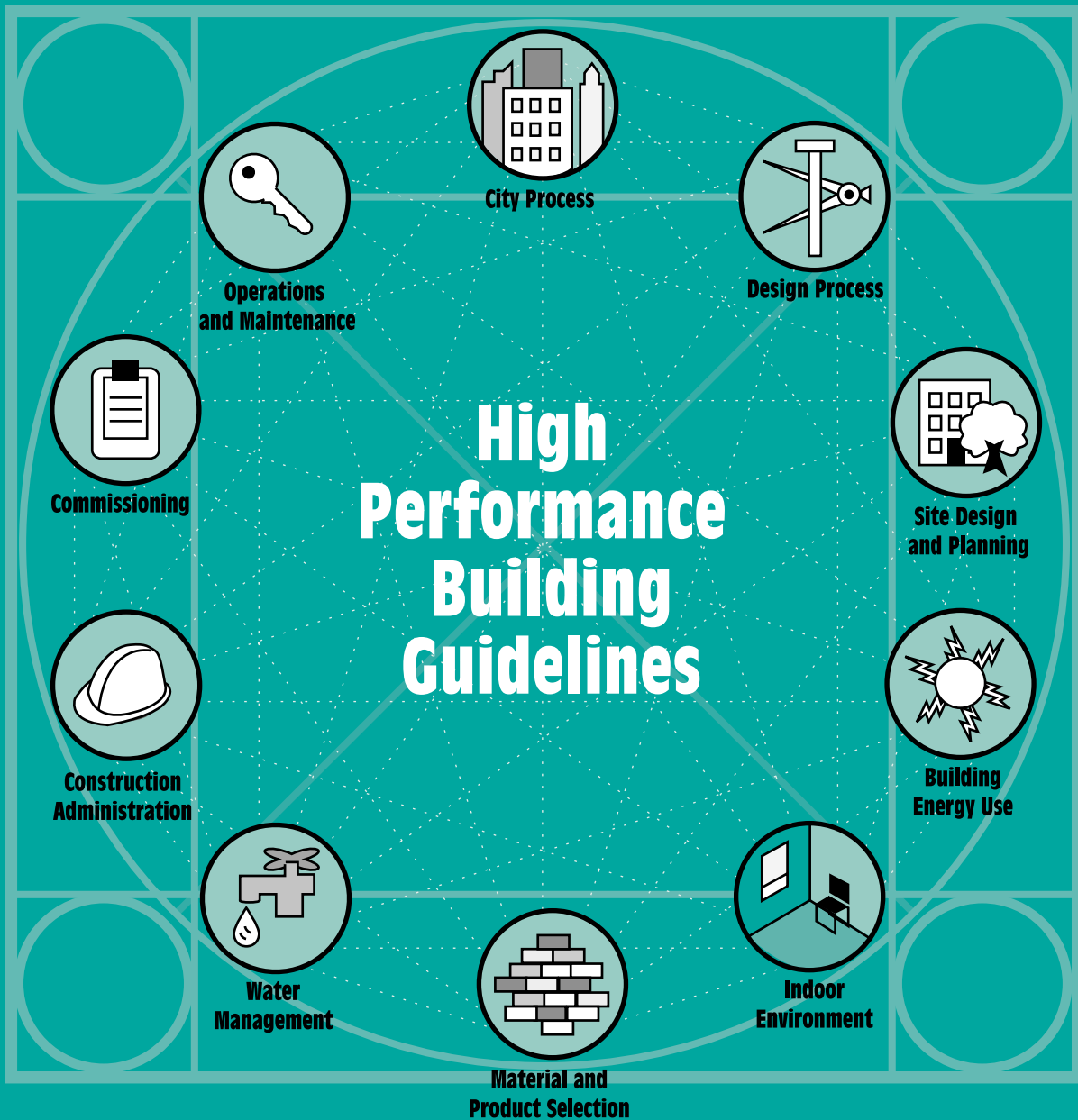




Implementing the High Performance Building Guidelines

City of New York
Department of Design
and Construction

November, 2002



Executive Acknowledgements

Kenneth Holden
Commissioner
New York City Department of Design and Construction

Claire Weisz
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Design Trust for Public Space

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Commissioner's Foreword

In the spring of 1999, the Department of Design and Construction (DDC) released a nationally important publication: the City of New York's *High Performance Building Guidelines*, produced through a uniquely collaborative process involving public, private, and non-profit contributions. The *Guidelines* have gone on to influence the design and construction of numerous public facilities for DDC's client agencies. It is the purpose of this follow-up report to share some outcomes of the *Guidelines'* application, exploring how best practices in sustainability can be consistent with good financial decision-making in capital construction. It is our hope that this report will increase awareness among other cities, institutional, and commercial developers of both the feasibility of, and the important returns from, building for "high performance."

The City is indebted to its underwriting partners for helping realize this implementation program and publication. We wish to acknowledge, once again, the imaginative support of the Design Trust for Public Space, a non-profit organization dedicated to improving the design, creation and understanding of public space throughout New York City. Similarly, the New York State Energy Research & Development Authority has given its support to implementation measures that will make "high performance" a part of every project.



Kenneth Holden
Commissioner
New York City Department of Design and Construction

Design Trust for Public Space Preface

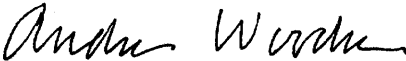
The publication of this report marks the conclusion of a particularly fruitful association between the Design Trust for Public Space and the New York City Department of Design and Construction. Thanks to the expertise and dedicated vision of the present and immediate past Commissioners and their staffs at DDC, New York has risen to leadership status in sustainable and high quality public design. This report's narratives and illustrations provide ample evidence of the remarkably creative environment currently at work within this far-reaching agency.

We are proud to have participated with DDC in furthering its goal of building environmentally sensitive structures throughout the City. During our collaboration, Design Trust fellows Stephen Campbell and William Reed worked in close association with DDC senior staff members as they met with decision-makers among DDC's client agencies. During educational project workshops, their expertise helped the various agencies analyze best practices in sustainable or "green" design, that applied to their operational goals. Enabling the implementation of the *Guidelines* has entailed their assimilation into a wide range of green public building types.

