



# MANAGING STORMWATER & IMPROVING AIR QUALITY WITH URBAN 'GREEN' ROOFS

*presented by*

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# DESCRIPTION

- This course will outline the role that the New York City Department of Buildings plays in regulating systems that impact water and air quality in the city. This presentation will address the interplay of different city agencies, but with specific emphasis on the construction codes and the requirements applicable to stormwater systems and green roofs.

# STORMWATER

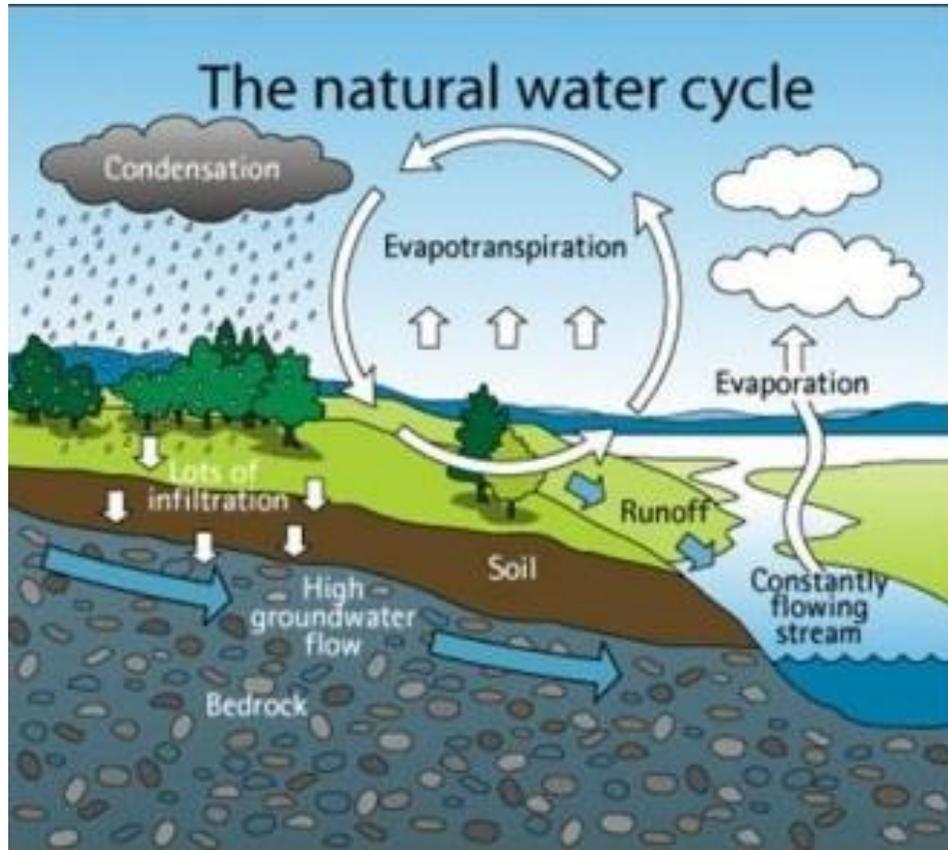
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# STORM WATER vs STORMWATER:

*Au Naturel*



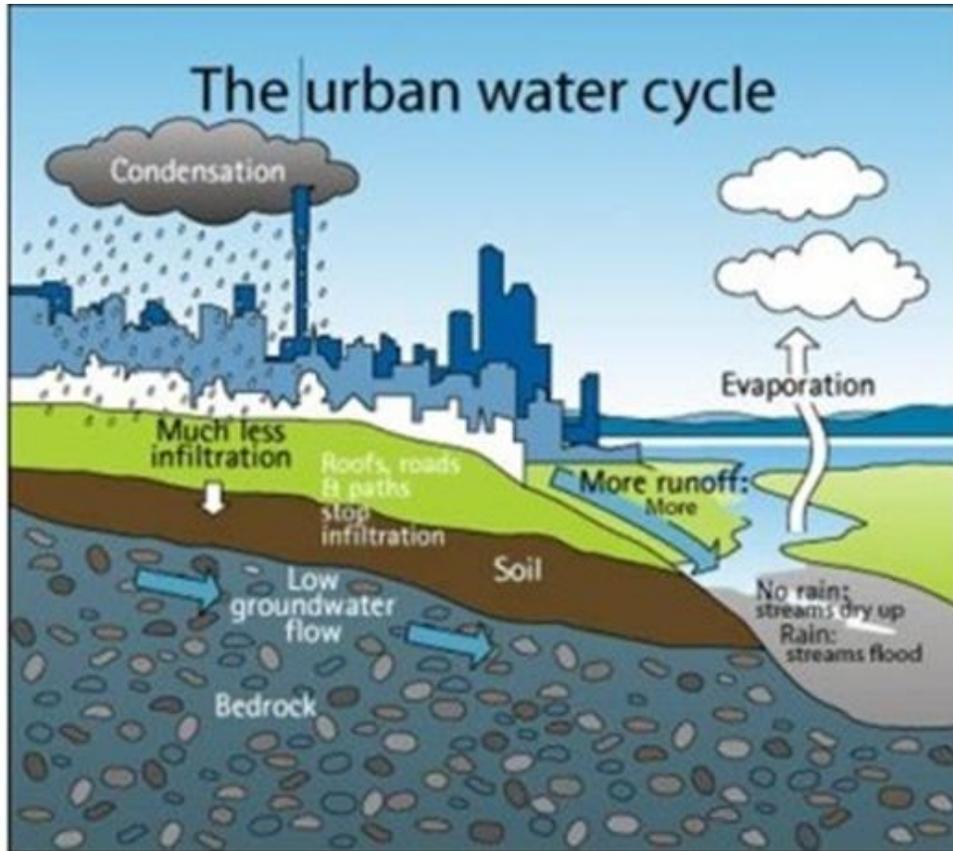
Source: <https://www.randolph-ma.gov/department-public-works/pages/stormwater-management>

- **STORM WATER OR STORMWATER.**

Natural precipitation, including snow melt, that has contacted a surface at or below grade

# STORM WATER vs STORMWATER:

## *The Problem*



Source: <https://www.randolph-ma.gov/department-public-works/pages/stormwater-management>

- **Flooding.** Runoff from impervious surfaces (buildings, walkways, parking lots) may quickly overwhelm natural watercourses and constructed drainage infrastructure. These conditions may result in rapid flooding, with damage to property and injury to residents.
- **Pollution.** As stormwater passes over urbanized areas and surfaces, it picks up pollutants such as oils, sediments, garbage and animal waste. This adversely affects water bodies such as rivers, but also increases the burden on storm infrastructure.
- **Erosion.** Increased speed and volume of stormwater leads to soil erosion, which may be considered another source of pollution, and presents a danger to properties and occupants.

# STORM WATER MANAGEMENT:

## *Greening Gray Infrastructure*

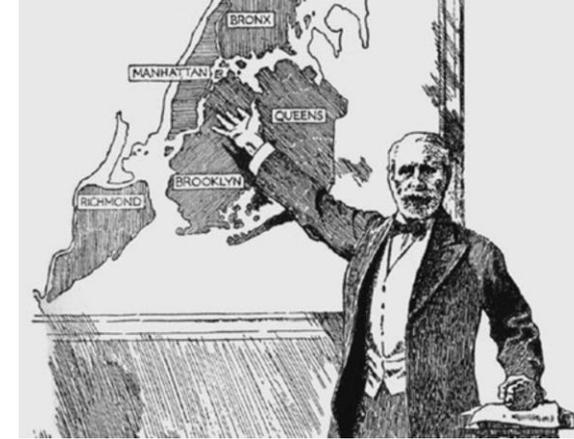


Source: <https://www.nytimes.com/2021/09/02/nyregion/ida-new-york-flood.html>

- Effective stormwater management relies on policies and construction methods that restore or mimic the natural water cycle.
- Through proper management, we can reduce the adverse impacts of flooding, pollution, and erosion.

# NEW YORK CITY CHARTER:

## Chapter 26 – Department of Buildings



Source: <https://www.boweryboyshistory.com>

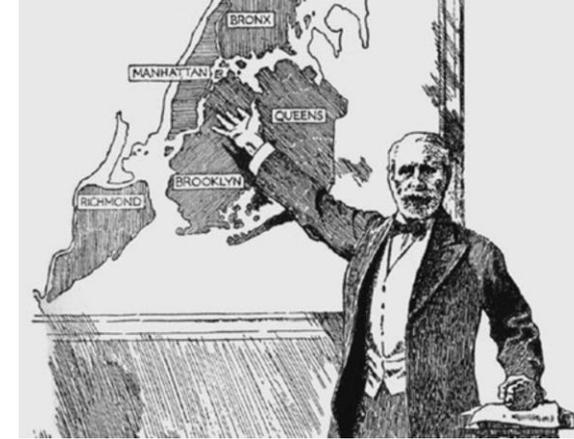
### SECTION 643 – DEPARTMENT; FUNCTIONS.

The department shall enforce, with respect to buildings and structures, such provisions of the building code, zoning resolution, multiple dwelling law, labor law and other laws, rules and regulations as may govern the construction, alteration, maintenance, use, occupancy, safety, sanitary conditions, mechanical equipment and inspection of buildings or structures in the city, and shall perform the functions of the city of New York relating to

- (1) the designation of buildings and structures as unsafe...
- (2) the shoring of hazardous and unsafe buildings...
- (3) the testing and approval of power-operated cranes and derricks...
- (4) the location, construction, alteration and removal of signs...
- (5) (i) all surface and subsurface construction within the curb line, including curb cuts and driveways, the covering thereof and entrances thereto and the issuance of permits in reference thereto, (ii) in conjunction with the issuance of permits for surface and subsurface construction within the curblines, such surface and subsurface construction outside the curblines as shall be expressly delegated to the department in the administrative code and the issuance of permits in relation thereto and, (iii) notwithstanding any inconsistent provision of section fourteen hundred three of this charter, in conjunction with the issuance of a permit for the construction of a building, the commissioner may approve the installation of and issue a permit for the construction of an individual on site private sewage disposal system for the premises. Such permit shall be issued in accordance with standards and specifications prescribed by the commissioner, in consultation with the commissioner of environmental protection, for the installation of individual on site private sewage disposal systems;

# NEW YORK CITY CHARTER:

## Chapter 57 – Department of Environmental Protection



Source: <https://www.boweryboyshistory.com>

### SECTION 1403 – POWERS AND DUTIES OF THE COMMISSIONER.

...The powers and duties of the commissioner shall include, without limitation, the following:

- a. Water resources control.
- b. Sewage control.

The commissioner shall have charge and control over the location, construction, alteration, repair, maintenance and operation of all sewers including intercepting sewers and sewage disposal plants, and of **all matters in the several boroughs relating to public sewers and drainage, and shall initiate and make all plans for drainage** and shall have charge of all public and private sewers in accordance with such plans; and shall have charge of the management, care and maintenance of sewer and drainage systems therein.

- b-1. Water pollution control.

(1) Except as otherwise provided by law and subject to the provisions of this chapter, the commissioner shall have the power to administer and enforce provisions of law, rules and **regulations relating to the management and control of discharges and runoff from public and private property, including but not limited to stormwater discharges**; regulate and control discharges into water within and about the city of New York of harmful or objectionable substances, contaminants and pollutants that may have an adverse impact on waters of the state; enforce all laws, rules and regulations with respect to discharges described in this paragraph; make such investigations and studies as may be desirable for the purpose of such enforcement and of controlling and eliminating pollution of waters within and about the city of New York; and, for the purposes set forth in this paragraph, compel the attendance of witnesses and take such witnesses' testimony under oath.

