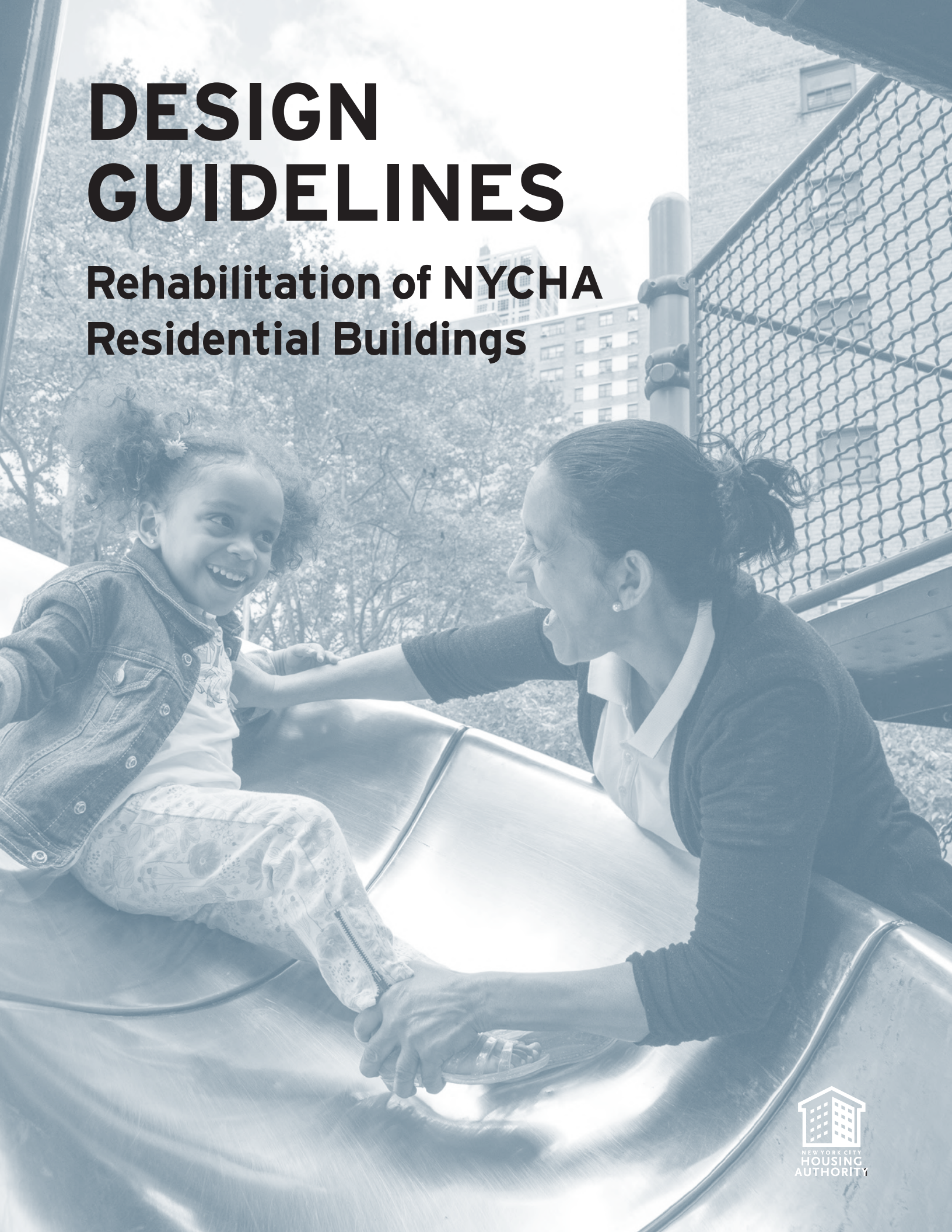
DESIGN GUIDELINES

Rehabilitation of NYCHA Residential Buildings



NEW YORK CITY HOUSING AUTHORITY

DESIGN GUIDELINES

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NEW YORK CITY HOUSING AUTHORITY

Letter from NYCHA Chair and CEO Shola Olatoye and General Manager Michael Kelly

Chair and CEO Shola Olatoye

General Manager Michael Kelly

With the *NextGeneration NYCHA* 10-year strategic plan, published in May 2015, New York City Housing Authority has laid out a vision of creating safe, clean, and connected communities. In pursuit of this vision, NYCHA seeks to define overarching design principles; create consistent, resident-focused design guidelines; and develop standards and specifications to promote excellence in renovations and new construction so that the next generation of NYCHA will be characterized by design excellence in buildings and on campuses. In so doing, NYCHA will achieve its ultimate goal of creating a better quality of life for residents.

Following the April 2016 publication of *NextGeneration NYCHA Sustainability Agenda*, this *Design Guidelines: Rehabilitation of NYCHA Residential Buildings* is the second in an anticipated series of publications that will help design professionals both inside and outside of NYCHA to stay current with the latest requirements for the NYCHA portfolio, and will also introduce new materials and techniques worthy of consideration. NYCHA's efforts in the realm of design excellence are a work in progress. Ongoing research and a feedback loop for projects completed will continue to add to and modify standards for the Authority's design, construction, and operation of its physical environment.

This program of creating design excellence in NYCHA's work relies on a collaborative approach. As we move into implementation, we will seek input from residents on the site-specific application of the Guidelines. Additionally, consistent with the design excellence strategy set out in *NextGeneration NYCHA*, the Authority has launched a peer review program utilizing pro bono services from architecture and engineering firms, as well as nonprofits engaged in design and community building. We thank our partners for their time and commitment to NYCHA's design excellence agenda and look forward to continuing our productive collaboration.

Sincerely,

Shola Olatoye
Chair & CEO

Michael Kelly
General Manager

INTRODUCTION

Design Excellence Initiatives

Design Guidelines: Rehabilitation of NYCHA Residential Buildings joins updated guidelines for new construction published in 2015 in conjunction with Next Generation NYCHA request for proposals, as well as the design guidelines set out in *NextGeneration NYCHA Sustainability Agenda*, published in April, 2016. These efforts are the result of New York City Housing Authority's design excellence initiatives to support well-designed NYCHA spaces. These initiatives and the resulting design principles focus on achieving the following overarching outcomes:

- Integrating NYCHA with surrounding communities;
- Creating safe, accessible, and attractive housing;
- Building facilities that are high quality, durable, and easy to maintain; and
- Attracting the best designers, architects, and engineers to work at and with NYCHA.

In support of its *Design Guidelines*, NYCHA, through its Office of Design (OoD), is also issuing standard specifications for rehabilitation projects. In addition, in collaboration with NYCHA's Operations Divisions, OoD will continue to establish guidelines to design for more effective and easier maintenance and operations of rehabilitated spaces.

This work is an ongoing initiative. Updated guidelines and specifications are forthcoming and will address topics such as community centers, storefronts, and Aging in Community.

This work cannot be accomplished effectively in isolation. In 2015, the Office of Design launched another core project for design excellence, its Architecture and Engineering Peer Review Program. Through this program, local architecture and engineering firms provide pro bono peer reviews, offering opinions and fresh perspectives on current projects to NYCHA's staff architects and engineers. In addition, OoD staff participate in issue-driven design workshops conducted by third parties, on matters such as supporting aging and multigenerational communities, to assist NYCHA designers in identifying design solutions to better serve NYCHA's residents.

Raising the Bar for Residential Rehabilitation Standards

The document you are now reading represents a critical next step for the design excellence initiative, laying out design guidelines for the bulk of NYCHA's capital investments. These guidelines incorporate contemporary best practices and set minimum standards and performance goals for aesthetics, cost-effectiveness, responsiveness to resident needs, and environmental sustainability.

In each of the four main functional areas of building rehabilitation—Site, Building Exteriors, Building Interiors, and Mechanical Systems—the guidelines aim to align all architects and engineers working on NYCHA buildings with three goals:

- Support Safety, Health & Comfort of Residents;
- Improve Environmental Impacts; and
- Achieve High-Quality, Cost-Effective Design & Construction

Given the ongoing innovation in design and construction, especially in the arena of sustainability and resiliency, these Design Guidelines identify several areas for further research.

Purpose of this Guideline

Intended to help design professionals at NYCHA and its partner architecture and engineering firms, these Guidelines address the scope of work for typical rehabilitation projects.

The Guidelines are not intended to supersede any applicable regulations of any other agency having jurisdiction. Many of these regulations are referenced in the pages that follow. All design documents must fully comply with the latest applicable laws, including, but not limited to those summarized in an appendix to this document (page 38).

Further, since 2011, all City-financed affordable housing projects have been required to conform to the NYC Overlay to the Enterprise Green Communities Criteria (NYC Overlay). NYCHA's participation in this effort creates a consistent policy for all affordable housing programs.

1 SITE

Enhance community

Well-designed open spaces around NYCHA residential buildings are a key to promoting a sense of community. Rather than maintaining fenced-off lawns and underused paved areas of the past, site improvement work can rejuvenate these spaces with new amenities like seating areas, playgrounds, and community gardens. Rehabilitation of existing amenities is also important for keeping grounds in active use. NYCHA has updated design standards for amenities to improve safety, comfort, and ease of maintenance.

Site improvement also offers unique opportunities for residents to participate actively in the design process. To that end, designers should incorporate the input of resident groups from the outset of a project. At project kick-offs, designers should present design proposals clearly and help residents choose options for site amenities that are consistent with the *NextGenerationNYCHA* goals of creating safe and connected NYCHA communities.

Since funds for a project for open spaces are often limited, designers are encouraged to plan with a phased approach. Projects can be phased creatively to attract additional funds. For example, NYCHA established the Fund for Public Housing to find new resources for community-driven initiatives.

Promote safety

Site improvements should address the safety of residents and their visitors. Design of open space and landscaping can enhance or diminish both perceived and actual safety. Designers should activate grounds strategically with elements like site amenities, visual clearance, and site lighting.

Encourage physical activity

NYCHA designs and maintains recreation spaces for its residents of all ages. It has recently explored ways to support urban living priorities beyond recreation, with spaces for activities such as urban farming and adult exercise. The Office of Design embraces the principles outlined in the Center For Active Design's *Active Design Guidelines: Promoting Physical Activity and Health in Design.*

→ **Active Design Guidelines: Promoting Physical Activity and Health in Design, http://centerforactivedesign.org/**
→ **2015 Enterprise Green Communities Criteria: 7.14**

1.1 Site Work

Existing green areas with low perimeter fences at Red Hook Houses

Proposal to extend and open up the edges of green areas for active use for Permanent Work at Red Hook East & West / Sandy Recovery Program
Photo: KPF, OLIN

Paving

NYCHA is moving away from asphalt paving for several reasons, including reduction of the "heat island" effect. Instead of asphalt, designers are urged to use concrete paving for walkways, vehicular access and parking areas, seating areas, building entrances, and gathering areas. Only use asphalt paving for basketball courts and playgrounds. In these cases, use safety surfacing or surface color paint in addition.

Designers are encouraged to use light-colored, high-albedo materials, with a minimum solar reflectance of 0.3, over at least 50% of the site's paved area.

→ **2015 Enterprise Green Communities Criteria: 3.7**
→ **Uniform Federal Accessibility Standards (UFAS)**

Fences

NYCHA typically installs perimeter fences to define pathways and protect green areas and site amenities such as playgrounds and parking areas. However, in the interest of creating connected and well-programmed ground spaces, designers are encouraged to use fences more judiciously. Where NYCHA would once have installed a fence around a particular area, designers are encouraged to use a different site design elements, such as benches or planting. Many new fence projects will require plans for removal of some existing fencing to prevent unnecessary accumulation of fences.

If a new fence is to be installed, designers should consider using heavy-duty mesh panels as an alternative to steel-bar or chain link fencing. Otherwise, use steel-bar fencing to define the site perimeter and designated planted areas within the development; use chain-link fencing only to enclose athletic areas. Using lower fences will help create better-connected and more visually open sites. Limit use of tall fences to chain-link fences around athletic areas and steel louver fences around exterior compactor areas.