The Design Trust is grateful for the invaluable financial support it received for this initiative from the Energy Foundation, the JM Kaplan Fund, the Joyce Mertz Gilmore Foundation, the New York State Council on the Arts and the Robert Sterling Clark Foundation. These public and private foundations shared the conviction that the City's green building design initiative would not only accrue to the benefit of its citizens, but would also strengthen the trend toward sustainable design in both public and private practice. Requests for the *Guidelines* have already come from dozens of cities nationally and internationally, as well as countless design and engineering firms. It is expected that this companion Report will prove to be equally influential.



Claire Weisz
Co-Executive Director
Design Trust for Public Space



Andrea Woodner
Co-Executive Director
Design Trust for Public Space



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New York City Department of Design and Construction

Implementation of the *High Performance Building Guidelines*

Written for the Design Trust for Public Space
and the Department of Design and Construction
by **Hillary Brown, AIA**

High Time for High Performance

Public Sector Leadership in Greening the Building Industry

Over the last several years, there has been a quietly productive revolution going on in many executive offices and back rooms of the nation's state and municipal governments. Here, public officials are championing environmentally responsible development. In addition to promoting "smart growth" alternatives to sprawl, they are encouraging better building practices by "greening" their own facilities first – reducing the environmental impact of building-related activities while producing meaningful savings to taxpayers. New, innovative civic structures – from courthouses to libraries, post offices and schools – are beginning to demonstrate the economic, environmental, and social benefits of improved building performance.

The engine behind this grass roots activity might be described as the power of public ideas, best defined as "collectively held values that become powerful determinants of individual action." It is the persuasive and expressive potential of public ideas that provokes alternative visions of what is desirable and possible. Sustainability has become one of the core public ideas of the current era; the various local initiatives and projects described in this report share a common desire to demonstrate environmental stewardship in the public realm.

Municipal initiatives in cities such as Seattle, WA, New York City, and Austin, TX provided the early leadership for green buildings within the public sector. Other cities have followed suit, including San Francisco, Santa Monica, and Chicago, as well as states such as California, Maryland, New York, and Pennsylvania, and counties in Minnesota and Washington. A number of public agencies or authorities are issuing their own guidelines, including, for example, New York's Battery Park City Authority and the Metropolitan Transit Authority. These policy instruments help educate builders about the benefits of sustainable development, and coach them through the new processes involved.

The programs that are being developed vary considerably. Some are compulsory, others voluntary, and still others offer tax credits to the private sector as incentives. Whether promulgated by executive order, ordinance, or legislative initiative, many agencies are building their projects by adopting the LEED™ rating system, which has been developed by the U.S. Green Building Council to establish a measurement of green building performance. It is noteworthy that many of these programs have resulted from bi-partisan creativity as well as the participation of advocacy work and technical assistance from non-governmental environmental and civic groups, the professional community, and the utility sector. In New York City, for example, the participation of the Design Trust for Public Space, New York State Energy Research and Development Authority (NYSERDA), New York Power Authority, and various environmental NGO's were instrumental in developing the High Performance Building Program.

New York City's *High Performance Building Guidelines*

New York City's entry into green building practices began in 1997 with the creation of the Office of Sustainable Design within the City's Department of Design and Construction (DDC). DDC handles the construction of a wide range of municipal buildings – police and fire stations, facilities for corrections and health and human services, and libraries and cultural institutions. With approximately five hundred building projects underway at any given time, budgeted annually at approximately a billion dollars, DDC is positioned to make a real difference. In 1997, DDC's newly formed Office of Sustainable Design began to integrate green building practices into its capital construction program through policy, outreach and demonstration projects.

To begin, the Office of Sustainable Design needed to develop a program with clear, comprehensible guidelines. It determined that – to be fully relevant to DDC and broadly



supported within it – the guidelines needed to be generated by the agency itself, rather than imposed upon it. To that end, twenty-five members of DDC staff (who later would be implementing the *Guidelines*) were enlisted as participants and authors, assisted by outside experts. In addition, key City agencies, including the Office of Energy Conservation, the Office of Management and Budget, and representative client agencies, were asked to join the process, thereby obtaining both relevant input and broad-based governmental commitment. The resulting *High Performance Building Guidelines* were published in early 1999.

Implementing the *Guidelines*

While the *Guidelines* were still being developed, the program's crucial backers – the Design Trust and the New York State Research and Development Authority – helped DDC accelerate its implementation phase by funding, as early as 1998, the Department's educational seminars for over twenty of its client agencies. The training included an introductory session on green building design, customizing the *Guidelines'* objectives to each agency, and subsequently applying those objectives to a typical project in a dedicated workshop.

Through this process, DDC was able to submit the principles, technologies, and new procedures for integrated design to the rigorous test of a bureaucratically administered construction program. The application of the *Guidelines* to a wide variety of building types (most with stringent operating constraints) has resulted in a number of successes and some disappointments, as client agencies and the professional design teams responded differently to committing to high environmental performance for their projects. This report describes how the *Guidelines* have been put into practice in a variety of high performance demonstration projects.

Guidelines' Application to Projects

As a guidance document, the *Guidelines* provide a step-by-step process to integrate high performance features in the programming, design and construction, and operation of a municipal facility. The *Guidelines* help each participant better understand the new technical practices involved and foster the team collaboration necessary for a successful integrated design. Major milestones for implementing high performance strategies usually include the following:

- ▣ **Conducting a goal-setting workshop:** half to full day facilitated sessions where the client and full design team commit to performance goals for the facility and identify appropriate and cost-effective measures for consideration.
- ▣ **Issuing a High Performance Plan:** a 20 to 30 page consensus document summarizing the workshop findings and strategies to be further investigated.
- ▣ **Preparing an environmental program matrix:** defining the environmental requirements for each space type – such as design temperature, humidity, access to daylighting, views, individual climate control, etc.
- ▣ **Conducting a computerized energy model:** examining building envelope and HVAC system alternatives from an operating energy savings and building life-cycle cost perspective.
- ▣ **Developing a materials report:** an outline specification of recommended materials selected for recycled – or low – contaminant content.
- ▣ **Ascertaining compliance at design milestones:** status of performance goals, and explanation of strategies eliminated based on cost or operational constraints.