# NEW YORK CITY ADMINISTRATIVE CODE:

## *DEP Title 24 – Environmental Protection & Utilities*



Source: [https://www1.nyc.gov/html/dep/html/press\\_releases/18-059pr](https://www1.nyc.gov/html/dep/html/press_releases/18-059pr)

### ■ § 24-503 Drainage plan

a. The commissioner of environmental protection shall devise and prepare a plan for the proper sewerage and drainage of the city, so far as the same has not already been done, for the purpose of thoroughly draining and carrying off water and other matter. He or she shall lay out the city into as many sewerage districts as he or she may deem necessary for such purpose, and shall determine and show, on suitable maps or plans...

### ■ § 24-505 Raising of grade for drainage.

Whenever the commissioner of environmental protection shall determine that it is necessary to raise the grade of any street or streets for the proper sewage of the sewer district in which such street or streets, or parts of streets, are situated, he or she shall prepare a plan showing such proposed change of grade, and shall present the same to the board of estimate and notify the community board for the community district in which the land is located and the office of the appropriate borough president. The board of estimate shall refer such plan to the commissioner of transportation for report. Such board may change the grade of such street or streets, or parts of streets, so far as shall be necessary for the proper drainage thereof, in accordance with such plan, in the manner provided by section one hundred ninety-nine of the charter.

# NEW YORK CITY ADMINISTRATIVE CODE:

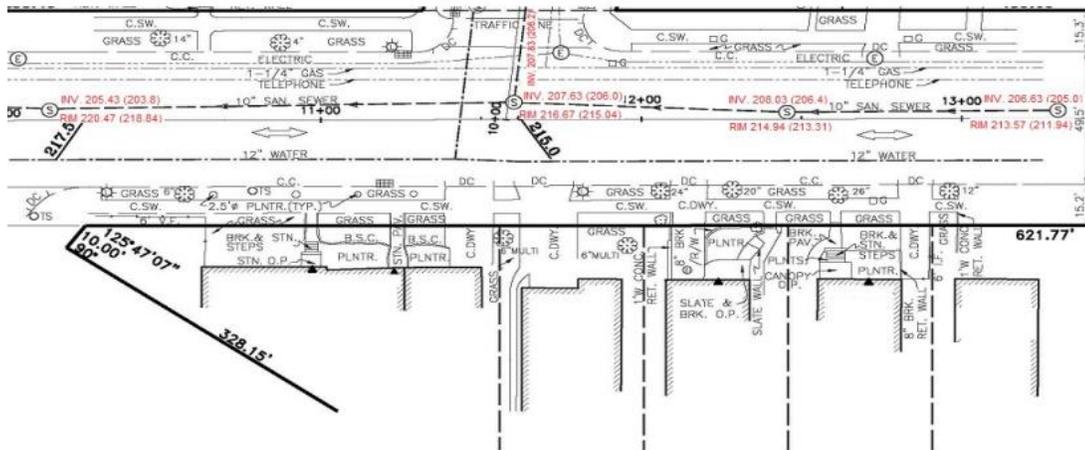
## Department of Buildings – Local Law 96 of 2013

### LEGEND



**NOTE: ALL ELEVATIONS REFER TO THE NORTH AMERICAN VERTICAL DATUM OF 1988 (NAVD 88), WHICH IS xxxx FEET\* BELOW THE xxxx BOROUGH SEWER DATUM.**

\*This graphic and notes are shown to clearly demonstrate the procedure for submission. This conversion varies and should be provided by a NYS Licensed Surveyor.



PLAN

inv 21 2014

Source: <https://www1.nyc.gov/assets/dep/downloads/pdf/about/water-and-sewer-forms/rules-of-the-city-of-new-york/local-law-96-vertical-datum-navd88.pdf>

### ■ § 28-104.7.6 City datum

All elevations noted in the construction documents shall be referred to and clearly identified as the North American vertical datum of 1988 (NAVD) as established and maintained by National Geodetic Survey of the National Ocean Service, National Oceanic and Atmospheric Administration or successor agency, which is hereby established as the city datum...

# NEW YORK CITY ADMINISTRATIVE CODE:

## Department of Buildings – Local Law 96 of 2013

**NYC Buildings** PW1: Plan / Work Application  Orient and affix BLD job number label here  Must be typewritten

**1 Location Information** Required for all applications.

House No(s) Street Name  
 Borough Block Lot BIN C.B. No.  
 Work on Floor(s) Apt. / Condo No(s)

**2 Applicant Information** Required for all applications. Fax, mobile telephone and e-mail address are optional information.

Last Name First Name Middle Initial  
 Business Name Business Telephone  
 Business Address Business Fax  
 City State Zip Mobile Telephone  
 E-Mail License Number  
 Choose one:  P.E.  R.A.  Sign Hanger  R.L.A.  Other:

**3 Filing Representative** Complete only if different from applicant specified in section 2. Fax, mobile phone, and e-mail are optional info.

Last Name First Name Middle Initial  
 Business Name Business Telephone  
 Business Address Business Fax  
 City State Zip Mobile Telephone  
 E-Mail Registration Number

**4 Filing Status** Required for all applications. Choose one and provide specified associated information.

Initial Filing 5, 7, 11, 12A, 25-26  Prior to Approval Actions 25-26  Reinstatement 24-26  
 Choose only one:  Amend Existing Filing 4A  Withdrawal 26  
 Standard Plan Examination or Review  Subsequent Filing 6-7, 8A (AR-2 only), 11  Specified in 4A and 6  
 Professional Certification PC1, POC?  Post Approval Amendment (PAA) 4A, 6, 24-25  Entire Job  
 Professional Certification of Objections A1? Will PAA affect filing fees?  Yes  No 4A Indicate existing document number affected by filing:  
 New (Superseding) Applicant 4A, 25-26

**5 Job/Project Types** Choose one and provide specified associated information.

Alteration Type 1 or Alteration Type 1 required to meet New Building requirements (28-101.4.5) 14, 20, 22  Alteration Type 2 5A, 6A-D, 8A-B, 9-10, 13C-E, & 9C-D, 9K, 9M, 13D-E, 14, 21A, 22  
 Alteration Type 3 5A, 6B-F, 8C, 9-10, 13C-E, 20, 22  Subdivision 9A, 9D, 12A-B  
 Alteration Type 1, OT: "No Work" 8C, 8F, 9-10 & 13A-E, 14, 18-20, PW1A, PD1  Condominium  Improved 17  
 Sign 5A, 6B-D, 9A, 9D, 22-23  5A Directive 14 acceptance requested?  Yes  No

**6 Work Types** Select all that apply but no more than allowed by job and filing type. "OT" required on all NB and Alteration 1 initial applications.

8A  BL - Boiler PW1C  FS - Fuel Storage PW1C  PL - Plumbing PW1B  CC - Curb Cut 16  
 FA - Fire Alarm  FP - Fire Suppression  SD - Standpipe PW1B  OT/LAN - Landscape  
 FB - Fuel Burning PW1C  MH - Mechanical  SP - Sprinkler PW1B  OT/ANT - Antenna  
 8B  EQ - Construction Equipment 15  OT/GC - General Construction  OT - Other, describe:  OT/BPP - Builders Pavement Plan 8D  
 OT/FPP - Fire Protection Plan  
 OT/MAR - Marquee 8E, 26B

- **§28-104.11.3 Required documentation.** Applications for construction document approval shall include copies of any required stormwater construction permit issued by the department of environmental protection and the stormwater pollution prevention plan for the covered development project.

# LOCAL LAW 97 OF 2017

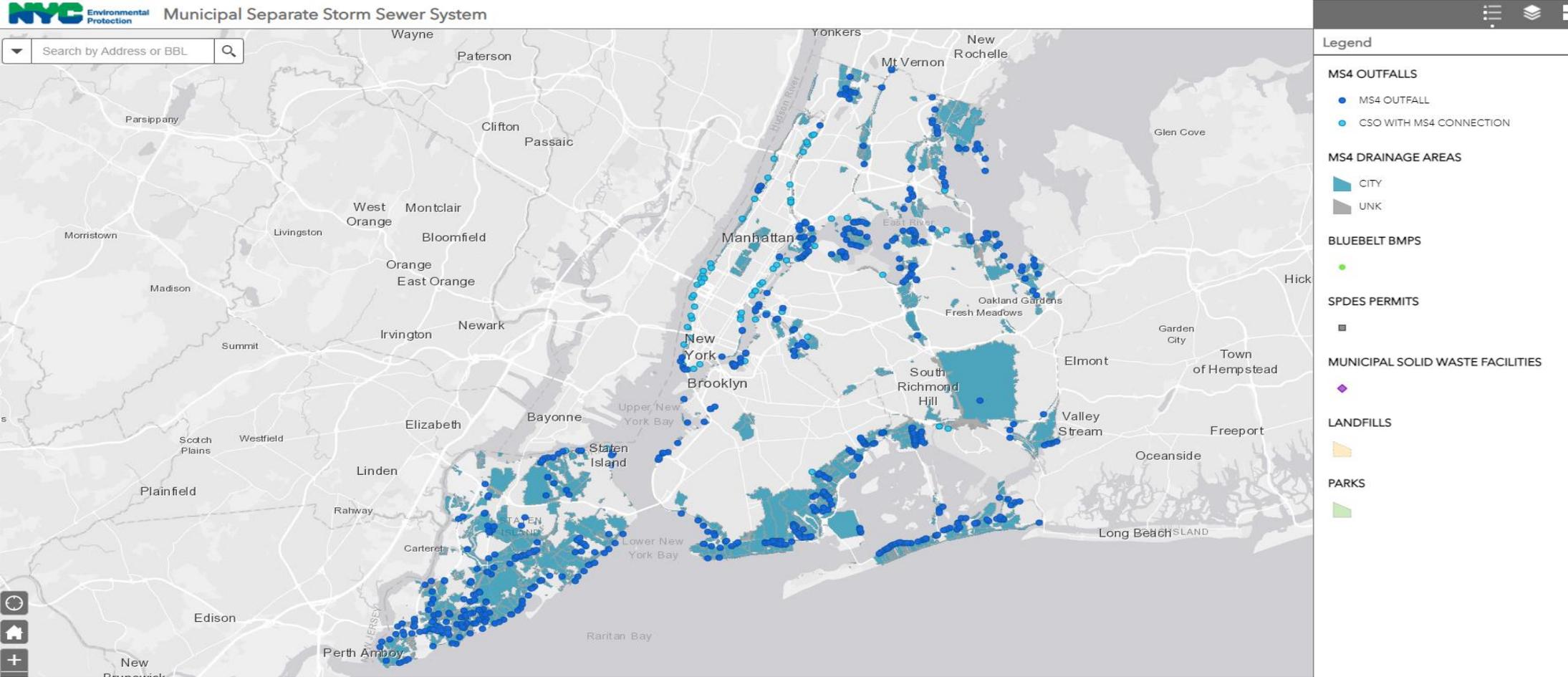
## Amendments to NYC Charter, Administrative Code, and Rules of the City

