Green Area Ratio (GAR): Background, Administration & Process

THURSDAY

Photo credit: Oculus, Inc.

Upcoming Trainings

• Green Area Ratio

• Wednesday, July 25, 2018

• Stormwater– General Compliance

• Wednesday, June 13, 2018

• Using the Stormwater Database

- Friday, April 27, 2018
- Tuesday, June 19, 2018
- Thursday, July 26, 2018

• Stormwater Retention Credit (SRC) Generation

- Thursday, April 26, 2018
- Thursday, June 14, 2018
- Friday, July 27, 2018
- SRC Financial Return Calculator
 - Thursday, June 7, 2018
- Specialized BMP Design and Maintenance
 - Permeable Pavement: Thursday, May 3, 2018

Agenda

- About GAR
- Zoning Regulations Review
- Related Regulations
- Regulatory Triggers
- Administrative Process
- GAR Plan Development
- Permitting Process
- Landscape Elements & Submission Requirements
- Examples

ABOUT GAR

Green Area Ratio

What is it?

 A flexible green site design requirement established in 2013 that varies by zone.



Menu items may include...

- Permeable pavement
- Vegetated roofs
- Native ground cover
- Rain gardens
- Trees & shrubs
- Green facades

GAR: How does it work?

How to calculate:

- Add up landscape elements by number or size
 - # trees
 - Size of green roof
 - Size of rain garden
 - # of plants
 - Soil depths
- Divide by lot area
- = GAR score





Stackable Elements



GAR LANDSCAPE ELEIVIENTS	MULTIPLIER
Landscaped area (select one of the following for each area)	
Landscaped areas with a soil depth of less than 24"	0.3
Landscaped areas with a soil depth of 24" or more	0.6
Bioretention facilities	0.4
Plantings	
Ground covers, or other plants less than 2' tall at maturity	0.2
Plants at least 2' tall at maturity	0.3
Tree canopy for all new trees with mature canopy spread of 40' or less	0.5
Tree canopy for all new trees with mature canopy spread of 40' or greater	0.6
Tree canopy for preservation of existing trees 6" to 24" in diameter	0.7
Tree canopy for preservation of existing trees 24" diameter or larger	0.8
Vegetated wall, plantings on a vertical surface	0.6
Vegetated roofs	
Extensive vegetated roof over at least 2" but less than 8" of growth medium	0.6
Intensive vegetated roof over at least 8" of growth medium	0.8
Permeable paving	
Permeable paving over at least 6" and less than 2' of soil or gravel	0.4
Permeable paving over at least 2' of soil or gravel	0.5
Other	
Enhanced tree growth systems	0.4
Renewable energy generation (area of)	0.5
Water features (using at least 50% recycled water)	0.2
Bonuses	
Native plant species	0.1
Landscaping in food cultivation	0.1
Harvested stormwater irrigation	0.1

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Coordination of Design Across Landscape Elements	Soils & Amendments	Bioretention	New & Existing Planting	Tree Preservation	Vegetated Walls	Vegetated Roofs	Permeable Paving	Enhanced Tree Growth	Renewable Energy	Water Features	Native Plants	Food Cultivation	Harvested Stormwater Irrigation
Soils & Amendments													
Bioretention													
New & Existing Planting													
Tree Preservation													
Vegetated Walls													
Vegetated Roofs													
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Renewable Energy													
Water Features													
Native Plants													
Food Cultivation													
Harvested Stormwater Irrigation													

ZRR and Changes to GAR

- Zoning Regulations Review passed January 2016
- GAR regulation revisions became effective
 September 6, 2016 for building permit applications submitted after this date or as otherwise noted in regulation
- For additional information on transition: http://dcoz.dc.gov

RELATED REGULATIONS

GAR & Stormwater Overlap

Green Area Ratio Rule

- DCMR Chapter 11
- Requires a C of O
- No Maintenance Covenant
- Interior Renovations:
 - 100% construction cost trigger
- Area Calculations
- Design constraints maximizes healthy vegetation

Stormwater Rule

- DCMR Chapter 21
- Includes Public Right of Way
- Unrelated to C of O
- Maintenance Covenant Required
- Interior Renovations:
 - 50% construction cost trigger
- Volume Calculations
- Contributing Drainage Area
- Design constraints maximizes stormwater retention

Overlap: to achieve stormwater environmental benefits Landscape Elements often the same practices as LID BMPs

SWM BMPs vs Landscape Elements

Stormwater Best Management Practices	Landscape Elements
Bioretention	Only considers practice area
Vegetated Roofs (green roofs)	Assigns greater value based on depth
Permeable Paving	Only considers practice area
Rainwater Harvesting	Limited to irrigation
Tree Canopy (new and preserved)	Higher value, more variability
Land abstraction not a BMP	Ground cover plantings
May improve BMP or land abstraction	Soil depth for landscaping
Is it receiving stormwater runoff?	Green Walls
Is it receiving stormwater runoff?	Enhanced tree growth systems
Suggested not required	Native planting rewarded in scoring
Not considered	Food cultivation
Not consider unless a harvest demand	Water feature
Not considered	Renewable energy

Related Zoning Requirements

Pervious surface requirements Landscaping for parking lots





Pervious Surface Requirements

- In zones R-1 through R-4
- Applies when increasing existing lot occupancy by 10%+ or 25%+ for historic structures
- Pervious = grass; mulched groundcover; plants; trees; permeable pavers; and decks or porches

ZONE DISTRICT AND STRUCTURE	MINIMUM PERCENTAGE OF PERVIOUS SURFACE
R-1 through R-4 Public recreation and community centers	30%
R-l-A, R-l-B All other structures	50%
R-2 All other structures	30%
R-3 All other structures	20%

Landscaping for Surface Parking

- Minimum 10% of lot landscaped
- Landscape end islands of 9+ spaces
- Trees must be min. 2.5" DBH at planting
- Plant 4' from protective barriers
- Special exceptions if impracticable







REGULATION TRIGGERS & & ADMINISTRATIVE PROCESS

Involved Parties



Who does not have a GAR?

- Buildings that do not require a Certificate of Occupancy,
 - Single family residences
- Properties within R-, RF-, USN, STE, HE, WR-1, & WR-6
- DC Water wastewater treatment facilities.
- Interior renovations of existing buildings when
 - Located within the Central Employment Area,
 - 100 percent lot occupancy,
 - Existing roof not capable of supporting vegetated system, and
 - Proposed work does not result in a roof capable of supporting vegetated roof.
- Buildings or structures deemed "historic resources",
 - Except when additions increase the gross floor area by 50 percent.

Who does not have a GAR?



Exemption Form

https://doee.dc.gov/node/619622

GOVERNMENT OF THE DISTRICT OF COLUMBIA DEPARTMENT OF CONSUMER REGULATORY AFFAIRS



APPLICATION FOR EXEMPTION STATUS FROM D.C. ZONING REGULATION GREEN AREA RATIO

[APPLICANT TO FILL OUT]

I hereby request evidence of exemption from the Green Area Ratio (GAR) Subtitle C Chapter 6 of DCMR Title 11 for the proposed construction on the property identified below.

Address:

Square: _____ Lot: _____ Permit Number: _____

xemptions (CHECK ONE):	Required Signatures
le dwelling unit (Subtitle A §302.2); buildings otherwise not requiring a certificate of occupancy (Subtitle C .3).	OZA
property within a R-, RF-, USN, STE, HE, WR-1, and WR-6 Districts (Subtitle C §601.2).	OZA
cipal wastewater treatment facilities operated by DC Water and Sewer Authority (Subtitle C 5601.3(b)).	DCWater and OZA
ling(s) or structure(s) certified by the DC Inventory of Historic Sites, or State Historic Preservation Officer, as oric resource(s)", additions increase the gross floor area by less than 50 percent (Subtitle C §601.3(d), §601.7).	Historic and OZA
tions, interior renovations, or both are less than 100 percent of the assessed building value as set forth in the ds of the Office of Tax and Revenue as of the date of the building permit application (Subtitle C §601.3)	OZA
or Renovations: (a) Central Employment Area, (b)100 percent lot occupancy, (c) existing roof not capable of orting vegetated system, and (d) proposed work does not result in a roof capable of supporting vegetated roof. c all four conditions are required for this exemption), (Subtitle C §601.3).	Structural and OZA
	xemptions (CHECK ONE): le dwelling unit (Subtitle A §302.2); buildings otherwise not requiring a certificate of occupancy (Subtitle C .3). oroperty within a R-, RF-, USN, STE, HE, WR-1, and WR-6 Districts (Subtitle C §601.2). cipal wastewater treatment facilities operated by DC Water and Sewer Authority (Subtitle C §601.3(b)). ling(s) or structure(s) certified by the DC Inventory of Historic Sites, or State Historic Preservation Officer, as orice resource(s)", additions increase the gross floor area by less than 50 percent (Subtitle C §601.3(d), §601.7), ions, interior renovations, or both are less than 100 percent of the assessed building value as set forth in the ds of the Office of Tax and Revenue as of the date of the building pernit application (Subtitle C §601.3) or Renovations: (a) Central Employment Area, (b)100 percent for occupancy, (c) existing roof not capable of ring vegetated system, and (d) proposed work does not result in a roof capable of supporting vegetated roof. c: all four conditions are required for this exemption), (Subtitle C §601.3).

Applicant Name:

Signature:

Address:

Date: Phone:

[FOR DCRA USE ONLY]

DCRA STRUCTURAL I find there is sufficient evidence the existing roof for the property is NOT capable of supporting a vegetated system.

I find there is sufficient evidence the proposed work will NOT result in a roof capable of supporting a vegetated system.

This review does not constitute an interpretation of zoning or building codes and does not entitle the applicant to any relief not authorized by zoning or building code officials pursuant to the applicable codes.

innature:	Printed Name:	Dates
signature:	r runeu wanie.	Dalei

STATE HISTORIC PRESERVATION OFFICER

I hereby certify that this property is either a historic landmark or a building or structure contributing to the character of a historic district listed in the D.C. Inventory of Historic Sites. This certification does not constitute an interpretation of zoning or building codes and does not entitle the applicant to any relief not authorized by zoning or building code officials pursuant to the applicable codes.

Signature:	Printed Name:	Date:
OFFICE OF ZONING ADV	INISTRATOR ONLY [Exemption Categories—Subtitle C §	601]
R and RF zoning d	istrict	
Municipal wastewa	ater treatment facilities operated by DC WASA	
Additions will NO Additions, and/or i	T result in an increase to the gross floor area by more than 50 per nterior renovations will NOT exceed 100 percent of the assessed	rcent (Historic Site) building value
Signature:	Printed Name:	Date:
DC WATER AND SEWER I hereby certify that this prope not constitute an interpretatio code officials pursuant to the	AUTHORITY OFFICER ty is a municipal wastewater treatment facility operated by DC 1 a of zoning or building codes and does not entitle the applicant to applicable codes.	Water & Sewer Authority. This certification does o any relief not authorized by zoning or building
Signature:	Printed Name:	Date:

DCRA, 1100 4th Street, SW, Suite E650 Washington, DC 20024 phone 202-442-4400 fax 202-442-9445

Transition Period: No GAR

- Building Permit Filed prior to October 1, 2013,
 - DCRA officially accepted as being complete.
- Building Permit Filed on or after October 1, 2013,
 - Unexpired approval, provided the vote to approve occurred prior to October 1, 2013,
 - A first stage, second stage, or consolidated planned unit development,
 - A variance, special exception, design review under the CG or SEFC overlay, or
 - A concept design by the Historic Preservation Review Board or Commission of Fine Arts.

Transition Period: No GAR

- Building Permit Filed on or after October 1, 2013,
 - Unexpired approval granted after October 1, 2013, provided a public hearing occurred prior to October 1, 2013,
 - A variance, special exception, or design review under the CG or SEFC overlay.
 - Unexpired approval granted after October 1, 2013, provided a set down for a public hearing occurred prior to October 1, 2013,
 - A first stage, second stage, or consolidated planned unit development.

Exemption Form

GOVERNMENT OF THE DISTRICT OF COLUMBIA DEPARTMENT OF CONSUMER REGULATORY AFFAIRS



APPLICATION FOR EXEMPTION STATUS FROM D.C. ZONING REGULATION GREEN AREA RATIO BASED ON TRANSITION PERIOD FILING STATUS

I hereby request evidence of a transition period exemption from the Green Area Ratio (GAR) Subtitle C, Chapter 6 of DCMR Title 11 for the proposed construction on the property identified below.

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Square: _____Lot:____Building Permit #.__

Allowable Transition Period Exemptions (CHECK ONE):

l.	Building Permit filed prior to October 1 st , 2013.
	Unexpired approval of a first stage, second stage, or consolidated planned unit development (PUD) when vote to approve occurred before October 1 ⁴ , 2013.
	Unexpired approval of a variance, special exception, design review under the CG or SEFC overlay when vote to approve occurred before October 1 ⁴ , 2013.
	Unexpired approval of a concept design by the Historic Preservation Review Board or Commission of Fine Arts when vote to approve occurred before October 1 ⁴ , 2013.
	Unexpired approval of a variance, special exception, design review under the CG or SEFC overlay when a public hearing occurred before October 1 st , 2013.
	Unexpired approval of a first stage, second stage, or consolidated planned unit development (PUD) when public hearing occurred before October 1 st , 2013.
	Property is not exempt from GAR. The applicable zone is, and the minimum required score is, The lot area is, source feet

NOTE: When impervious surface or lot occupancy is increased by 20 percent or more, that increase is not covered under this exemption. The GAR is applied to the modification.

