NYC:DDC
A Market in Transformation

Department of Design and Construction

Dr. Feniosky Peña-Mora
Commissioner

Margaret O’Donoghue Castillo, FAIA, LEED AP, Chief Architect
$15 billion
current portfolio value

660
Active infrastructure portfolio

$17 billion
expected by 2020

641
active public buildings portfolio

$16 billion
completed since 1996

4151
projects completed since 1996

1321
in-house workforce

1300
consultant workforce

250+
awards won since inception

641
projects completed since 1996

250+
awards won since inception

$16 billion
completed since 1996
NYC DDC is the City's primary capital construction project manager.

4,151 projects completed

$15B active portfolio value

641 active public buildings projects

660 active infrastructure projects
Citywide Efforts to Date – Buildings

- **2007**
  - PlaNYC sets citywide goal of 30x30

- **2009**
  - **Greener, Greater Buildings Plan**
    - LL84 - Benchmarking*
    - LL85 - First NYC Energy Code, based on ASHRAE 90.1-2007
    - LL87 - Energy Auditing*
    - LL88 - Submetering/Lighting*
  
  *For buildings over 50,000 gsf

- **2014**
  - **One City Built to Last**
    - sets citywide goal of 80x50

- **2016**
  - **One City Technical Working Group**
    - completes report on retrofitting existing NYC buildings

- **2016**
  - **NYC ECC**
    - updated to ASHRAE 90.1-2010
    - LL84/87/88 expanded to buildings over 25,000 gsf

PlaNYC new york city local law 84 benchmarking report August 2012

One City Built to Last

One City Built to Last Technical Working Group Report

Transforming New York City Buildings for a Low-Carbon Future

PlaNYC

A Greener, Greater New York
Citywide Efforts to Date – Municipal Buildings

- **2005 LL86** requires LEED v2 Silver minimum
- **2009 LL86** updated to LEED v3 Silver
- **2016 LL24** requires solar feasibility study and implementation
- **2016 LL6** requires geothermal feasibility study and implementation (effective 2017)
- **2016 LL31** sets low-energy use intensity targets (effective 2017)
- **2016 LL32** updates LL86 to LEED v4 Gold (effective 2017)
Local Law 31 of 2016 (LL31)

- 50% Median LL84: 50% of the median Source EUI for buildings of similar use, as determined by most recent Local Law 84 Benchmarking Data;

- 50% ASHRAE 90.1 2013: 50% of median Source EUI for buildings of similar use, as designed to meet the prescriptive and mandatory requirements of ASHRAE 90.1-2013 or

Mayor de Blasio’s goal to reduce New York City’s carbon emissions by 80% of the 2005 baseline by 2050
Roadmap to 80x50

Projected Citywide GHG Emissions Reductions (MtCO2e)

- All percent reductions are relative to the 2005 citywide baseline

Citywide 80x50 Target

- Pre-2014 Policies
- One City Built to Last Policies
- TWG ECMs
- Performance-based Energy Code
- Deep Energy Retrofits, including high efficiency electric technologies for heat and hot water
- Low Carbon Intensity Electric Grid

2005 Baseline

2014

2050

- Waste
- Transportation
- Buildings
- Energy Supply

59.2

-12%

-2%

- Pre-2014 Policies
- Zero Waste

-20%

- Pre-2014 Policies
- Shift away from Personal Vehicles
- Low Carbon Fuels and Vehicles
- Improved Network Efficiency
- Improved Freight Efficiency
- Low Carbon Intensity Electric Grid

-46%

11.8

New York City’s Roadmap to 80 x 50
Existing Buildings - Technical Working Group ECMs