Technical Assistance and Financial Leverage

At the time of this writing, some twenty-four new construction projects or major renovations – with an aggregate construction value of \$700 million – are either underway or have been completed in DDC's High Performance Building program. This has been accomplished at relatively little expense to the taxpayer, by leveraging assistance and approximately \$2 million in grant monies from two sources. The first source, NYSERDA (the New York State Energy Research and Development Authority), has provided cost-shared technical assistance to the design teams. These services include energy feasibility studies, computerized energy modeling, commissioning services, and green materials outline specifications. The second source, NYPA (the New York Power Authority), finances the incremental premium cost of specific efficiency measures for high performance projects. The City repays NYPA over time through its energy savings. This enables DDC to offset higher first costs through life-cycle savings.






Projects

Since 1997, the Office of Sustainable Design has advanced a significant number of high performance demonstration projects (new construction and major renovation) identified from the City's capital construction program. These pilots cover a wide range of building types. For most of these initiatives, the City has received technical assistance grants from the New York State Energy Research and Development Authority (NYSERDA). On a significant number, the New York Power Authority has or will fund the cost differential for energy efficiency features, receiving repayment from the City's operating energy savings.

The following projects are described in this report:

-  **Kensington Branch Library**
-  **Bronx Criminal Court Complex**
-  **New York Hall of Science Addition: Phase IIA**
-  **Seabury Day Care Center**
-  **Children's Intake Center**
-  **448 Cell Correctional Punitive Support Unit at the George R. Vierno Center**
-  **Queens Botanical Garden
New Administration and Maintenance Buildings and Landscaping**

In addition to the above listed projects, discussed in some depth in the next section, there are currently several other high performance projects in various stages of design and construction in New York City:

-  South Jamaica Branch Library, opened December, 1999
-  Brooklyn Children's Museum
-  LaVaughn Robert Moore Day Care Center
-  Williamsburg Day Care Center
-  Weeksville Museum

Not yet underway are the following high performance project candidates in pre-design or early design phase:

- New 40th Precinct
- New 120th Precinct
- 200 Bed Dormitory, Adolescent Reception and Detention Center
- 800 Bed Dormitory, Rose M. Singer Center
- New York Zoological Society Lion House Renovation
- Department of Transportation Harper Street Yard
- Department of Transportation Sunrise Yard
- Staten Island Zoo Serpentarium Renovation

At this time, the South Jamaica Branch Library and the Children's Intake Center are the only two completed projects, a sampling too small from which to extract overall findings on how these buildings are functioning under operation. Due to project delays unrelated to the application of the *Guidelines*, several of the original projects launched at the outset of the program have not advanced far into construction.

Kensington Branch Library

BROOKLYN, NEW YORK
Brooklyn Public Library

Design Team:

Sen Architects, LLP
A.G. Consulting Engineers PC
Steven Winter Associates, Inc.

With this new \$5 million, 15,000 s.f. facility, the Brooklyn Public Library, a leader in traditional and innovative library services, will go beyond on some of the high performance features considered in the design of the 1999 South Jamaica Branch Library. This new branch, located in the Kensington/Borough Park section of Brooklyn, will contain a main reading room, a children's reading area, a computer lab with public access to the Internet, circulation and staff support spaces, and a multi-purpose community room.

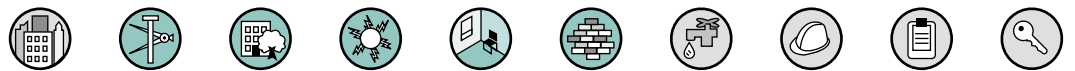
The building is organized around the concept of daylight, with its central top-lit atrium, its north-facing high performance curtain wall, south-facing garden wall and sidewall set-back for east exposure. The introduction of generous daylight will significantly reduce the building's use of electrical lighting. This project will also pilot for the City the use of ground source heating and cooling – a first in NYC DDC projects. Through the use of a heat pump, heat will be exchanged between the building and the constant temperature of the earth below the building. (A test well indicates that there is sufficient water flow in a layer of sand/gravel 240' below grade to support the open loop system proposed.) Not only does this emerging technology eliminate some initial costs and maintenance costs, it also eliminates noisy cooling equipment from the roof and the on-site emissions associated with such conventional mechanical systems, making this green building a good neighbor in this residential community.

This branch will also be designed in accordance with good green housekeeping principles. Appropriate design measures at the entrance will eliminate dirt from traveling into and moving around the building, reducing labor and chemicals required for cleaning.



VIEW FROM NORTH EAST

High Performance Features



- Ground source heating and cooling through three 240' deep wells reduces use of fossil fuel
- Controlled, glare-free north light at street window, light shelves on east facade, deep set windows on south facade, daylight dimming of fixtures
- Atrium skylights with sun filter controlled by motorized louvers. Filters also reduce light pollution during dusk and evening operating hours
- Operable windows operate in tandem with louvers at gable end of skylights provide cross-ventilation



SECTION LOOKING EAST

- North glazing is clear, low-emissivity glass. East curtain wall uses clear fritted glass
- Landscaping includes native and adapted species that avoid requirement for permanent irrigation. Permeable paving reduces runoff
- White-coated built-up roofing reduces heat gain on flat roof surfaces
- Terra cotta rainscreen panel system on concrete masonry unit backup wall provides breathable exterior wall (good thermal barrier)
- Environmentally responsive materials include recycled rubber floor tiles in basement, terrazzo floor (chemically stable) on entry floor and bamboo strip flooring on second floor
- Use of certified wood veneer on wheatboard backer panel made without formaldehyde

Bronx Criminal Court Complex

BRONX, NEW YORK
Office of Courts Administration
Office of the Criminal Justice Coordinator

Design Team:

Rafael Viñoly Architects P.C.
Flack + Kurtz Inc.
Steven Winter Associates, Inc.