Applicant	Telephone
Address	
Signature	Date
ZONING OFFICE USE ONLY Building Permit submitted prior 10/01/2013. PUD vote prior 10/01/2013. PUD with public hearing prior 10/01/2013. Variance, special exception, or design review under the CG or SEI Historic Preservation Review Board or Commission of Fine Arts v Property is not exempt from GAR. The applicable zone is	FC overlay vote prior 10/01/2013. FC public hearing prior 10/01/2013. rote prior 10/01/2013. and the minimum required score is

Office of Zoning Administrator

Transition Period: Reduced GAR

- Building Permit Filed on or after October 1, 2013 but no later than July 14, 2014,
 - A Large Tract Review (LTR) completed prior to July 1, 2012,
 - Application consistent with conditions of LTR,
 - GAR equals 0.1 or greater,
 - independent of zone district.

Campus Plan

- College or university proposing new building or addition to existing building
 - Demonstrates the extent to which GAR is met
 - Reviewed by the Zoning Commission

Reduced GAR

- A special exception from the Board of Zoning Adjustment (BZA) may be granted if the application meets sustainability goals through means outside the scope of the GAR.
- Full or partial reduction in GAR score requirement
- Upload BZA Order with reduced GAR requirements to the stormwater database
- 6 month process

Who has a GAR?

- All New Buildings that require a Certificate of Occupancy (C of O).
 - Submit during the Foundation-to-Grade (FD) or Civil (BCIV) permit application
- Additions and Interior Renovations to existing buildings,
 - When the construction cost exceeds 100% of the assessed building value within any 12 month period.
 - A "historic resource" with a 50 percent (or more) increase to the gross floor area.
 - Submit during the Building (B) permit application

GAR Required by Zone District: Effective September 6, 2016

Zone District	Green Area Ratio
RA-1, RA-2, RA-6, RA-7, RA-8 RC-1; WR-2, WR-3, WR-4, WR-5, WR-7, WR-8	0.40
RA-3, RA-4, RA-5, RA-9, RA-10 MU-1, MU-2, MU-3, MU-4, MU-5, MU-6, MU-12, MU-13, MU-14, MU- 15, MU-16, MU-17, MU-18, MU-19, MU-23, MU-24, MU-25, MU-26, MU-27, NC-1, NC-2, NC-3, NC-4, NC-5, NC-7, NC-9, NC-10, NC-11, NC-14, NC-16, NC-17 SEFC-2, SEFC-3, CG-1, CG-2, RC-2, RC-3 ARTS-1, ARTS-2, D-2, CG-5	0.30
MU-7, MU-8, MU-28 NC-6, NC-8, NC-12, NC-13, NC-15, ARTS-3	0.25
MU-9, MU-10, MU-20, MU-21, MU-22, MU-29 D-3, D-4 , D-5, D-1-R, D-4-R, D-5-R, D-6, D-6-R, D-7, D-8 SEFC-1, CG-4, ARTS-4, CG-3	0.20
 PDR (all lots unless otherwise noted): Lot with principal building that is one (1) story in height Lot with principal building that is two (2) stories in height 	0.30 0.10 0.20

Helpful reference for property summary: propertyquest.dc.gov/

PQ 1200 first st ne		Ownership and Taxes			
		Tax lot	0672 0856		
Basic Information		Premises	1200 1ST ST NE		
1200 1ST STREET NE		Owner	VEF-VN CAPITOL PLAZA I LLC		
SSL (Square, Suffix & Lot)	0672 0856		5530 WISCONSIN AVE STE 1000		
Lot type	tax lot		CHEVY CHASE, MD 20815-4330		
Ward	Ward 6	Use	Commercial-Office-Large		
ANC	ANC 6C	Land area	34405 square feet		
SMD	SMD 6C06	Tax class	Commercial, industrial		
Neighborhood Cluster	Cluster 25	Tax rate	n/a		
Police District Fifth Police District		Current assessmen	Current assessment (2016)		
Police Service Area	PSA 501	land	\$16 101 540		
Voting Precinct	Presinet 83	improvemente	\$147.076.940		
Zoning	D-5	Improvements	\$147,070,840		
Downtown subarea	NoMa	total	\$163,178,380		
2010 census tract	106	Proposed assessme	ent (2017)		
2010 census block group	2	land	\$16,101,540		
2010 census block	2023	improvements	\$136,528,090		
No historic resources noted.		total	\$152,629,630		

Definitions...

- Addition and interior renovation of existing building structure
 - Extension or increase in floor area or height.
 - Alteration, renovation or repair to the interior of the existing structure.
- Assessed value of the building, not including the land value
 - Office of Tax and Revenue records.
 - Date of the building permit application.
- Construction cost for an addition, alteration, or repair
 - Amount indicated by the applicant in the building permit application (Contract Agreement Form).
- Historic resource is a building or structure,
 - Certified by the DC Inventory of Historic Sites or State Historic
 Preservation Officer .

GAR Plan Development

GAR Plan Development

- Do you know the project boundaries?
- Have you hired a Landscape Expert?
- Do you know the score for your zone?
- Design considerations,
 - Stormwater obligations.
 - Energy goals.
 - Green building standards.

GAR Plan Development: Project Boundaries

- Based on the property's **Record Lot** boundary
 - If separated into tax lots, show how the whole record lot and each tax lot comply with GAR
- Multiple/phased lots within one permit
 - Each lot must meet its GAR score
 - Checklist sign-off occurs at each phase completion
- Multiple zones in one lot
 - Each zone must meet score, but whole lot may be used
 - Confirmed by OZA
- Lots with historic structures
 - The addition exceeds 50% of the existing gross floor area
 - The historic structure's footprint is excluded from lot area

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Lot type	tax lot		CHEVY CHASE, MD 20815-4330
Ward	Ward 6	- Vee	Commercial Office Large
ANC	ANC 6C	Land area	34405 square feet
SMD	SMD 6C06	lax class	Commercial, industrial
Neighborhood Cluster	Cluster 25	Tax rate	n/a
Police District	Fifth Police District	Current assessment (2016)	
Police Service Area	PSA 501	lond	\$16 101 540
Voting Precinct	Precinct 83		\$10,101,540
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GAR Plan Development

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GAR Plan Development: Who is a Landscape Expert?

- Certified Landscape Expert is:
 - Maryland or Virginia Licensed Landscape Architect
 - International Society of Arboriculture (ISA)
 Certified Arborist
 - Maryland Certified Professional Horticulturist
 - Landscape Contractors Assoc. MD-DC-VA certified
 Landscape Technician

GAR Plan Development

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No historic resources noted.		total	\$152,629,630			

D-5 Floor Area Ratio (max,) ^{1,2} Height (ft,)? Penthouse Height (ft,)/Stories Lot Occupancy (percentage) ³ Rear Setback (ft,) Side Setback (ft,) Green Area Ratio Zoning Regulatic Reference None 130 (fronts on right-of-way of at least 110 ft,) 20 20 20 25 in, per 1 ft, of vertical distance from the mean finished grade at the middle of the structure to the highest point of the main roof or parapet, but not less than 12 ft. If provided, a least 2 in. wide for each 1 ft, of height of building but less than 0.20 0.20 Subtitle Chapter										
Floor Area Ratio (max)1.2Height (ft.)2Penthouse Height (ft.)/StoriesLot Occupancy (percentage)3Rear Setback (ft.)Side Setback (ft.)Green Area RatioZoning Regulatio Reference100130 (fronts on right-of-way of at least 110 ft.)130 (fronts on right-of-way of at least 100 ft.202020202020202020202020202020202020202020202020202020202020202020202020202020202020202020202020202020202020202020202020202020202020202020202020202020202020202020202020202020202020202020202020202020202020202020202020202020202020202020202020202020202020202020202020202020202020202020202020202020 <th></th> <th></th> <th></th> <th></th> <th></th>										
D-5 $ \frac{130 (fronts on right-of-way of at least 110 ft.)}{120 (fronts on right-of-way of at least 100 ft.)} = 120 (fronts on right-of-way of at least 100 ft.) = 120 (fronts on right-of-way of at least 100 ft.) = 110 (fronts on 130 ft.) = 110 (fronts on right-of-way of at least 90 ft.) = 110 (fronts on right-of-way of at least 90 ft.) = 110 (fronts on right-of-way of at least 90 ft.) = 110 (fronts on right-of-way of at least 90 ft.) = 110 (fronts on right-of-way of at least 90 ft.) = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20 = 0.20$		Floor Area Ratio (max.) ^{1, 2}	Height (ft.) ²	Penthouse Height (ft.)/Stories	Lot Occupancy (percentage) ³	Rear Setback (ft.)	Side Setback (1	:.)	Green Area Ratio	Zoning Regulation Reference
None120 (fronts on right-of-way of at least 100 ft. but less than 130 ft.)120 (fronts on right-of-way of at least 100 ft.2.5 in. per 1 ft. of vertical distance from the mean finished grade at the middle of the structure to the highest point of the main roof or parapet, but not less than 12 ft.If provided, a least 2 in. wide for each 1 ft. of o.20Subtitle SubtitleD-56.5 (non- residential)1 plus mezzanine; Second story permitted for penthouse100100If provided, a least 2 in. wide for each 1 ft. of permitted for permitted for perthouse mechanical space0.20Subtitle Chapter			130 (fronts on right-of-way of at least 110 ft.)	20						
D-5 $ \begin{array}{c c} 110 (fronts on right-of-way of at least 90 ft. but less than 120 ft.) \\ 90 (historic landmark or contributing let the or industry of the main roof or parapet, but not less than 12 ft. \end{array} $		None	120 (fronts on right-of-way of at least 100 ft. but less than 130 ft.)			2.5 in. per 1 ft. of vertical distance from the mean finished grade at	If provided, a			
a historic district)	D-5	6.5 (non- residential)	110 (fronts on right-of-way of at least 90 ft. but less than 120 ft.) 90 (historic landmark or contributing building within a historic district)	1 plus mezzanine; Second story permitted for penthouse mechanical space	100	the middle of the rear of the structure to the highest point of the main roof or parapet, but not less than 12 ft.	for each 1 ft. d height of buildi but no less that ft.	f ng 5	0.20	Subtitle I, Chapter 5

GAR Plan Development

- Do you know the project boundaries?
- Have you hired a Landscape Expert?
- Do you know the score for your zone?
- Design considerations,
 - Stormwater obligations.
 - Energy goals.
 - Green building standards.

Permitting Process

Process - Development to Submittal

Project Applicant determines GAR applicability

Plan development

Request BZA special exception (as necessary)

CLE signs off on plans for approval

Plans submitted to DCRA and uploaded to stormwater database

Plan Submittals

- Synergy with stormwater and ESC plan submittals
- doee.dc.gov/swtraining



Intake Process



DOEE Review within DCRA Permit Process

• Minor projects may be reviewed in ProjectDox, Database entry still required

DOEE Stormwater Database (https://doee.dc.gov/swdb)

Provide site and plan information for DOEE review of DCRA permit applications for:

- Stormwater Management (SWMPs)
- Soil Erosion and Sediment Control (ESC)
- Green Area Ratio (GAR)

DOEE Plan Review



DOEE Plan Review





Pourport Turo	Poumont Poquiromont	Fees by Land Disturbance Type or Building Footprint				
Payment Type	Payment Requirement	≤10,000 ft²	>10,000 ft ²			
Initial*	Due upon filing for building permit	\$593.55	\$877.43			
Final	Due before building permit is issued	\$129.03	\$206.45			
Supplemental	For reviews after first resubmission	\$516.13				

-*Initial fee includes 1 hour pre-development meeting. Additional meetings are charged an hourly rate of \$72.26.

-DOEE Stormwater Management Regulations - Chapter 5, DCMR Title 21 § 501.10 - Fees adjusted annually for inflation - fees above effective April 21, 2017

Plan Revisions After Approval

An additional review is required if:

Reduce plant quantity

Change location of landscape element

Species substitution

Decrease in GAR score

Process – Approval to C of O

DOEE reviews and approves the GAR Plan

CLE oversees installation of GAR landscape elements

CLE / DOEE inspect site and sign Landscape Checklist

OZA receives Landscape Checklist and issues C of O

Property Owner maintains GAR landscape elements

Construction

Landscape Expert confirms installation as per plan







GOVERNMENT OF THE DISTRICT OF COLUMBIA DISTRICT DEPARTMENT OF ENVIRONMENT WATERSHED PROTECTION DIVISION/INSPECTION & ENFORCEMENT BRANCH

Green Area Ratio - Landscape Checklist

I,			, declare as follows:
Fu	II Name of Certifie	d Landscape Ex	pert (Printed)
🗖 I instal	am a Certified Lan llation of the appro	dscape Expert, wed landscape	as defined in DCMR Title 11, Chapter 34, responsible for confirming plan for development located at:
	Street Address	s (Printed)	, Washington, DC, and developed pursuant to:
	Building Permi	it Number	DDOE Plan Number
	Ward	Lot	Square

The landscape elements shown on the DDOE-approved landscape plan or DDOE-approved modification for this property have been installed as approved and in a manner consistent with the standards of 11 DCMR Chapter 34. This includes the number size, and approximate location of plantings and other approved landscape elements.

Any changes or species substitutions (if applicable) have been approved by DDOE.

A completed Landscape Maintenance Plan has been submitted to the property owner.

I declare under penalty of perjury under the laws of the District of Columbia that the following is true and correct.

Signature of Certified Landscape Expert

Certification/Registration Number Date

NOTE: If any landscape elements have been changed during installation, DO NOT SIGN OR SUBMIT this checklist until a revised landscape plan has been approved by the District Department of Environment. If you provide false information in this document, you will subject yourself to criminal liability.