Grading & Drainage

For effective control of surface water flow, the pitch for positive drainage should be between 2% and 4.9% (except for planted areas, which should have zero pitch).

Pitched surfaces steeper than 5% slope should follow ADA design criteria for ramps.

Plants

NYCHA rarely irrigated its grounds in the past, but designers are now encouraged to include irrigation in planting projects. In such cases specify plants that require 1–2 years of irrigation after planting.

Use native plants or plants suited to the local climate for water conservation. Designers are encouraged to specify plants that are non-invasive, attractive, and low-maintenance.

→ **2015 Enterprise Green Communities Criteria: 3.4**

1.2 Site Amenities

In general, locate site amenities along accessible routes.

Seating

NYCHA prefers seating with backs and armrests to ensure comfort and safety, particularly for elderly residents. For most developments, benches should be all-steel, coated in lighter colors like gray, and located near trees, shade, and other gathering areas.

When installing concrete retaining walls, designers should explore opportunities to use the walls to create seating areas.

Game Tables

Game tables must be accessible to everyone. Tables and seats may be located near playgrounds to provide additional recreation for families and caretakers of children. Typically game tables are precast concrete, mounted on concrete or on a concrete-filled steel pipe pedestal, and set in a concrete foundation. NYCHA will approve other materials on a case by case basis.

Bicycle Racks

Install bicycle racks near entrances and pedestrian routes, and in high-visibility areas not blocked by plants or other amenities.

Athletic Areas

Use open plan design principles to provide maximum visibility throughout the area.

Athletic area surfacing should be appropriate to the activity: for basketball courts, use slip-resistant, acrylic-colored surface on top of pavement; for baseball, use natural or artificial turf.

Bleachers in athletic areas must be made of metal. The underside of bleachers should be open to view. Existing concrete seating may be refurbished but concrete should not be used for new installations.

→ **Exterior lighting guidelines in 1.3 & 4.2**

Playgrounds

NYCHA playgrounds should support a full range of social, physical, and educational opportunities for children of different ages and abilities, while also offering a comfortable environment for their families and caregivers. Typical playgrounds are designed for one of two age groups: pre-school (2 to 5 years) and school-age (5 to 12 years).

Locate all playgrounds along accessible routes. Provide adequate room for circulation by the non-ambulatory among pieces of play equipment. Include signage in multiple languages (per local needs) indicating age-appropriate use.

Basketball court rehabilitation at Woodside Houses

Seating located near trees and other planting

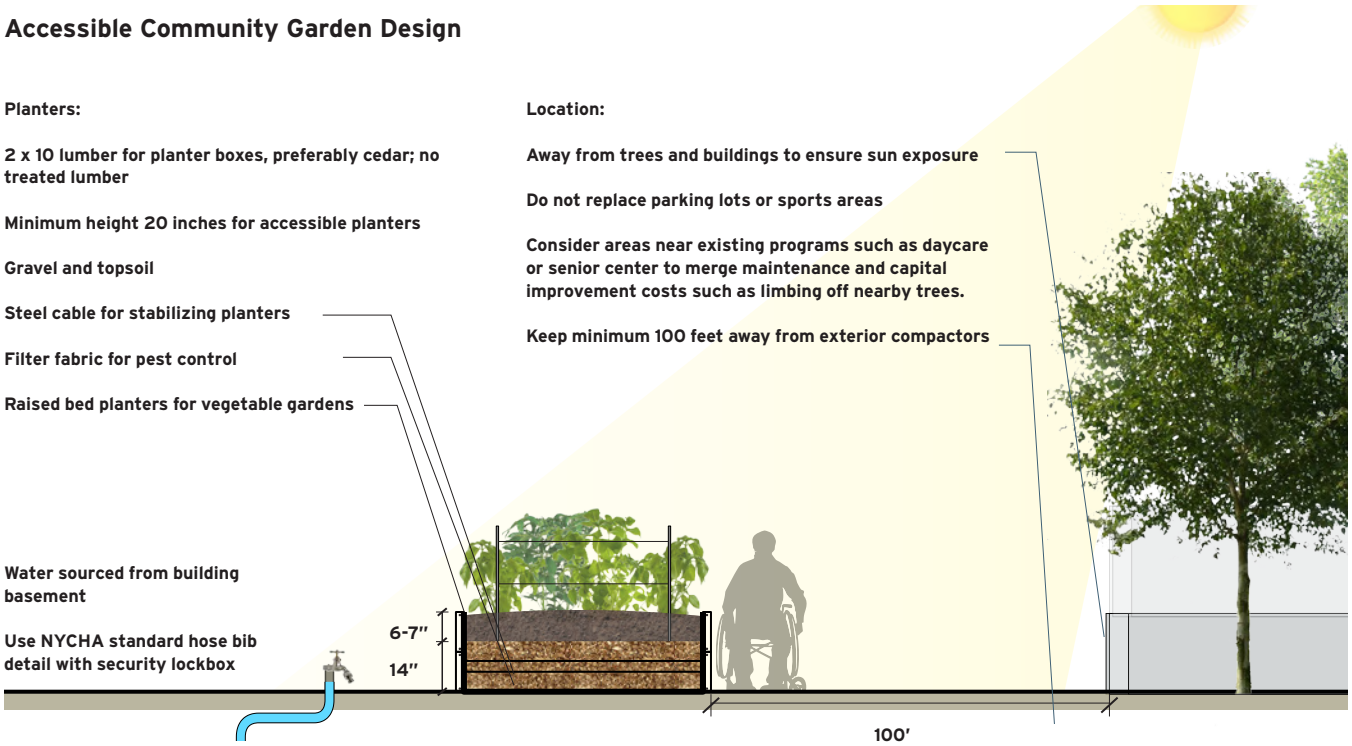
Flood wall also serves as a public bench
Photo: Nelligan White Architects

Playground Spray Shower and Water Fountains

Spray unit must be powder-coated steel. Provide non-electric, mechanical control with water-saving timer mounted on the unit. Shower surface must be slip-resistant with acrylic coloring (see illustrations next page).

Provide water fountains near athletic fields, playgrounds, and other active areas. Plumbing must be installed below frostline and winterized. All controls and valves must be located in the nearest basement and accessible only to site staff.

Accessible Community Garden Design



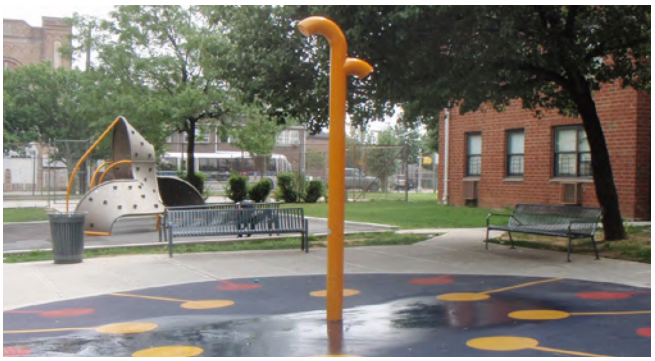
Community Gardens

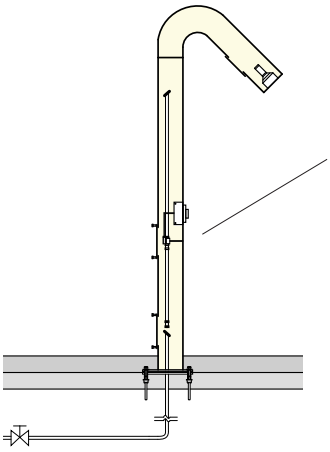
NYCHA has a long history of resident-planned and -operated community gardens. Various NYCHA departments support gardens by providing access to water and space as well as facilitating connections to community partners who provide educational and material resources for residents.

In order that more community gardens are available to residents, the Office of Design recommends guidelines illustrated above.

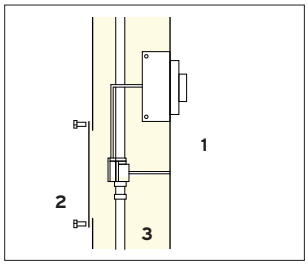
If an improvement to a community garden is a part of site improvement, designers should designers should consult the Directive 10 regulation of the NYC Office of Management and Budget to understand items that are eligible for funding. The improvement of a community garden must include a comprehensive betterment, as defined in Directive 10, and meet the $35,000 minimum cost eligibility for each area.

Playground spray shower





Spray detail section



1. Mechanical button located at 36" inches above ground

2. Access door

3. Manually adjustable timer, set at maximum 2 minutes

1.3 Exterior Lighting

Exterior lighting is required on pedestrian paths, near seating, play and athletic areas, in parking lots and along vehicular circulation paths, at building entrances, and on building facades. See section 4.2 below for additional details.

1.4 Parking

Parking area design is guided by several regulation packages, including NYC DOT, NYCHA (standard lighting and signage), UFAS, NYC Building Code, ADA/VCA and ADAAG.

→ **Americans With Disabilities Act Accessibility Guidelines (ADAAG) Chapter 6 for further guidelines on accessibility and VCA**
→ **Exterior lighting guidelines in 1.3 & 4.2**
→ **NYC Department of Transportation (NYC DOT) Guidelines**
→ **NYC Building Code**

1.5 Waste Management

NYCHA is developing a comprehensive waste management plan to support the City's goal of sending zero waste to landfills by 2050. The Office of Design supports this plan by providing standard designs for trash and recycling receptacles and exterior compacting areas.

→ **NextGenerationNYCHA Sustainability Agenda Strategy S5**

Trash Receptacles

Locate powder-coated or painted steel trash receptacles along walkways and plazas, play areas, and exterior gathering spaces. Anchor receptacles to a concrete footing with no cable or chain attachments.

Exterior Compactor, Recycling & Bulk Containers

Follow Department of Sanitation guidelines and provide NYCHA standard lighting (see diagram below).

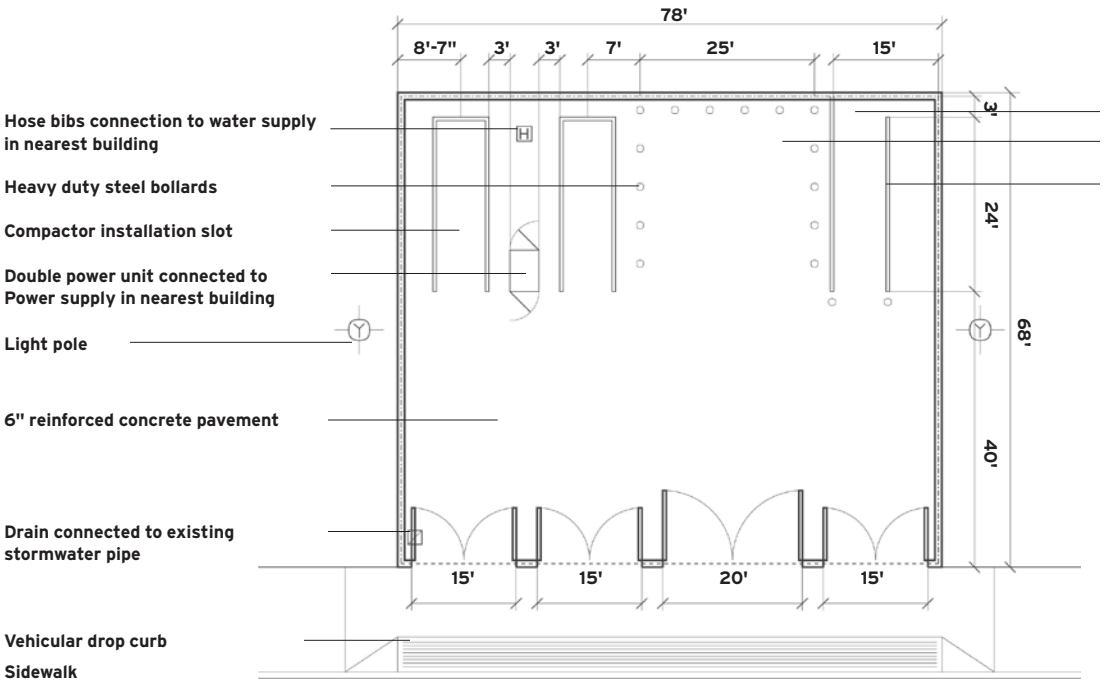
→ **NYC Department of Sanitation**

Construction Waste

Divert at least 50% of all non-hazardous construction waste from landfill. Recycle all of two of the following materials: cardboard, wood, drywall, metals, masonry, and asphalt. As an alternative to recycling one material, develop and implement a comprehensive efficient framing plan.