One of NYC's largest recent building endeavors (in this case to be constructed by the NY State Dormitory Authority) is the Bronx Criminal Courts Complex, designed by architect Rafael Viñoly, P.C. This 750,000 s.f., \$230 million high visibility project added environmental performance criteria after design was already well underway.

As a building type, the courthouse has complex security and circulation systems, which result in deep building sections with the primary courtrooms located in the dense center. Providing a quality indoor environment for the courtrooms and ancillary spaces complements the mission of the Courts and helps ensure optimal performance for the courtroom functions. Therefore, emphasis was placed on a good indoor air quality, daylighting and thermal comfort as critical goals.

To achieve a number of high performance goals, yet respect the symbolic and aesthetic importance of the architect's two block-long south-facing curtain wall, the design team used computerized energy modeling, daylight modeling, high performance glass and light shelves to improve its thermal performance. With a transparent curtain wall a given, both the security and solar performance were enhanced by the inclusion of a graduated fritted glass treatment. The project also utilizes high-efficiency lighting and air delivery systems. In the major spaces, the use of "displacement ventilation" provides low velocity air delivery directly at the level of the occupants to avoid having to heat and cool the large volumes of space above them.

Additional studies not typically performed during conventional design addressed chiller sizing analysis (to save first cost and capture efficiency from the good fit between load and equipment tonnage), study of institutional quality materials with low off-gassing characteristics, and feasibility analysis to examine incorporating photovoltaic panels into the south-facing curtain wall.

Daylight plays a fundamental role, providing for full illumination of public and private circulation. Appropriate reflective materials and light shelves in the curtain wall bounce incoming daylight deep into the interior courtrooms and ancillary spaces. Good indoor air quality will be obtained through carbon dioxide sensors located in the courtrooms and support spaces. These will ensure that fresh air is introduced according to occupant demand, measured by the amount of carbon dioxide produced through exhalation, and conserving energy when these spaces are under-occupied.



EXTERIOR VIEW

High Performance Features

(AS DESIGNED)



SECTION THROUGH COURTROOM LOOKING EAST

- High performance curtain wall, insulated, low-emissivity glass
- Solar controlled glazing – fritted glass pattern
- Daylight contribution to occupied spaces maximized
- Light shelves bring reflected daylight to interior court parts
- Efficient lighting and occupancy sensors
- Use of "displacement ventilation"
- Location of indoor intakes away from standing traffic and near roof level
- Use of carbon dioxide sensors improve air quality
- Potential to further reduce energy use by allowing for extended temperature range in private corridors
- Engine-driven, gas-fired chiller, variable frequency drives and efficient motors
- Approximately \$330,000 annual energy savings
- Operating energy savings estimated at 28% above NYS Energy Code

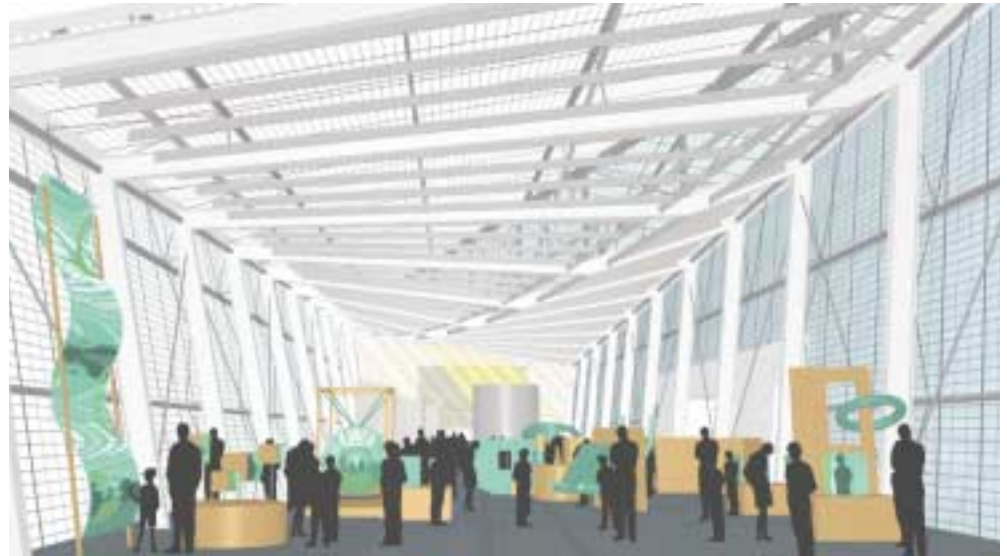
New York Hall of Science Addition: Phase IIA

QUEENS, NEW YORK
Department of Cultural Affairs

Design Team:

Polshek Partnership Architects LLP
Flack + Kurtz Inc.
Steven Winter Associates, Inc.

The New York Hall of Science, one of the country's premier science and technology museums located in Flushing Meadows Park, Queens, is constructing a major addition to its facility to accommodate the increase in public visitors. The dramatic new wing (and renovations to existing spaces) will contain exhibits, together with office and other support space. The project cost is \$35 million.



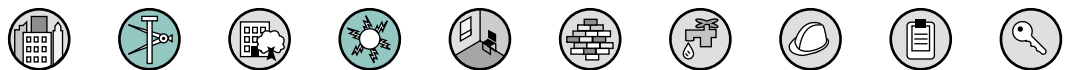
INTERIOR VIEW

Challenged by the client requirement that any high performance features not add first cost to the project, the design team achieved the following: daylighting strategies significantly inform the building massing and the enclosure system of the building envelope. The architects have utilized a translucent fiberglass insulating panel system as envelope for both wall and roof. This choice allows for a generous daylight factor in the permanent exhibit space and significantly reduces electrical lighting requirements.

A number of energy efficiency strategies were implemented and paid for through the ENCORE program offered by the New York Power Authority. These include use of low-emissivity glass, additional insulation, temperature stratification in the exhibit hall, a new high-efficiency chiller, variable frequency drives on pumps, and warmest zone controls for the variable air volume system. To a limited extent, this project also emphasizes beneficial air quality for the staff and visiting school children through good ventilation strategies and appropriate material selection.

