

LIVING ARCHITECTURE MONITOR[®]

A GREEN ROOFS FOR HEALTHY CITIES PUBLICATION

VOLUME 18 / ISSUE 2 / SUMMER 2016

THE POLICY ISSUE

- ON THE ROOF WITH... TWO POLICY LEADERS SHARE INSIGHTS ON GOING GREEN
- DC'S ANSWER TO THE HIGHLINE? STARCHITECT JASON LONG, OMA, ON THE PROPOSED I1TH STREET PROJECT IN DC
- ANNUAL GREEN ROOF SURVEY HIGHLIGHTS
- LANCE DAVIS ON GSA'S NEW POLLINATOR POLICY!
- THE ART OF CAMOUFLAGE - RANDY SHARP REFLECTS ON GREEN WALL INDUSTRY
- ARE YOU READY - FOR ALGAE INTEGRATED BUILDINGS?

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VOLUME 18
ISSUE 2
SUMMER 2016

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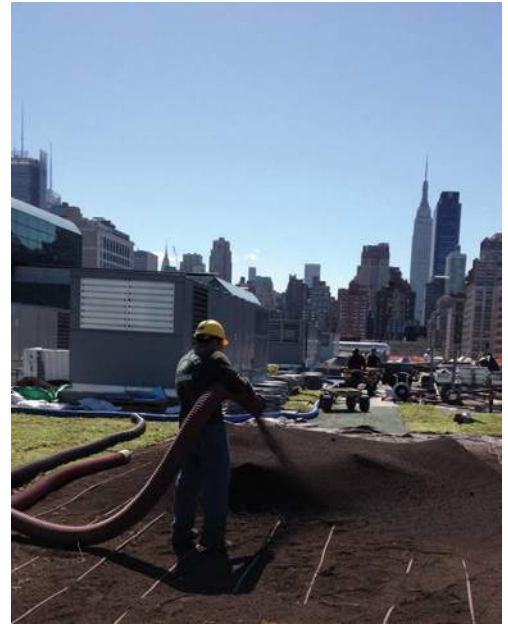
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*On the Cover: Rendering of Proposed 11th Street Bridge Project in DC.
Courtesy OMA and OLIN.*



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MISSION

Green Roofs for Healthy Cities' mission is to develop and protect the market by increasing the awareness of the economic, social and environmental benefits of green roofs, green walls, and other forms of living architecture through education, advocacy, professional development and celebrations of excellence.

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WILLFUL BLINDNESS AND THE CASE FOR POLICY NOW!

With 2015 the hottest year on record, it is becoming increasingly obvious that something is very wrong with our climate, even without any knowledge of climate science.

Three months ago, the most powerful hurricane ever recorded threatened to wipe Puerto Vallarta, Mexico from the map. Thankfully it lost much of its lethal power before making landfall. Our papers report daily stories of change. Snakes are migrating northward. Insects, like the Emerald Ash Borer, are moving northward killing millions of ash trees. To the far southern reaches of our planet, incomprehensibly large Antarctic ice sheets are breaking away from the land, and gradually slipping into the Antarctic ocean threatening to eventually flood our coastal cities. The US EPA estimates coastal flooding will cost \$5 trillion in damages by 2100 if climate change isn't addressed.

We need public and private sector leadership to reduce greenhouse gases rapidly, while helping us adapt quickly to the changes that are already upon us. This is difficult, because we don't see things that are too distant from our own experience, or too separate from our own immediate concerns. According to Margaret Heffernan, a social scientist who wrote *Willful Blindness* (2011), "One of the reasons it has proven so hard for climate change activists and negotiators to gain traction must be that the threats feel so far away in time

- well after the heads of state responsible for it will have left the stage."

While Heffernan may well be right, there are huge and mounting costs to not acting on climate change. Moreover, there are multibillion dollar business opportunities in preparing for extreme weather events. Many of these opportunities involve the use of green infrastructure, right now, and in the immediate future, not 'so far away'.