→ **2015 Enterprise Green Communities Criteria: 6.12**

Exterior compacting refuse management area



6' steel bar fence gate with 6' louver panel fence on 2' concrete wall

1.6 Erosion and Stormwater Control

Comply with the NYC overlay for erosion and sedimentation control, as well as selection of native or adapted species for planting. If irrigation is used, install efficient irrigation and water re-use. Designers are encouraged to follow surface stormwater management practice as outlined in the NYC overlay.

NYCHA stormwater infrastructure includes rain gardens, subsurface infiltration systems, and porous paving (see photos). NYCHA also supports right-of-way bioswales and stormwater green streets for adjacent DOT sites. Design must follow NYC DEP Office of Green Infrastructure standards.

→ **NYC DEP Green Infrastructure Standards and Specifications (www.nyc.gov/dep)**
→ **NextGenerationNYCHA Sustainability Agenda Strategy S11**

Designers must also:

Protect existing infrastructure:
— Avoid interference with NYCHA safety and security infrastructure including electrical conduits.
— Locate at least 10 feet from any building.
— Locate at least 25 feet from MTA sites.
— Rehabilitate existing curbs to guide water flow to the new infrastructure.

Communicate about maintenance:
— Meet with NYCHA's stormwater management partner to clarify maintenance duties.
— NYCHA staff need only remove all trash from the area.
— Stormwater management partner must develop educational signage and maintenance cards to facilitate communication.

Designers are encouraged to retain, infiltrate, and/or harvest the first inch of rainfall in a 24-hour period sitewide.

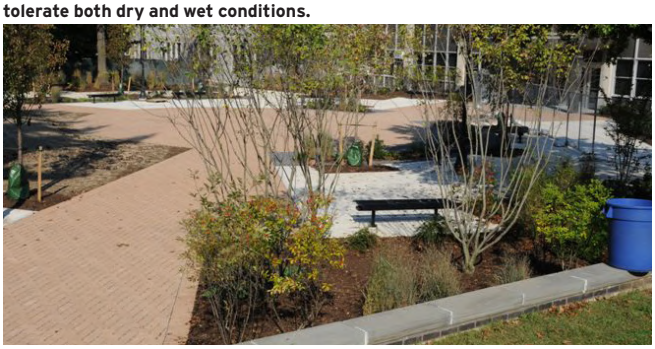
Designers are encouraged to find appropriate opportunities to substitute porous pavement for impervious concrete or asphalt paving, and to use porous materials for playground and athletic field surfaces, where applicable and maintainable (see images on this and next page for more on porous pavement).

→ **2015 Enterprise Green Communities Criteria: 3.2, 3.6**

Right-of-way bioswales and stormwater greenstreets are planted areas in a sidewalk or roadbed that capture curb runoff. They are installed over a layer of broken stone with engineered soil and topped with appropriate plants and trees.

Subsurface infiltration systems are installed underneath parking lots or other large paved surfaces. They include a bed of broken stone and a storage system, such as storm chambers or perforated pipes.

Rain gardens are similar to bioswales but are larger and are located within a property rather than on a public thoroughfare. Like a bioswale, they include a stone layer, engineered soil, and planted area. The plants must be able to tolerate both dry and wet conditions.



Porous paving can be configured to either allow water to infiltrate through the paver joints or through the paving itself. As with the other systems described above, porous paving is installed over a base of broken stone (see more next page).

Photos: New York City Department of Environmental Protection

What Lies Ahead: Green Infrastructure

Stone pavers and planting area installed for Edenwald Houses Green Infrastructure Program

Broken stone base for porous paving at Edenwald Houses

NYCHA's 2500 acres of land present a uniquely large opportunity to manage stormwater runoff from sidewalks, parking lots, and roofs by directing it to green infrastructure systems, which typically feature soils, stones, and vegetation. By reducing the stormwater runoff entering the City's sewer systems, green infrastructure can reduce combined sewer overflows (CSOs) to City waterbodies. Smart management of stormwater on NYCHA properties can increase landscaped areas, decrease surface ponding on paved areas, and potentially decrease surface and basement flooding by reducing the demand on site drainage.

Design standards discussed in 1.6 Erosion and Stormwater Control (page 13) are developed from NYCHA's green infrastructure programs, through a partnership with the NYC Department of Environmental Protection (DEP). In 2010 and 2013, NYCHA and DEP began pilot green infrastructure installations throughout the NYCHA portfolio in areas affected by CSOs, including Bronx River Houses, Hope Gardens, and Seth Low Houses. Under the current, expanded program, NYCHA and DEP are constructing the City's largest green infrastructure installation at Edenwald Houses and evaluating opportunities at 32 developments in Brooklyn, Queens, and the Bronx.

These targeted green infrastructure programs will yield new design approaches, technology, and techniques that can then be carefully incorporated into future site work within the annual capital plan whenever playgrounds and sports courts are being rebuilt, sidewalks and walkways replaced, or roads and parking lots resurfaced.

For example, porous concrete pavement is generally considered to be a relatively cost-competitive alternative to large impervious concrete or asphalt surfaces installed on NYCHA grounds. However, in adopting new standards for porous pavement, designers must understand and plan for maintenance of these surfaces. Porous pavement acts like a giant filter and allows rain to penetrate to the ground below instead of collecting at the perimeter of the paved area and overflowing. Like all filters, porous pavement can become clogged over time and must be cleaned. This added requirement will present a new burden to maintenance departments. Stone pavers set in sand may provide a less maintenance-intensive alternative to concrete pavement, but they are far more expensive to install. In the green infrastructure program with DEP, a maintenance plan is in place through DEP. These concerns for maintenance, plus porous pavement's relative unsuitability for vehicular traffic, have been considered strong barriers to wider use in NYCHA developments.

Challenges of adopting the green infrastructure design standards more widely in NYCHA site improvement projects may be complex. As the impacts of climate change intensify, however, wide-spread adoption will be critical not only to safeguard mechanical equipment in basements and first floors, but for the health and safety of NYCHA residents.

2 BUILDING EXTERIORS

Repair the Exterior to Address Problems on the Interior

Since more than 60% of NYCHA buildings are 50 years old or older, rehabilitation work must focus on repairing the effects of long-term wear and deferred maintenance. NYCHA must repair roofs, facades, and windows to prevent water entering from the exterior. Better sealed building exteriors will help to preserve routine rehabilitation and maintenance work in the interior. Bringing exteriors to a state of good repair will ensure interior improvements are not wasted.

Better Performing Building Exteriors

Higher standards for insulation, windows, and other envelope elements can substantially lower NYCHA energy bills and operating costs.

Buildings three stories and lower must achieve a HERS (Home Energy Rating System) index of 85 or less (in some cases the threshold rises to 100). Taller buildings must meet the ASHRAE 90.1-2010 Appendix G standard.

Historic Preservation

Some NYCHA exterior rehabilitation work requires review and approval by the New York State Historic Preservation Office (SHPO). NYCHA works closely with SHPO to identify developments where a preservation review process is required. See appendix for the current list of these developments (page 39).

→ **2015 Enterprise Green Communities Criteria: 5.1c, 5.1d, 7.6**

2.1 Facades

Most NYCHA building envelopes are masonry. Over time the mortar and, sometimes, the bricks themselves, have become damaged or worn, or have failed. For all masonry rehabilitation work below, designers must first test a sample area of the existing wall to ensure new masonry matches structural characteristics of the original brick and mortar.

Pointing

Masonry walls frequently deteriorate at the mortar joints. When this happens, loose and damaged mortar must be thoroughly removed from the joints and replaced. Improper pointing can compromise the structural integrity of the masonry and undermine the performance of the facade. New mortar must match original mortar in compressive strength, vapor permeability, color, texture, and tooling.

Brick Replacement

In addition to matching in structural characteristics, new masonry must also match the original in color, texture, and size. Create the brick and mortar reference mock-up by cleaning an area (see photo). Ensure replaced brick and mortar match the cleaned patch of the wall. In many developments, subtle design details in the original masonry were constructed with specially-shaped or placed masonry units; these features should be replicated as part of the rehabilitation.

Parapet Walls and Other Roof Elements

Masonry is labor intensive and requires frequent upkeep. Masonry at the parapet walls carry added importance, as they prevent water infiltration where the roof meets the facade.

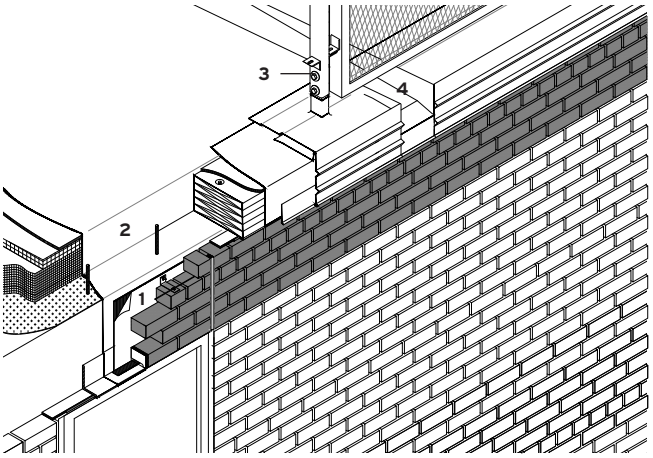
For more cost-effective and longer-lasting rehabilitation, NYCHA has moved away from repairing or replacing masonry parapet walls where possible and now installs easy-to-maintain metal rails during roof rehabs (see photo and Office of Design sample detail).

NYCHA has worked closely with NYC DOB to identify appropriate treatments for removal and reduction of rooftop structures, such as long-dormant smoke rooms and a height reduction of what used to be incinerator stacks. These flues now generally serve as trash chutes that connect to garbage compactors.

→ **Department of Buildings Building Facade Safety Program / Local Law 11**

Brick-matching mock up

Rehabilitated parapet walls



Sample detail for rehabilitated parapet wall
1. Cavity construction at panel to prevent water from entering and thermal binder at spandrel beam
2. Built up insulation to meet current energy code requirements
3. Railing post connected to roof slab via a warrantable roofing penetration
4. Scupper to prevent water accumulation in case of primary drain clog
Photo: Nelligan White Architects

2.2 Windows

A mock up for pilot window frame design with integrated AC partition

Detail view of integral sash

Window Types

The Office of Design recommends:

— Living rooms and bedrooms: sliding and casement windows
— Kitchens and bathrooms: casement windows
— Bathrooms where window is located at shower or tub: double-hung windows

The color of windows, doors, and louvers located on lower floors must match the color of the existing lower-floor windows, doors, and louvers.

Energy Performance

NYCHA uses thermally broken aluminum frames. The Office of Design recommends baked enamel over an anodized aluminum finish. Glazing must meet NYC Energy Conservation Code and the NYC Overlay. Low-emissivity coatings or films must be used to improve solar and thermal performance without compromising the amount of visible light transmitted.