Relative Impact, If Applied to All Applicable Buildings

1 MtCO₂e

- Increase data center efficiency
- Replace boilers with sealed combustion or power boilers
- Accelerate No. 4 oil phase out
- 1 Pipe Steam - Install master venting + indoor feedback
- Reduce over-ventilation of kitchen and bath exhaust
- Improve tenant lighting controls/zoning
- Through Wall ACs - Replace units*
- Replace most used bulbs with LEDs
- PTAC - Complete comprehensive upgrade
- Chillers - Rebalance water loops
- Integrate individual BMS systems
- Place LPD requirements on dwelling units
- Require installation of EMS or BMS
- Water Cooled Units - Install load side controls
- Close shaft vents for elevators
- Air seal & insulate roofs
- Replace old dishwasher*
- Decrease window u-value at time of replacement*
- Install VFD motors
- 2 Pipe Steam - Complete comprehensive upgrade
- Install linkageless burner and draft control upgrade
- Install bi-level lighting*
- Improve DHW temperature control
- 1 Pipe Steam - Complete comprehensive upgrade
- Replace steam boilers serving hydronic loops with hot water boilers*
- Install low flow fixtures
- Air seal home
- Install solar thermal hot water heaters
- Water Cooled Units - Upgrade to more efficient units*
- Add film to single pane windows
- Air seal room cooling equipment
80x50 at DDC Builds on A History of Sustainable Design Leadership
Design and Construction Excellence
2.0 Guiding Principles

Equity
Sustainability
Resiliency
Healthy Living
Guiding Principles – Sustainability

- Use natural resources responsibly
- Encourage responsible water use
- Design holistic, integrated systems
- Promote sustainable urban ecology
- Minimize energy use and reduce greenhouse gas emissions
Optimize site conditions

Use passive tactics

Optimize systems

Minimize secondary electrical loads

Use renewable sources

Sustainability – Minimize Energy Use and Reduce Greenhouse Gas Emissions
Bring sustainable urban ecology inside

Optimize campus solutions

Improve commissioning

Leverage site and envelope response

Design with Users in mind

Sustainability – Design Holistic, Integrated Systems
Rescue Company 2
Studio GANG

**DAYLIGHTING**
A large glass lantern brings sunlight deep into the center of the firehouse, reducing artificial lighting energy use on the apparatus floor and spaces surrounding it.

**SOLAR ENERGY**
The sun’s energy is harvested to generate both electricity and domestic hot water for use within the building.

**ROOF & PERIMETER PLANTING**
While much of the site is paved to facilitate vehicle maneuvering, the edges are continuously planted to absorb runoff and to allow vines to creep up the perimeter fence. Plantings are also incorporated within terraces and on the green roof, creating strong connections to the outdoors from all occupied levels of the building.

**GEOTHERMAL ENERGY**
A system of closed geothermal loops exchanges heat between the building and the ground, keeping interior spaces cooler during summer and warmer during winter.

**STORMWATER DETENTION**
Excess roof and site stormwater runoff is stored in an on-site detention tank, mitigating the site’s impact on the city’s storm drains.

**NATURAL VENTILATION**
Large overhead doors and louvers at both ends of the firehouse promote cross-ventilation throughout the apparatus floor, and high-level vents in the glass roof lanterns induce a vertical stack effect. These passive strategies ensure a more healthful interior environment for building occupants.

Simulated. Not Actual.
Case Studies
Building Basics:
Constructed 1912-1916
7 stories + basement
140,739 gsf

Architecture:
Concrete-encased steel frame
Solid masonry exterior with limestone base
Historically significant street-facing façades

Systems:
Dual-fuel steam boilers and perimeter radiators
Window air conditioning units
Operable windows

Planned base scope (on hold):
Interior gut renovation with all-new systems
Extensive façade repair and restoration
Window replacement and lintel repair

Case Studies
Bergen Building, Bronx - Renovation by Studio Gang Architects, Buro Happold Engineering, Thornton Tomasetti
WALL ASSEMBLY STUDIES
(Insulated)
Typical wall section WT2- Option 2
The typical wall section built-up is: (from inside to outside)
- 2” Closed Cell Spray Foam Insulation
- ~12” Masonry Wall
- 6” Mineral Wool Insulation

Area under investigation
Temperature & Dew Point curve don’t cross each other

+ Relative Humidity< 85%

↓ No Condensation
WINDOW ASSEMBLY - AREA AND U-FACTOR

The windows in this example have identical glass, spacer, and framing components. The only difference is their size.