Sunlight itself plays a role in the main exhibition hall. A "light wall" or solar sculpture at the terminus of the space calls attention to the traverse of the sun during the day. The sun, passing through perforated colored metal panels, will create a constantly shifting pattern of color and texture on the wall and floor.

High Performance Features



EXTERIOR VIEW

- Daylighting of permanent exhibit space
- Daylight dimming in the windowed offices
- High performance low-e fritted glazing
- Additional inch of insulation increased the effective R-value
- Occupancy sensors for lighting
- Carbon dioxide sensors in permanent exhibit area
- Use of temperature stratification to condition exhibit space
- Premium efficiency motors
- Variable frequency drives
- Estimated operational savings at 37% beyond current code
- Walk-off mats in entryway
- ENCORE financing
- Native species planting

Seabury Day Care Center

BRONX, NEW YORK
Agency for Child Development

Design Team:

BKSK Architects LLP
Lilker Associates Consulting Engineers PC
Steven Winter Associates, Inc.

The design of this new \$5 million day care center in the Bronx will be responsive to the needs of its young clientele in a number of important ways. By taking advantage of a large site, the design is organized around a pleasant passive/recreational courtyard with native species planting. This feature is in addition to the more active play spaces at the rear. Such a layout results in an optimal north and south orientation for classrooms that can be ventilated and lit from both sides. Through the use of light shelves and roof monitors, the design maximizes daylight in the classrooms; research indicates this use of daylighting is a significant factor in children's health, moods, and sense of well-being.



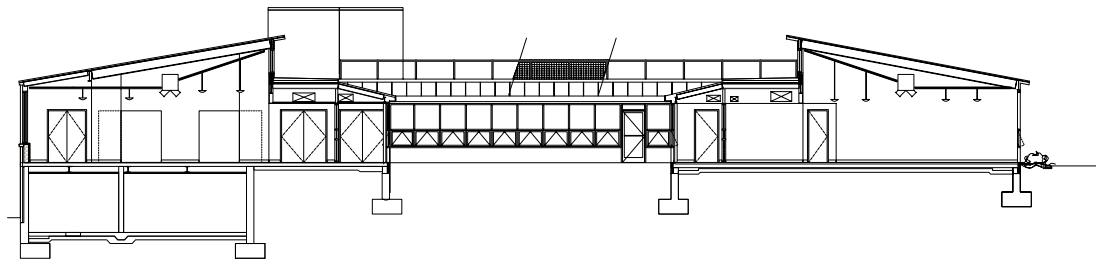
AERIAL VIEW

A similar sensitivity is reflected in the design palette. Notably, children (especially those with asthma or other respiratory problems who are vulnerable to the adverse effects of a poor indoor air quality) will be the beneficiaries of a thoughtfully designed, healthy environment. Careful selection of building materials and furnishings will reduce the overall presence of volatile organic compounds and other harmful chemicals in the indoor play environment. The design also incorporates material resource efficiency through selection of recycled-content materials and certified wood.

High Performance Features



- Native species planting (with temporary irrigation for establishment of plants)
- Light colored high-albedo (high-reflectivity) sloping roofs
- High-efficiency boilers
- Night-purge feature on ventilation system
- High-efficiency filters
- Daylighting in occupied spaces and in cellar; north/south daylighting for day care classrooms through monitors
- Daylighting for entry and circulation via courtyard layout
- Operable windows in all occupiable spaces; ventilation system exceeds code fresh-air requirements and provides night purge
- Low-emissivity, high-shading coefficient glass
- Employs full building maintenance system (BMS) for increased control of mechanical systems
- Recycled content and renewable materials; low VOCs in sealants, adhesives and paints
- Building commissioning



SECTION LOOKING EAST

Children's Intake Center

MANHATTAN, NEW YORK
Administration for Children's Services

Design Team:

Richard Dattner & Partners Architects PC
Lakhani & Jordan Engineers PC
Steven Winter Associates, Inc.

The Administration for Children's Services sought to consolidate its new function into a headquarters with a dignified image. This \$65 million retrofit of a handsome 1901 McKim Mead and White structure underwent design concurrently with the publication of the *Guidelines*, providing an opportunity for DDC to pilot a major high performance adaptive reuse effort.

Today, this registered landmark building, formerly part of the Bellevue hospital complex, provides an intake center for children entering the foster care system, as well as

administrative offices and a training academy for social workers in emergency care for children. As a green building, the design capitalizes on the existing narrow floor plate and large windows to promote daylighting. A healthy indoor environment is emphasized for children and the caseworkers alike. Carefully selected materials, high-efficiency air filters, and carbon dioxide sensors will provide spaces that serve as a respite for this young population, many of whom suffer from respiratory diseases and chemical sensitivities. Outside air intakes were located at the roof level away from traffic exhaust on adjacent avenues.

Energy efficiency measures include a glycol loop heat recovery system to recapture heat from exhaust ventilation air, high-efficiency lighting systems, variable-speed drives on motors and pumps, additional building insulation, and low-emissivity glazing on the windows. Daylighting is accentuated with the use of light shelves, and renders both health and energy efficiency benefits. Overall, the project will save about 33% or \$94,000 in operating energy costs annually. The payback period for all the energy improvements is less than four years. By tapping into existing district steam for heating, the building also reduces on-site carbon dioxide emissions from a conventional heating system by 44%, relative to a minimally code-compliant building. This is the equivalent (in avoided fossil fuel use) of eliminating approximately 200 vehicles from NYC streets.