### ■ Beginning June 1, 2019

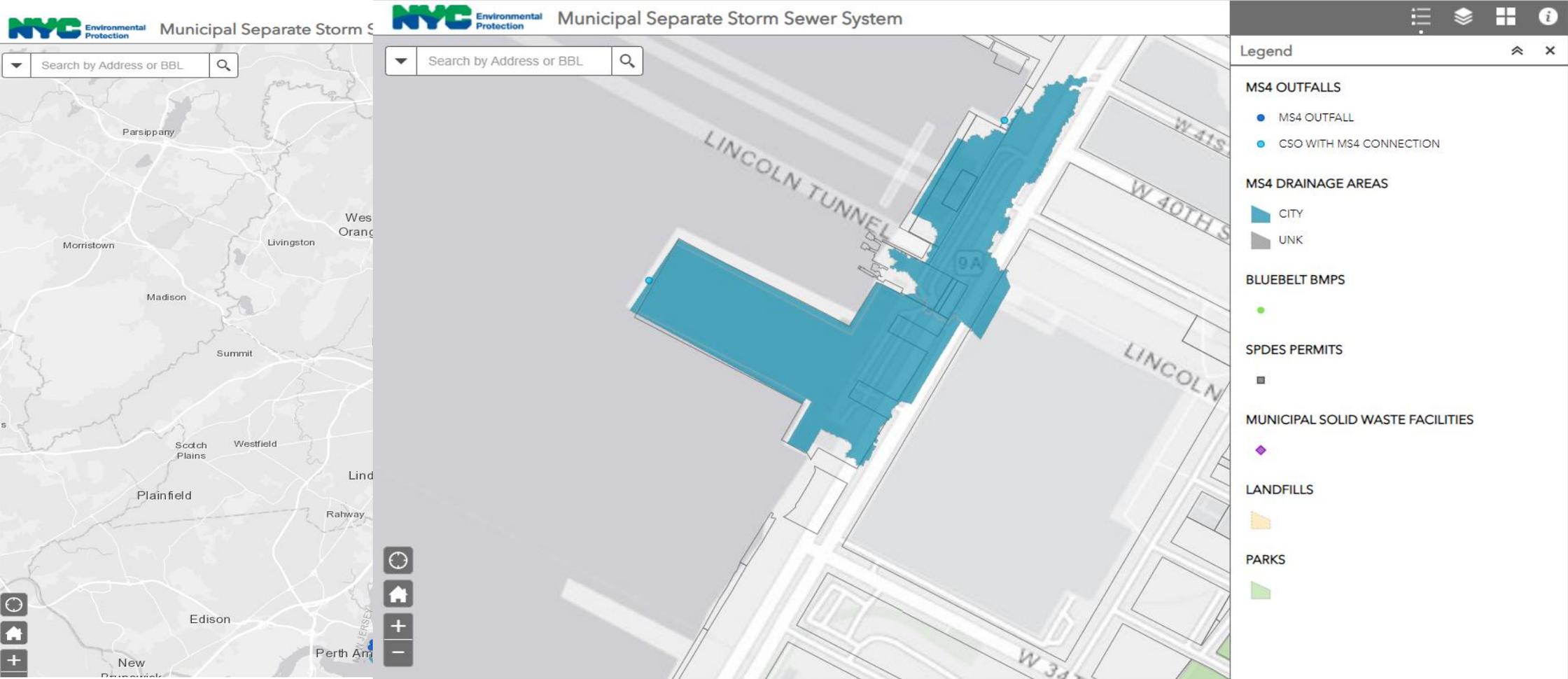
- Stormwater Construction Permit from the NYC Department of Environmental Protection (DEP) must be obtained for development projects if the projects:
  1. Are expected to disturb 1 or more acres of soil; and
  2. Either:
    - a. Are located in the MS4 area on the Interactive MS4 Map on DEP's website; **or**
    - b. Require a DEP connection for a separate storm sewer. A DEP Stormwater Construction Permit must be obtained prior to a Department of Buildings plan approval

*\*MS4 = Municipal Separate Storm Sewer System*

# LOCAL LAW 97 OF 2017



# LOCAL LAW 97 OF 2017



# UNIFIED STORMWATER RULE



- Published February 15, 2022
- Stormwater Construction Permitting program.
  - “Covered Development Project” development activity that involves or results in an amount of soil disturbance greater than or equal to 20,000 square feet or creation of 5,000 square feet or more of impervious surface or covered maintenance activity.
- Site/House Connection Proposal Certification program
  - Flow rates into city sewers

# 2022 BUILDING CODE

- **107.11 Discharge of sewage and discharge and/or management of stormwater runoff.** Applications for construction document approval shall comply with Sections 107.11.1, 107.11.2 and 107.11.3.
  - **107.11.1 Sewage.**
  - **107.11.2 Stormwater.** Applications for construction document approval shall include submittal documents relating to the availability and feasibility of a public combined or storm sewer or other approved method for stormwater discharge in accordance with Sections 107.11.2.1 and 107.11.2.2 for the following types of applications:
    1. **New buildings;**
    2. Alterations of buildings proposing **horizontal building enlargement;** and/or
    3. Alterations that **increase impervious surfaces** on the tax lot.
  - **107.11.3 Post-construction stormwater management facilities.**

# 2022 BUILDING CODE

- **107.11.2.1 Connection feasible and available.** Where a public combined or storm sewer is certified by the Department of Environmental Protection or certified by an applicant in accordance with rules of such department to be available and connection thereto is feasible, applicants shall submit:
  1. Department of Environmental Protection certification of availability and feasibility
  2. Applicant certification of availability and feasibility

\* 1-3 family homes that are not Covered Development = House Connection Proposal (HCP)  
All other projects = Site Connection Proposal

# 2022 BUILDING CODE

- **107.11.2.2 Connection not feasible or not available.** Where a public combined or storm sewer is not available, or where connection thereto is not feasible, applicants shall submit:
  1. Department of Environmental Protection or applicant certification of unavailability or non-feasibility.
  2. On-site disposal. A proposal for the design and construction of a system for the on-site disposal of stormwater conforming to the provisions of this code and other applicable laws and rules including but not limited to minimum required distances from lot lines or structures and subsoil conditions. Construction documents for such system shall be subject to the approval of the department.

# UNIFIED STORMWATER RULE

**Table 2.8.** C values for various surface types.

C	Surface Description
0.95	Roof areas
0.85	Paved areas
0.70	Green roof with 4 in. growing media
0.70	Porous asphalt/Porous Concrete <sup>a</sup>
0.70	Synthetic turf fields <sup>a</sup>
0.65	Gravel parking lot
0.30	Undeveloped areas
0.20	Grass, bio-swales, or landscaped areas

<sup>a</sup> Using a C value of 0.7 for the indicated surface types typically requires the use of an outlet pipe, with approval at the discretion of DEP.

- DEP's runoff coefficient indicates a 26% reduction for a green roof vs traditional roofing construction.

$$V_V = \frac{R_D}{12} * A * C_W$$

where:

$V_V$ : sewer operations volume (cf)

$R_D$ : rainfall depth (in)

A: contributing area (sf)

$C_W$ : weighted runoff coefficient relating peak rate of rainfall and runoff

**NYC Environmental Protection** DEPARTMENT OF ENVIRONMENTAL PROTECTION  
BUREAU OF WATER & SEWER OPERATIONS  
SITE CONNECTION PROPOSAL FORM  
VALID FOR TWO (2) YEARS  
[SC / ]

PE/RA signature and original seal

**A. PROJECT DATA:**  
Borough of \_\_\_\_\_ Building Dept. No (s) \_\_\_\_\_  
Tax Block \_\_\_\_\_ Lot (s) \_\_\_\_\_ Zoning \_\_\_\_\_ Map No. \_\_\_\_\_  
Project Location \_\_\_\_\_  
Applicant \_\_\_\_\_  
Address \_\_\_\_\_ Zip \_\_\_\_\_ Phone (\_\_\_\_) \_\_\_\_\_  
Owner \_\_\_\_\_  
Address \_\_\_\_\_ Zip \_\_\_\_\_ Phone (\_\_\_\_) \_\_\_\_\_

**B. PROJECT USE:**  
TYPE:  1, 2, 3, Family  Multiple Dwelling  Commercial \_\_\_\_\_  
Number of Buildings \_\_\_\_\_ Total Number of Dwelling Units \_\_\_\_\_  
 Single-Family  Multi-Family  Home Owner Association  Other \_\_\_\_\_

**C. SITE CONNECTIONS REQUESTED:**  
Total Developed Site Storm Flow \_\_\_\_\_ cfs  
Allow. Storm Flow to the Sewers \_\_\_\_\_ cfs  
 Detention  Retention  
No. Requested \_\_\_\_\_ Sanit. \_\_\_\_\_ Storm \_\_\_\_\_ Comb. \_\_\_\_\_ Drywells \_\_\_\_\_  
Size \_\_\_\_\_ xxxxxx  
Material (s) \_\_\_\_\_ xxxxxx  
Total Q (s) \_\_\_\_\_  
**Note:** The property owner is responsible for plugging all inactive pre-existing sewer connections.

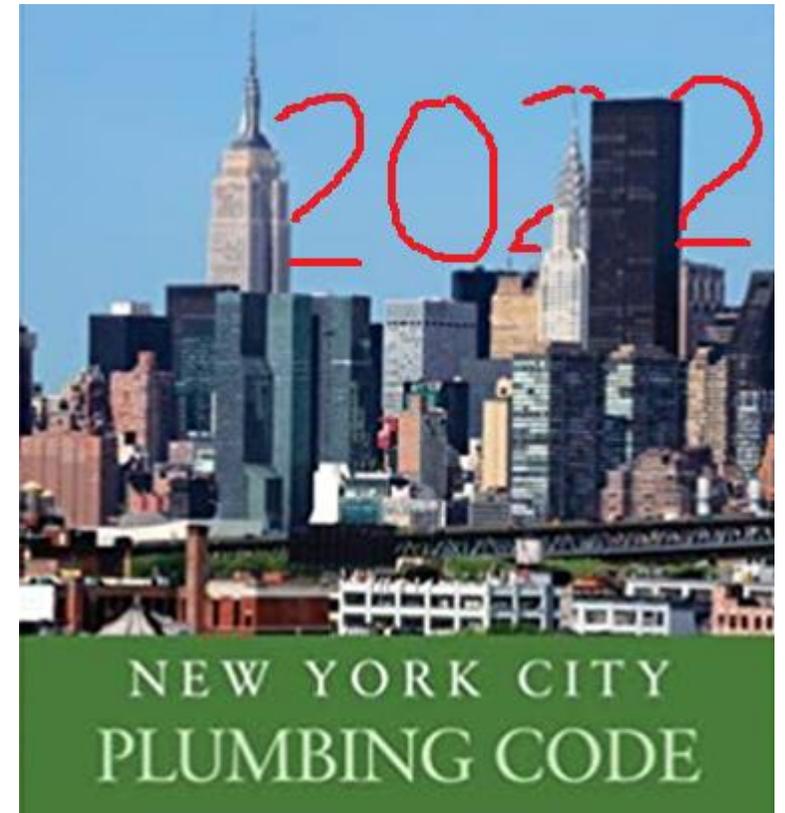
**D. CONNECTION INFO:**  
 Connection to existing  
 Spur  Riser  Curb Connection  
 Proposed New Riser  
 Fold Spur in  
 Drill in  
 M.H. Conn  Exist  Prop  
 Reuse Plugged Connections