→ **2015 Enterprise Green Communities Criteria: 5.1c & 5.1d**

Window-Mounted Air Conditioners (ACs)

NYCHA receives numerous citations for improper window AC installations, which causes tremendous financial waste and organizational inefficiency. Recently, the Office of Design developed a pilot design for a thermally-broken window AC partition that makes installation and removal easy and code-compliant (see photo above). For buildings with through-wall AC sleeves, rehabilitation should ensure the sleeves are airsealed.

→ **For further guidelines on cooling service, see 4.1**

Other Regulations

Integral sash stops are required to prevent children from falling out (see photo above). Window operating forces, heights, and other accessibility factors must comply with Federal, State, and City codes.

→ **NYC Health Code**

2.3 Roofs

Roof insulation installation
Photo Tom Sahagian

Railing installation detail

Completed roof rehabilitation.

The majority of NYCHA buildings have low-slope roofs, many of which were originally designed as "no-slope" coal-tar roofs. The original roofing system had few roof drains and often allowed standing water to accumulate.

The Office of Design recommends three roofing systems for rehabilitation of existing low-slope roofs:

1. Cold fluid applied reinforced roofing system: No-slope with drainage enhancers.
2. Three-ply built-up roof with SBS cap sheet: Low-slope with tapered insulation.
3. Spray polyurethane foam with top coat.

Designers should choose from above listed systems based on site conditions and budget. Before selecting a roofing system, analyze existing conditions, including number of roof drains, configuration of bulkhead doors, building edge condition, energy code requirements, and construction schedule. The roof coating must be ENERGY STAR certified.

→ **2015 Enterprise Green Communities Criteria: Chapter 6**

What Lies Ahead: High-performance Building Envelopes

uPVC casement windows tested and used in a supportive housing in Madison, WI
Photo: Heartland Housing

Example of precast concrete panels with brick veneer installation.
Photo: Blue Sea Development

NYCHA's aging building envelopes lack insulation, and many facades suffer from significant deterioration of the masonry mortar or even of bricks themselves. The need to reduce heat loss through these building envelopes will accelerate as NYC's 80 x 50 efforts move forward. NYCHA has been improving standards and specifications of building envelope elements over many years, exploring solutions in improved windows, design strategies to eliminate air infiltration through ACs, increasing R-value of roof assemblies, and in exterior insulation.

Windows

As seen in a pilot window design discussed in 2.2 Windows (page 17), NYCHA has been improving standards and specifications of windows. In recent decades, this work focused on switching from single-pane double-hung windows with thermally-unbroken metal frames to double-glazed sliding windows with thermally-broken aluminum frames. NYCHA continues to experiment with improved window designs that are user-friendly and low-maintenance, and discourage potential Local Law 11 violations (e.g. improperly installed window AC units).

Window frames made from structurally improved fiberglass or uPVC, a more robust form of vinyl, typically outperform aluminum frames in terms of energy and tenant comfort. Casement and awning-type windows are far easier to operate than sliders and double-hungs, and better at keeping out cold drafts. The challenge for the future is to find a window with all these superior characteristics that is price-competitive, structurally acceptable for use in high-rises, resistant to solar degradation, and easily adapted for insect screens and child guards. NYCHA is currently reviewing several options in this regard and is committed to improving this most critical building envelope component.

Exterior Insulation

NYCHA is considering retrofitting building envelopes with durable exterior insulation, as this can reduce heat loss through building envelopes and future needs for masonry rehabilitation. The potential payoff of exterior insulation cladding is high—a mere 4 inches of rigid insulation would reduce the conductive heat load of the wall area, excluding the windows, by approximately 80%.

But there remain complex technical and financial challenges to the scale of improvements needed to preserve these buildings in a changing climate.

Beginning in 2017, NYCHA will work closely with the New York State Energy Research and Development Authority (NYSERDA) on RetrofitNY, a State initiative to create a self-sustaining marketplace for deep-energy retrofits in occupied multifamily buildings in New York. Through RetrofitNY, NYSERDA will seek to develop simplified, scalable solutions for conducting deep energy retrofits that could reduce energy consumption in multifamily buildings by 70%, as well as financing mechanisms and new business models to foster deep energy retrofits in New York State's affordable multifamily building market. A truly cost-effective, replicable solution would transform NYCHA's envelope-focused capital program, which constitutes 60% of construction expenditures. If successful, RetrofitNY would enable NYCHA to greatly improve envelope performance for the same cost as our current conventional building envelope projects.

3 BUILDING INTERIORS

Improved Kitchens and Bathrooms
Decades-old standards ensured durability and compliance with HUD regulations, but they often made NYCHA homes look institutional and outdated. The Office of Design has adopted new kitchen and bathroom standards that continue to ensure durability and cost-effectiveness while also enhancing comfort and aesthetics.

Healthy Homes
NYCHA is strongly committed to improving indoor air quality and providing healthy and sustainable apartments free of mold, pests, and asthma-triggering materials.

Project Planning
Interior renovations are typically planned for a large number of apartments in a development at once, often as part of an even larger upgrade that includes building systems nearing the ends of their useful lives. The Office of Design has found that the key to success in these projects is to take a collaborative approach and engage resident associations, property managers, and operations staff early in the design process to help identify priorities and solutions.

3.1 Entrances & Lobbies

Entrances
Entrances should be accessible and include canopies, security lighting, and address signage wherever possible. Entry doors should be made of durable and vandal-resistant materials such as stainless steel or hollow metal, and be thermally broken. Provide key fobs as required by NYCHA security policy.

→ **NYCHA Security Department Guidelines**

Lobbies
Lobbies should be accessible and include a vestibule, unless a vestibule would drastically impair sight-lines necessary for security.

First-floor lobby materials must be appropriate for heavy foot traffic—NYCHA prefers terrazzo and quarry tiles. Resilient flooring tiles are acceptable for hallways and upper floor lobbies.

→ **See Chapter 6 for further guidelines on accessibility**

3.2 Apartment Interiors

All NYCHA buildings must now use low- or no-volatile organic compound (VOC) caulks, paints, primers, coatings, and adhesives as defined by SCAQMD Rules 1113 and 1168. New materials standards include composite wood products that emit little or no formaldehyde per the requirements of California 93120 Phase 2.

Use non-vinyl, non-carpet floor coverings throughout a building. Identify lead hazards and abate according to EPA and HUD guidelines.

The NYC Overlay requires durable, cleanable surfaces in bathrooms and kitchens to help with pest management.

→ **2015 Enterprise Green Communities Criteria: 6.1, 6.2, 6.7a, 6.7b, 7.15**

3.3 Water Conservation

NYCHA has committed to support the City goal of reducing water demand 5% by 2020. Water-conserving standards match citywide standards for fixtures in affordable housing:

Fixture*	Flow Rate
Toilet	1.28 gpf
Showerhead	1.5 gpm
Kitchen Faucet	1.5 gpm
Lavatory Faucet	1.0 gpm or less

*All WaterSense-rated except kitchen faucet

Toilets must also have a MaP rating of 1000. Designers are encouraged to specify toilets with overflow protection.

→ **2015 Enterprise Green Communities Criteria: 4.1, 4.2, 4.3**
→ **See NextGeneration NYCHA Sustainability Agenda Strategy S3 & S5**

3.4 Integrated Pest Management (IPM)

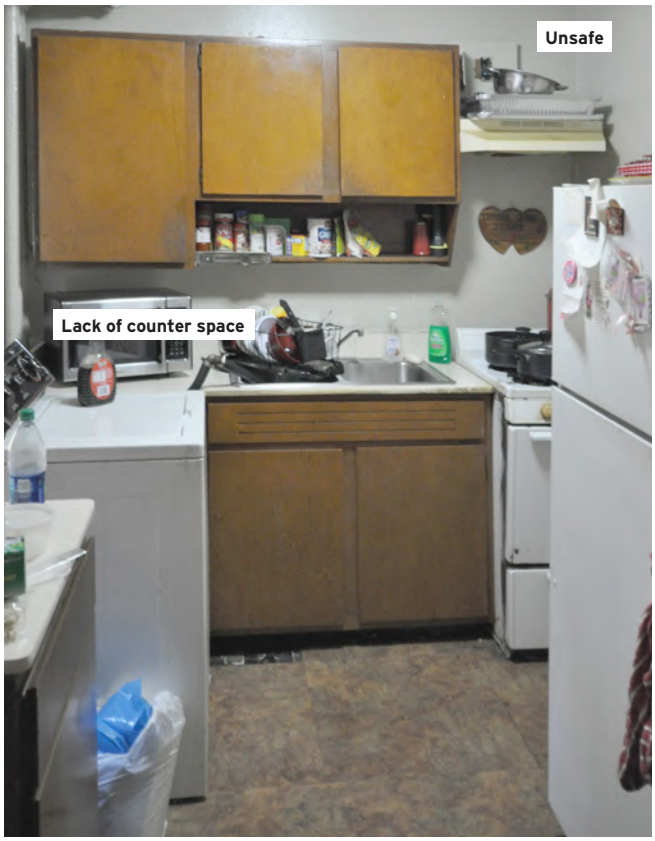
NYCHA's operations and maintenance practices a comprehensive pest management program. To support this effort, design for easy inspection of all pest-prone areas by NYCHA operation and maintenance staff. In addition, specify the following:

— Seal all wall, floor and joint penetrations with low-VOC caulk or other non-toxic methods (window screens, door sweeps, metal plates).
— Install rodent- and corrosion-proof material (i.e., copper or stainless-steel mesh or rigid metal cloth) for openings large than ¼ inch.
— Seal entry points under kitchen and bathroom sinks.

These items will provide the added benefit of sealing air leaks (see pages 23 and 25), and will save energy and increase tenant comfort.

→ **2015 Enterprise Green Communities Criteria: 7.10**

3.5 Kitchen Standards



Old kitchen design

New kitchen design

Cabinetry
Provide 12-inch (D) x 42-inch (H) wall cabinets; the countertop must measure 4 feet above the floor. Install floor cabinets with a 24-inch (D) base; the top of counter must measure 34 inches above the finished floor. For durability, use solid hardwood face frame, 5-ply side panels, 7-ply doors, and 170 degree (minimum) hinges. Provide cabinet spaces for standard refrigerator and microwave. When the kitchen size allows, provide a pantry closet.

→ **HUD Minimum Property Standards**

Countertops
Provide as much counter space as possible. Countertops shall be ¾-inch exterior-grade plywood covered with plastic laminate with integral 4-inch backsplash.

Sinks
Provide 18-gauge stainless steel, three-hole, single or double bowl sinks. Provide single-lever faucet with threaded inlet shanks, fastened for durability.

Appliances
All appliances must be ENERGY STAR certified (where applicable). Provide a top-freezer refrigerator and a 30-inch-wide gas range with a non-vented range hood.