EXTERIOR VIEW

High Performance Features



COMPOSITE SECTION
THROUGH ADMINISTRATIVE SPACE

- Adaptive reuse of existing building fabric
- Traditional narrow floor-plate supports daylighting and use of daylight dimming
- Design maximizes occupant access to daylighting/views through borrowed lights and placement of open office space adjacent to window walls
- Modular electric chillers facilitate redundancy and efficient operation at part load
- Closed loop heat recovery system
- Argon-filled double pane low-e glazing
- CO₂ sensors help optimize air quality in places of public assembly
- Use of sprayed-in-place cementitious insulation
- Materials selected for improved indoor air quality (IAQ)
- Recycled content materials include ceramic tile, toilet partitions, wallboard
- Low-VOC paints, cork flooring, low fiber ceiling tile and insulation
- Projected 33% reduction (\$94,000) in annual energy use over NYS Energy Code
- 1-2% increase in first cost for high performance features
- 44% reduction in CO₂ emissions from NYS Code
- Building commissioning

448 Cell Correctional Punitive Support Unit at the George R. Vierno Center

RIKERS ISLAND, NEW YORK
Department of Corrections

Design Team:

Urbahn Associates Inc.
Joseph R Loring & Associates, Inc.
Steven Winters Associates, Inc.

Given the overarching security concerns and stringent operational regimens for correctional facilities, it is significant that the Department of Corrections (DOC) is integrating several high performance features into this and other upcoming capital projects. Given the 24-hour demand for energy and other resources, coupled with extremely weather-exposed and harsh site conditions, DOC anticipates realizing shorter payback on many efficiency items in this project (combined simple payback of 3.87 years), and thereby long-term operational savings. It also believes that improving the indoor environmental quality is part of its on-going concern for inmate health.



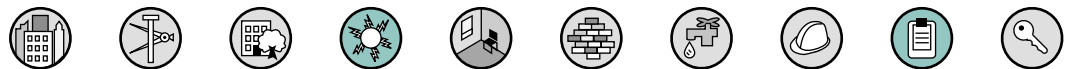
AERIAL VIEW

The George R. Vierno building is one of ten housing facilities for detainees on Rikers Island. This \$110 million addition will replace modular housing units with permanent facilities for a punitive detention housing block and support spaces. The design team realized a synergy between the pre-cast concrete cell's security performance and its high thermal mass (a passive solar strategy). Other passive solar features include additional insulation, glazing improvements, and high-albedo (high-reflectivity) roof surfaces.

The DOC will further improve building operational performance through a building commissioning phase.

The project went through several redesigns during the course of development. A number of energy efficiency measures under consideration were eliminated because they imposed significant operational and/or maintenance burdens, for example, solar shading of exterior balconies, and heat recovery.

High Performance Features



- High performance glazing
- Additional insulation
- Improved lighting efficiency
- Improved EER rating on chillers
- Oxygen trim control on boilers
- Variable air volume boxes
- Variable-frequency drives / high-efficiency motors
- 21% reduction in annual energy costs over those of a NYS Energy Code compliant building
- Video-conferencing for certain court procedures and attorney/client visiting
- Building commissioning
- Light colored roof coating
- ENCORE funding

Queens Botanical Garden New Administration and Maintenance Buildings and Landscaping

FLUSHING, NEW YORK

Design Team:

BKSK Architects LLP
Atelier Dreiseitl Conservation Design Forum
PA Collins, PE
Steven Winter Associates, Inc.

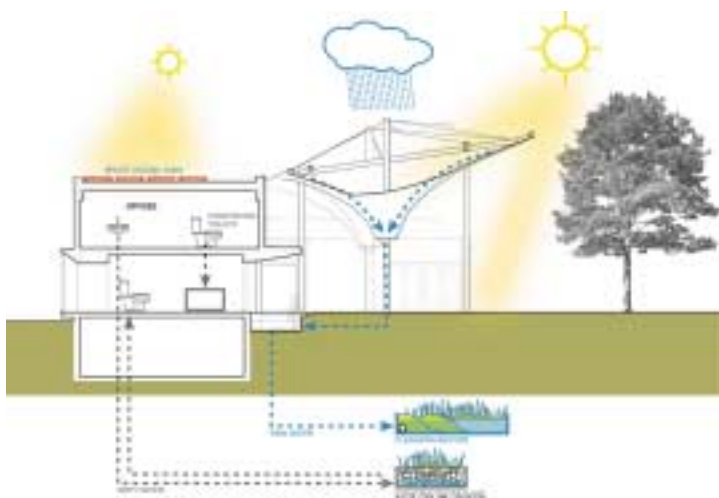


AERIAL VIEW

The Queens Botanical Garden serves a constituency in the heart of Flushing, Queens which represents an unusual cross section of cultural traditions, making it an interesting center for people and plants to come together. Visitors use the building and grounds for meditation, recreation, education, and ceremonies. With the design of its new \$8 million administration/visitor center, the leadership of the Garden has broadened its role as environmental steward. The project addresses the challenges of how to reduce the impact of a building in a natural environment. In a graceful architectural synthesis, it achieves an “integrated” design of landscape/building envelope and building systems.

The project illustrates sustainable design principles through several key features. The elongated administrative wing fosters daylighting and cross-ventilation. Its roof surface of photovoltaic cells will collect solar energy, offsetting some of the building’s energy use. The sloping green roof of the auditorium serves as a ramp to the second story. Its planted surface provides excellent thermal insulation and serves as an acoustic buffer against nearby airport noise. Techniques of water management are on display: site-harvested rainwater spills visibly into a ground level water feature – a channel running through the building ground floor, and connecting with a remediating pond, or cleansing biotope. Greywater from the building will be cleansed by a constructed wetland for reuse for toilet flushing and irrigation. The site’s parking and paving strategies reduce visual impact on the garden setting while improving re-charge of groundwater: the hard surfaces of the parking lot are broken up with pervious paving, swales (vegetated ditches), and planted hills.