**E. SEWER DATA:**  
1. P.D. Plan No. \_\_\_\_\_ Date Approved \_\_\_\_\_ Expiration Date \_\_\_\_\_  
2. Date Construction Permit Was Issued \_\_\_\_\_  
3. Date Sewer Was Accepted By DEP \_\_\_\_\_  
4. Sanitary Discharge Tributary to: \_\_\_\_\_ Location \_\_\_\_\_

Private Sewage Treatment Plant  No  Yes \_\_\_\_\_  
Private Pumping Station  No  Yes \_\_\_\_\_  
Private Sewer  No  Yes \_\_\_\_\_

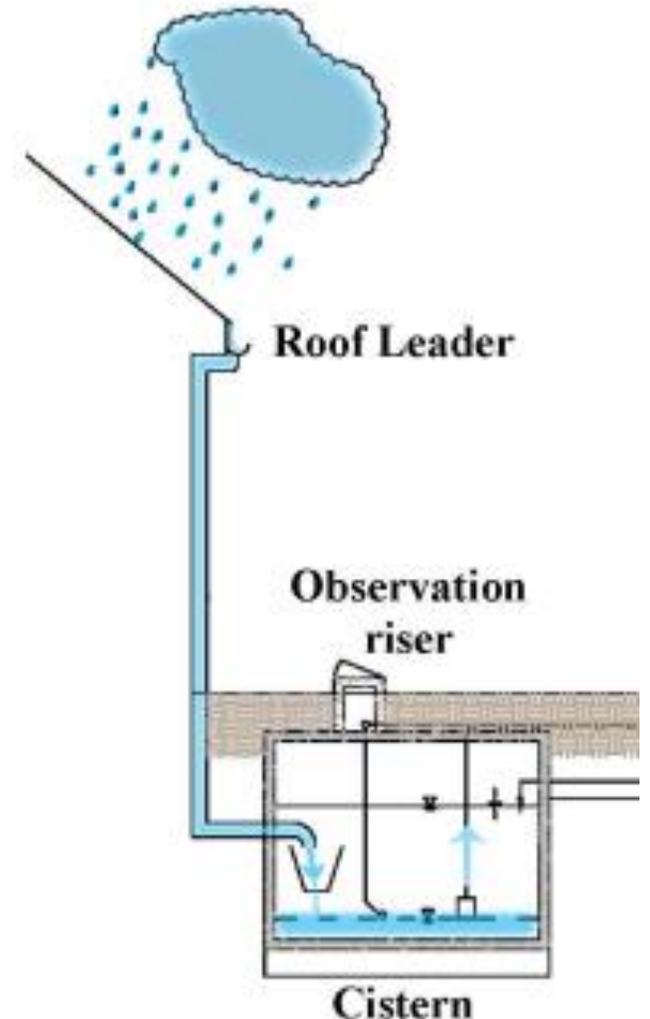
# 2022 BUILDING CODE

- **101.4.4 Plumbing.** The provisions of the New York City Plumbing Code shall apply to the installation, alteration, repair and replacement of plumbing systems, including equipment, appliances, fixtures, fittings and appurtenances, and where connected to a water or sewage system and all aspects of a medical gas system.
- Plumbing Code governs systems that capture, retain, detain, and utilize stormwater.



# 2022 PLUMBING CODE

- **CONDUCTOR.** A pipe inside the building that conveys storm water from the roof to a storm or combined building drain.
- **DETENTION SYSTEM.** A system that slows and temporarily holds rainwater or storm water runoff so that it can be released into the public sewer system at a controlled rate.
- **LEADER.** An exterior drainage pipe for conveying storm water from roof or gutter drains to an approved means of disposal.
- **RETENTION SYSTEM.** A system that captures rainwater or storm water runoff on site with no release.



Source: Texas Guide to Rainwater Harvesting

# 2022 PLUMBING CODE:

## *Chapter 11 – Storm Drainage*

- 1101 – General
- 1102 – Materials
- 1103 – Traps
- 1104 – Conductors & Connections
- 1105 – Roof Drains
- 1106 – Size of Conductors, Leaders & Storm Drains
- 1107 – Siphonic Roof Drainage Systems
- 1108 – Secondary (Emergency) Roof Drains
- 1109 – Combined Sanitary & Storm System
- 1110 – Controlled Flow Roof Drain Systems
- 1111 – Subsoil Drains
- 1112 – Building Subdrains
- 1113 – Sumps & Pumping Systems
- 1114 – Private Onsite Stormwater Disposal Systems



Source: <http://www.roofslope.com>

# 2022 PLUMBING CODE:

## Section 1101 - General

### ■ 1101.1 Scope.

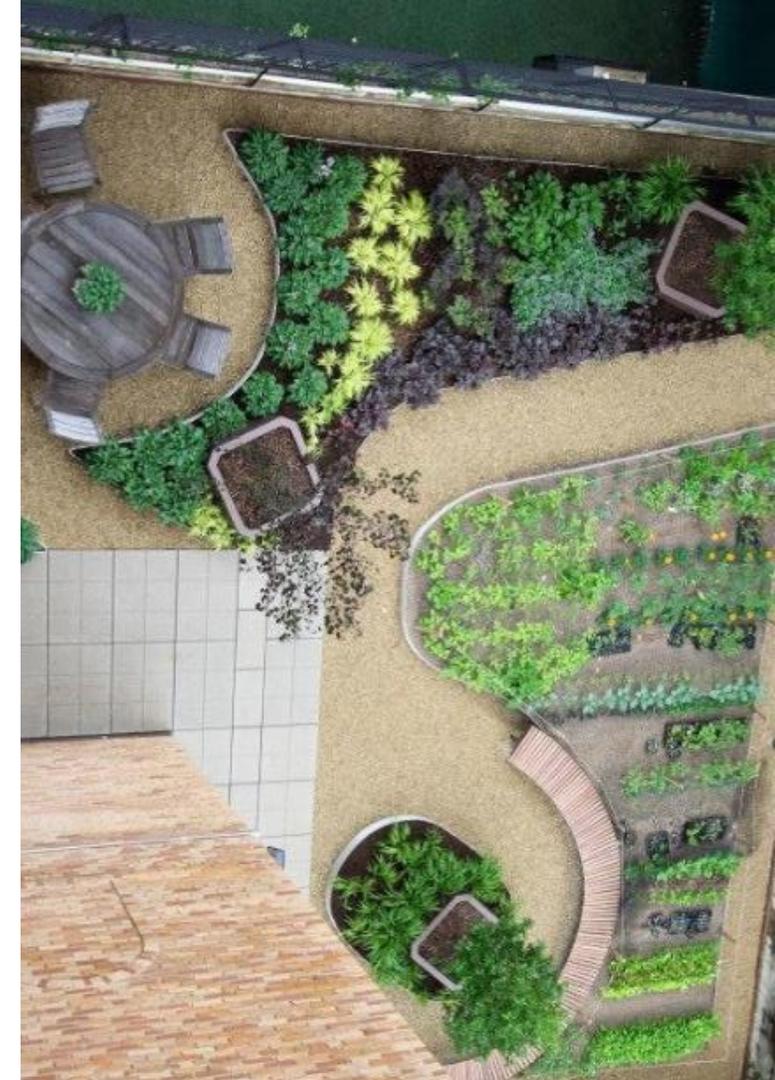
Provisions govern the materials, design, construction and installation of storm drainage. Storm discharge shall be in accordance with requirements of Department of Environmental Protection.

### ■ 1101.2 Where required.

Requires all roofs, paved areas, yards, courts and courtyards to drain into a separate storm sewer, combined sewer, or place of disposal approved by the commissioner & in accordance with DEP

### ■ 1101.3 Prohibited drainage.

Storm water cannot drain into dedicated sanitary sewer.



Source: NYC Stormwater Manual

# 2022 PLUMBING CODE:

## *Storm Drainage Requirements*

- **1101.7 Roof design.**

Roofs must be designed for the max. depth of ponding water, assuming primary drains are blocked.

- **1101.8 Cleanouts required.**

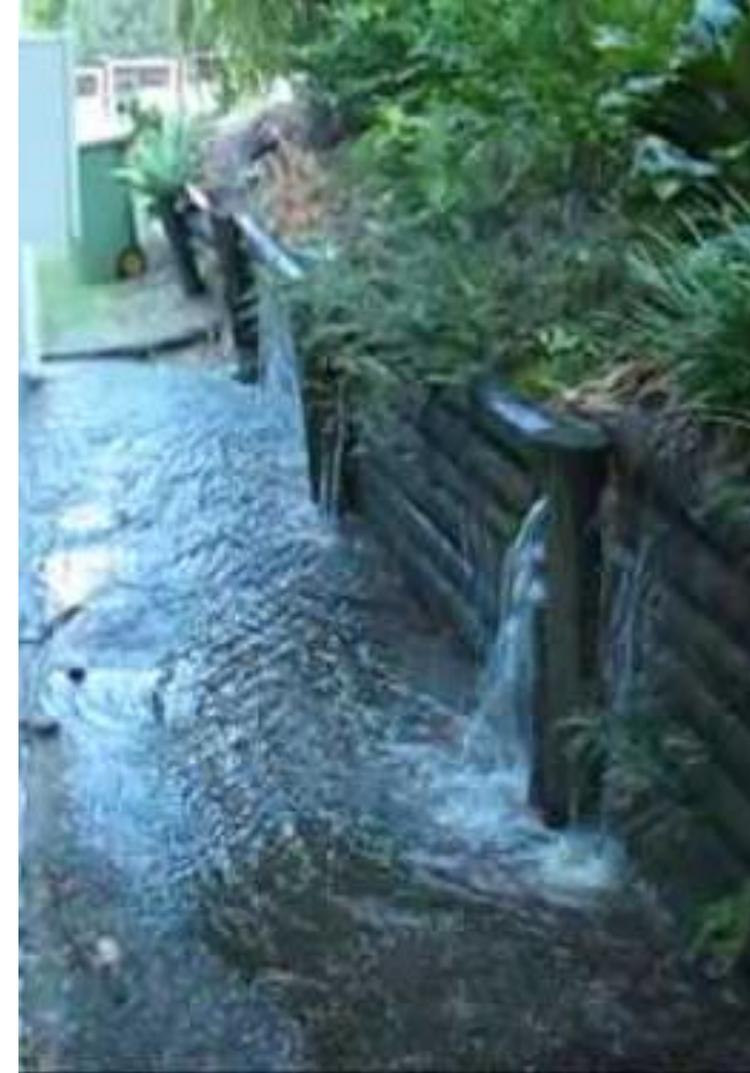
Except in subsurface systems, cleanouts are required.

- **1101.9 Backwater valves.**

Must be provided, in accordance with PC 715.

- **1101.12 Site grading.**

General prohibition on grading/land contouring that results in stormwater flowing on adjacent property and sidewalks.