[TO BE COMPLETED BY DDOE INSPECTOR]

Document received b	y: Inspector Signature	Printed Name	Date
DDOE (WHITE)	OWNER/AGENT (YELLOW)	LANDSCAPE EXPERT (GOLDENROD)	INSPECTOR (PINK)

Temporary Certificate of Occupancy

- Apply to Office of Zoning Administrator
- Granted only twice, each time for 4 months.
- Considered by the DOEE inspector under the following conditions:

Weather

Seasonal restrictions

Site construction

Post-Construction Maintenance

Property owner responsible after granted Certificate of Occupancy

Follow landscape maintenance plan provided by Certified Landscape Expert

Must maintain GAR score

GAR plan submittal to DCRA not required after Landscape Checklist signed-off

LANDSCAPE ELEMENTS & SUBMISSION REQUIREMENTS

General Submission Requirements

Minimum Submittal Requirements:

- Completed GAR Scoresheet
- Completed GAR Worksheet, if landscape elements are divided between multiple pages
- GAR plan with landscape elements called out
- Completed CLE Signature Template
- Maintenance plan for all proposed landscape elements
- Construction sequence for each landscape element
- No invasive plant species permitted to be installed anywhere in GAR projects
- New plat if combining multiple record lots into one
- Graphic scale, north arrow, and dimensions

Score Sheet and Worksheet

				_			Gre	en Area Rati	o Scoresheet
* *	*	Address			Sq	uare		Lot	Zone District
		Other		٦					
		ouler	Lat size (anter this unles first)		Lot area (sf)	Minimum Score		Multiplier	GAR Score
⊢	1.2	ndscan	e Flements					SCORE:	#DIV/0:
	La	nuscap	e Liements			Square Feet	Factor		IOtal
A	Lan	dscaped	areas (select one of the following for e	ach	area)	square feet			
1	La	nuscape	a areas with a soli depth < 24			square feet	0.30		-
2	La	indscape	d areas with a soil depth $\ge 24^{\circ\circ}$			square feet	0.60		-
3	Bi	oretentio	on facilities				0.40		-
В	Pla	ntings (c	redit for plants in landscaped areas fro	n S	ection A)	square feet		Native Bonus	
1	Gr	roundcov	ers, or other plants < 2' height		# of elects		0.20	Nof obsts	-
2	Pla - I	ants≥2′ calculate	height at maturity d at 9-sf per plant		a of plans	0	0.30		-
3	Ne -	ew trees calculate	with less than 40-foot canopy spread ed at 50 sq ft per tree		# of trees	•	0.50	ll of trees	
4	Ne - I	ew trees calculate	with 40-foot or greater canopy spread d at 250 sq ft per tree		II of trees	•	0.60	# of trees	
5	Pr	eservatio calculate	on of existing tree 6" to 12" DBH ed at 250 sq ft per tree		# of trees	•	0.70	# of trees	
6	Pr	eservatio calculate	on of existing tree 12" to 18" DBH d at 600 sq ft per tree		# of trees	•	0.70	# of trees	
7	Pr	eservatio calculate	on of existing trees 18" to 24" DBH d at 1300 sq ft per tree		# of trees	•	0.70	Il of trees	
8	Pr	eservatio calculate	on of existing trees 24" DBH or greater d at 2000 sq ft per tree		If of trees	•	0.80	II of trees	
9	Ve	egetated	wall, plantings on a vertical surface			square feet	0.60	square feet	
с	Veg	getated o	or "green" roofs						
1	0	ver at lea	st 2" and less than 8" of growth medium			square feet	0.60	square feet	
2	0	ver at lea	st 8" of growth medium				0.80		-
D	Per	meable	Paving***						
1	Pe	ermeable	paving over 6" to 24" of soil or gravel			square feet	0.40		
2	Pe	ermeable	paving over at least 24" of soil or grave			squarejeet	0.50		-
E	Ot	ther							
1	Enh	nanced tr	ee growth systems***			square feet	0.40		
2	Ren	newable	energy generation			square feet	0.50		
3	App	proved w	ater features			square feet	0.20		-
<u> </u>					sub-total of so ft	= 0			
F	Bor	nuses			_as tota of 54 /1	courses fort			
1	Na	ative plar	nt species			onume feet	0.10		-
2	Lan	dscaping	in food cultivation			square jee?	0.10		
3	Har	rvested s	tormwater irrigation			square feet	0.10		
*** Perm	eable	paving and	structural soil together may not qualify for more than Total square foot	one	third of the Green A of all permeable pay	rea Ratio score. ing and enhanced tre	e growth		

GRI Wor	GREEN AREA RATIO RONMENT														
					Q	uantity of (GAR Featur	es per Subi	mitted She	et					
		L100, L110,	1 404	L200/L201	1.202	1.224	1 200	1404 1405	1.440	1.601	1.500	1 600	1 700/1 701	CIV.	TOTAL
	square feet	LIZI	LIUI	12210	L202	L221	LOUU	L404-L403	L410	LOUI	LOUZ	LOUU		CIV	TOTAL
A1	square feet														0
A3	square feet														0
B1	square feet		171												171
B2	Total for B2		14		213		175	190			171				763
B3	# of trees				19			20							39
B4	# of trees														0
B5	# of trees														0
B6	square feet														0
B7	square feet														0
B8	square feet														0
B9	square feet					146			79						225
C1	square feet						1422					3429			4851
C2	square feet			2875.5			1772	5445		5215			668		15975.5
D1	square feet														0
D2	square feet														0
E1	square feet														0
E2	square feet														0
E3	square feet														0
H1	square feet of native plants		27		626		325	1421			423				2822
H2	square feet														0
H3	square feet													18741	18741
* See (Green Area Ratio Scores	heet for cat	tegory defi	nitions											
** Ente	* Enter totals on the Green Area Ratio Scoresheet														

Credits A1-A2: Landscape Soils

A1: Soils < 2-foot depth	A2: Soils ≥ 2-foot depth
(Multiplier: 0.3)	(Multiplier: 0.6)
Credits planted areas without trees or vegetated walls	Credits planted areas with trees, vegetated walls, and/or soils preserved from compaction

Minimum Submittal Requirements:

- Soil depth and area shown on plans
- Soil protection measures and existing vegetation if claiming preservation credit
- Soil improvement specifications



• All planting areas next to vehicle access areas must show how vegetation is protected from vehicles (bollards, curbs, etc.)





Credit A3: Bioretention

Mu	ltip	lier:	0.4
	•		

Credit the area of filter bed (side slopes to be credited under "landscape soils")

Native plant species recommended

Must follow SWM Guidebook feasibility, pretreatment, design, construction, and maintenance criteria, as well as DC Water guidelines.

Must submit geotechnical report to verify infiltration rates and groundwater table levels.



NOTE: If underlying soil inflitration rate <0.5//hr, the underdrain and inflitration sump option may be used. The inflitration sump option must be designed to inflitrate the design storm volume in less than 72 hours.

Minimum Submittal Requirements:

- Soil depth and area shown on plans
- Dimensioned details showing media depths
- Soil specifications
- Construction sequence, following SWM guidelines



Credits B1-B2: Groundcovers and Plants ≥ 2-Foot Height

B1: Groundcovers (Multiplier: 0.2)	B2: Plants ≥ 2-foot height (Multiplier: 0.3)			
All plants < 2 feet in height	Shrubs, herbaceous, and grass quantity credited on a one-for-one basis as shown on plan – 9 sf per plant			
Credited by mature sf are less than minimum size are credited under B2				
Annuals, bulbs, or plantings that require annual replanting not eligible,				



Minimum Submittal Requirements:

Plant location and spacing

unless used for food cultivation purposes

- Plant schedule containing: common and scientific name, container size, quantity, credit, native status, spacing
- Planting and other details illustrating soil depth, staking, planting hole





Credits B3-B4: New Tree Plantings

B3: Trees < 40-foot canopy spread* (Multiplier: 0.5)	B4: Trees ≥ 40-foot canopy spread* (Multiplier: 0.6)		
Quantity credited on a one-for-one basin as shown on plan – 50 sf per tree	Quantity credited on a one-for-one basin as shown on plan – 250 sf per tree		
Credit by canopy spread	Same		
 Minimum tree size: Single trunk – 1.5 inch caliper Multi-stem – 8-foot height 	Same		
 Minimum soil volume requirements Minimum 400-600 cf soil volume** Measured within 16-foot radius 	 Minimum soil volume requirements Minimum 1,000-1,500 cf soil volume Measured within 27-foot radius 		

*Based on *average* canopy spread.

**Maximum depth used for calculations is 3 feet.

***Transplanted trees receive credit based on the classifications above.

Minimum Submittal Requirements:

- Same as Credits B1-B2, plus:
- Soil volume areas and calculations

Property Line



Property Line



Credits B5-B8: Tree Preservation

Credit for tree canopy for preserved tree, trunk at DBH:	Equivalent Square Footage	Multiplier
At least 6 in, less than 12 in	250	0.7
At least 12 in, less than 18 in	600	0.7
At least 18 in, less than 24 in	1,300	0.7
At least 24 in	2,000	0.8



Minimum Submittal Requirements:

- Tree survey of all preserved trees showing location, scientific and common name, trunk DBH, condition, and critical root zone (CRZ)
- Tree preservation plan for all construction phases
- Civil site plans showing extent of site work
- CRZ must not be disturbed

Property Line



Credit B9: Vegetated Walls

Multiplier: 0.6

Credited by vertical coverage

Soil volume - 1 cf / 10 sf of credited wall coverage

Max 30-foot height for green facades

Minimum Submittal Requirements:

- Same as Credits B1-B2, plus:
- Max growing height, growth habit
- Dimensioned façades and sections showing support structure
- Must be minimum of 5 feet from facing wall or property lines where the adjacent property has a zero-lot line allowance
- Irrigation plan or supplemental irrigation
- Harvested stormwater irrigation, if proposed, serves vegetated wall


Credit B9: Vegetated Walls

Multiplier: 0.6

Credited by vertical coverage

Soil volume - 1 cf / 10 sf of credited wall coverage

Max 30-foot height for green facades



Sample of proposed GAR plant list

Scientific Name	Common Name	Max. Height	Attachment	Sun / Shade	Native	Notes
		(ft.)				
Actinidia polygama	Silver Vine	10-15	Twining	Sun / partial		
Aristolochia macrophylla (A. durior)	Dutchman's Pipe	20-30	Twining	Sun / partial	х	
Bignonia capreolata	Crossvine	30-50	Clinging/Twining	Sun / partial	х	
Campsis radicans	Common Trumpetcreeper	30-40	Clinging	Sun / partial	х	



Credits C1-C2: Vegetated Roofs

C1: Soils 2-8 inch depth (Multiplier: 0.6)	C2: Soils ≥ 8 inch depth (Multiplier: 0.8)			
Credited by surface area				
Depth = soil media only*				
Container plantings over structure credited				
Plant type by soil media depth and irrigation provided				
Permanent irrigation needs dependent upon specified plant type and % coverage				
Multiplier accounts for soil mec Plants > 2-foot credited separat	lia + groundcover vegetation – ely			

Must follow SWM Guidebook feasibility, design, construction, and maintenance criteria, as well as applicable building codes

Must achieve 80% coverage within 2 years

*Soil media 1 inch or greater and less than 2 inches may receive credit if supplied with an additional water retention layer with a depth of at least 1 inch.



Credits C1-C2: Vegetated Roofs

- Soil media depth and area shown on plans
- Details and product specifications



- Plant species, size, spacing, type of root system
- Irrigation plan or supplemental irrigation source
- Existing buildings must provide a statement signed by a structural engineer confirming the roof can support a vegetated roof
- Roof drainage and overflow plan
- Access points for maintenance
- Mechanical equipment and roof penetration locations
- Construction sequence, following SWM guidelines

Credits C1-C2: Vegetated Roofs: Vegetated Roof Plant Coverage Guidelines

Vegetated roof coverage for plant species			Credited categories		
Soil media	No permanent irrigation	Permanent irrigation	Native	Groundcover	Plant ≥ 2'
depth			(H1.)	(B1.)	(B2.)
2–4" soil	Succulents	Succulents	30% max.		
	Non-succulents (≤10% cover)	Non-succulents (≤10% cover)			
					Na
	Succulents Grasses	Succulents Grasses	50% may		NO
4-8 SOII	Succulents-Glasses-	Succulents-Glasses-	50% max.		
	Herbaceous	Herbaceous			
	Non-succulents (≤30% cover)			No	
8–12" soil	Succulents-Grasses-	Succulents-Grasses-		(Included in	
	Herbaceous	Herbaceous - Small shrubs		green roof)	
12–24" soil	Grasses-Herbaceous	Succulents-Grasses-			
		Herbaceous-Shrubs	100% max.		Yes
	Succulents (≤10% cover)				
24"+ soil		Succulents-Grasses-			
		Herbaceous-Shrubs-Trees			

Credits C1-C2: Vegetated Roofs: Green Roof Plant Coverage Guidelines

Conditions:

- Growing media consists of 70%–80% inorganic material and a maximum of 30% organic matter by volume. Growing media shall be capable of supplying all of the following in quantities sufficient to support plant growth: nutrient supply, water-holding capacity, drainage, root support, and ballast.
- Growing media less than 4 inches deep should have a water-retention layer 0.5 inches thick or greater unless otherwise provided with permanent irrigation. Growing media with a depth of 1 inch or greater and less than 2 inches may be credited if supplied with a water-retention layer 1 inch or greater. Only succulents may be specified and non-natives credited at less than 2-inch depth of growing media.
- Planting designs shall have a minimum of 5–7 species evenly mixed throughout the area to ensure suitability to varied rooftop microclimates. Non-succulent species in non-irrigated or shallow growing media should have demonstrated drought tolerance for vegetated roof conditions (refer to the GAR Plant List for species recommendations).
- Individual native species may compose no more than 20% of total vegetated roof coverage.