The 4th Annual *Grey to Green Conference* (greytogreenconference.org) in Toronto June 1-4, 2016 focuses on green infrastructure and its ability to provide scientifically proven solutions to the mitigation and adaptation to climate change. Green roofs and walls, rain gardens and urban forests help mitigate greenhouse gas emissions by reducing energy consumption in buildings, by reducing the urban heat island, as well as capturing and retaining huge volumes of stormwater thereby reducing flooding that costs billions in insurance claims.

In this Policy Issue of the *Living Architecture Monitor*, we shine light on lessons learned from policy makers in Portland and Milwaukee (page 10). Unsurprisingly our Annual Green Roof Market Survey found the largest markets, Washington and Toronto, are also those with the most effective policies (page 4). Congratulations to policy makers in these cities. Our On Spec piece looks at how policy leadership can

drive innovation and job growth (page 35).

Are we moving fast enough to implement policy and leverage our entrepreneurial and business talents to implement living architecture, and the broader range of green infrastructure to prepare for climate change? The answer depends largely on where you stand on the climate change issue - from those who deny its existence outright (the willfully blind) at one end of the spectrum, to those who are deeply concerned. Yet, with or without climate change, there are still many excellent business, health and well-being reasons to implement policies that support the greening of our buildings and communities now, and in the immediate future!

Sincerely yours,



Steven W. Peck,
GRP, Honorary ASLA
Editor

FIND OUT MORE

EPA Estimates on Costs-Benefits of Addressing Climate Change
<https://goo.gl/TdlPV7>

STRATA



Photo courtesy of Steven Peck

LIVING ARCHITECTURE DOCTOR

Extensive green roof with high level of aggregates and very thin substrate. Test your skills – tell us what went wrong on this green roof. Diagnose the problem by emailing editor@greenroofs.org. Your response could be featured in the next issue of the Living Architecture Monitor magazine.

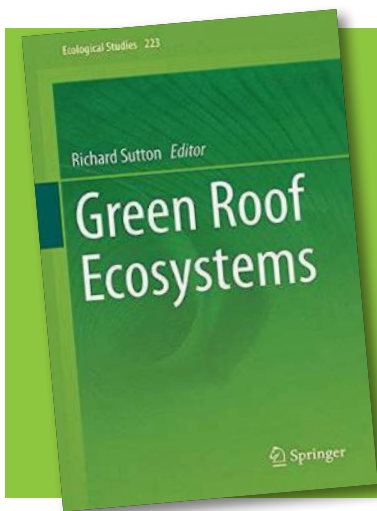


SPRING ISSUE

When the day lilies were first planted there were lots of bare areas left over. The roof was not maintained for five years so over 50 species of pioneering plants established themselves, competing with the lilies. (left image)

TREATMENT

The growing media was full of seeds, but they have been suppressed with tarps, and this roof has gradually been turned into a rooftop farm which produces more than 25,000 pounds of produce per year (right image). A tour of the roof is being given at the Grey to Green conference in Toronto June 1-4, 2016.



BOOK REVIEW: GREEN ROOF ECOSYSTEMS RICHARD SUTTON (ED), SPRINGER (2015)

This book provides is a compilation of green roof, design, and management from an ecosystem perspective with more than 25 experts contributing chapters. It reviews, explains, and poses questions about monitoring, substrate, living components and the abiotic, biotic and cultural aspects connecting green roofs to the fields of community, landscape and urban ecology. The work contains examples of green roof venues that demonstrate the focus, level of detail, and techniques needed to understand the structure, function, and impact of these novel ecosystems. This compilation delves to explore the next wave of evolution in green technology and defines potential paths for technological advancement and research. If you didn't purchase a copy at CitiesAlive 2015 in New York, you can order one [online](#).