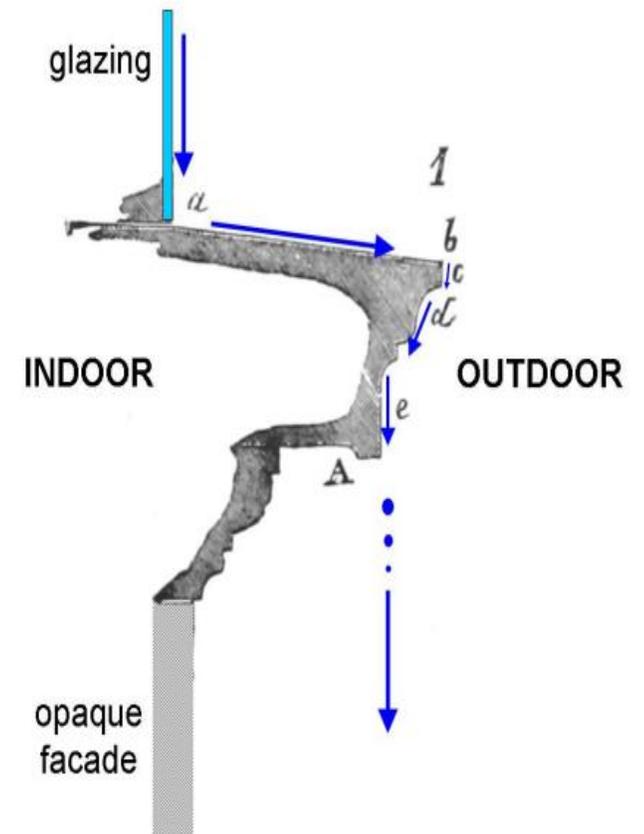


Source: <https://stormwatersydney.com>

# 2022 PLUMBING CODE:

## *Storm Drainage Design Considerations*

- **1104.3 Combining storm with sanitary drainage.**  
Sanitary & storm systems must be separate. Systems may be connected downstream of the building house trap only when connecting to a combined sewer. Storm connections must be at least 10ft downstream of any soil stack.
- **1105.2 Roof drain flow rate.**  
Storm drainage piping must be based on published roof drain flow rate & maximum anticipated ponding.
- **1106.4 Vertical walls.**  
Roof drains & piping must be sized to account for anticipated runoff from 1/4 the area of vertical walls.



Source: [http://www.urbanphysics.net/2013\\_BAE\\_Runoff\\_Review](http://www.urbanphysics.net/2013_BAE_Runoff_Review)

# 2022 PLUMBING CODE:

## *Detention/Retention System Requirements*

- **1101.5.1 Detention systems.**

Allows for the reduction in pipe sizing in the direction of flow but requires emergency overflow.

- **1101.5.2 Detention and retention tanks.**

Tanks must either be located above design flood elevation, or able to withstand static pressure during flooding.

- **1101.5.2.1 Emergency overflow.**

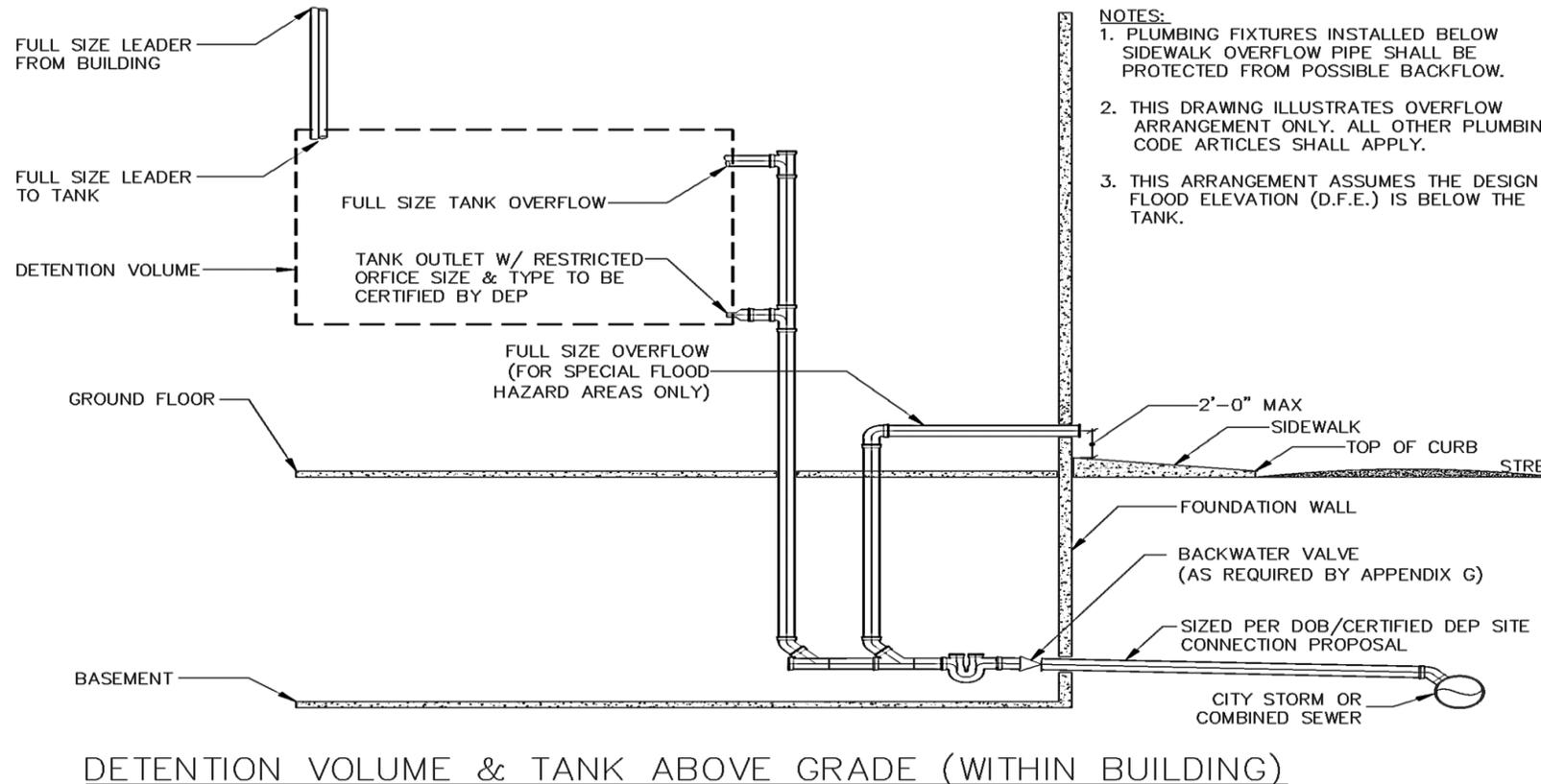
Overflow piping sized per incoming stormwater flow. Overflow & vent piping terminations must be above DFE and discharge into either the tax lot, or the public sewer

See Figures 1101.5.2.1(1), 1101.5.2.1(2) and 1101.5.2.1(3)



Source: NYC Stormwater Manual

# 2022 PLUMBING CODE: Overflow/Vent Configuration



**FIGURE 1101.5.2.1(1)**

# 2022 PLUMBING CODE: Overflow/Vent Configuration

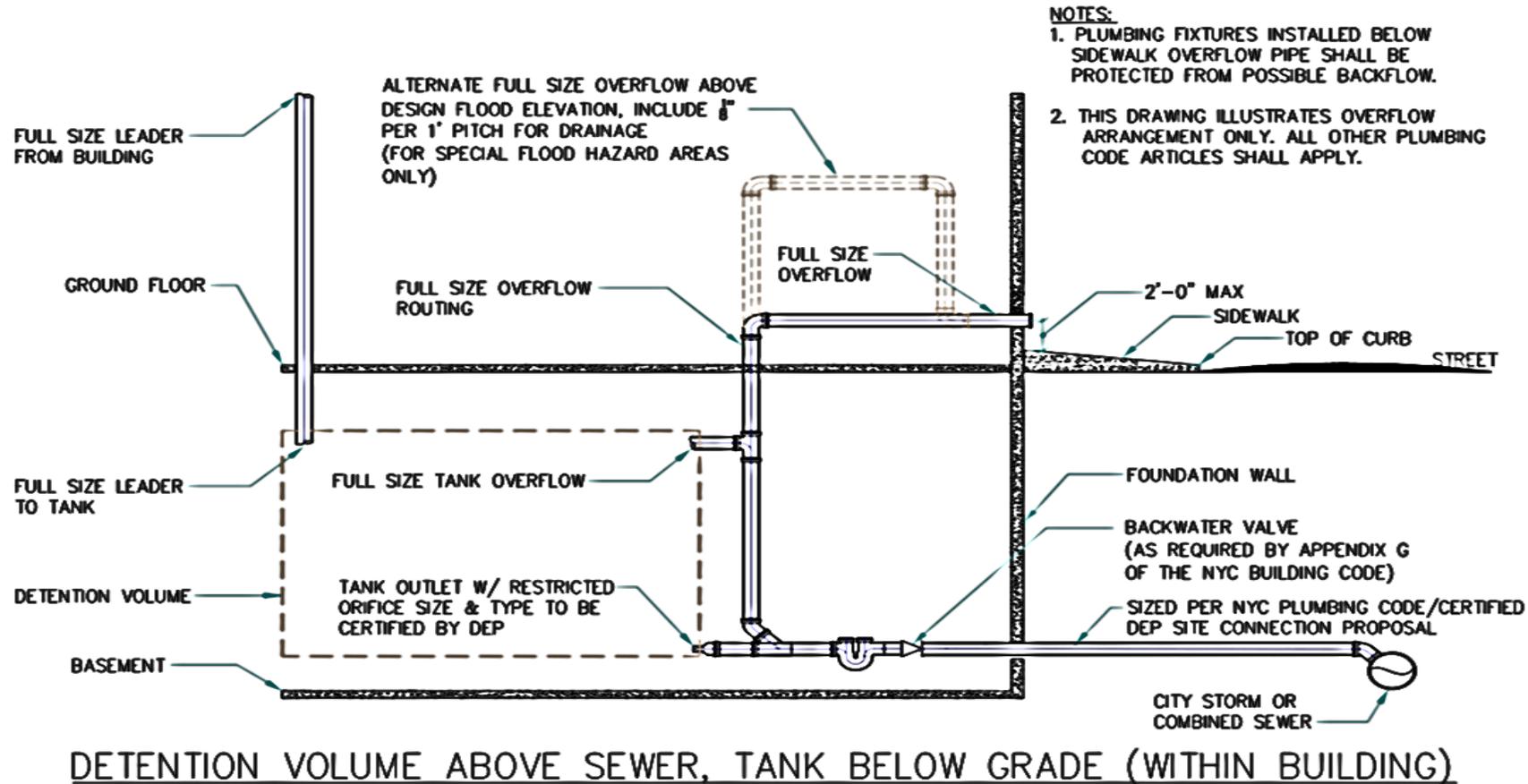


FIGURE 1101.5.2.1(2)