Credits D1-D2: Permeable Pavement

D1: Reservoir depth 6-24 inches (Multiplier: 0.4)	D1: Reservoir depth ≥ 24 inches (Multiplier: 0.5)
Area of pavers with reservoir layer b	eneath
Cannot credit > 33% of GAR score (to enhanced tree growth)	otal for perm. pavement and
Credit based on reservoir plus sump	(if applicable) depth
Gravel and soil alone are not credite	d
Permeable paving over structure man hours, and a schematic plan showing the location and type of flow-contro	y receive credit, if it drains in 36-48 g the flow path of stormwater with I roof drains is provided
Must follow SWM Guidebook feasib construction, and maintenance crite	ility, pretreatment, design, ria, as well as DC Water guidelines.

Must submit geotechnical report to verify infiltration rates and groundwater table levels.



Credits D1-D2: Permeable Pavement

- Permeable pavement depth and area shown on plans
- Location of observation wells and underdrains (if underdrains required)
- Details showing material depths and types, type of permeable paving, underdrain (if applicable), observation wells
- Construction sequence, following SWM guidelines
- Drawdown calculations must drain within 36-48 hours











Credit E1: Enhanced Tree Growth Systems

Multiplier: 0.4

Area of soil with structural capacity and located beneath pavers

Cannot credit > 33% of GAR score (total for perm. pavement and enhanced tree growth)

Depth of soil media - 2 feet minimum

Soil media may be credited to both permeable pavers and enhanced tree growth to provide stacked credit

Can contribute to soil volume requirements

Show provide minimum opening 2-3 times the size of mature trunk DBH

Follow SWM Guidebook engineered tree boxes for design guidance

- Soil volume areas and calculations
- Specify if using suspended pavement, sandbased structural soil (SS), or aggregate SS



Credit: Cornell University



Credit E2: Renewable Energy

Multiplier: 0.5

Solar photovoltaic and solar thermal

Credit provided to area of array

Green roof below panels may receive full credit, must follow SWM 2017 Errata

Schematic plan for electrical or plumbing systems

Shall comply with applicable DCRA building codes

- Supplemental solar permit number
- Reference note on GAR plans listing all electrical, plumbing, mechanical, or other relevant solar sheets
- Schematic solar diagram and solar specifications
- Shading analysis





Credit E3: Water Features

Multiplier: 0.2

Area of water feature to be under water \geq 6 months per year

Harvested rainwater to provide \geq 50% of water supply

Schematic plan for electrical or plumbing systems

Must follow SWM Guidebook for harvested rainwater, as well as applicable building codes



- Demonstration that harvested stormwater provides at least 50% of annual irrigation
- Water budget indicating percentage of water demand met by rainwater, calculated on monthly and annual basis
- Construction sequence, following SWM guidelines



Bonus Element F1: Native Plants

Bonus element (Multiplier: 0.1)	Bonus multiplier may be applied to the following elements
Native plants	New and existing plantings, tree preservation, vegetated wall, vegetated roof

- Must first be credited under the landscape element(s) defined above
- Must be listed in the GAR Plant List or the U.S. Fish and Wildlife Service's Native Plants for Wildlife Conservation Landscaping: Chesapeake Bay Watershed Guide
- Or provide 2 references showing the plant is native to the DC region



Native Species Lists

 U.S. Fish and Wildlife Service's Native Plants for Wildlife Conservation Landscaping: Chesapeake Bay Watershed Guide <u>http://www.nps.gov/plants/pubs/chesapeake</u> <u>http://nativeplantcenter.net/</u>

Invasive Species Lists

- Plant Invaders of Mid-Atlantic Natural Areas
 - <u>http://www.nps.gov/plants/alien/pubs/midatlantic/</u>
- Mid-Atlantic Exotic Pest Plant Council Plant List
- National Park Service Center for Urban Ecology Exotic Plant Management Team
- Virginia Invasive Plant Species List

Bonus Element F2: Food Cultivation

Bonus element (Multiplier: 0.1)	Bonus multiplier may be applied to the following elements
Food cultivation	New and existing plantings, vegetated wall, vegetated roof

- Must first be credited under the landscape element(s) defined above
- Location, species, and areas designated for food cultivation
- Identify building access
- Identify type and location of water source
- Annual maintenance and crop cover plan



Bonus Element F3: Harvested Rainwater Irrigation

Bonus element (Multiplier: 0.1)	Bonus multiplier must first be applied the following elements
Harvested rainwater	Landscape soils, new and existing plantings, vegetated wall, vegetated roof
irrigation	

- Must first be credited under the landscape element(s) defined above
- Schematic irrigation and drainage plan showing: irrigated areas, delivery system (spray, drip), anticipated water demand, water budget calculated on monthly and annual basis, drainage plan
- Confirm cistern, filters, and pumps are size correctly
- Construction sequence, following SWM guidelines for harvest rainwater





Landscape Maintenance Plan

SOILS AND AMENDMENTS

Seasonal application

Mulch – Apply yearly or as necessary to replace decomposed mulch. Compost – Apply compost yearly at 1–2 inch depth. Coarse textured sand and clay soils require greater compost addition than loamy soils. The organic matter content of the chosen compost will determine the depth applied

Fertilizer – If choosing to apply fertilizer, perform a soil test for nutrient levels only after incorporating compost into topsoil. This will avoid over-application of nutrients, as compost itself will increase the nutrient content.

Material source

Compost should be well-decomposed material, stable, free of weeds, contaminants and foul odors. Compost may be derived from yard waste (decomposed leaves, grass clippings, branches) or food waste.

Mulch can be derived from organic sources such as shredded bark, or leaf mulch.

BIORETENTION

Frequency Maintenance Tasks

Upon establishment

For the first 6 months following construction, the practice and CDA should be inspected at least twice after storm events that exceed 1/2 inch of rainfall. Conduct any needed repairs or stabilization.

Inspectors should look for bare or eroding areas in the contributing drainage area or around the bioretention area, and make sure they are immediately stabilized with grass cover.

One-time, spot fertilization may be needed for initial plantings.

Watering is needed once a week during the first 2 months, and then as needed during first growing season (April-October), depending on rainfall.

Remove and replace dead plants. Up to 10% of the plant stock may die off in the first year, so construction contracts should include a care and replacement warranty to ensure that vegetation is properly established

At least 4 times per year

Mow grass filter strips and bioretention with turf cover Check curb cuts and inlets for accumulated grit, leaves, and debris that may block inflow

Twice during growing season Spot weed and mulch

Annually

Conduct a maintenance inspection Supplement mulch in devoid areas to 3" depth Prune trees and shrubs

LANDSCAPE AREAS ALL PLANTINGS

Provide supplemental watering if rainfall is less than 1 inch per week during the first two growing seasons.

Conduct weeding as necessary to reduce competition between weeds and new plantings for nutrients, soil moisture, and sunlight. Replace mulch as necessary to reduce competition for available moisture and nutrients.

Monitor the plantings for disease or stress and modify cultural practice as necessary. Employ an integrated pest management (IPM) approach if possible.

Remove dead plant material and replant in the next appropriate growing season.

TREES AND SHRUBS

For trees, install slow leak watering bags or tree buckets during the first two growing seasons and water as necessary to supplement precipitation if less than 1 inch per week.

Inspect trees for signs of dead, diseased, or crossing branches and prune accordingly. Remove hazard limbs especially from established trees. Never remove more than 20% of the tree canopy

during pruning activities in any year.

Spread mulch to 2-4 inch depth.

Maintain the health of the tree by limiting all grade changes and other soil disturbance underneath the tree's Critical Root Zone. PERENNIALS AND GROUNDCOVERS

In the early spring, deadhead top-growth from perennials and warm-season grasses.

Periodically divide perennials as necessary to encourage rejuvenated growth.

Spread mulch at a maximum 2-inch depth. TURFGRASS

Test soil for pH and apply lime only as necessary.

Maintain turfgrass at an increased height to reduce weed germination. Never mow more than one third of the grass height. Leaving grass clippings in-place after mowing requires less fertilizer application.

Regularly monitor and over-seed bare spots to prevent weed establishment.

In late fall, core aerate and topdress with organic matter.

VEGETATED WALLS

Living Facades

Periodically inspect roof gutters and drains for clogging with vegetation or debris.

Cable systems may require re-tensioning or inspection of the

When using harvested stormwater irrigation, valves and fertilizer injectors should be checked for function, and the irrigation pipes checked for leaks. Schedule frequent irrigation inspections. Drip irrigation emitters should be checked during operation to ensure water is being delivered to all panels. Winterize irrigation systems as per the irrigation specification. Schedule regular plant maintenance during establishment and ongoing growth. Inspect the vegetated wall for signs of disease, inadequate irrigation, and erosion.

HARVESTED STORMWATER IRRIGATION Cistern

The cistern must be cleaned yearly. To clean, use a submersible pump to remove the water. Brush walls with a hard bristle brush or use a high pressure cleaner.

Purpose of the maintenance is to remove the sediment that inevitably deposits on the cistern's floor and which may give rise to parasitic fermentation and odor. The rate at which the sediment accumulates depends on the region's atmospheric pollution (for dust), the roof type, and the quality of the set-up upstream from the cistern's storage compartment. A fine mesh filter placed between the roof gutter's main downspout and the sedimentation basin will substantially delay the accumulation of sediment in the barrel or cistern. Additionally, a sedimentation basin equipped with an appropriate trapped overflow that prevents the passage of floating impurities can work. Filters need to be cleaned monthly. Cisterns and rain barrels should be dewatered often to ensure available volume on the onset of rain events.

Irrigation

Conduct frequent inspections to verify integrity of irrigation system.

Periodically review the pressure regulators, filters, controller, sensors, valves, sprinkler heads and other system components to verify they meet original design criteria for efficient operation and uniform water distribution.

In-Class Demonstration & Examples





scale: 1/8" = 1'-0"







— planting soil mix per specs



		Quantity		
		LS.101	LS.10	
A1	Landscaped Area (<24")	79	0	
A2	Landscaped Area (min. 24")	0	0	
A3				
B1	Plantings < 24"	0	0	
B2	Plantings > 24"	75	0	
B 3	Trees (<40' Canopy)	0	0	
B4	Trees (>40' Canopy)	0	0	
B5	0			
B6	0			
B7	0			
B8	0			
B 9	0			
C1	0			
C2	Vegetated Roofs 2"-7" Depth	0	0	
D1	Vegetated Roofs 8" Depth	0	72	
D2	Permeable Paving (min. 24")	175	0	
E1	0			
E2	0			
E3	0			
F1	Native Plant Bonus	675		
F2	0			
F3	0			





GREEN AREA RATIO ELE

category	1
a. landscaped areas	a
b. plantings	ł
d. permeable paving	Ċ
h. bonuses	ł

t*	tt minimum eter of DETAIL DETAIL I Land A Land A Land A Land A Land A Land B Planti 1 Gro 2 Plan - cc 3 New - cc 4 New - cc 4 New - cc 3 New - cc 4 New - cc 3 New - cc 4 New - cc - cc 4 New - cc - cc	Address	Green Area Ratio Sc Lot Zon inimum Score Multiplier G 30 SCORE: Score: square feet Pactor Score: Score: square feet 0.50 square feet 0.40 square feet 0.40 Native Bonus square feet 0 0.20 0 model square feet 0.30 75 0.30 75 0 0.50 0 0 0 0 0 0.50 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 <td< th=""><th>Scoresheet MU-4 GAR Score 0.3033 Total 23.7 - - - - - - - - - - - - -</th><th></th></td<>	Scoresheet MU-4 GAR Score 0.3033 Total 23.7 - - - - - - - - - - - - -	
0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	0 2 Over 0 0 D Permet 0 0 1 Per 0 0 2 Per 0 0 1 E Oth 175 0 3 Appro 0 0 1 Nat 0 0 1 Nat 0 0 1 Nat 0 0 1 Nat 1 0 2 Lands 3 Harve **** Permeable pav	er at least 8" of growth medium eable Paving*** meable paving over 6" to 24" of soil or gravel meable paving over at least 24" of soil or gravel mer need tree growth systems*** wable energy generation oved water features ses sub-total of sq.ft = ses tive plant species caping in food cultivation isted stormwater irrigation ing and structural soil together may not qualify for more than one third of the Green Area F Total square footage of all permeable paving ar	square feet square feet 72 0.80 square feet 0.40 square feet 0.40 square feet 0.50 square feet 0.50 square feet 0.20 1,001 square feet 675 0.10 square feet 0.10	57.6 - B - - - - - - - - - - - - -	
botanical name carex pensylvanica bed preparation	size 1 gal. container sf	spacing comments 12" o.c. b&b on plan see landscape specs - 1.102			
LEMENTS BY ELEMENT landscape element a1 - landscaped areas with a soil depth b2 - plants > 24" at maturity	& SIZE of less than 24" inches	area 79 sf (non-turf planting areas) 675 sf (75 grasses @ 9/sf, all native)			
d2 - permeable paving over at least h1 - native plant species This is further the li	24" of gravel STATEM is to certify that I have r certify that all aspect sted GAR score, meet of the	175 sf (rear parking, not including concrete edge) 675 sf (75 grasses) EENT BY CERTIFIED LANDSCAP e examined all required GAR plan sub- ts of the submittal, including landscape t the specifications required under Sub District of Columbia Municipal Regu Name and Title	E EXPERT mittals prior to submise e elements within the title C, Chapter 6 of T lations.	ission. I e Lot and Title 11	