High Performance Features



SITE PLAN

- Daylight provided to all occupied spaces
- Operable windows
- Light shelves for sun control
- Water-harvesting membrane roof
- Photovoltaic roof tiles on office wing
- Structurally insulated panels
- Low-emissivity glass
- Greywater system, waterless urinals, composting toilets and other water conserving measures
- Living technologies (i.e. constructed wetland and cleansing biotope) to clean greywater and rainwater for reuse
- Porous paving and bio-swales at parking lot and throughout site
- Groundwater heat pump system
- Daylight dimming and other lighting control measures
- High-efficiency lighting and occupancy sensors
- Full spectrum lamps
- Recycled content and renewable materials
- Low VOCs in sealants, adhesives and paints
- Building commissioning
- Native plantings (for non-exhibit plantings)

Program Trends and Implementation Findings

Despite the slow progress of these early pilot projects, the participation in the High Performance Program has steadily increased over the past five years, from four projects in 1997 to a present total of approximately twenty-four projects. A significant number of client agencies (Cultural Institutions, Corrections, Agency for Child Development, for example) have explicitly solicited the use of the *Guidelines* on their capital projects. The increased interest in voluntary participation in high performance implementation might be attributed to the following program strengths:

Good Alignment with Municipal Agency Values and Core Mission

The *Guidelines* implementation process encourages DDC's client agencies to align green building design objectives with their core service mission. Specifically, how do high performance features make the building more successful in serving its clientele? Examples of a good fit include: daylighting as a preferred source of illumination for reading and activity rooms in libraries; sustainable landscape and horticultural practices for a botanical garden; water pollution prevention for an aquarium; emphasis on air quality and other indoor health concerns for day care centers.

Consistency with Agency Fiscal Prudence:

Projects that have been designed for integrated, system-wide energy efficiencies can realize 30% or greater operating savings and associated benefits at low additional first cost, in the range of 1 to 5%. This is especially the case when the project has high internal loads (e.g. a courthouse), or is run on a 24-hour basis (New Children's Center). These factors contribute to a shorter payback on efficiency investments and likelihood of obtaining full premium cost financing and long-term operating energy savings.

Enhancement of Building Educational Opportunities

For the education mission of many cultural institutions (from science museums, zoological societies, to children's museums), a High Performance Building can be a showcase for environmental stewardship by creating a pedagogical link between the design features of the building, and the actual exhibits on science, technology, ecology or other subjects.

Consistency with "Good Government" Principles

Clients are realizing that "High Performance" can exemplify "*reinvented government*." There is recognition that within green facilities, public services are rendered not just more efficiently (lowering operating and life-cycle costs, less environmental impact) but more effectively: indoor environments with daylighting and improved indoor air quality deliver higher human resource outcomes. In addition, many of these high performance features contribute to making the settings appear less institutional.

Synergy with Architectural Design Ideas

Architects will pro-actively embrace high performance challenges when they perceive a good fit between aesthetic goals and the formal possibilities of green features. At the Bronx Courthouse, the desired transparency of the curtain wall worked well with a scheme emphasizing daylighting. At the Queens Botanical Garden, the elements of water conservation are skillfully developed into formal explorations for the building massing and unique landscape designs to "de-institutionalize" the parking lot.

Lessons Learned

Architects Describe Experiences with Implementing High Performance

Five architects whose offices were commissioned by DDC to implement the *Guidelines* on New York City projects provided useful feedback during a moderated round-table format conducted by DDC in February, 2002. The participants' comments illuminate both opportunities and challenges for building green in the public sector at this point in the nation's learning curve.

From working in tandem with NYSERDA's green experts who provided technical assistance, these design professionals became exposed to new practices, tools and expertise. As BSKS architect **Joan Krevlin** put it, *"The resources are out there – you just need to get out beyond your normal circle."* The participants spoke encouragingly about how the high performance design experience has begun to alter some of their own office practices. They've been prompted to consider new systems, materials and processes. For Kensington Branch Library for example, Sen Architects cited their adoption of a terra cotta rain-screen cladding product, widely used in Europe to extend life of exterior walls in temperate climates. **Joseph Coppola** of Richard Dattner's office extolled the value of the building commissioning process as an additional means to monitor construction, and provide extra insurance that systems were built as designed.

In general, the architects offered high praise and positive feedback on how DDC has implemented the High Performance Program. Almost all agreed that the *Guidelines* and the initial green workshops helped the team focus on quantitative and qualitative outcomes of good design. BSKS's **George Schieferdecker** stated that *"health, safety, security are experiential properties of the building that everyone [on the team] came to own and support."* Bringing the entire team of project participants together to establish project goals gets everyone behind the new ideas from the get-go, encourages program-specific input from building operators, and establishes clear goals that can be referenced later. **Don Henry** of Urbahn Associates spoke about the value of the initial green design workshop and the resultant "consensus document" of technical strategies and performance goals: *"...it's amazing how useful a tool it is. Every consultant has to take responsibility for some of these items on this plan of action. It establishes early and strong buy-in."* George Schieferdecker urged DDC to use this tool continuously and especially at each milestone review meeting *"to go back through the list of commitments and recharge everyone on the principles and practices."* As a function of using the *Guidelines*, *"the firm is more educated"* he continued. Partner **Joan Krevlin** said, *"it is invigorating for the office and our knowledge base."*

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Many architects are also finding an exciting formal challenge in the discipline of designing for climate and healthier buildings. Some formally rigorous project examples include the saw-toothed roof monitors of the South Jamaica Branch Library, the configurations of the green roof and the water-harvesting roof of the Queens Botanical Garden, and the Bronx Criminal Courthouse's elegantly integrated light shelves and graduated ceramic frit curtain wall that synergistically provide solar control, daylighting, and a visual security function.

In addition to using the *Guidelines*, several projects are taking on the goal of obtaining green building "certification" from the US Green Building Council, through the use of the Leadership in Energy and Environmental Design (LEED™) rating tool. LEED™ assigns points for incorporation of various high performance features. Generally speaking, the architects have found the LEED™ system complementary to the strategies outlined in the *Guidelines*.

They recognized its rigor and challenging performance standards as a bracing reality-check throughout the various stages of design. Many stated that LEED™ compliance seemed more geared to commercial rather than institutional structures. Still others stated concerns about the onerous nature of documentation requirements (the rating process can be like *"the Olympics of green building design"*, said one architect).

The projects being reviewed had inherently uneven prospects for achieving high performance goals. They ranged from the categorically green new Administration Building for the Queens Botanical Garden, to a high security correctional facility, where stringent security and operating constraints limit innovation. Nonetheless, whatever the building type, the non-prescriptive character of the *Guidelines* enabled the architects to work creatively and productively within the limitations of their particular projects.