# 2022 PLUMBING CODE: Overflow/Vent Configuration

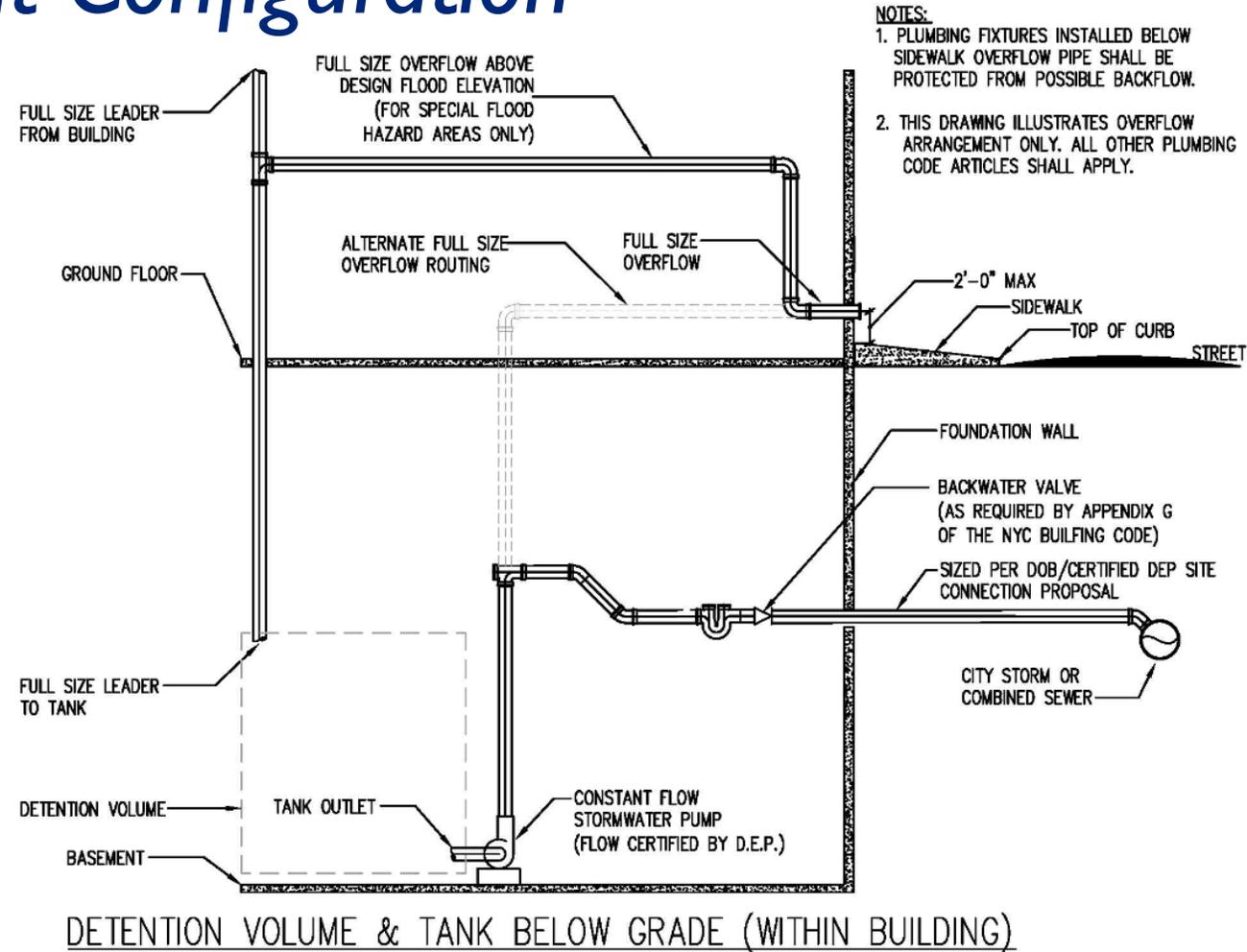


FIGURE 1101.5.2.1(3)

# 2022 PLUMBING CODE: SECTION 1110

## *Controlled Flow Roof Drain Systems (Blue Roofs)*

### ■ 1110.1 General.

Controlled flow system must be engineered based on design rainfall & roof must be designed for water storage loads.

### ■ 1110.2 Control devices.

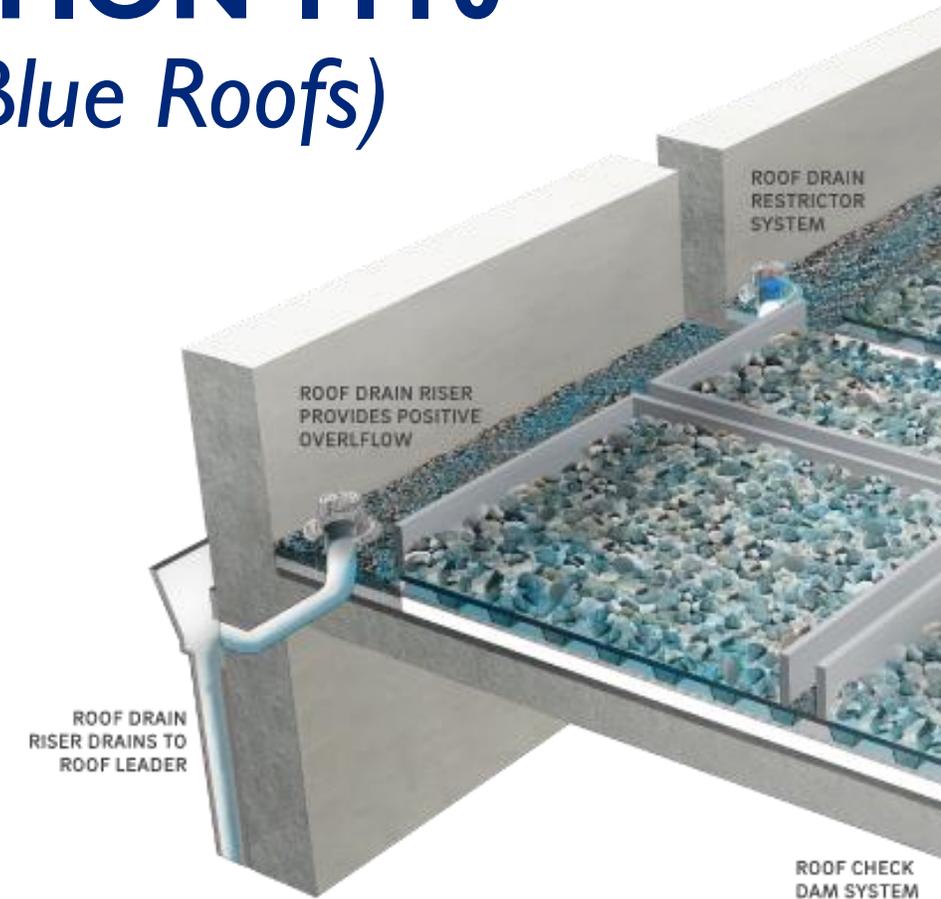
Control device installation must ensure compliance with DEP's permissible flow.

### ■ 1110.3 Installation.

Control devices must be protected by strainers.

### ■ 1110.4 Minimum number of roof drains.

At least 2 roof drains per 10,000 sf; at least 4 for roofs greater than 10,000 sf in area.



Source: <https://www.pwdplanreview.org/manual/chapter-4/4.6-blue-roofs>

# 2022 PLUMBING CODE: SECTION 1114

## *Private On-Site Stormwater Disposal System*

### ■ 1114.1 When permitted.

1. Connection to public sewer is either not available or not feasible; or 2. connection available, but disposal system is a condition of approval; or 3. for enlargements not more than 1,000 sf; or 4. limited to drinking fountains; or limited to foundation drainage.

### ■ 1114.1.2 Acceptable systems.

1. Drywells; 2. Gravel beds; 3. Perforated pipe; 4. Stormwater chambers that facilitate infiltration; and 5. Alternate method approved by DOB & DEP.

### ■ 1114.2 Field investigation.

Soil classification and infiltration capability must be determined prior to construction document approval. Investigation is subject to Special Inspection.

### ■ 1114.3.1 Runoff rate.

System must be designed based on rational method, with total site area and a rainfall intensity of 5.95" per hour.

### ■ 1114.3.1.1 Storage volume.

System storage volume must be measured 3' above water table, verified during site investigation.

### ■ 1114.4 Required components.

Systems must provide adequate storage, support surface uses, and allow for proper maintenance.



Source: NYC Stormwater Manual

# 2022 PLUMBING CODE:

## Chapter 13 – Nonpotable Water Systems

- 1301 – General
- 1302 – On-Site Nonpotable Water Reuse Systems
- 1303 – Nonpotable Rainwater Collection and Conveyance Systems
  - *Water from nonpotable systems must be collected, stored, treated, conveyed and used on the same tax lot.*
  - *Nonpotable water end use applications and requirements established by the Department of Health and Mental Hygiene.*

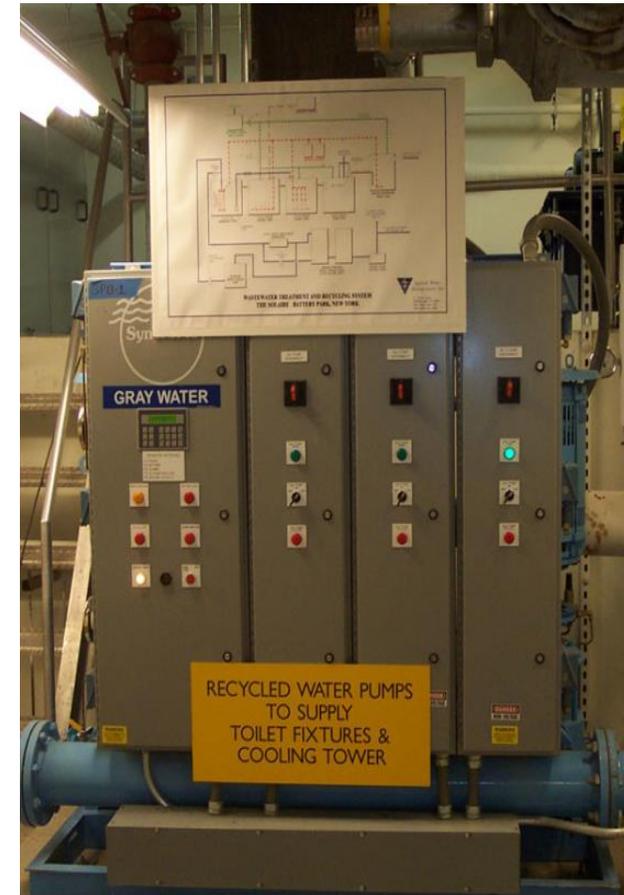


Source: Battery Park City Sustainability Plan

# 2022 PLUMBING CODE: SECTION 1303

## *Nonpotable Rainwater Collection & Conveyance Systems*

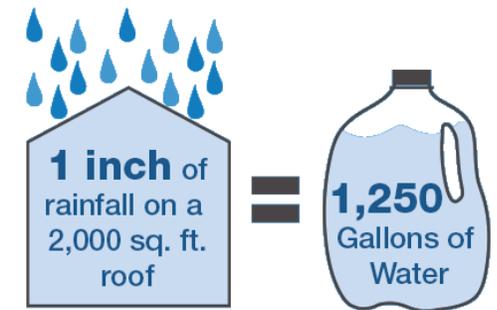
- **1303.2 Collection surface.** Water may only be collected from above ground surfaces. Runoff from parking is only permissible for landscape irrigation.
- **1303.3 Debris excluder.** System must be equipped with self-cleaning excluders to prevent contamination by sticks, leaves, etc.
- **1303.6 Drainage.** Waste from debris excluders & roof washers is excluded from sanitary drainage system.
- **1303.8 Filtration.** Water must be filtered for its intended use, per standards of Department of Health & Mental Hygiene (DOHMH).
- **1303.9 Disinfection.** Water must be disinfected for its intended use, per DOHMH.
- **1303.15 Tests and Inspections.** The system design and construction are subject to test and inspection by DOB. System operation subject to test and inspection by DOHMH.