DATE:
SCALE:
1/8" = 1'-0"
SHEET NUMBER:
L001

Address Date: Phone No:	

Certified Landscape Expert Signature:	Certifying Organization	Certification Number
Sheets: LP.101, LP.102, LP.103, LP.10	04, LP.105	









GRI	EEN AREA RATIO V	Vorksh	eet*			
		Q	uantity of G	AR Features per Sub	mitted Sheet	
		LS.101	LS.102			TOTAL
A1	Landscaped Area (<24")	79	0			79
A2	Landscaped Area (min. 24")	0	0			0
A3						0
B1	Plantings < 24"	0	0			0
B2	Plantings > 24"	75	0			75
B 3	Trees (<40' Canopy)	0	0			0
B4	Trees (>40' Canopy)	0	0			0
B5	0					0
B6	0					0
B7	0					0
B8	0					0
B9	0					0
C1	0					0
C2	Vegetated Roofs 2"-7" Depth	0	0			0
D1	Vegetated Roofs 8" Depth	0	72			72
D2	Permeable Paving (min. 24")	175	0			175
E1	0					0
E2	0					0
E3	0					0
F1	Native Plant Bonus	675	0			675
F2	0					0
F3	0					0

Live Roof Vendor Information:

Sedum Mix:

"Evergreen "

Mix Source:

Riverbend Nursery, Inc. 800-638-3362

1295 Mt. Elbert Road NW Riner, Virginia, 24149 http://www.riverbendnursery.com sales@riverbendnursery.com

Lead Times can be as long as 14-16 weeks

ng mix	botanical name	size	spacing	comments
ix" by live roof		cuttings	45-50 per module	min. 95% coverage at installation
	sedum album 'coral carpet'			
	sedum rupestre 'angelina'			
	sedum floriferum 'weihenstephaner gold'			
	sedum sexangulare			
	sedum hybridum 'immergrunchen'			
	sedum spurium 'dragon's blood'			
	sedum reflexum blue blush			
	sedum spurium 'voo doo'			

GREEN AREA RATIO ELEMENTS BY ELEMENT & SIZE

	landscape element	area
n roof	c2. green roof (min. 8" deep)	72 sf

STATEMENT BY CERTIFIED LANDSCAPE EXPERT This is to certify that I have examined all required GAR plan submittals prior to submission. I further certify that all aspects of the submittal, including landscape elements within the Lot and the listed GAR score, meet the specifications required under Subtitle C, Chapter 6 of Title 11 of the District of Columbia Municipal Regulations.	
Name and Title	DATE:
Address	SCALE:
Date: Phone No:	Varies
Certified Landscape Expert Signature: Certifying Organization Certification Number	sheet number:
Sheets: LP.101, LP.102, LP.103, LP.104, LP.105	L002

1 2 3	30% Coordination 1st Submission 2nd Submission	2/1/18 2/12/18 3/6/18
	Green Area Ratio Planting Plans)	
	DATE:	
	SCALE: Varies	

REVISIONS

General Planting Installation Notes

- 1. The contractor is responsible for verifying utility depths and avoiding conflicts when trenching over or across areas where utilities exist.
- Contractor to contact 'miss utility' 72 hours prior to the commencement of work on the site. No work is to begin until all utilities are marked. If utility line/tree conflicts are evident, please contact landscape architect.
- Verification of the accuracy of the total quantities shown in the plant schedule shall be the responsibility of the contractor. In the event of discrepancy, the planting plan shall govern. Any plant substitutions proposed require the approval of the owner or landscape architect.
- All plants shall be nursery grown, well branched, true to type specimen material, free of insect infestation, injury, disease or other defects. Plants are to conform to standards set in american standard for nursery stock and shall meet or exceed measurements specified in the plant schedule.
- 5. The contractor shall warrant all new plantings for a period of one year from the date of final acceptance. All replacement plants shall conform to original specifications. When planting operations must be performed outside the normal planting season for the locality, this warranty may be renegotiated with the owner prior to planting.
- Planting and bed preparation are to be conducted under favorable weather conditions. Under no circumstances shall soil be worked, driven over, or walked upon while in a wet condition.
- 7. The contractor is responsible for reporting to the landscape architect any conditions on site that vary from the plans and that effect installation.
- 8. Prune only broken or crossing branches. Do not thin tree canopies.
- 9. Contractor to install tree protection fencing as needed and is responsible for replacing any damaged trees on site.
- 10. All new planting to be fed with an organic slow release fertilizer.
- 11. Contractor is responsible for watering and insect control until the date of final inspection.
- 12. The work area is to be kept reasonably neat and clean and all debris hauled away and disposed of legally, off site, in a timely manner
- 13. It shall be the contractor's responsibility to perform all work in a manner that protects completed work by others, such as curbs, utilities, drainage, fences, driveway aprons, drives, vegetation, etc. The contractor shall be responsible for the cost of satisfactory repair of all damage in kind resulting from his failure to comply.

Landscape Specifications

- 1. Plant material shall conform in size and grade to american standards for nursery stock.
- 2. Plant materials shall be of standard quality of their species or variety. Plants shall be carefully labeled and sizes noted. Right is reserved to reject plants considered as unsatisfactory. Rejected plants shall be removed from site. Plants should not be pruned prior to delivery. Heading- back plants to meet sizes indicated in drawing schedule will not be permitted.
- 3. Grass seed / sod all permanent grass seed / sod shall be listed on the current virginia turf grass variety recommendations and be blue tag certified. All newly laid sod to be rolled with water-filled metal drum to achieve uniform appearance. All sod should be cut and laid within 24 hours.

Plants and Trees

- 1. Contractor shall stake the location of each tree and shrub in accordance with the locations shown on the drawing. Staking and layout shall be done sufficiently in advance of planting operation to permit the contracting officer to check, revise if desired, and approve the locations before digging operations begin.
- Excavate planting beds and pockets to a depth required for planting. At least 2/3 of ball below finished grade
- Remove the burlap, twine, and wire baskets from the top 1/3 of all b&b root balls. No plastic twine or burlap shall be permitted on b&b plants. Planting pits shall be the same depth as root balls.
- 4. Any rock or other underground obstruction shall be removed to depth necessary to permit planting according to specification.
- 5. Plants shall be treated at the time of planting with anti- desiccant as specified in full accordance with the directions furnished by the manufacturer.
- All plant labels and tags to be removed after final inspection. 6.
- 7. In general, contractor shall thoroughly water all planted areas after planting and in dry weather. Use enough water to thoroughly soak all tree pits before planting. Contractor shall make necessary arrangements in advance of start of work to insure that an adequate supply of water and watering equipment are available when required.

Mulching

- 1. Mulch top of root ball and saucer within 48 hours to a minimum depth of 2" and to a depth not to exceed 3".
- 2. All shade and flowering trees shall be mulched with 3 inches thick (settled and covering an area twelve inches greater than the diameter of pit.
- All plantings are to be provided with a 3" depth of triple shredded hardwood bark mulch (2" depth in ground cover areas). Mulch to bed lines where shown. Hedges are to be mulched as continuous beds of the width shown on plan (plants are not to be mulched individually). Trees shall be mulched within a minimum three (3) foot radius of each trunk. Re-mulch existing plantings.
- 4. No mulch is to be placed in plant crowns or against tree trunks.

Soil and Amendment Specification

Macronutrients & micronutrients

Topsoil Physical and Chemical Parameters

Topsoil characteristic	Test Method
Texture class	
% Sand (0.05 mm-2.00 mm)	Hydrometer < 70%
% Silt (0.002 mm-0.05 mm)	Hydrometer < 70%
% Clay (< 0.002 mm)	Hydrometer < 30%
% Organic matter (by weight)	Loss of Ignition
pH	C

Soil Source

The topsoil and subgrade may be from a naturally occurring soil or soil that has been mixed to achieve the requirements of the plant selections.

Debris Content

Particles and stone greater than 1 inch in the longest dimension should not be allowed. This includes fragments of brick, concrete, wood, glass, metal, stone, and plastic. The total volume less than 1 inch long should not be more than 5% of the soil volume. Stones ranging from 0.5 to 1 inch (1.25 to 2.5 cm) should not exceed 5% of the soil volume, and gravel ¹/₄ to ¹/₂ inches (0.6 to 1.25 cm) should not exceed 5% of the soil volume.

Contaminants Prohibited The soil shall have no herbicides, heavy metals, biological toxins, or hydrocarbons that will impact plant growth.

Texture

Topsoil texture can be variable and include: loam, silt loam, sandy clay loam, sandy loam, clay loam. The percent composition must fall within this range: sand (< 70 %), silt (< 70%), and clay (<30%). Particle size is determined according to USDA Classification: sand (< 0.002mm), silt 0.002mm-0.05 mm, sand (0.05 mm-2 mm).

Soil texture triange (source: USDA NRCS)

Organic Matter

Organic matter should be a minimum of 4% in lawn soils and 5% in planting beds. Percentage organic matter is measured by weight. Incorporate compost to raise organic matter content.

Soil pH

Soil pH determines the availability of nutrients in the soil. The exact pH range is dependent on the plant species to be planted and should be tested and adjusted based on species prior to installation. The ideal pH for most landscape plants falls in the range of 6.0-7.0, however other plants prefer a pH outside this range. A pH of 6.5-7.2 is beneficial to microbial activity that converts nitrogen, phosphorous, and sulfur into forms most available to plants.

Nutrient Recommendations

Subgrade Preparation

Percolation

After preparing the subgrade, conduct a percolation test. Water should readily drain from the soil. Percolation rates of 1-2 inches per hour are preferred if irrigation will be installed. A drainage system should be installed if the native subsoil has a drainage rate less than 1 inch per hour.

Handling, Storage, and Spreading Topsoil

Material shall not be handled or hauled when it is wet, as after a heavy rainfall or if frozen. Soil shall be handled only when the moisture content is less than at field capacity. The Landscape Expert or a professional soil scientist shall be consulted to determine if the soil is too wet to loam. Stockpiles shall be covered during wet weather. Spread topsoil in no greater than 12-inch lifts, using the lightest possible equipment. Compact the topsoil to the proper soil density so that it is suitable for root growth and plant stability.

Soil Density and Compaction

Soil density must be high enough to avoid settlement and low enough to encourage root growth. Using a rod penetrometer, soil and subsoil shall be less than 260 pounds per square inch (psi) throughout the depth of credited soil. Compaction completely inhibits root growth at 300 psi. A rod cone penetrometer should be used to measure compaction when soil moisture is at field capacity, after the soil is wetted but drained. The penetrometer shall be inserted at a rate of 72 inches per minute (1.2 inches/second), according to ASAE Soil Testing Specifications.

SOIL IMPROVEMENT SPECIFICATION (AMENDMENTS)

Compost

Compost shall be derived from plant material and provided by a member of the U.S. Composting Seal of Testing Assurance (STA) program. See www.compostingcouncil.org for a list of local providers. Alternative specifications and/or certifications, such as those administered by the Maryland Department of Agriculture or other agencies, may be substituted, as authorized by DDOE. In all cases, compost material must meet standards for chemical contamination and pathogen limits pertaining to source materials, as well as reasonable limits on phosphorus and nitrogen content to avoid excessive leaching of nutrients. The compost shall be the result of the biological degradation and transformation of plant derived materials under conditions that promote anaerobic decomposition. The material shall be well composted, free of viable weed seeds, and stable with regard to oxygen consumption and carbon dioxide generation. The compost shall have a moisture content that has no visible free water or dust produced when handling the material. It shall meet the following criteria, as reported by the U.S. Composting Council Seal of Testing Assurance Compost Technical Data Sheet provided by the vendor:

- 1. 100% of the material must pass through a 1/2-inch screen
- 2. The pH of the material shall be between 6 and 8
- 4. by weight
- 5. The organic matter content shall be between 35% and 65%
- 6. Soluble salt content shall be less than 6.0 mmhos/cm
- 7. Maturity must be greater than 80%
- 8. Stability shall be 7 or less
- 9. Carbon/nitrogen ratio shall be less than 25:1 10. Trace metal test result = "pass"

11. The compost must have a dry bulk density ranging from 40 to 50 lb/ft³

Compost Application Rate

Add 1.75 inches of compost per 8 inches of existing topsoil and incorporate by rototilling or mixing prior to respreading stockpiled topsoil. Scarify the subgrade down to a 4-inch depth. Using 35% to 60% organic matter in compost, this will provide a topsoil organic matter rate of 5%. The amended soil and subsoil together provide 12 inches of amended topsoil. For deeper soils, such as planting beds, mix compost and topsoil at the same rate.

The DDOE 2013 Stormwater Management Guidebook, Appendix J, describes compost application rates for impervious cover disconnections and grass swales.

Additional Amendments

Limestone - dolomitic limestone containing no less than 50% total carbonates and 25% total magnesium with a neutralizing value of at least 100%. Acidulant - commercial grade sulfur, ferrous sulfate, and aluminum sulfate for horticultural use. Fertilizer - granular or pelleted slow-release fertilizer consisting of 50% water-insoluble nitrogen, phosphorous, and potassium in a composition recommended by the soil testing laboratory.

Required Standard

Loam, silt loam, sandy clay loam, sandy loam, clay loam

Lawn areas (4%-6%), Planting beds (5-7%) 6.0-7.2, specific plantings may require alternate values Determined by professional soil scientist

Have a soil scientist provide recommendations for macronutrients and micronutrients.

Using a backhoe or similar device, scarify and loosen the subgrade. Remove from the area all debris or stones that are one inch or greater.