→ **2015 Enterprise Green Communities Criteria: 5.4**

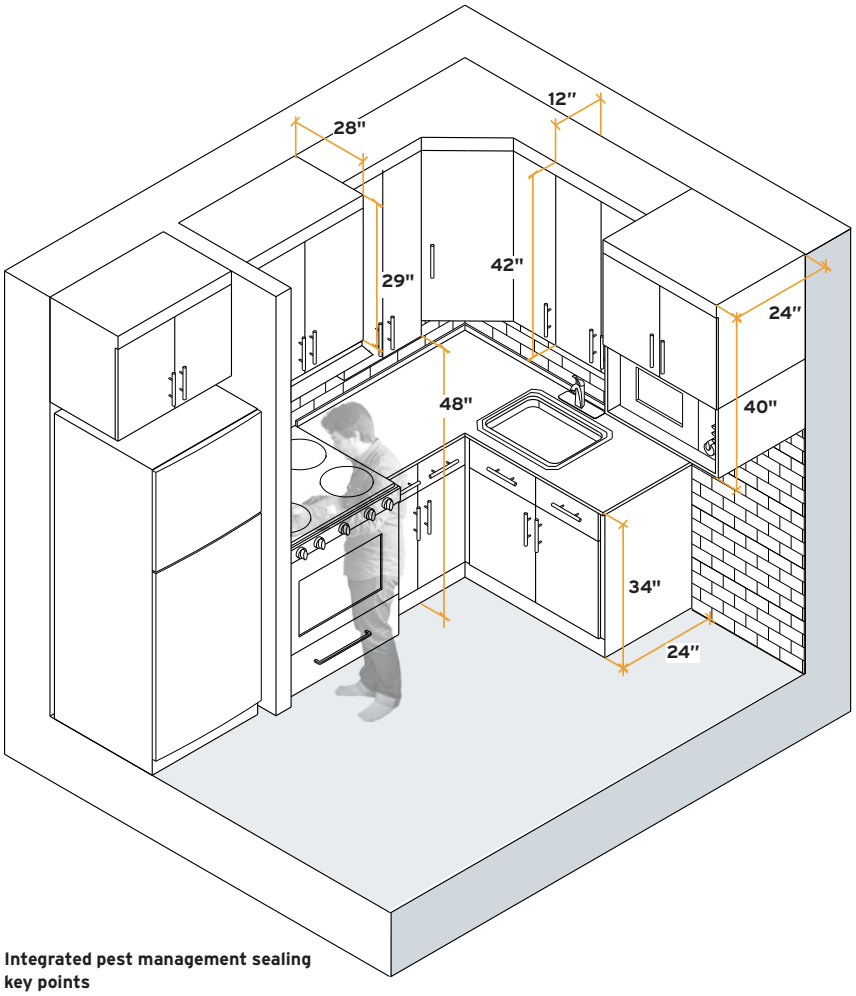
Accessibility & Durability
NYCHA kitchens must be designed to comply with ADA adaptability standards. The cabinets described above must allow relatively easy removal of components below the countertop for accessibility. Fixtures must comply with UFAS and ADA standards, and with durability standards set by the Severe Use requirements in the HUD Minimum Property Standards (see illustrations next page).

→ **See Chapter 6 for further guideline on accessibility and VCA**
→ **HUD Minimum Property Standards**

Ventilation
Kitchenettes (less than 80 square feet) must be provided with natural ventilation unless in accordance with the New York City Mechanical Code.

Install one hard-wired smoke detector CO alarm with battery backup for each sleeping zone.

→ **2015 Enterprise Green Communities Criteria : 7.1, 7.3**
→ **See 4.1 for further discussion of ventilation**
→ **NYC Building Code**



New features:

Taller wall cabinets provide more storage.

Wall cabinet for microwave saves counter space.

For durability:

Provide 4" Integral backsplash

Cabinets should consist of 5-ply side panels with solid hard wood face frame and 7-ply wood doors. Use minimum 170 degree hinges.

Sustainability standards:

Kitchen faucet water conservation standard: 1.5 gpm

All appliances provided are ENERGY STAR Certified

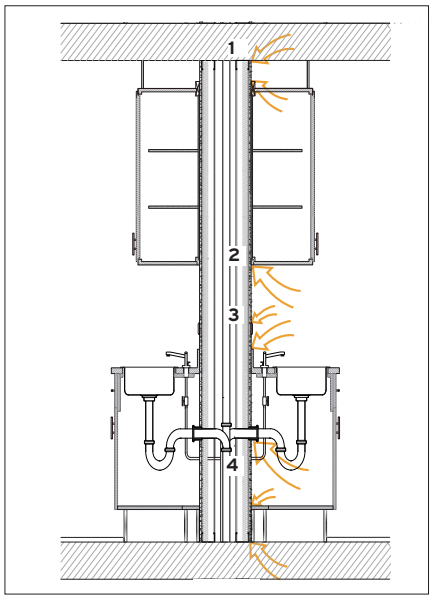
For cabinets use wood products that emit little or no formaldehyde.

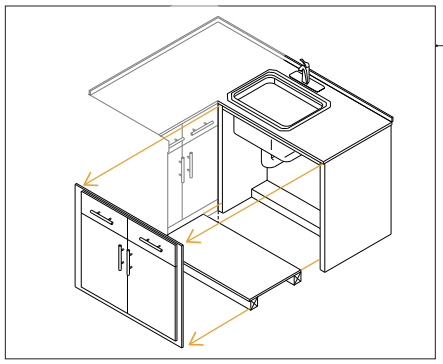
Floor and wall finish must use low- or no-volatile organic compound (VOC) caulks, paints, primers, coatings, and adhesives.

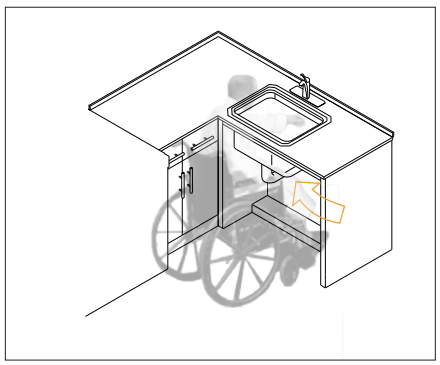
Integrated pest management sealing key points

Seal all wall, floor, joint penetrations, heating pipe penetrations, etc. with low-VOC caulking or other appropriate nontoxic sealing methods to prevent pest entry.

1. Top and bottom plates
2. Electrical penetrations
3. Back of cabinetry
4. Plumbing penetrations in common wall





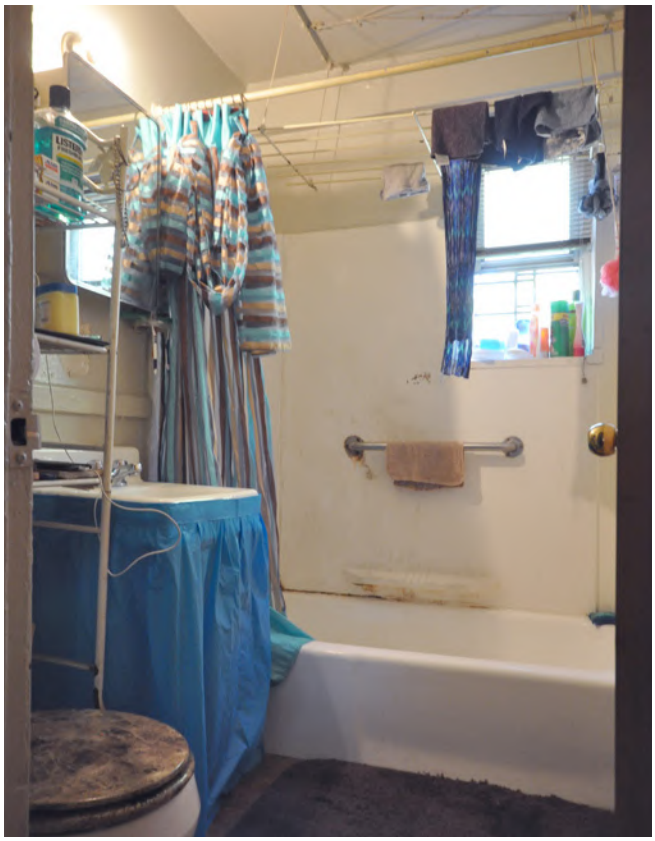


ADA adaptable kitchens

1. Floor cabinets can be made ADA compliant by removing the face frame and doors.

2. Use ADA compliant under sink protector.

3.6 Bathroom Standards



Old bathroom design

New bathroom design

Floors & Walls

Floor should be tiled with a 6-inch ceramic base. Use cement board, fiber cement board or the equivalent per ASTM #D3273 for all wet wall backing.

→ **2015 Enterprise Green Communities Criteria: Chapter 6, especially 6.1, 6.2, 6.7a, 6.8, 6.9, 6.10**

Bathtubs

Provide standard cast-iron enamel bathtub with a push pop-up drain stopper with overflow and water-saving showerhead. Walls must be fitted with a fiberglass tub surround. If a tub surround is installed at a window, use 3- to 5-piece trim kit. Provide five grab bars total (see diagram next page). Provide 20-gauge 304 polished stainless steel curtain rod.

Bathroom Sinks

NYCHA typically used cast-iron, wall-mounted enamel sinks in the past. While they are durable, repairing them has been labor-intensive and costly. NYCHA now requires ADA adaptable 20-inch (W) x 19-inch (D) vitreous china sinks, which will help reduce long-term maintenance cost and accessibility standards.

Toilets

Provide floor-mounted toilets a maximum of 27 inches from the rear wall, with a 15-inch centerline from the side wall (see diagram next page). Toilet may be rear-discharge if a new wastepipe is provided.

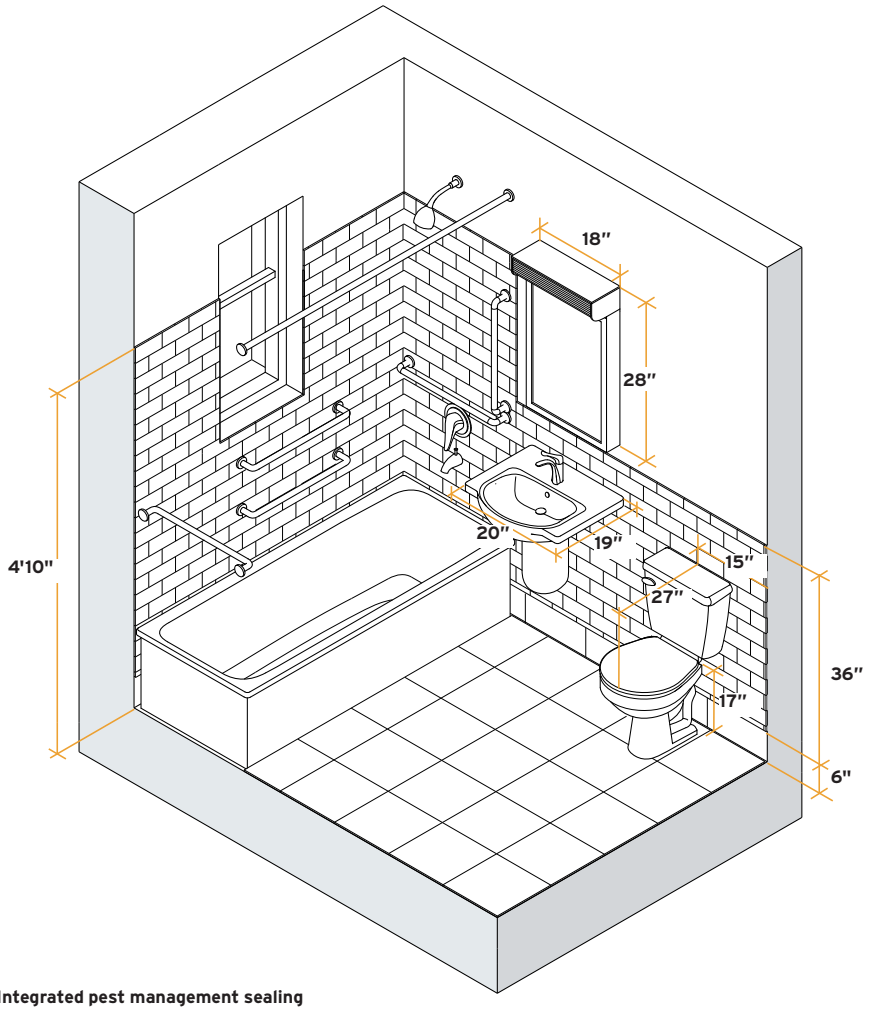
Accessories

Above sink, provide a soap dish and toothbrush holder and a 28-inch (H) x 18-inch (W) surface-mounted medicine cabinet with mirror and LED light fixture. Provide GFI outlet. Provide toilet paper holder and towel rod.

Accessibility & Durability

NYCHA bathrooms must be designed with accessibility in mind. Because the size of NYCHA bathrooms poses a challenge to meet all ADA requirements, designers are encouraged to include accessibility features as guided by VCA. Specify fixtures that comply with UFAS and ADA standards (key fixture installation guidelines are illustrated on the next page).