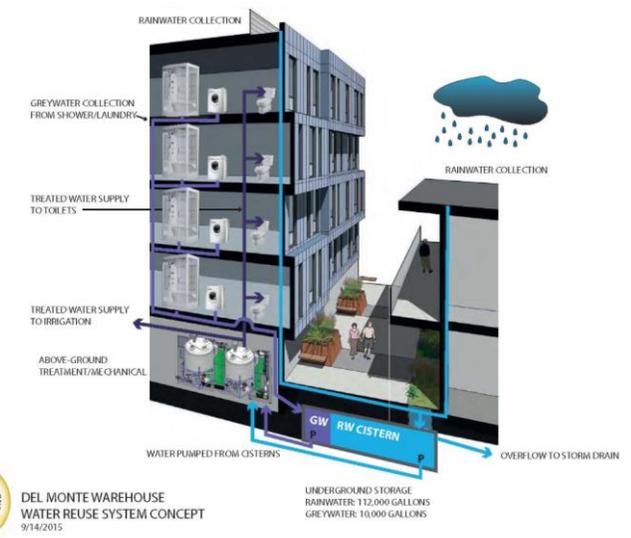
Source: <http://www.nsuwater.com>

# NYC'S STORMWATER OPPORTUNITY: Regulating Small Projects to Meet Big Challenge

- **Gray Infrastructure.** Drains, pipes, gutters, sewers, etc. which remove water from developed urban areas.
- **Green Infrastructure.** Mimics natural cycles to lessen the impact of stormwater pollution and flooding.
- **Detention.** Strategy which manages stormwater flow and levels the demand on storm systems.
  - Tanks
  - Blue roofs
- **Retention.** Strategy which prevents stormwater from entering public sewer and treatment systems.
  - Harvesting for onsite use in buildings
  - Green roofs



Source: <http://www.aquascapeinc.com>



Source: <http://www.ecologicalconcerns.com>

# GREEN ROOFS AND THE 2022 NYC BUILDING CODE

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# DEFINITION

- **2022 BC Chapter 15 (Roof Assemblies and Rooftop Structures)**
  - **Green Roof System.** “See definition for VEGETATIVE ROOF.”
  - **Vegetative Roof.** A system constructed in-situ consisting of either a roof assembly and additional landscape material components, including growing media, engineered soils, filter fabric, integral drainage systems and roof surface to facilitate the growth of vegetation or a pre-vegetated tray or trays no more than 6 inches (152 mm) high and assembled on top of a roof covering.

# GREEN ROOFS

- Green roofs have vegetation that absorbs rainwater, provides insulation, and combats the heat island effect, where urban environments have higher temperatures than surrounding areas.
- Because a green roof will add substantial weight to the structure of a building, a PE or RA must be hired to perform a structural analysis to determine if the existing roof and its support system can hold the added load without a modification.

# INFORMATION REGARDING INSTALLATION OF GREEN ROOF SYSTEMS

**NYC Buildings** Translate | Text-Size

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Code Development | **NYC Codes** | Code Notes | Reference

2022 Construction Codes

2014 Construction Codes

Energy Conservation Code

Electrical Code

Prior Codes

[Sustainability](#)

Code Tools

## Green Roofs

Green roofs have vegetation that absorbs rainwater, provides insulation, and combats the heat island effect, where urban environments have higher temperatures than surrounding areas.

Because a green roof will add substantial weight to the structure of a building, you must hire a Professional Engineer (PE) or Registered Architect (RA) to perform a structural analysis to determine if the existing roof and its support system can hold the added load without a modification.

### NYC Green Roof Property Tax Abatement Program

The design of a green roof must meet specific requirements to be eligible for property tax abatement. For example, it must have a layer of vegetation covering 50% of the rooftop. Sedum, or drought-resistant, live plants, must be spaced to cover at least 80% of this planted layer. Plus, a New York State licensed professional engineer (PE), New York State registered architect (RA), New York State licensed and registered landscape architect or horticulturist must prepare a four-year maintenance plan.



The design of a green roof must meet specific requirements to be eligible for property tax abatement. For example, it must have a layer of vegetation covering 50% of the rooftop. Sedum, or drought resistant, live plants, must be spaced to cover at least 80% of this planted layer. Plus, a New York State licensed professional engineer (PE), New York State registered architect (RA), New York State licensed and registered landscape architect or horticulturist must prepare a four-year maintenance plan.

#### BENEFITS

##### One-year Tax Abatement

- Standard Abatement: \$5.23 per square foot of green roof
- Enhanced Tax Abatement: \$15.00 per square foot of green roof

Maximum abatement: \$200,000 (a tax abatement that exceeds the total tax liability for one year may be applied within the succeeding five years)

#### REQUIRED ELEMENTS OF A GREEN ROOF TO QUALIFY FOR AN ABATEMENT

Include all of the following:

- Construction of any of the green roof requirements must have begun on or after August 5, 2008
- At least 50% of eligible roof space must be covered by the green roof
- A **vegetation layer**, at least 80% of which must be covered by live plants such as sedum or equally drought resistant and hardy plant species. The 80% coverage means spacing of plants in a manner that will cover 80% of the layer by the end of the compliance period (the year the tax abatement is granted.) A New York State licensed and registered architect, engineer, landscape architect or a horticulturist with a degree or certificate from an accredited training institute, must certify the vegetative layer.
- A **weatherproof and waterproof roofing membrane** compliant with NYC Construction and Fire Codes
- A **root barrier layer**
- A **drainage layer** designed so the drains can be inspected and cleaned
- A **filter or separation fabric**
- A **growth medium** including natural or simulated soil at least two inches in depth
  - If the depth of the growth medium is less than three inches, an **independent water holding layer** that is designed to prevent the rapid drying of the growth medium is also required, unless the green roof is certified not to need regular irrigation to maintain live plants.
- **Maintenance Plan** that includes:
  - Semi-annual inspection
  - Plans for plant replacement
  - Monthly inspections of drains; free from debris
  - Maintenance of green roof for a minimum of 4 years after the tax abatement is granted

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[Green Roofs - Buildings \(nyc.gov\)](https://www.nyc.gov/buildings/green-roofs)

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# STANDPIPE SYSTEMS

**905.3 Required installations.** Standpipe systems shall be installed where required by Sections 905.3.1 through 905.3.9 and ...

**905.3.8 Rooftop gardens, landscaped roofs and green roofs.** Buildings with a rooftop garden, landscaped roof, green roof, or roof used for any purpose other than weather protection or maintenance that are equipped with a standpipe system shall extend the standpipe system to the roof level on which the rooftop garden, landscaped roof, green roof, or roof used for any purpose other than weather protection or maintenance is located.

# EXTERIOR WALLS PERFORMANCE REQUIREMENTS

**1403.8 Bird friendly materials.** Bird friendly materials shall be required in accordance with Sections 1403.8.1 through 1403.8.4.

**1403.8.4 Adjacency to green roofs.** The exterior wall envelope, and any associated openings, installed adjacent to a green roof system on the same building shall be constructed with bird friendly materials up to 12 feet (3658 mm) above the walking surface.

November 27, 2020	<a href="#">Technical/ Buildings Bulletin 2020-022</a>  <a href="#">Bulletin Highlights</a>  <a href="#">Bird Friendly Building Design and Construction Requirements Guidance Document</a>	BC 107 BC 107.6 BC 1403.8 AC 28-101.4.3 AC 28-103.36	Clarify applicability, design and filing requirements necessary to show compliance with Local Law 15 of 2020.
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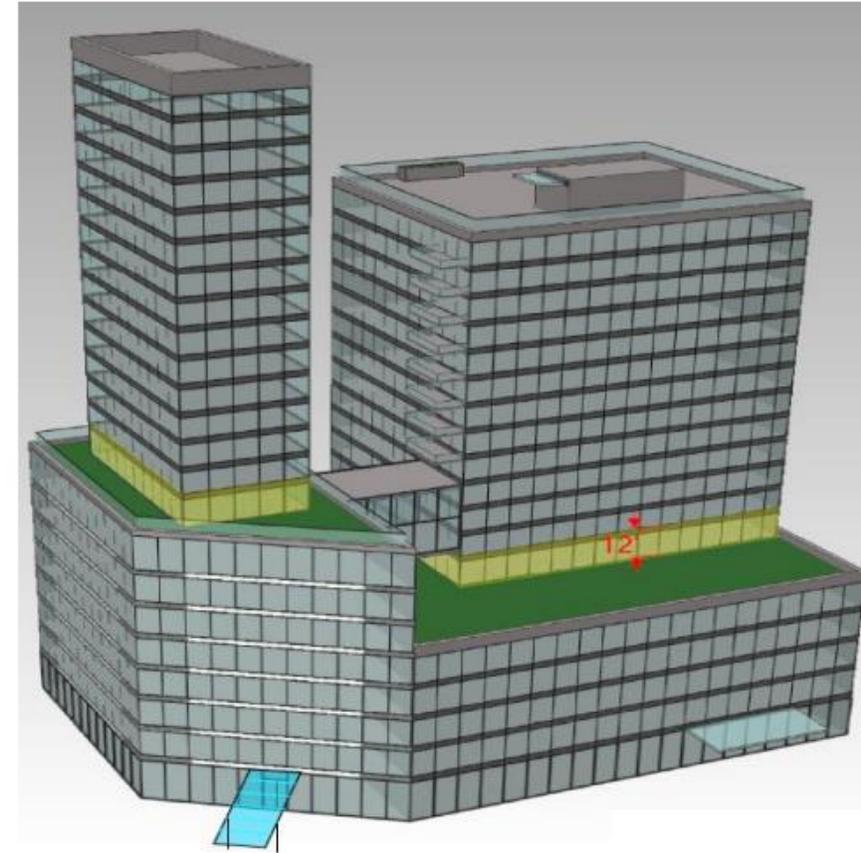


Figure 13. Adjacency to Green Roofs (Source: Alina Kurchenko of Vidaris, Inc.)

# REQUIREMENTS FOR ROOF COVERINGS

**1507.16 Vegetative roofs, roof gardens and landscaped roofs.** Vegetative roofs, roof gardens and landscaped roofs shall comply with the provisions of this section and New York City Fire Code.

**1507.16.1 Design standards.** Vegetative roofs, roof gardens and landscaped roofs shall comply with ANSI/SPRI RP-14 and ANSI/SPRI VF-1, or with FM DS 1-35.

*Exceptions:*

1. The aggregate area of landscaping materials or growth media or both on any single roof level of a building or structure is 250 square feet (23.2 m<sup>2</sup>) or less.
2. The roof area is 22 feet (6706 mm) or less from grade.
3. The [green] vegetative roof system is a container garden.



ANSI/SPRI RP-14 2016  
**Wind Design Standard For  
Vegetative Roofing Systems**

Approved September 9, 2016

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ANSI/SPRI VF-1  
**External Fire Design Standard for Vegetative Roofs**

Approved May 11, 2017

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1.0 Introduction ..... 2

# REQUIREMENTS FOR ROOF COVERINGS

**1507.16.2 Roof structure.** The roof structure shall comply with Chapter 16 for the design of the vegetative roofs, roof gardens and landscaped roofs.