3. Manufactured inert material (plastic, concrete, ceramics, metal, etc.) shall be less than 1.0%

To achieve a minimum 5% organic matter content, apply compost at the rate specified below.

Landscape Maintenance Plan:

Soils and Amendments

Decompaction: Decompact topsoil by tilling or subsoiling and incorporating compost throughout the depth of compacted soil. Do not till soils underneath existing trees; instead consider practices such as mulching under the canopy or air tilling to ameliorate compaction. Mulch: Apply yearly or as necessary to replace decomposed mulch. **Compost:** Apply compost yearly at 1-2 inch depth. Coarse textured sand and clay soils require greater compost addition than loamy soils. The organic matter content of the chosen compost will determine the depth applied Fertilizer: If choosing to apply fertilizer, perform a soil test for nutrient levels only after incorporating compost into topsoil. This will avoid over-application of nutrients, as compost itself will increase the nutrient content. Material source: Compost should be well-decomposed material, stable, free of weeds, contaminants and foul odors. Compost may be derived from yard waste (decomposed leaves, grass clippings, branches) or food waste. Mulch can be derived from organic sources such as

shredded bark, or leaf mulch.

Landscape Areas

All Plantings:

- 3. Replace mulch as necessary to reduce competition for available moisture and nutrients.
- approach if possible.
- 5. Remove dead plant material and replant in the next appropriate growing season.
- 6. Remove weeds on a regular basis.
- **Trees and Shrubs**
- supplement precipitation if less than 1 inch per week.
- 3. Spread mulch to 2-4 inch depth.
- **Perennials and Groundcovers:**
- 1. In the early spring, deadhead top-growth from perennials and warm-season grasses.
- 2. Periodically divide perennials as necessary to encourage rejuvenated growth.
- 3. Spread mulch at a maximum 2-inch depth.
- **Turfgrass:**
- 1. Test soil for pH and apply lime only as necessary.

- 4. In late fall, core aerate and topdress with organic matter. **Tree Preservation**
- clustered, mulch the entire planting area.
- 3. Mulch should never be more than 4 inches deep or applied to the tree trunk.
- vehicular below. Never prune more than 20% of a tree canopy per year.
- season after construction.

1. Provide supplemental watering if rainfall is less than 1 inch per week during the first two growing seasons.

2. Conduct weeding as necessary to reduce competition between weeds and new plantings for nutrients, soil moisture, and sunlight.

4. Monitor the plantings for disease or stress and modify cultural practice as necessary. Employ an integrated pest management (IPM)

1. For trees, install 20-gallon slow leak watering bags (Tree Gator or equal) for the first two growing seasons and water as necessary to

2. Inspect trees for signs of dead, diseased, or crossing branches and prune accordingly. Remove hazard limbs especially from established trees. Never remove more than 20% of the tree canopy during pruning activities in any year.

4. Maintain the health of the tree by limiting all grade changes and other soil disturbance underneath the tree's Critical Root Zone.

2. Maintain turfgrass at an increased height to reduce weed germination. Never mow more than one third of the grass height. Leaving grass clippings in-place after mowing requires less fertilizer application.

3. Regularly monitor and over-seed bare spots to prevent weed establishment.

1. The property owner must replace dead trees with an equivalent landscape element to meet the minimum-required GAR score for the

2. Where appropriate, spread 3 inches of organic mulch over the soil surface out to the drip line of preserved tree. If preserved trees are

4. Apply slow-decomposing organic mulches, such as shredded bark, compost, leaf mulch, or wood chips. Grass clippings and sawdust are not recommended as mulches because they decompose rapidly.

5. As needed, prune dead, diseased, broken or crossing branches. Elevate lower branches to provide clearance for pedestrian and

6. Existing trees whose roots have been pruned during construction should be watered at least once a week during the first growing

7. Water trees deeply and slowly to encourage deeper root growth. Soaker hoses and drip irrigation work best for deep watering of trees. 8. Consult with a qualified professional for tree pruning, fertilization, and hazard condition management.

STATEMENT BY CERTIFIED LANDSCAPE EXPERT This is to certify that I have examined all required GAR plan submittals prior to submission. I further certify that all aspects of the submittal, including landscape elements within the Lot and the listed GAR score, meet the specifications required under Subtitle C, Chapter 6 of Title 11 of the District of Columbia Municipal Regulations.	
Name and Title	DATE:
Address Date: Phone No:	SCALE: Varies
Certified Landscape Expert Signature: Certifying Organization Certification Number Sheets: LP.101, LP.102, LP.103, LP.104, LP.105	sheet number

REVISIONS	

reen Area Ratio Plan	of 3 of 5 (Landscane Snerifications)	rei o ai o (parisancape operativatio)

She

NUMBER:

LiveRoof[®] System Specifications Specifications

LiveRoof, LLC P.O. Box 533 Spring Lake, MI 49456 (800) 875-1392

www.liveroof.com sales@liveroof.com

Module Size

1' x 1' x 3¹/₄" for the Maxx System (soil height approximately 8" elevation for the Maxx System) Module Weight

17 oz/ft² for the Maxx System

Material 100% recycled polypropylene (avg. 10% post-consumer, 90% post-industrial).

Water Dispersal Appx. 10.0 gal. per min. per lineal foot. **Module Color**

Black or gray.

Weight Vegetated Approximately 55-65 lbs/ft² for the Maxx System.

Drainage

Positive drain holes, at lowest point in module.

Soil Media

Proprietary LiveRoof specified engineered soil, based upon German FLL granulometric specifications, 94+% by dry weight inorganic content for minimal shrinkage/ decomposition. (92% in British Columbia). Dry weight approximately 60-65 lbs/cu. ft. May vary slightly with local grower.

Acceptable Protective Underlying Materials

Modules to be placed directly upon heavy duty (HDPE, Polypropylene, TPO, EPDM or recyclable PVC) slip sheet/root barrier of 40-60 mil. thickness with effectively bonded seams. This is placed as an additional protective barrier above roof waterproofing membrane and extended 3" vertically along parapet to ward against edge abrasion. This may also be glued to parapet if manufacturer approves. Confirm suitability of waterproofing membrane with manufacturer. Alternatively low profile drain boards work well and manufacturers of cold fluid applied reinforced urethane membranes typically warrant their systems for use in conjunction with LiveRoof system.

Edge Treatments

RoofEdge[™] aluminum edging with <u>adequate drain perforations</u> recommended. Any edging should allow for adequate drainage (extending to the bottom of the edging) with sidewalls tall enough to completely cover the modules and contain the soil.

Pavers

Pavers of compatible dimensions, weight and materials recommended. for the Maxx System Plants

See section 2.3 PLANTS

Conveyance Method

Pre-vegetated modules to be delivered by Hoppit® or other appropriately engineered conveyance device.

PART 1: GENERAL

1.1. SCOPE

Provide equipment, materials, tools, and labor to install vegetated roofing modules. Modules to include growth media and plants. This work shall also include edge treatments, custom shaping of modules, and installing paver stones or ballast, slip sheet/root barrier and irrigation system, if specified.

1.2 SUBMITTALS

- A.Product data for vegetated roofing systems.
- B. To provide evidence of wind and fire safety, demonstrate video evidence of firespread testing and high speed wind resistance testing (minimum of 110 mph), and report of full scale dynamic wind uplift testing results. Provide green roof system wind uplift rating according to "Standard test method for wind resistance of modular vegetated roof assembly (CAN/CSA-A123.24-15)." C.Planting mix design indicating species and density of accent plants.
- D.Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.
- E. Maintenance instructions for inclusion into owner's manuals.
- **1.3 QUALITY ASSURANCE**
- A.No deviation should be made from this specification. Installer assumes liability for any deviations from specification.
- B. Only LiveRoof Certified Installer personnel shall complete all work. Contact Riverbend Nursery, 1295 Mt. Elbert Road, NWRiner, VA24149((800) 638-3362 x105) for specific for experienced contractor recommendations.>
- C. Prior to installing LiveRoof modules, the following procedures are to be conducted:
- 1. The building Owner, Architect, or Engineer shall verify that the roof is properly designed and constructed to adequately support the load of the LiveRoof system.
- 2. The roof is to be flood tested for water tightness for 24 hours. Water testing shall be witnessed and confirmed in writing by Owner's Representative and/or Design Professional, Waterproofing Contractor, Membrane Manufacturer, and Installation Contractor.
- 3. Slip sheet/root barrier to be properly installed, seams overlapped and bonded, in accord with architect's and manufacturer's specifications.
- 4. The roof is to be inspected and determined ready to accept the LiveRoof modules by a Technical Representative of the Installer.
- D.During the LiveRoof installation and afterward, an inspection is to be conducted by a Technical Representative of the installer to verify that the LiveRoof modules have been installed tight against each other, in straight rows, corners aligned, properly oriented, and tight against the edging.
- **1.4 PRE-INSTALLATION MEETING**
- A.Installer to convene one week before starting work of this section. Review LiveRoof Installation Standardized Procedures with supervisory staff and installation team.
- B. Schedule certified installation personnel to supervise entire green roof installation.
- C.Ensure that the slip sheet material meets membrane and green roof manufacturer specifications. D.Ensure that edging is perforated at the bottom to allow water to drain freely and is installed between modules and stone ballast or wherever parapet or paver is of insufficient height/thickness to contain the soil from the subterranean green roof modules.
- E. Ensure that soil and debris will be swept clean before placing each module.

F. Configure installation to minimize or eliminate walking on the plants during installation. PART 2: PRODUCTS

2.1 VEGETATED ROOFING MANUFACTURER

- A.Provide vegetated roofing systems from the following LiveRoof Licensed Grower.
 - **Riverbend Nursery** 1295 Mt. Elbert Road, NW Riner, VA 24149 (800) 638-3362 x105
- B. 100 mil. thick (sidewall) recycled polypropylene and colored black or gray with dimensions of 1' x 1' x 3¼" for the Maxx System. The LiveRoof Soil Elevator[™], the insert collar that allows for growing soil above the container edge, is approximately 81/4" tall for the Maxx System, 155mil thick for the Maxx System, and composed of recycled polyethylene or suitable biodegradable material. Each module is to be filled to the top of the Soil Elevator. Soil height from container bottom is approximately 8" elevation for the Maxx System, although normal settling is to be expected and will reduce this height somewhat.
- C.Saturated weight with mature vegetation: approximately 55-65 lbs/ft² for the Maxx System. D.Module clearance above roof deck: ¹/₂ inch.
- E. LiveRoof® Licensed Grower to execute the following:
- 1. LiveRoof Soil Elevator is to be properly inserted into fasteners inside LiveRoof module. 2. LiveRoof module is to be filled with LiveRoof soil and appropriately settled either by mechanical vibration or flooding with water. Any settled soil is to be replaced so that LiveRoof soil extends to top of Soil Elevator at time of planting.

F. LiveRoof module is to be planted with green roof plants specified in Section 2.3. Plants are to be grown to maturity (appx. 95%+ soil coverage).

2.2 GROWING MEDIUM Growing medium is an engineered blend of inorganic and organic components based upon German FLL granulometric guidelines and to contain ecologically sustainable levels of organic content.

2.3 PLANTS

Sedum Mix: Evergreen Mix Source:

Riverbend Nursery, Inc. 800-638-3362 1295 Mt. Elbert Road NW Riner, Virginia, 24149 http://www.riverbendnursery.com sales@riverbendnursery.com

Lead Times can be as long as 12-14 weeks

Base Plants: Sedum album \\\\\\\\\\\\\Coral Carpet\\\\\\\\\\\\\\ Sedum rupestre \\\\\\\\\\\\\Angelina\\\\\\\\\\\\\\ Sedum floriferum 'Weihenstephaner Gold' Sedum sexangulare Sedum hybridum \\\\\\\\\\\'Immergrunchen\\\\\\\\\\\\\\\ Sedum reflexum Blue Blush® Sedum spurium \\\\\\\\\\\V\Voo Doo\\\\\\\\\\\\\\

2.4 SLIP SHEET

A.Provided by Membrane Manufacturer. Confirm compatibility of slip sheet and waterproofing membrane with manufacturer.

B. Conventional Membrane Roof Assembly

- 1. Minimum 1-1.5 mm (40-60 mi) thickness with overlapped and effectively bonded seams to ward against root penetration and to keep waterproofing layer safe and clean from soil during installation. Slip sheet/root barrier typified as follows:
- a. Welded Seam Types 1 mm (40 mil) or greater thickness -TPO, with seams heat welded -PVC, with seams heat welded
- -Polypropylene, with seams heat welded -HDPE, with seams heat welded
- **b. Glued Seam Types** 1 mm (40 mil) or greater thickness -EPDM, with seams overlapped a minimum of 75 mm and glued with roll out adhesive or double sided tape adhesive of the type that is impervious to and not affected by moisture, and recommended by the manufacturer. -Low profile drain board of appx. 0.5 mm (17 mil) thickness, with edges overlapped 75 mm and glued with manufacturer approved adhesive.

C.Do not use duct tape or adhesive for seaming that is not approved by the membrane manufacturer.