Area = 24.0 ft$^2$
U-Factor = 0.4 BTU/ft$^2$·hr·°F

Area = 8.0 ft$^2$
U-Factor = 0.5 BTU/ft$^2$·hr·°F
(25% “worse”)

COG = 15.7 ft$^2$
(65%)
EOG = 3.6 ft$^2$
(15%)
FRAME = 4.7 ft$^2$
(20%)

COG = 3.3 ft$^2$
(41%)
EOG = 2 ft$^2$
(25%)
FRAME = 2.7 ft$^2$
(34%)

For the smaller window shown, the amount of higher-performing COG area decreased from 65% to 41%, and the lower performing frame increased from 20% to 34%.
Glass Coatings and U-Factor

Low-e coatings improve both COG and EOG U-Factors.
(All Winter U-Factors in BTU/hr-ft²°F)

<table>
<thead>
<tr>
<th></th>
<th>COG</th>
<th>EOG</th>
<th>Frame</th>
</tr>
</thead>
<tbody>
<tr>
<td>1″ Insulating</td>
<td>0.47</td>
<td>0.49</td>
<td>0.86</td>
</tr>
<tr>
<td>Uncoated</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1″ Insulating</td>
<td>0.29</td>
<td>0.37</td>
<td>0.85</td>
</tr>
<tr>
<td>Low-e Coated</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

38% better

<table>
<thead>
<tr>
<th></th>
<th>COG</th>
<th>EOG</th>
<th>Frame</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-3/4″ Triple</td>
<td>0.30</td>
<td>0.39</td>
<td>0.71</td>
</tr>
<tr>
<td>Insulating</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Uncoated</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1-3/4″ Triple</td>
<td>0.16</td>
<td>0.27</td>
<td>0.69</td>
</tr>
<tr>
<td>Insulating</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Double Low-e</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

47% better

At left: Illustrates the difference between a 1″ uncoated IG unit, and a 1″ IG unit with a Low-e coating on the #2 surface, improving the COG U-Factor by 38%

At right: Illustrates the difference between an uncoated triple IG unit, and a triple IG unit with two Low-E coatings on the #2 and #4 surfaces, improving the COG U-Factor by 47%
1 - UFAD - FLOOR-X-FLOOR AHU TO UFAD

2 - VAV - OVERHEAD VAV

3A/B - FCU - DEDICATED OA WITH FCUS FOR COOLING/HEATING

4 - ACB - DEDICATED OA TO ACTIVE CHILLED BEAMS, OPTIONAL PERIMETER RADIANT

Case Study
Bergen Building, Bronx - Studio Gang - BuroHappold Engineering
Case Study

Bergen Building, Bronx - Studio Gang - BuroHappold Engineering

BASELINE EUI:
217 KBTU/YR/SQFT

MODIFIED SITE EUI:
212 KBTU/YR/SQFT

MODIFIED SITE EUI:
194 KBTU/YR/SQFT

POTENTIAL ROOF POWER GENERATION:
180,000 kWh/yr

POTENTIAL ROOF INSULATION
18 KBTU/YR/SQFT
SOLAR PANEL MOUNTING OPTIONS

OPTION 1 - ON ROOF, FLAT

OPTION 2 - TILTED

OPTION 3 - OVER ROOF, FLAT

OPTION 4 - TRACKING
**Case Studies**

**Bergen Building, Bronx** - Renovation by Studio Gang Architects, Buro Happold Engineering, Thornton Tomasetti
Case Studies

Bergen Building, Bronx - Renovation by Studio Gang Architects, Buro Happold Engineering, Thornton Tomasetti
Building Basics:
2 stories
11,621 gsf
Targeting LEED Gold certification

Base Scope Architecture:
Steel frame with diagonal columns
Curtain wall with ceramic frit
Precast concrete panels

Base Scope Systems:
Air-source heat pumps with variable refrigerant flow
Dedicated outdoor air system with energy recovery
Hydronic radiant flooring

Constraints:
Adjacent elevated subway requires high STC (sound transmission class) rating for curtain wall
Case Studies
Westchester Square Library, Bronx - Snøhetta, Altieri Sebor Wieber Consulting Engineers, Atelier Ten
Building Basics:
2 stories
10,640 gsf
Replaces facility damaged by Sandy

Base Scope Architecture:
Steel frame
Insulated metal panel walls
Glazing located behind perforated metal screens

Base Scope Systems:
#2 fuel oil boiler (no natural gas service to site)
Conventional rooftop HVAC

Constraints:
Located in floodplain - first floor designed to allow floodwaters to pass through, second floor elevated
Case Studies

NYPD Bomb Squad Facility, Bronx - Rice+Lipka Architects, Plus Group Consulting Engineering