→ **Chapter 6 for further guidelines on accessibility and VCA**



New features:

Bigger medicine cabinets with wall-mounted LED Light

Increased number of grab bars for safety

Better walls and floor materials protect against water damage and mold.

Solid tub and wall surrounds and larger base tiles are more durable and help better prevent water damage.

Vitreous china sinks reduce long-term maintenance cost.

Sustainability standards:

Water conservation standard: Toilet 1.28 gpf

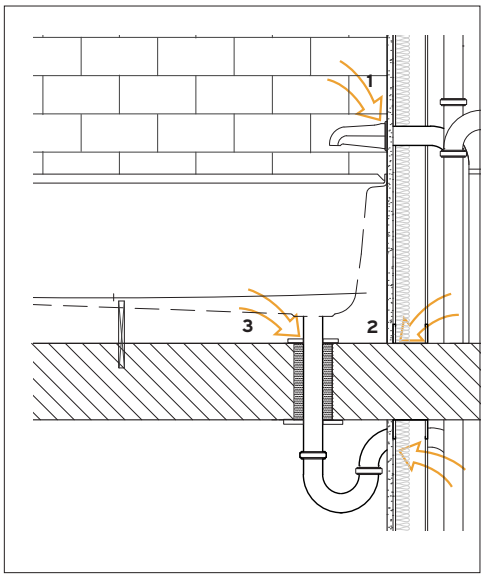
Lavatory faucet: 1.0 gpm or less

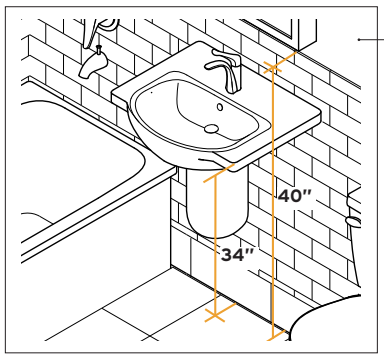
Shower head: 1.5 gpm

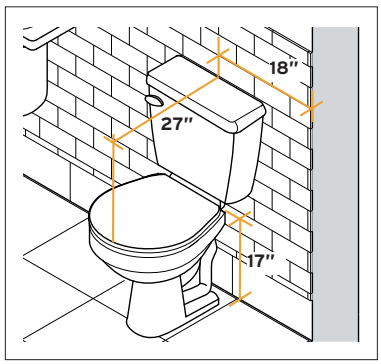
Integrated pest management sealing key points:

Seal all wall, floor, and joint penetrations with low-VOC caulking or other appropriate nontoxic sealing methods to prevent pest entry.

1. Plumbing penetrations
2. Top and bottom plates
3. Bathtub drain penetrations







ADA compliant bathrooms:

1. Use ADA compliant pedestal sink. Note installation height of sink and medicine cabinet.

2. 18″ centerline installation for toilets

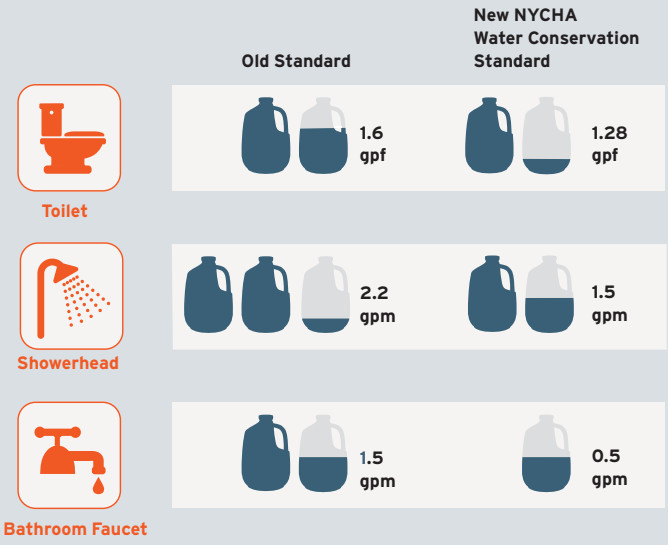
What Lies Ahead: Water Conservation

Water conservation translates into direct utility savings for NYCHA and conserves New York City's precious natural resource. According to NYC Department of Environmental Protection (DEP), residents of NYCHA developments consume 38 million gallons of water daily, accounting for 4% of the City's overall water consumption. Despite steady progress in adopting water-conserving fixtures, data from metered NYCHA developments show that NYCHA consumption is some 30% higher than the citywide multifamily average. The reasons for this higher consumption are not known with certainty, but likely contributors are higher than reported occupancy, undetected system-wide leaks, and unmetered non-residential consumption. Better water consumption management lessens the burden on NYCHA's operating budget and facilitates the demand reductions necessary to successfully complete infrastructure repairs on the Delaware Aqueduct (see NYC's Water for the Future initiative. www.nyc.gov/waterforthefuture).

To this end, NYCHA must first better understand the patterns of water consumption and identify conservation opportunities. NYCHA has partnered with DEP to conduct a consumption baseline study to understand the end-uses of NYCHA's water. The project is supported by a Cleaner Greener Communities Grant by NYSERDA, and will begin in July 2017. The study will install fixture-level monitors and supply-riser submeters.

In addition to matching NYCHA's water conservation fixture standards to the citywide requirements for water conserving fixtures in affordable housing (described in 3.4 Water Conservation, page 21), moving to ultra-high efficiency toilets may be necessary to balance higher than average occupancies in NYCHA apartments. In parallel with the consumption baseline study, NYCHA is testing ultra-high efficiency toilets at South Jamaica Houses, where 0.8 gpf single-flush toilets will replace 3 gpf toilets.

Wireless water leak detection meter installed on the ultra-high efficiency toilets to monitor and collect water usage data.
Photo: H2O Degree



4 MECHANICAL, ELECTRICAL & PLUMBING SYSTEMS

The Keys to Resident Comfort and Operational Efficiency
The repair and replacement of mechanical, electrical, and plumbing (MEP) equipment and systems constitutes one of NYCHA's biggest challenges.

A typical NYCHA development employs a large central steam plant to provide space heat and domestic hot water. These systems are relatively inefficient and are difficult to control.

NYCHA has installed and monitored alternative heating systems in pilot projects. In some cases such systems might apply to a rehabilitation project, because the energy savings can be substantial. The initial capital cost of conversion from a central steam system to another system is usually the main obstacle to implementation.

Because NYCHA is moving to become a center of innovation in all areas of sustainable residential building systems, these pilot projects will increase in scope and frequency in the near future. NYCHA is researching new plumbing and electrical materials, new heating and control technologies, and new ways to prevent flooding and other storm damage. As NYCHA learns more about these and other innovations they will be incorporated into later versions of these *Guidelines.*

4.1 Mechanical Systems

Typical low water content boiler

Constant Airflow Regulators (CAR) automatically regulate airflows, compensating for changes in duct pressure caused by stack effect, building pressure, distance from fan, etc.

Mechanical rehabilitation work updates heating, domestic hot water (DHW), and cooling and ventilation systems.

Heating & Hot Water

In some cases it may be cost-effective to convert the central steam system to distributed condensing boilers and hydronic convectors.

NYCHA recently began to install instantaneous steam-to-DHW systems, but more efficient systems are available. Thus, where cost-effective, convert steam-to-DHW converters in each building to a gas-fired condensing boiler and storage tank.

At developments where the existing heating system is hydronic, any new system should have the following features:

— Low water content boiler with sealed combustion air intake and flue
— VFDs on heating hot water (HHW) pumps
— Hydraulic coupler on HHW pipe system
— Indirect-fired DHW with storage
— Outdoor reset boiler control
— Fuel oil tanks

NYCHA discourages the use of mixing valves for DHW, but if one is necessary for a particular project it should be motorized and electronically-controlled.

New heating and cooling equipment must be sized using ACCA Manuals J and S or ASHRAE handbooks. New DHW systems shall be sized on the basis of ASHRAE guidelines and/or metered data from the system to be replaced.

Design and install heating and DHW systems so that, in case of emergency, their operation will not be grossly affected. Locate heat and DHW equipment above flood elevation.

→ **NextGeneration NYCHA Sustainability Agenda Strategy S4**
→ **2015 Enterprise Green Communities Criteria: 5.8a**
→ **NYSED Fuel Tank Projects Project Management Process**
→ **What Lies Ahead: Condensing Domestic Hot Water (DHW) Systems**

Cooling

Cooling is provided by resident-owned window AC units. If a building's windows are to be rehabbed, include the NYCHA-recommended partition (as noted in 2.2) and provide conveniently-located dedicated wall outlets, per the NYC Electrical Code.

Ventilation

Properly-sized and -balanced exhaust fans remove moisture-laden air, lowering the potential for mold growth and odor accumulation.

In-apartment ventilation must meet ASHRAE 62.2 standards. Existing belt-driven rooftop fans should be replaced whenever possible with fans that use direct-drive motors (ECM motors for 300 to 2,000 cfm) and variable-speed control. Fan replacement should be concurrent with a clean-seal-and-balance scope of work on the ductwork, using techniques for sealing (aerosolized mastic, spot-spray mastic) ducts and balancing at each register (Constant Airflow Regulators, customized orifice plate) appropriate to the original construction materials. Whenever possible, modernizing ventilation should include converting the exhaust ventilation system to continuous whole-building operation, with airflow rate calculated per the ASHRAE 62.2 standard. Where such conversion is impractical, intermittent ventilation must be linked to occupancy (e.g. light switch) and provide no less than 50 CFM or per ASHRAE 62.2.

→ **2015 Enterprise Green Communities Criteria : 7.1**

4.2 Electrical Systems

A typical NYCHA electrical system rehabilitation includes updates of outlets, switch configurations, lighting, fire alarms, and security systems.
Design and install electrical systems so that, in case of emergency, their operation will not be grossly affected. Locate switchgear and main disconnect above flood elevation.

Designers are encouraged to provide emergency power via an islandable photovoltaic system or a permanent generator.

→ **2015 Enterprise Green Communities Criteria : 5.8a, 5.8b**

Exterior Lighting

Exterior lighting design should encourage street life and integrate NYCHA grounds with the surrounding community. Designers should limit the use of wall packs fixtures on residential buildings. Light fixtures should be as energy efficient as possible, promote ease of maintenance, and reduce light pollution. NYCHA's new standards require LED lamps because of their energy efficiency and reduced maintenance cost (see table and photo next page).

EGC requirements:

— Minimum 40 lumens per watt
— Recessed light fixtures must be Insulation Contact Air-Tight (ICAT) models with ENERGY STAR LED.
— Exterior lights fixtures must be ENERGY STAR LED, Dark-sky-friendly, and must include motion sensor, integrated photovoltaic cell, photosensor, and astronomic time clock control.
— Common-area lights must be LED and must include occupancy sensor or bi-level control

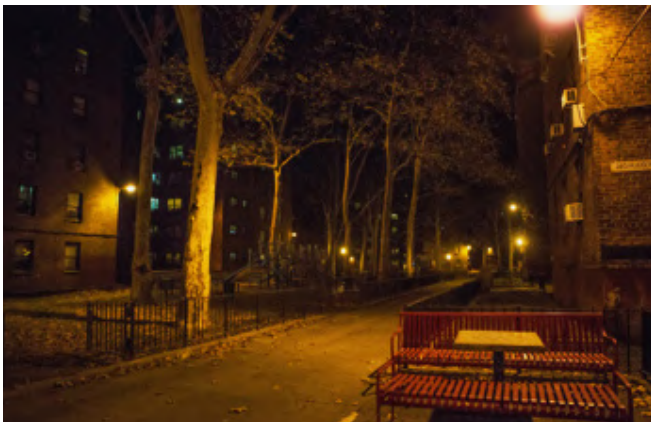
→ **See also Section 1.3**
→ **2015 Enterprise Green Communities Criteria: 5.5**

Security

NYCHA strategically installs CCTV cameras in public areas to provide security. So-called NYPD "VIPER" sites may require additional cameras to be installed during a rehab project. In addition, NYCHA's Layered Access Control Program can provide further security for storefronts and building entry doors for tenant security. Components of the Layered Access Control Program include electronic access with key tags (or "key fobs"), a direct call intercom system, and new door locks.