- D. Never use moisture holding fabric, such as needle-punched / non-woven polyethylene or felt, under the green roof system with "conventional" membrane roof assemblies. Such materials may trap aggregates and are impossible to sweep during installation and stay wet and encourage root growth and root penetration, which is especially detrimental if woody plants become established as such plants have woody root systems and may potentially cause roof leaks. This could lead to impeded drainage and compromise plant health.
- E. In cases where electronic leak detection may be desired, a fiber-backed drainboard may be used Fiber-backed drainboards are only recommended when electronic leak detection is desired, and only when vegetated with Sedums or Sempervivums, or other succulents, as these plants are sparsely-rooted and not prone to rooting into the fiber of the drainboard. 2.5 ACCESSORIES

A.Pavers/Ballast

- 1. Select pavers of compatible size, design and appropriate weight for all other module sizes.<*Specifier - Indicate Color(s)*: Beach Sand, Charcoal, Light Reflective, Mocha, or Natural>
- B. RoofEdge Aluminum Edge Restraint
- 1. Provide RoofEdge aluminium edge restraint as manufactured by: LiveRoof Global, LLC PO Box 533, Spring Lake, MI
- (800) 875-1392
- 2. Aluminum, L-Shaped Edge restraint to be 8.5" x 3.25" for the Maxx System with a minimum thickness of .115" for the Maxx System.
- 3. Edge restraint to be perforated to allow for drainage of 186 liters per minute per lineal meter.
- 4. Edge restraint to be *<specify finish: mill finish, black anodized, bronze anodized<*
- 5. Edging design must allow for sliding connector to be used to transition from Standard to Deep and/or Maxx LiveRoof modules. Edge pieces to be connected with aluminum sliding connectors. For the Deep System, Maxx System, two sliding connectors must be used at each connection point.
- 6. Edging must be certified as extruded and stamped in the USA.
- 7. Corners to be prefabricated by the manufacturer, or may be bent or welded by the contractor. 8. Edging required at perimeter of green roof when exposed, or adjacent to stone ballast or conventional pavers.
- 9. Edging installations that are not surrounded by stone ballast or pavers should be secured to the green roof modules to ensure it is held in place. Edging should be fastened using 3/16" diameter wide-domed blind rivets into 0.192"-0.196" (drill size #11) holes on 12" centers.

C.WindDisc[™]

- 1. To enhance wind uplift resistance, system to be interconnected using WindDisc module connectors
- 2. 1-3/4" diameter by 0.1" thick plastic discs to be inserted horizontally into slots at corners of each module. A ratio of approximately 1 WindDisc module connector to LiveRoof module is appropriate for most designs.

PART 3: EXECUTION

- 3.1 LIVEROOF INSTALLATION MUST BE CONDUCTED BY LIVEROOF CERTIFIED INSTALLER A.Installer must provide current proof of certification from LiveRoof, LLC through a through a
- certificate dated for the current year. 3.2 PREPARATION OF ROOF SURFACE
- A.Slip sheet/root barrier, specified by architect and approved by LiveRoof and membrane manufacturer, of 1-1.5 mm (40-60 mil) thickness with overlapped and effectively bonded seams to ward against root penetration and to keep waterproofing layer safe and clean from soil during installation.
- 1. Do not use duct tape or adhesive for seaming that is not approved by the membrane manufacturer
- 2. Never use moisture holding fabric, such as needle-punched polyethylene or felt, under the green roof system.
- B. Experienced Contractor to install slip sheet/root barrier in accordance with manufacturer's recommendations.
- C. All surfaces to be smooth, free of debris, soil, and grit prior to placing modules. All materials to be tested water tight and free draining prior to module placement.
- D.All surfaces to be maintained clean and free of debris, soil, and grit during installation process via use of broom. Never walk upon such materials as they may damage membranes.

3.3 INSTALLATION SEASON

work.

Module Installation to be conducted when plants are:

D.When plants cover 95% or more of soil surface.

- A.Properly adapted and acclimatized to local weather conditions.
- B. When weather is above 33° F and there is no ice on the roof and LiveRoof soil is unfrozen.

C.No later or earlier than the cut off date required by the green roof system provider's warranty terms. In areas of cold-winter temperatures, installation season is typically April 1 to November 15.

E. When the Owner and General Contractor can ensure that, during and after the green roof installation, no foot traffic will be allowed on the plantings. If the Owner or GC cannot guarantee that modules will not experience late fall, winter or early spring foot traffic, the green roof installation should not occur until the following spring when other trades have finished their

3.4 DELIVERY, STORAGE, HANDLING, PROTECTION

A.LiveRoof modules are to be delivered in good condition free from shipping damage.

B. Keep LiveRoof modules out of sun on job site if plastic wrapped to avoid overheating. C. LiveRoof modules are to be installed on the roof top within 4 hours of delivery.

- D.On the job site, LiveRoof modules are to be handled to prevent damage to the modules themselves and all roofing components.
- E. To ensure optimum plant condition and safety, modules must be conveyed to the roof using Hoppits or similar rack designed specifically for this use and constructed according to engineer approved and stamped plans. DO NOT stack modules during conveyance to rooftop or installation.
- F. LiveRoof modules are to be conveyed to roof surface with equipment that is designed to carry the collective load of the LiveRoof modules and transport vehicle or Hoppit®. Account for decreasing load limits when boom (of crane or fork lift) is extended. Use crane stabilizers and take all necessary precautions to protect building and personnel.
- G.Never exceed the load capacity of the roof deck when placing LiveRoof modules on the roof. H. When suspending LiveRoof modules and conveyance vehicle or Hoppit® above deck, take precautions to stabilize vehicle and prevent twisting of conveyance vehicle or Hoppit®. Two
- layers of Styrofoam or 4 to 8 tires laid on the deck are recommended. I. Surround area below conveyance vehicle and/or crane with caution/stay clear tape to prevent potential injury.
- J. During installation, protect the roof deck and membranes with appropriate material such as plywood sheeting. Never scrape or puncture slip sheet or membranes. Keep roof surfaces free of soil, grit, or debris at all times with broom not blower. Never set LiveRoof modules on top of soil, dirt or grit.
- K.LiveRoof Roll-a-Roof® conveyor to be used for optimum efficiencies when moving modules about rooftop.
- L. Transport carts to have pneumatic tires, to be wheeled about only upon protective plywood sheeting, and to be loaded so as not to exceed weight capacity of roof deck.

3.5 SAFEGUARDING SYSTEM INTEGRITY Before working on roof, all Installers and Laborers to be:

- A.Properly instructed in safety procedures and provided LiveRoof Guide to Standardized Installation Procedures.
- B. Instructed to keep all work surfaces clean and debris free.
- C. To report immediately any damage to membranes, protective sheeting, or drain elements to supervisor, and to make appropriate repairs before proceeding.
- D.Instructed in proper methods of LiveRoof installation by certified representative of installation company.
- 3.6 LAYING (PLACING) MODULES
- A.LiveRoof module installation to follow behind installation of slip sheet/root barrier, irrigation system, pavers, ballast, and edging.
- B. LiveRoof installation to be conducted in strict accordance with LiveRoof installation guidelines. Surface to be swept clean and free of soil, dirt, stones or grit before placing each module. Rows to be straight, modules to be tight against each other with edges overlapping and arranged in proper directional orientation. As soon as one row of modules is surrounded completely by the parapet, RoofEdge[™] L-shaped edging, RoofStone pavers, or other LiveRoof modules, pull all of the LiveRoof Soil Elevators out of the modules in the surrounded row. NOTE: If biodegradable Soil Elevator is used, then Soil Elevator is left in place. Pull the Soil Elevators while standing on the slip sheet and avoid walking or kneeling on the plants.
- C. As each row of modules is installed tightly together, insert WindDisc module connectors in module slots facing the installer. Line up the next row of modules and slide into place so that the WindDisc module connectors each hold four module corners together.
- D.LiveRoof module installation to be conducted in accordance with green roof design.
- E. LiveRoof modules to be placed over RoofBlue risers atop appropriate slip sheet/root barrier. F. It is recommended that any custom cutting/fitting be oriented on the high side (top), or sides of the roof. It is recommended that the cut side of the module be set tight against the edging or toward the side of an intact module so as to prevent soil spillage. If custom cutting must be done on the low, draining, side of the roof, it is imperative that no filter cloth be inserted as it could impede drainage. It is best to orient the cut side against another module, facing upstream.
- G.After installing modules, they should be immediately watered so as to thoroughly moisten the media from top to bottom. Water shall be of suitable quality for plant growth and irrigation system or hoses and sprinklers may be used for such purpose. Note: it takes approximately 2 inches of water for the Maxx System, or 2¹/₂ gallons per module for the Maxx System to moisten each module thoroughly.
- H. First maintenance visit to be conducted two (2) weeks after installation is completed and continued according to Section 3.8. < *Specifier: Indicate who provides maintenance:* Maintenance visits performed by hired Maintenance Contractor. Installer to perform first six months of maintenance commencing at completion of green roof system installation.

3.7 WARRANTY

- A.50 Year Module Limited Warranty: Green Roof system manufacturer shall provide limited fifty (50) year guarantee that product will be free of material defects and against photodegradation. 1. Installer shall complete and submit warranty registration form and post-installation punch list to manufacturer within 60 days of delivery to complete warranty registration.
- B.15 Year Aluminum Edge Restraint Warranty Manufacturer shall provide limited fifteen (15) year guarantee against material defects.
- C.Overburden Removal/Replacement Limited Warranty: Warranty coverage may be provided by LiveRoof Global, LLC for terms up to twenty years. Call LiveRoof Global, LLC for terms and pricing, 800-875-1392.

3.8 MAINTENANCE

A. Documentation

- 1. Upon email request, LiveRoof, LLC shall provide twice monthly informational email maintenance protocol, free of charge, that shares current best maintenance practices, seasonal topics related to plant care, and chronologically guides the maintenance contractor though the various steps of the maintenance protocol beginning March 15 and ending Nov. 1 of each vear
- 2. Record all green roof maintenance events. Include name of person, date and activity. a. If soil test, record lab, test, and results
- b. If fertilizer, record type and amount applied per 1000sf c. Record time needed for bi-weekly weed walk and drain inspection
- d. If irrigation, record duration and quantity
- B. Foot Traffic: Limit foot traffic to a random path a couple times per week by one person. Avoid walking in a single path, standing in one place, or trampling plants. If parapet or adjoining wall must be serviced, plants may be covered with plywood or foam sheeting for up to 4 hours intermittently, provided foliage is not wet or frozen and conditions are not too hot or sunny.
- C. Spring Maintenance (March to June)
- 1. Soil Testing and Fertilization. Approximately 2-3 weeks before spring "growth flush," administer an annual soil test for PH and fertility levels. Growth flush varies by region, consult biweekly maintenance protocol email for specific recommended testing date in project's region.
- 2. Maintain pH in the range of 6.5 to 8.0. In the event that pH falls below 6.0, consult the testing lab for appropriate recommendations to increase alkalinity. If the soil is above 8.0, it can be made more acidic with elemental sulphur or an application of acidifying fertilizer.
- 3. Maintain fertility in the normal range using a typical field soil fertility test as provided by A&L labs or equivalent testing lab. Evaluate the various nutrient levels such as Nitrogen (N or NO3N), Potassium (K), Phosphorus (P). If the soil contains a low (L) amount of these nutrients, conduct a single application of controlled release fertilizer, such as Nutricote® or Osmocote®, at the lab recommended rate. Ensure that the chosen fertilizer contains NO Herbicides or Pesticides. Follow the fertilizer labeled directions for application rate and use a rotary spreader to ensure even fertilizer application. Runoff potential does exist and should be evaluated by the applicator in accord with the site specifics; the greater the runoff sensitivity, the lower the application rate. All applications of fertilizer are the sole responsibility of the applicator.
- 4. Mowing (optional)
- a. If desired, conduct a single annual mowing in early April. Set the mower blade just above the foliage in order to remove dried seed heads. Do not bag the clippings; instead, blow them into the green roof so that they can decompose and nourish the soil.
- b. Be safe, use protective equipment, including harnesses if required. Make sure the roof is free of frost or other slipping hazards.

5. Conduct Biweekly Inspections

- any woody plant to establish in a green roof system, as they have deep root systems which can damage roofing membranes.
- brand engineered green roof soil.
- ensure proper drainage.
- d. Debris Removal: Remove any debris blown onto the roof immediately to ensure no damage to plants.
- e. Pest Control: Monitor pest presence, as most pest problems are the result of an pesticides are the sole responsibility of the applicator.
- D. Summer Maintenance (June to September) 1. Conduct Biweekly Inspections

2. Irrigation

- sloping roofs, and roofs exposed to persistent winds or reflected sunlight. Such conditions can dry out the soil and can cause plant dormancy or, in extreme cases, death.
- b. Except when populated solely with drought tolerant succulents such as Sedums, populated with native or conventional (non-succulent) perennials or grasses.
- c. There are no absolutes when it comes to irrigation. Check the plants for wilting in the signs of wilting.
- d. Shaded areas require less irrigation.
- E. Fall Maintenance (October to November) 1. Conduct Biweekly Inspections, unless ice or frost is present.
 - hardiness of the plant material.
- **3.** Do Not Water Period: For the northern temperate zone, LiveRoof recommends that you do plants to endure winter's cold. For this reason, watering during the winter is also not recommended.

4. Rake, bag and remove fallen and matted leaves. These can smother the green roof plants. F. Winter Maintenance

1. Northern Temperate Climates

- a. Watering is not recommended.
- Consider use of heat strips with pavers, provided they can be applied without damage to the roofing membrane.
- d. Avoid piling the snow in a single place. Disperse snow evenly over the green roof and keeping them warm and wet, thereby triggering fungal diseases. 2. Warm Climates

a. Conduct Biweekly Inspections, unless ice or frost is present.

G.Paver Maintenance

3. Snow and Ice Removal:

slip agents.

green roof systems manufacturer.

request; five working days notice required.

3.8 ACCEPTANCE

specified.