**1507.16.3 Roof covering.** Roof covering shall comply with Section 1507.10, 1507.11, 1507.12, 1507.13, or 1507.15.

**1507.16.4 Slope.** The roofing membrane shall have a design slope in accordance with the roof covering utilized. Overburden shall be installed to prevent slippage tested as an assembly.

**1507.16.5 Structural fire resistance.** The structural frame and roof construction supporting the load imposed upon the roof by the vegetative roof, roof gardens or landscaped roofs shall comply with the requirements of Table 601.

# SUSTAINABLE ROOFING ZONE

**SUSTAINABLE ROOFING ZONE.** Areas of a roof assembly where a solar photovoltaic electricity generating system, a green roof system, or a combination thereof, is installed.

**1512.2 Sustainable roofing zone.** A sustainable roofing zone shall be required on 100 percent of the roof

[Buildings Bulletins 2019-010 - Technical \(nyc.gov\)](https://www.nyc.gov/buildings-bulletins-2019-010-technical)



New York City Department of Buildings  
280 Broadway, New York, NY 10007

Melanie E. La Rocca, Commissioner



## BUILDINGS BULLETIN 2019-010 Technical

**Supersedes:** None

**Issuer:** Joseph Ackroyd, P.E., CFM   
Assistant Commissioner, Technical Affairs & Code Development

**Issuance Date:** October 24, 2019

**Purpose:** This bulletin clarifies the green roof and solar requirements for new and existing buildings under Local Laws 92 and 94 of 2019 (LL 92/2019, LL 94/2019).

<b>Related Code/Zoning Section(s):</b>	AC 28-101.4.3	BC 1504.9
	BC 1511	FC 504.4
	BC 1502.1	FC 512
		FC 318

**Subject(s):** Green roof systems, vegetative roofs, solar photovoltaic systems, sustainable roofing zones.

### I. APPLICABILITY

Local Laws 92 and 94 of 2019 (LL 92/2019, LL 94/2019), effective November 15, 2019, amend the 2014 Administrative Code and Chapter 15 of the New York City Building Code to require, subject to certain exceptions, new buildings, new roofs resulting from enlargement of existing buildings, and existing buildings replacing an entire existing roof deck or roof assembly to be provided with a "sustainable roofing zone," 100 percent of which must be a solar photovoltaic electricity generating system, a green roof system, or a combination thereof.

# LIVE LOADS

**1607.13.3 Occupiable roofs.** Areas of roofs that are occupiable, such as vegetative roofs, roof gardens or for assembly or other similar purposes and marquees are permitted to have their uniformly distributed live loads reduced in accordance with Section 1607.11.

**1607.13.3.1 Vegetative and landscaped roofs.** The weight of all landscaping materials shall be considered as dead load and shall be computed on the basis of saturation of the soil as determined in accordance with Section 3.1.4, of ASCE 7. The uniform design live load in unoccupied landscaped areas on roofs shall be 20 psf (0.958 kN/m<sup>2</sup>). The uniform design live load for occupied landscaped areas on roofs shall be determined in accordance with Table 1607.1.

# ASCE 7 SECTION 3.1.4

## VEGETATIVE & LANDSCAPED ROOFS

- The weight of all landscaping and hardscaping materials shall be considered as dead load. The weight shall be computed considering both fully saturated soil and drainage layer materials and fully dry soil and drainage layer materials to determine the most severe load effects on the structure.

# NYC GREEN ROOF PROPERTY TAX ABATEMENT PROGRAM

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# OVERVIEW

- The design of a green roof must meet specific requirements to be eligible for property tax abatement.
- For example, it must have a layer of vegetation covering 50% of the rooftop. Sedum, or drought-resistant, live plants, must be spaced to cover at least 80% of this planted layer.
- Plus, a New York State licensed professional engineer (PE), New York State registered architect (RA), New York State licensed and registered landscape architect or horticulturist must prepare a four-year maintenance plan.

# BENEFITS

## One-year Tax Abatement

- Standard Abatement: \$5.23 per square foot of green roof
- Enhanced Tax Abatement: \$15.00 per square foot of green roof
- Maximum Abatement: \$200,000 (a tax abatement that exceeds the total tax liability for one year may be applied within the succeeding five years)

# REQUIRED ELEMENTS OF A GREEN ROOF TO QUALIFY FOR AN ABATEMENT

Include all of the following:

- Construction of any of the green roof requirements must have begun on or after August 5, 2008.
- At least 50% of eligible roof space must be covered by the green roof.
- A vegetation layer, at least 80% of which must be covered by live plants such as sedum or equally drought resistant and hardy plant species. The 80% coverage means spacing of plants in a manner that will cover 80% of the layer by the end of the compliance period (the year the tax abatement is granted.) A New York State licensed and registered architect, engineer, landscape architect or a horticulturist with a degree or certificate from an accredited training institute, must certify the vegetative layer.

# REQUIRED ELEMENTS OF A GREEN ROOF TO QUALIFY FOR AN ABATEMENT *(continued)*

- A weatherproof and waterproof roofing membrane compliant with NYC Construction and Fire Codes
- A root barrier layer
- A drainage layer designed so the drains can be inspected and cleaned
- A filter or separation fabric
- A growth medium including natural or simulated soil at least two inches in depth
  - If the depth of the growth medium is less than three inches, an independent water holding layer that is designed to prevent the rapid drying of the growth medium is also required, unless the green roof is certified not to need regular irrigation to maintain live plants.

# REQUIRED ELEMENTS OF A GREEN ROOF TO QUALIFY FOR AN ABATEMENT *(continued)*

- Maintenance plan that includes
  - Semi-annual inspection
  - Plans for plant replacement
  - Monthly inspections of drains; free from debris
  - Maintenance of green roof for a minimum of 4 years after the tax abatement is granted

# ENHANCED TAX ABATEMENT REQUIREMENTS

All of the preceding, and

- Construction of any of the green roof requirements must have begun on or after July 1, 2019 and concluded on or before June 30, 2024.
- Growth medium must be at least four inches
- The property must be located in a priority community district. Locate your community district at <https://communityprofiles.planning.nyc.gov/>

BOROUGH	PRIORITY COMMUNITY DISTRICT*
Bronx	1, 2, 3, 4, 5, 6, 11
Brooklyn	3, 4, 5, 8, 9, 16, 17
Manhattan	10

*\*As of August 2021. For the most updated list of priority community districts, visit the NYC Mayor's Office of Sustainability website at [nyc.gov/sustainability](https://nyc.gov/sustainability)*

# PROPERTY TAX ABATEMENT FILING REQUIREMENTS

A NYS registered architect or licensed professional engineer must submit the application to DOB through eFiling at [www.nyc.gov/dobefiling](http://www.nyc.gov/dobefiling).

- The architect or engineer must file with DOB a professionally certified Alteration Type 2 (ALT2) application selecting Directive 14 (D14) acceptance. The application for work related to the green roof property tax abatement must be filed as a separate application from any related New Building (NB) or Alteration application.
- The ALT2 application must only include work related to the green roof system.
- If the project requires an electrical work permit, the DOB NOW: *Build* electrical application must indicate **S - Sustainable Energy Installs** in the Work Description, Category of Work.
- Select both of the following items on the **PC1: Required Items Checklist Form** for professionally certified jobs, PTA3: Green Roof Tax Abatement Application and PTA3: Tax Abatement Eligibility Approval

***NOTE: Applications that do not have these two items selected will not be approved for a property tax abatement.***

# PROPERTY TAX ABATEMENT FILING REQUIREMENTS *(continued)*

- Submit the completed **Property Tax Abatement Application (PTA3) Form** at the same time as a request for construction sign-off.
  - The form must indicate if the property is located in a priority community district and thereby eligible for the Enhanced Tax Abatement.
  - The form must be signed and sealed by the architect/engineer and the property owner.
  - DOB must receive the completed PTA3 Form by March 15th in order to qualify for a tax abatement to take effect on July 1st of the same calendar year.

***NOTE: See the PTA3 Instructions for assistance in completing the form.***

DOB will review all documents and supporting information, and forward approved abatement applications to the NYC Department of Finance (DOF). DOF will review and, if appropriate, apply the requested tax abatement.

# CONSTRUCTION DRAWINGS & DOCUMENTS

The following information, prepared by an architect or engineer, must be included on construction drawings submitted to DOB for the installation of a green roof system.

- **Plot Plan** that indicates the location of the building on the lot, as well as front, side and rear yard dimensions, and include the Community District in which the property is located
- **Roof Plan** that indicates eligible roof space and green roof space with the net square footage of each, and location of rooftop equipment demonstrating access is provided for maintenance. Demonstrate or acknowledge that the installation does not obstruct fire fighting access if applicable.
- **Structural Analysis** that demonstrates the roof is capable of sustaining the added loads imparted by the green roof in a saturated condition.
  - Where the green roof is designed for live loads equal to or less than 20psf as per BC Section 1607.11.2.3 of the 2008 NYC Building Code a note stating the following should be present on drawings: “The green roof and its perimeter are not for human occupancy.”
  - Where a green roof is designed for live loads in accordance with table 1607.1 and Section 1607.11.2.2 of the 2008 NYC Building Code, whichever is greater, the note need not be present on design drawings.

# CONSTRUCTION DRAWINGS & DOCUMENTS *(continued)*

- **Roof Details** should be adequate to depict the construction of the roof. Where applicable details should include, but not be limited to:
  - Details showing any structural modification to support the green roof
  - Details showing typical structural connections
  - Details showing typical roof drains; and
  - Typical roof system, insulation and flashing details.
- **Green Roof Details** should have details of the installation showing conditions at terminations, transitions and penetrations
  - Layout for the internal drain conduit
  - A profiled schematic showing the thickness of all materials; and
  - Notes that include the species of vegetation (sedum or equally drought resistant species) planted and acknowledging live plants will cover 80% of the vegetation layer by the end of the compliance period.

***\*\*NOTE: Construction drawings are not required for green roofs of 4 inches or less. When construction drawings are not required, the application must still be filed by a NYS registered and licensed architect or engineer. In such cases, an architect or engineer must inspect and certify, based on a structural analysis of the existing building, that the roof without modification can support the green roof in a saturated condition.***

# POST-APPROVAL, CONTINUING REQUIREMENTS

- Maintenance of the green roof during compliance period
- Within 15 calendar days prior to the last day of the compliance period (the year the tax abatement is granted), an inspection of the green roof must be performed by an architect, engineer or landscape architect to certify its continuing compliance. An inspection report must be prepared by the inspecting professional and maintained on file for review by DOB upon request. If the green roof is not in compliance, the inspecting professional must notify DOB by email at [greenroofandsolar@buildings.nyc.gov](mailto:greenroofandsolar@buildings.nyc.gov)

# ADDITIONAL INFORMATION

For additional information on the Green Roof Tax Abatement Program, please review:

- [NYC Green Roof Property Tax Abatement Program Guide](#)
- [New York State Real Property Tax Law §§499-bbb](#)
- [1 RCNY 105-01](#)

The background of the image is a dark blue color. Overlaid on this background are several wireframe models of buildings, rendered in a lighter blue color. The wireframes show the structural grid of the buildings, including walls, floors, and roofs. The buildings are arranged in a perspective view, with some in the foreground and others receding into the background. The overall aesthetic is modern and architectural.

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