Apartments

Submetering of apartments will likely be necessary to achieve NYCHA's electricity-reduction goals (and the City's 80 x 50 goals). NYCHA now installs submeters as part of substantial electrical system upgrades. As NYCHA invests in energy conservation improvements, it is moving towards platforms in which submetering will not financially burden residents.



Before exterior lighting improvement

New exterior lighting helps connect NYCHA grounds with the surrounding community.

→ **2015 Enterprise Green Communities Criteria: 5.6**

Fire Alarm & Safety

Provide fire alarm system as required by NYC Building code. All carbon monoxide and smoke detectors must be hard-wired with battery back-up.

4.3 Plumbing Systems

"Dark-sky friendly" pedestrian post light

It is of the utmost importance for safety and efficiency that designers survey and carefully analyze existing conditions and all available as-built drawings.

A Subsurface Utility Engineering Study of Quality Levels D through A may be required to map relevant existing sub-grade infrastructure when underground lines are to be replaced.

Domestic Water

Hot water lines must be insulated to comply with the NYC Energy Code. Domestic water line chases must be adequately protected to drain or otherwise capture condensation from cold water lines.

Gas

Within dwelling units, gas piping must have threaded connections and run outside of chases. When run within concealed, inaccessible spaces, it should not have fittings, unions, bushings, compression couplings, or swing joints. When installed in public corridors, the piping shall comply with Fuel Gas Code and NYC Building Code.

Exterior lighting standards

Location	Fixture	Mount	Light level*
Seating, play areas, and walkways	Pedestrian post light	12-ft pole	1 fc
Parking, vehicular circulation, and maintenace areas	Cobra head	18-ft poil & foundation with 4-ft to 6-ft extension arm	2 fc
	Flood light	20-ft pole with either 4-ft to 6-ft extension arm or quadrubple to single fixture on top of pole	2 fc
Sports courts	Cobra head	18-ft pole & foundation with 4-ft to 6-ft extension arm	10 fc from dusk to 10 pm then dim to 1 fc
Building facades, entrances, and means of egress	Wall pack with exposed conduit	—	4 fc at 10 ft from entrance door

*Minimum footcandle (fc) requirement at sidewalk level

What Lies Ahead: Heat and Hot Water Systems

Condensing gas boilers are much more energy efficient than their steam and hydronic counterparts. Installation at Hope Gardens.

Instantaneous hot water heater at Carver Houses

Ninety-two% of NYCHA apartments are heated with steam, produced in boiler plants that are virtually identical (except in their fuel) to the plant installed at the time of original construction. This early 20th-century technology requires more energy to provide comfortable temperatures and is much more difficult to control than modern systems. At the same time, the traditional NYCHA Domestic Hot Water (DHW) generator consists of steam-to-DHW heat exchangers located in each building, fed by the central steam plant—a highly inefficient strategy, especially in the summer. While wholesale replacements of existing systems would require much more capital than NYCHA can access, there are many incremental improvements that NYCHA has already begun to make to improve the efficiency and reliability of these antiquated systems. As discussed in 4.1 Mechanical Systems, Heating and Hot Water (page 28), NYCHA must strategically plan for long-term adoption of new technologies as they mature.

Pilot projects and studies over many years at NYCHA and beyond have found that modernizing heating distribution control systems improves performance dramatically. A typical NYCHA building uses 50% more energy per square foot for heating than the typical non-NYCHA New York City 2-pipe steam building. Installing a single control upgrade—indoor temperature feedback controls—eliminates that performance disparity. In existing steam buildings, simply replacing a boiler (or boiler plant) with like technology yields no energy performance improvements. Whether through indoor temperature feedback controls for zone valves in campus heating systems or through thermostatic radiator valves (TRVs), eliminating overheating while fixing heating distribution failures lies at the center of NYCHA's strategy to improve heating system performance.

Since 2006, NYCHA has switched many DHW systems to more efficient and reliable instantaneous hot-water heaters; however, the inherent disadvantages of the central plant, the steam itself, and the conversion losses remain.

Whereas the overall efficiency of the existing approach is in the range of 40% to 60%, a system based on low-water-content gas-fired condensing boilers can be as high as 90% to 95%. Where possible (e.g. in the Office of Recovery and Resilience and in the Energy Performance Contracting program), NYCHA is exploring conversion to stand-alone high-efficiency DHW boilers and co-generation systems, with the goal of dramatically improving the efficiency of DHW generation, especially in the summer months.

Looking ahead to 2050, NYCHA must begin to anticipate moving away from steam heat – it is simply too inefficient to achieve 80 x 50 goals. In the short term, this means testing the "leap-frog" technologies indicated by the technical studies conducted by the City, such as air source heat pumps. In the medium term, it may mean changing the boiler replacement protocol to account for a 10–20 year investment horizon rather than the 30–40 years used in the past by choosing to repair and upgrade heating plants selectively rather than performing comprehensive "wall-to-wall" replacements. Because comprehensive replacements cost more, revisiting the strategy for plant replacements will allow more plants to be addressed. Reducing the scope and cost of plant replacement will also make room to invest in heating distribution repairs and modernization, which are much more cost-efficient ways to reduce energy use.

5 ELEVATORS

NYCHA buildings are served by more than 3,300 elevators.

Typical Rehabilitation Scope of Work – New Components

- Permanent-magnet A.C. gearless traction hoist machines and motors
- Cab enclosures including door operators and door zone locks
- Safety devices for unintended car movement and ascending car overspeed protection
- Controllers, selectors, Variable Voltage Variable Frequency Alternating Current (V.V.V.F. A.C.) motor drives, regeneration units, and remote elevator monitoring systems
- Car and hall signal fixtures—ADA-compliant car operating panel, hall button fixtures, digital position indicators in the car and at main floor, in-car traveling lanterns, emergency communication device, and phase I & II firefighter's service
- LED lighting fixtures in the cab, pit, top and bottom of car, and LED bulbs/boards in the car and hall signal fixtures

Elevator Machine Room Ventilation

Current standards require an intake louver and a thermostatically-controlled exhaust fan with gravity damper sized for 45 air changes per hour.

Accessibility & Safety

NYCHA follows the ADA accessibility requirements. Where elevator doors are the manual swing type, convert them to the automatic side slide type. When existing elevator shaft cannot be enlarged, and is too narrow for ADA compliant cab and door size, accessibility requirements are guided by Voluntary Compliance Agreement (VCA).

6 ACCESSIBILITY

NYCHA recognizes the challenges of improving accessibility where the majority of buildings and grounds were designed and built long before accessibility was a consideration, much less a legal requirement. Some apartments are easier to modify than others, however, and NYCHA has now identified them.

To ensure compliance with the accessibility requirements of Section 504 of the Rehabilitation Act of 1973, NYCHA entered into a Voluntary Compliance Agreement (VCA) with HUD.

NYCHA aims to modify 5% of its apartments to meet accessibility requirements. UFAS governs accessibility modifications. Most NYCHA apartment conversions will entail:

- Widening of interior doorways
- Fully-accessible bathrooms and kitchens (except where the structure or dimensions of some bathrooms prevent conversion to full accessibility)
- Adjustments such as lowering light switches, raising outlets and installing audio-visual smoke and CO alarms
- Accessible routes to the converted apartments

The plan is also to modify, at selected sites, common areas and grounds such as sports and play areas, to provide barrier-free routes and accessible site amenities.

→ **Uniform Federal Accessibility Standards (UFAS)**
→ **Voluntary Compliance Agreement (VCA) with the U.S. Department of Housing and Urban Development (HUD) 2015 Enterprise Green Communities Criteria: 7.11b**

APPENDICES

Enterprise Green Communities Criteria

This is a brief summary of the 2015 Enterprise Green Communities Criteria (EGC) and Enterprise Green Communities Criteria NYC Overlay (NYC Overlay) items referenced in this document. It is for quick reference only and is not a substitute for reading the complete documents.

→ **Download EGC and NYC Overlay at www.enterprisecommunity.org/green**

Designers must follow all mandatory EGC requirements that apply to a given rehab project and are encouraged to follow "recommended" items as well.

The project architects, construction managers, and general contractor should attend Green Communities Healthy Homes training, a free two-hour, inter-disciplinary seminar that focuses on topics like Integrated Pest Management and Active Design. These training sessions are conducted by the New York City Department of Health and Mental Hygiene (DOHMH). For NYCHA employees, a customized training program may be available, conducted by NYCHA with DOHMH's support.

Definitions:

Substantial rehabilitation: A project that includes the replacement and/or improvement of at least two major systems of a building, including its envelope. Major building systems include roof structures, wall or floor structures, foundations, plumbing, heating and air conditioning, and electrical systems. The building envelope is defined as the air barrier and thermal barrier separating exterior from interior space.

Moderate rehabilitation: A project that does not fully expose the structure and envelope of the building and/or does not include replacement or improvement of two or more major systems of the building, yet is still able to comply with the energy performance requirements of either Criterion 5.1c or 5.1d.

M=Mandatory
R=Recommended

3. Site Improvements

3.2 Erosion and Sedimentation Control (Except for infill sites with buildable area smaller than one acre) - M
Implement EPA's Best Management Practices for Construction Site Stormwater Runoff Control, or local requirements, whichever is more stringent.

3.4 Landscaping - M
If providing new plantings, all should be native or adapted to the region, appropriate to the site's soil and microclimate, and not an invasive species. Reseed or xeriscape all disturbed areas. See "Resources" in the EGC for databases of native and adapted plants.

3.6 Surface Stormwater Management - R
Retain, infiltrate and/or harvest the first 1.0 inch of rain that falls, or as calculated for a 24-hour period of a one-year storm event, so that no stormwater is discharged to drains/inlets. For both options, permanently label all storm drains and inlets.

3.7 Reducing Heat-Island Effect: Paving - R
Use light-colored, high-albedo materials and/or an open-grid pavement, with a minimum solar reflectance of 0.3, over at least 50% of the site's hardscaped area.

4. Water Conservation

4.1 Water-Conserving Fixtures and **4.2 Advanced Water Conservation - M**
Install water-conserving fixtures in all units and any common facilities (see table on page 21 of this document). For all dwelling units in buildings three stories or fewer, the static service pressure must not exceed 60 psi.

4.3 Leaks and Water Metering - M
Conduct pressure-loss tests and visual inspections to determine if there are any leaks; fix any leaks found; and meter or submeter each dwelling unit with a technology capable of tracking water use. Separately meter outdoor water consumption. See NYC Overlay for detailed requirements.

5. Energy Efficiency

5.1c Building Performance Standard (low-rise multi-family) - M
For each dwelling unit, achieve a HERS Index score of 85 or less. Exception: Substantial rehabs of buildings with walls made only of brick/masonry that are three

stories or fewer and built before 1980, as well as moderate rehabs of buildings that are three stories or fewer and built before 1980, are permitted instead to achieve a HERS Index score of 100 or less for each dwelling unit.

NYC Overlay:
Note that the NYSERDA Low Rise Residential New Construction program is available for gut rehabilitations and would satisfy the requirements of this criterion; associated incentives may be available. For more information, see www.nyserda.ny.gov/All-Programs/Programs/Low-Rise-Residential. Certification to any of the programs referenced in Criterion 5.2 (including Passive House Institute US) also satisfy this requirement.

5.3 Sizing of Heating and Cooling Equipment - M
Size and select heating and cooling equipment in accordance with the Air Conditioning Contractors of America (ACCA) Manuals J and S or ASHRAE handbooks. Since tenants provide their own air conditioner, designers are recommended to provide room by room cooling loads to guide tenants equipment purchase.