Don Henry of Urbahn Associates, and his client, the Department of Corrections, for example, initially saw the High Performance Program to be a difficult fit with their new high security project. However, after some discussion, a “win-win solution” emerged that will improve the performance of the building without compromising security: utilizing pre-fabricated concrete units reduces waste through factory efficiencies, and enhances energy performance through increased thermal mass. Additionally, off-site assembly eliminates the security risk of keeping waste dumpsters at the site.

By contrast, high performance features were a perfect synergy for the Queens Botanical Garden. The design team intended at the outset to build their design concept around environmental stewardship – envisioning their new facility as an educational set piece. Consequently the architects are tackling some state-of-the-sustainable-art elements such as photo-voltaic panels, a green roof, on-site storm-water remediation and re-utilization of greywater as showcase for water conservation measures.

The consultants recognized some pronounced conflicts between the innovative ambitions of the program and its bureaucratic setting. They highlighted obstacles such as the City’s procurement requirements, which may preclude the specification of innovative “sole-source” items. Other examples include agency prescriptive standards for building performance – such as minimum foot-candle illumination requirements. Even when overall performance goals might be better met using other metrics (contrast ratios for brightness, or the improved visual “acuity” offered at lower foot-candles by full-spectrum lighting), these agency standards ordinarily will take precedence.

Specific recommendations came out of discussions concerning project costs and related design fees. While most agreed that their projects have experienced, or will experience, cost increases related to high performance features, there was no agreement on the increment. Some are documenting increases in the range from 1% to 2%, however, the smaller projects are experiencing a 5% premium. The library’s incorporation of a rain-screen terra cotta exterior has added higher materials costs, for example. As one architect pointed out, “*it very much depends on how green you wish to go.*” These architects further recommended that design services for green buildings separately assign allowances to cover the costs of energy modeling, green materials research and documentation required for a LEED™ rating system.

The discussion closed with recommendations for augmenting the high performance process by introducing the construction managers to the concepts early in the process, and to draw upon their expertise in developing cost-effective details.

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Program Challenges

As mentioned in some of the project descriptions above, DDC has experienced different levels of success in implementing its major pilot project initiatives. Failure by some client agencies to ultimately incorporate high performance features may be due to a number of factors:

Operational Constraints

The most common ground for eliminating a high performance feature is the concern that a non-conventional system's uniqueness or perceived complexity would further tax the agency's finite operating resources. For this reason, the more sophisticated the proposed system, the greater the perceived risk and the less its likelihood of incorporation.

Higher First Cost

Items with a longer payback are usually eliminated, even though they might result in additional comfort or amenity (increased insulation, natural ventilation). In general, it is difficult to maintain high performance features as high priorities when severe budget constraints threaten other elements on the designer or client's wish list.

Perceived As Trade-offs

High performance features are seen as burdensome/extraneous in the context of a schedule- and budget-driven program initiative, such as the Fire Department's emergency response centers.

Perceived Risk

Many clients were presented with the option of installing a green or planted roof as a valuable high performance feature. However, with one exception, all have perceived this technology as risky, since it has no track record in a public sector environment.

Additional Challenges to Implementation of the *Guidelines*

Lagging Industry Learning Curve

Since the *Guidelines'* publication three years ago, there continues to be slow growth in practical knowledge among the broader design community about the techniques and benefits of high performance practices. Although DDC's High Performance Program success has encouraged other similar City and State agency initiatives, the corresponding demand for green design capability from among other institutions and within the commercial real-estate sector has not markedly increased.

Fiscal Barriers

Current fiscal practices within City government structurally separate capital and operating budgets, prescribing relatively fast pay-backs for efficiency improvements rather than encouraging a life cycle cost approach that would make feasible more extensive performance improvements in new buildings, or deeper retrofits, and yield greater economies across the building life span. It is this fragmentation of operating and capital decision-making that prejudices most design choices towards first cost savings, rather than life-cycle economies.

Missing Incentives

Operating savings that might arise from a client agency's prudent capital investments in energy efficiencies are prevented from being "shared." In this way, efficiencies will never accrue to the client's benefit. Instead, savings are returned to the City's General Fund. This removes a major client incentive to adopting high performance improvements and realizing useful operational savings for other agency-perceived program needs.

Future Program Goals

Next Step: Mainstreaming the High Performance Building Program

DDC has made a considerable commitment to the publication of the *High Performance Building Guidelines* and its current undertaking of a dozen high profile pilot projects, with many others under consideration. As the program matures, the next logical step is to work towards mainstreaming High Performance Program requirements across the agency's portfolio.

To that end:

- With NYSERDA's funding, DDC has already developed language in its standard ***Design Guide for Consultants*** that commits all architects on all projects to specifying readily available products with recycled content. Additional language encourages many other sustainable design strategies.
- The Office of Sustainable Design and Construction (OSDC) is currently working on finalizing specification language to require construction and demolition waste management on all projects.
- DDC is providing on-going training sessions for clients and staff to become conversant with high performance features and technical applications.
- OSDC is engaged in ongoing research to inform the High Performance process. Research projects include studies of ground-water heat pumps, construction and demolition waste management, healthy materials, the LEED™ certification process, green roofs and high-reflectance roofs, full-spectrum lighting, etc.
- Having taken an early lead in developing an expertise in High Performance Buildings, OSDC has become a resource that can eventually inform city-wide green building initiatives.
- OSDC is continuing to extend the reach of High Performance within DDC portfolio, with projects for new client agencies as well as agencies that it has worked with on previous projects.



Further Information

This report has been developed as a follow up to the publication of New York City's *High Performance Building Guidelines* in April, 1999. It explores how the *Guidelines* are being applied to a wide range of capital projects designed and built for the City of New York.

For further information on the High Performance Building Program, and to download the *High Performance Building Guidelines*, please visit the DDC's Office of Sustainable Design (OSD) website: <http://www.nyc.gov/buildnyc/ddcgreen>