3.9 CLEAN UP

- 1. After installation, clean only with water using scrub brush. Do not apply chemical cleaners. 2. Sealing:
- where stain-inducing liquids, berries or fruit are likely to be problematic.

a. Weed Walk: Pull and dispose of all weeds before they flower and set seed. NEVER allow

b. Displaced Soil: Nesting birds may displace soil. Replace lost soil using only LiveRoof

c. Drainage Inspection: Inspect roof drains for any debris, pebbles or leaves and remove to

nbalance in the relationship of pest organism and its natural biological controls and these problems may self-correct. If pest problems are persistent, use organic and natural biological control agents to restore balance. Pesticide use is discouraged and should always be considered secondary to cultural and biological control measures, as pesticides can contaminate runoff water and cause environmental damage. Pesticides shall only be applied by qualified and licensed applicators, and only as required. All applications of

a. When planted with drought tolerant succulents, irrigation recommended as a temporary management tool **during prolonged hot dry weather** to prevent plant thinning or death. Prolonged hot dry weather is generally defined as periods of 75° F weather with less than 1" of rainfall persisting for 2 weeks for the Lite system and 4 weeks for all other systems. This time period will be less if the temperatures are hotter, the climate warmer, on

Sempervivums, and Alliums, the green roof modules may require frequent irrigation if

afternoon. Water thoroughly to runoff to remoisten entire soil profile if the plants show

2. Do Not Fertilize during the fall. It may stimulate tender growth and compromise the cold

not water within 4 weeks of the expected average frost date. Normally, there is plenty of moisture this time of year, and adding additional water may compromise the durability of the

b. Avoid walking on frozen plants and roof surfaces as they are slippery and dangerous. c. If clear pathways are needed, avoid using salt and other deicing chemicals, which may kill plants and damage pavers. Instead, use sand or cat litter as an anti-slip agents.

plantings as excess snow piling can potentially damage plants by insulating the plants

a. Prior to installation, a non-silicone, 90% breathable concrete sealer may be applied to the top surface of the paver, however it is not required. Sealer recommended for applications b. Avoid getting sealer on roof surface as it may damage integrity of waterproofing system.

a. The use of de-icing agents including but not limited to Sodium Chloride (Salt), Calcium Chloride, Ammonium Nitrate, and Ammonium Sulfate, is prohibited; these chemicals will damage pavers. Snow should be removed manually and sand or clay used as non

A.Conduct post installation inspection to determine acceptance of modules. Inspection to be made by General Contractor's Representative or by Owner's Representative upon General Contractor's

B. Installer is responsible to complete requirements to obtain confirmation of warranty from the

C.Installer is responsible to ensure proper module/plant maintenance until work has been accepted by representative of Owner or General Contractor.

D.Upon acceptance, Owner assumes responsibility for module/plant maintenance unless otherwise

A.Throughout installation, keep all work surfaces clean and free of grit, dirt, or debris. Use broom not blower, do not sweep soil under modules or slip sheet. Following installation, remove all excess materials and tools from job site. Ensure that any damage that occurs as a result of installation is appropriately and immediately repaired.

STATEMENT BY CERTIFIED LANDSCAPE EXPERT This is to certify that I have examined all required GAR plan submittals prior to submission. I further certify that all aspects of the submittal, including landscape elements within the Lot and the listed GAR score, meet the specifications required under Subtitle C, Chapter 6 of Title 11 of the District of Columbia Municipal Regulations.	
Name and Title	DATE:
Address	SCALE:
Date: Phone No:	Varies
Certified Landscape Expert Signature: Certifying Organization Certification Number	sheet number:
Sheets: LP.101, LP.102, LP.103, LP.104, LP.105	L004

REVISIONS		
1	30% Coordination	2/1/18
2	1st Submission	2/12/18
3	2nd Submission	3/6/18





TYPICAL PERMEABLE PAVER DETAIL

Permeable Paver Installation

(Source: DDOE Stormwater Management Guidebook, Section 3.7, July 2013)

The following is a typical construction sequence to properly install permeable pavement, which may need to be modified depending on the particular type of permeable pavement that is being installed.

Step 1: Stabilize Drainage Area. Construction of the permeable pavement should only begin after the entire contributing drainage area has been stabilized. The proposed site should be checked for existing utilities prior to any excavation. Do not install the system in rain or snow and do not install frozen bedding materials.

Step 2: Install Soil Erosion and Sediment Control Measures for the Bioretention. As noted above, temporary soil erosion and sediment controls are needed during installation to divert stormwater away from the permeable pavement area until it is completed. Special protection measures, such as erosion control fabrics, may be needed to protect vulnerable side slopes from erosion during the excavation process. The proposed permeable pavement area must be kept free from sediment during the entire construction process. Construction materials contaminated by sediment must be removed and replaced with clean material.

Step 3: Minimize Impact of Heavy Installation Equipment. Where possible, excavators or backhoes should work from the sides to excavate the reservoir layer to its appropriate design depth and dimensions. For small pavement applications, excavating equipment should have arms with adequate extension so they do not have to work inside the footprint of the permeable pavement area (to avoid compaction). Contractors can utilize a cell construction approach, whereby the proposed permeable pavement area is split into 500- to 1,000-square foot temporary cells with a 10- to 15-foot wide earth bridge in between, so cells can be excavated from the side. Excavated material should be placed away from the open excavation so as to not jeopardize the stability of the side walls.

Step 4: Promote Infiltration Rate. The native soils along the bottom of the permeable pavement system should be scarified or tilled to a depth of 12 inches prior to the placement of the filter layer or geotextile fabric. In large-scale paving applications with weak soils, the soil subgrade may need to be compacted to 95 percent of the Standard Proctor Density to achieve the desired load-bearing capacity.

Note: This may reduce or eliminate the infiltration function of the installation, and it must be addressed during hydrologic design.

Step 5: Order of Materials. Geotextile fabric should be installed on the sides of the reservoir layer (and the bottom if the design calls for it). Geotextile fabric strips should overlap down-slope by a minimum of 2 feet and be secured a minimum of 4 feet beyond the edge of the excavation. Where the filter layer extends beyond the edge of the pavement (to convey runoff to the reservoir layer), install an additional layer of geotextile fabric 1 foot below the surface to prevent sediment from entering into the reservoir layer. Excess geotextile fabric should not be trimmed until the site is fully stabilized.

Step 6: Install Base Material Components. Provide a minimum of 2 inches of aggregate above and below the underdrains. The up-gradient end of underdrains in the reservoir layer should be capped. Where an underdrain pipe is connected to a structure, there shall be no perforations within 1 foot of the structure. Ensure there are no perforations in clean-outs and observation wells within 1 foot of the surface.

Step 7: Stone Media. Spread 6-inch lifts of the appropriate clean, double washed stone aggregate (usually No. 2 or No. 57 stone). Place at least 4 inches of additional aggregate above the underdrain, and then compact it using a vibratory roller in static mode until there is no visible movement of the aggregate. Do not crush the aggregate with the roller.

Step 8: Reservoir Media. Install the desired depth of the bedding layer, depending on the type of pavement, as indicated in Table 3.14.

Step 9: Paving Media. Paving materials shall be installed in accordance with manufacturer or industry specifications for the particular type of pavement.

• Contractor to verify that no utility conflicts exist. In the event of a conflict, contractor to notify owner and

• Permeable paver details and specifications are to be used as a guide by the contractor. Contractor to verify that permeable paver manufacturer 's recommended installation techniques before installation. In the event of a conflict, contractor to notify owner and landscape architect.

• Permeable pavers to be Techo-Bloc "Inflo" paver or approved equivalent.

Reservoir layer to be clean, double-washed, aggregate. See Permeable Paver Material Specifications. • Dimensions of permeable paver parking to be per approved GAR plan.

• Within 10 feet of buildings or structures, use an impermeable liner along the sides of the permeable pavement practice (extending from the surface to the bottom of the practice). See Permeable Paver Material Specifications. • Along areas where the permeable pavement practice abuts a public alley, install an impermeable liner (full-depth, extending from end to end of the practice). See Permeable Paver Material Specifications.

• Provide a perforated 4" schedule 40 PVC underdrain. See Permeable Paver Material Specifications.

• Bedding Layer: 2" of ASTM D448 size No. 8 stone (e.g., 3/8 to 3/16 inch in size). Must be double-washed and

• Upper Reservoir Layer: 10" of ASTM D448 size No. 57 stone (e.g., 1 1/2 to 1/2-inch in size). Must be double-washed and clean and free of all fines

• Lower Reservoir Layer: 12" of No. 2 Stone (e.g., 3 inches to 3/4 inches in size). Must be double-washed and

• Underdrain: Use 4 inch diameter perforated schedule 40 PVC pipe, with 3/8-inch perforations at 6 inches on center. Perforations to start 12" inside of the permeable pavement cell. Perforated pipe to be installed for the full length of the permeable pavement cell, and non-perforated pipe, as needed, is used to connect with the storm drain system. T's and Y's should be installed as needed, depending on the underdrain configuration. Observation wells to be located at each end of the underdrain and extend to the surface.

Geotextile: The underlying native soils should be separated from the stone reservoir by geotextile. Use an appropriate geotextile fabric that complies with AASHTO M-288 Class 2, latest edition, requirements and has a permeability of at least an order of magnitude higher (10x) than the soil subgrade permeability. Impermeable Liner: Use a thirty mil (minimum) PVC Geomembrane liner (follow manufacturer's instructions

• Observation Well: Use a perforated 4-inch vertical, schedule 40 PVC pipe with panella type cleanout top.

4" pvc observation well, full depth of trench, 3/8" perforations @ 6" on center around pipe no perforations within 12" of payer edge where the permeable pavement practice -abuts the public alley, provide an impermeable liner (full-depth, extending from end to end of the practice)

provide footplate for bottom

(marine plywood, $8"x8"x\frac{1}{4}"$)

of observation well

scale: 1" = 1'-0"

Permeable Paver Maintenance

(Source: DDOE Stormwater Management Guidebook, Section 3.5.7, July 2013)

Maintenance is a required and crucial element to ensure the long-term performance of permeable pavement. The most frequently cited maintenance problem is surface clogging caused by organic matter and sediment. Periodic street sweeping will remove accumulated sediment and help prevent clogging; however, it is also critical to ensure that surrounding land areas remain stabilized. The following tasks must be avoided on ALL permeable pavements:

- Sanding
- Re-sealing
- Re-surfacing •
- Power washing
- Storage of snow piles containing sand Storage of mulch or soil materials
- Construction staging on unprotected pavement

It is difficult to prescribe the specific types or frequency of maintenance tasks that are needed to maintain the hydrologic function of permeable pavement systems over time. The frequency of maintenance will depend largely on the pavement use, traffic loads, and the surrounding land use. One preventative maintenance task for large-scale applications (e.g., parking lots) involves vacuum sweeping on a frequency consistent with the use and loadings encountered in the site. Many experts consider an annual, dry-weather sweeping in the spring months to be important. The contract for sweeping should specify that a vacuum sweeper be used that does not use water spray, since spraying may lead to subsurface clogging. Typical maintenance tasks are outlined below:

Typical Maintenance Tasks for Permeable Pavement Practices

After installation:

• For the first 6 months following construction, the practice and CDA should be inspected at least twice after storm events that exceed 1/2 inch of rainfall. Conduct any needed repairs or stabilization.

Once every 1-2 months during the growing season: • Mow grass in grid paver applications

As needed:

- Stabilize the CDA to prevent erosion
- Remove any soil or sediment deposited on pavement.
- Replace or repair any pavement surfaces that are degenerating or spalling

2-4 times per year (depending on use):

- Conduct a maintenance inspection
- Spot weed for grass applications

Annually:

- Conduct a maintenance inspection
- Spot weed for grass applications

Once every 2-3 years:

• Remove any accumulated sediment in pretreatment cells and inflow points

If clogged:

• Conduct maintenance using a regenerative street sweeper or a vacuum sweeper • Replace any necessary joint material

Seasonal Maintenance Considerations:

Winter maintenance for permeable pavements is similar to standard pavements, with a few additional considerations: Large snow storage piles should be located in adjacent grassy areas so that sediment and pollutants in snowmelt are partially treated before they reach the permeable pavement.

- toward permeable pavement, since it will quickly clog the system.
- to traditional pavements, using similar equipment and settings.

When permeable pavements are installed on private residential lots, homeowners will need to (1) be educated about their routine maintenance needs and (2) understand the long-term maintenance plan. It is recommended that a qualified professional conduct a spring maintenance inspection and cleanup at each permeable pavement site, particularly at large-scale applications.

• Sand or cinders should never be applied for winter traction over permeable pavement or areas of standard (impervious) pavement that drain

• When plowing plastic reinforced grid pavements, snow plow blades should be lifted 1/2 inch to 1 inch above the pavement surface to prevent damage to the paving blocks or turf. Porous asphalt (PA), pervious concrete (PC), and some permeable pavers (PP) can be plowed similar

• Chloride products should be used judiciously to deice above permeable pavement designed for infiltration, since the salt will be transmitted through the pavement. Salt can be applied but environmentally sensitive deicers are recommended. Permeable pavement applications will generally require less salt application than traditional pavements.

STATEMENT BY CERTIFIED LANDSCAPE EXPERT This is to certify that I have examined all required GAR plan submittals prior to submission. I further certify that all aspects of the submittal, including landscape elements within the Lot and the listed GAR score, meet the specifications required under Subtitle C, Chapter 6 of Title 11 of the District of Columbia Municipal Regulations.	
Name and Title	DATE:
Address	SCALE:
Date: Phone No:	Varies
Certified Landscape Expert Signature: Certifying Organization Certification Number	sheet number:
Sheets: LP.101, LP.102, LP.103, LP.104, LP.105	L005

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Sheet 5 Details

Questions & Answers

For additional information: doee.dc.gov/GAR