5.4 ENERGY STAR Appliances - M
If providing appliances, install ENERGY STAR clothes washers, dishwashers, and refrigerators.
If appliances will not be installed or replaced, specify that, at the time of installation or replacement, ENERGY STAR models must be used.

5.5 Lighting - M
Follow the guidance for high efficacy lighting controls and other characteristics for all permanently installed lighting fixtures in project dwelling units, common spaces and exterior.

5.6 Electricity Meter - M for Substantial Rehab, R for Moderate Rehab
Install individual electric meters or submeters for all dwelling units.

5.8a Resilient Energy Systems: Floodproofing - R
Provide floodproofing, including perimeter floodproofing (barriers/shields), of lower floors. Design and install building systems so that the operation of those systems will not be grossly affected in case of a flood.

5.8b Resilient Energy Systems: Islandable Power - R
Provide emergency power through an islandable photovoltaic (PV) system or an efficient and portable generator that will offer limited electricity for critical circuits during power outages per one of the three options listed. (Projects may earn points through Criterion 5.7b or 5.8b, but not both.)

6. Materials

6.1 Low / No VOC Paints, Coatings and Primers - M
All interior paints and primers must have VOC levels, in grams per liter, less than or equal to the thresholds established by South Coast Air Quality Management District (SCAQMD) Rule 1113.

6.2 Low / No VOC Adhesives and Sealants - M
All adhesives and sealants (including caulks) must have VOC levels, in grams per liter, less than or equal to the thresholds established by SCAQMD Rule 1168.

6.7a Environmentally Preferable Flooring - M
Do not install carpets in building entryways, laundry rooms, bathrooms, kitchens/kitchenettes, utility rooms or any rooms built on foundation slabs. Where installed, all carpet products must meet the Carpet and Rug Institute's Green Label or Green Label Plus certification for carpet, pad and carpet adhesives. Any hard surface flooring must be either ceramic tile or solid unfinished hardwood, or meet the Scientific Certification System's FloorScore program criteria (including pre-finished hardwood flooring).

6.7b Environmentally Preferable Flooring: Throughout Building - R
Use non-vinyl, non-carpet floor coverings throughout each building in the project.

6.8 Mold Prevention: Surfaces - M
Use materials that have durable, cleanable surfaces throughout bathrooms, kitchens and laundry rooms. Materials installed in these rooms should not be prone to deterioration due to moisture intrusion nor should they encourage the growth of mold.

6.9 Mold Prevention: Tub and Shower Enclosures - M
Use moisture-resistant backing materials such as cement board, fiber cement board or equivalent per ASTM #D3273 behind tub/shower enclosures. Projects using a one-piece fiberglass tub/shower enclosure are exempt from this requirement.

6.10 Asthmagen-Free materials - R
Do not install products that contain ingredients that are known to cause or trigger asthma. Key products to avoid are:

— Insulation: Do not use spray polyurethane foam (SPF) or formaldehyde-containing fiberglass batts.
— Flooring: Do not use flexible vinyl (PVC) roll or sheet flooring or carpet-backed with vinyl with phthalates. Do not use fluid applied finish floors.
— Wall coverings: Do not use wallpaper made from vinyl (PVC) with phthalates or site-applied high-performance coatings that are epoxy or polyurethane based.
— Composite wood: Use only Ultra Low Emiiting Formaldehyde products for cabinetry, subflooring and other interior composite wood uses.

6.11 Reduced Heat-Island Effect: Roofing - M
Use an ENERGY STAR–certified roofing product for 100% of the roof area OR install a "green" (vegetated) roof for at least 50% of the roof area and ENERGY STAR–certified roofing product for the remainder of the roof area.

6.12 Construction Waste Management - M
Commit to following a waste management plan that reduces non-hazardous construction and demolition waste through recycling, salvaging or diversion strategies through one of three options (see the full Criteria for details). Achieve optional points by going above and beyond the requirement.

7. Healthy Living Environment

7.1 Ventilation - M
For each dwelling unit, in full accordance with ASHRAE 62.2-2010, install a local mechanical exhaust system in each bathroom and a local mechanical exhaust system in each kitchen. For each multifamily building of four stories and more, in full accordance with ASHRAE 62.1-2010, install a mechanical ventilation system for all hallways and common spaces.

For all project types, in addition to the above requirements:

— All systems and associated ductwork must be installed per manufacturer's recommendations.
— All individual bathroom fans must be ENERGY STAR labeled, wired to turn on with the light switch, and equipped with a humidistat sensor, timer or other control (e.g., occupancy sensor, delay off switch, ventilation controller).
— If using central ventilation systems with rooftop fans, each rooftop fan must be direct-drive and variable-speed with speed controller mounted near the fan. Fans with design CFM 300-2000 must also have an ECM motor.

NYC Overlay:
Constant Airflow Regulators are recommended. All substantial rehab projects with existing central exhaust ventilation systems are required to specify duct cleaning and sealing, airflow balancing, and right-sizing roof-top fans. All moderate rehab projects with existing central exhaust ventilation systems are required to calculate the cost/benefit of cleaning, sealing, balancing, and fan right-sizing. We strongly recommend that project teams incorporate performance-based ventilation specifications in their construction documents. Additional reference for ventilation retrofit: https://buildingscience.com/documents/bareports/ba-1209-multifamily-ventilation-retrofit-strategies/view

7.3 Combustion Equipment - M
For new construction and rehab projects, specify power-vented or direct vent equipment when installing any new combustion appliance for space or water heating that will be located within the conditioned space.

In substantial and moderate rehabs, if there is any combustion equipment located within the conditioned space for space or water heating that is not power-vented or direct vented and that is not scheduled for replacement, conduct initial combustion safety testing per RESNET or BPI guidelines. Install one hard-wired carbon monoxide (CO) alarm with battery backup function for each sleeping zone, placed per National Fire Protection Association (NFPA) 720.

7.6 Water Drainage - M
Provide drainage of water away from walls, windows and roofs (see the full Criteria for the list of techniques).

7.10 Integrated Pest Management - M
Seal all wall, floor, and joint penetrations with low-VOC caulking or other appropriate nontoxic sealing methods to prevent pest entry.

7.11b Beyond ADA: Universal Design - R
Design a minimum of 10% of the dwelling units (one, at minimum) in accordance with ICC / ANSI A117.1, Type A, Fully Accessible guidelines. Design the remainder of the ground-floor units and elevator-reachable units with accessible unit entrances designed to accommodate people who use a wheelchair.

7.14 Interior and Outdoor Activity Spaces for Children and Adults - R
Provide an on-site dedicated recreation space with exercise or play opportunities for adults and/or children that is open and accessible to all residents.

7.15 Reduce Lead Hazards in Pre-1978 Buildings- M for Substantial Rehab
Conduct lead risk assessment or inspection to identify lead hazards, then control for these per EPA or state/ local laws and requirements.

7.16 Smoke-Free Building - R
Implement and enforce a no-smoking policy in all common and individual living areas, and within a 25-foot perimeter around the exterior of all residential projects.

NYC Overlay:
It is strongly recommended that all projects consider implementing a smoke-free building policy. For guidance, please see "Resources" in the full 2015 Criteria, which includes the New York City Department of Health's Smoke-Free Housing Resources.

Applicable Regulations Summary

All design documents must fully comply with the latest versions of applicable laws, including, but not limited to those summarized below:

Agency	Regulation
NYC Department of Buildings (DOB)	Building Code
	Fuel Gas Code
	Mechanical Code
	Electrical Code
	Energy Code
	Local Law 11
NYC Department of Sanitation (DSNY)	Rules and Regulation (exterior compactor area)
NYC Department of Transportation (DOT)	Standard details of construction (parking)
NYC Department of Health and Mental Hygiene (DOHMH)	Health Code
NYC Department of City Planning (DCP)	Zoning Resolution
New York City Department of Environmental Protection (DEP)	Asbestos Control Program Asbestos Rules and Regulations
NYC Office of Management and Budget	Directive 10 - Charges to the Capital Projects Fund
NYCHA	NYC Overlay to the Enterprise Green Communities Criteria
New York State	Multiple Dwelling Law
	NYSED Fuel Tank Projects Project Management Process
	State Historic Preservation Office (SHPO) New York State Historic Preservation Act
United States Department of Housing and Urban Development (HUD)	Section 504 of Rehabilitation Act of 1973
	Uniform Federal Accessibility Standards (UFAS)
	Americans with Disabilities Act Accessibility Guidelines (ADAAG)
	Minimum Property Standards (HUD Severe Use Specifications)
Others	American Society for Testing and Materials (Playgrounds)

Developments with SHPO Review Process Requirement

Some NYCHA exterior rehabilitation work that require review and approval by the New York State Historic Preservation Office (SHPO). NYCHA works closely with SHPO to identify developments where preservation review process is required. Below is the current list of these developments. (November 2016)

		National Register Eligible	Entire Complex National Register Eligible	National Register listed
Brooklyn	Albany I and II	•		
	Bayview Houses	•		
	Boulevard Houses	•		
	Brownsville Houses	•		
	Ingersoll Houses		•	
	Marcus Garvey Group A	•		
	Marlboro Houses	•		
	Pennsylvania Ave-Wortman Ave	•		
	Red Hook Houses	•		
	Whitman Houses		•	
	Williamsburg Houses	•		
Bronx	Boston Road Plaza	•		
	Bronx River Houses	•		
	Clason Point Gardens	•		
	Davidson Houses	•		
	Eastchester Gardens	•		
	Gun Hill Houses	•		
	Sedgwick Houses	•		
	Twin Parks West (Sites I and II)	•		
Manhattan	Amsterdam Houses	•		
	Baruch Houses	•		
	Carver Houses	•		
	Douglas Rehabs (241 West 101st St, 229 and 251 West 103rd St, 244 West 104th St)	•		
	East River Houses	•		
	First Houses			•
	Harlem River Houses			•
	Jacob Riis I and II	•		
	King Towers	•		
	Randolph Houses			•
	Smith Houses	•		
	Taft Rehabs			•
	Vladeck Houses and Vladeck II			•
	Wise Rehab (54 West 94th St)	•		
	W.S.U.R.A. Brownstones (47 West 89th St, 15 and 38 West 90th St, 22 and 64 West 91st St)			
Queens	Forest Hills Co-Op	•		
	Queensbridge		•	
	South Jamaica I	•		
Staten Island	Berry Houses	•		

ABBREVIATIONS

ACCA	Association of Chartered Certified Accountants
ADA	Americans with Disabilities Act
ADAAG	Americans with Disabilities Act Accessibility Guidelines
AFCI	Arc Fault Circuit Interrupter
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers
CPSC	US Consumer Product Safety Commission
DFCI	Dual Function Circuit Interrupter
DHW	Domestic Hot Water
EGC	Enterprise Green Communities Criteria
EPA	US Environmental Protection Agency
EPC	Energy Performance Contract
FGC	Fuel Gas Code
HERS	Home Energy Rating System
HUD	US Department of Housing and Urban Development
MEP	Mechanical, Electrical & Plumbing
NYC DEP	NYC Department of Environmental Protection
NYC DOB	NYC Department of Buildings
NYC OVERLAY	NYC Overlay to the Enterprise Green Communities Criteria
SCAQMD	South Coast Air Quality Management District
SHPO	NY State Historic Preservation Office
UFAS	Uniform Federal Accessibility Standards
VCA	Voluntary Compliance Agreement
VOC	Volatile Organic Compound

ACKNOWLEDGMENTS

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Enterprise Rose Architectural Fellowship

Special thanks to the Fund for Public Housing, Deutsche Bank, and Enterprise Community Partners for their support and partnership in NYCHA's Design Excellence Initiative, and to Morgan Stanley and Citi Foundation for their support of Enterprise's Public Housing work, including the Enterprise Rose Architectural Fellowship.