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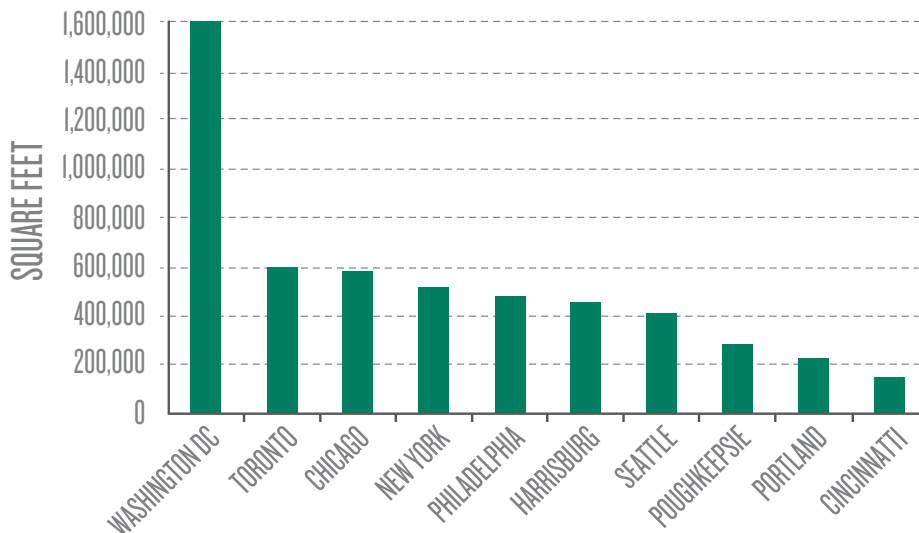
JURISDICTIONS WITH STRONG POLICY SUPPORT DOMINATE GREEN ROOF INSTALLATIONS:

WASHINGTON LEADS NORTH AMERICA FOR GREEN ROOF INSTALLATIONS IN 2015

WRITTEN BY BLAINE STAND, GREEN ROOFS FOR HEALTHY CITIES MEMBERSHIP COORDINATOR

Washington DC has continued to lead North America for the amount of green roofs installed in a metro region, as reported in the Green Roofs for Healthy Cities' *Annual Green Roof Industry Survey*. According to the survey the DC metro area installed 1,595,957 square feet of green roofs in 2015, up from 1,207,114 square feet in 2014, largely due to DC's Stormwater Retention Credit program, detailed at <http://goo.gl/nuRbE4>.

TOP NORTH AMERICAN METRO REGIONS OF GREEN ROOFS INSTALLED IN 2015



For the second year, the Metro Toronto Area has ranked second amongst North American cities, with 594,710 square feet of green roofs installed. The Green Roof By-Law, detailed at <http://goo.gl/x8t8kQ>, which requires green roofs on most new buildings, has resulted in the permitting of more than 2 million square feet. The remaining cities in the top five were Chicago, New York City, and Philadelphia. Overall, the growth rate of the industry increased by 18.5 per cent over the previous year's 12 per cent shortfall, adding market growth to the 2013 total.

FIND OUT MORE

GRHC is currently conducting the first-ever Green Wall Survey. If you would like to participate please contact Blaine Stand at bstand@greenroofs.org or 416-971-4494 x223. For more information and to purchase the full detailed survey report visit: <http://goo.gl/wBPRIR>

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- Riverbend Nursery
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RISING TO THE STORMWATER CHALLENGE!



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CONFERENCE HIGHLIGHTS

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AGENDA AT A GLANCE

Monday, October 31

6:00 PM - 8:00 PM GRP Networking Event

Tuesday, November 1

8:30 AM - 5:00 PM Training Courses*
9:30 AM - 5:00 PM Stormwater Technical Workshop*
12:00 PM - 6:30 PM Trade Show Opens
6:45 PM - 7:45 PM Opening Plenary and Keynotes:
George Hawkins, DC Water

Wednesday, November 2

8:30 AM - 10:15 AM Morning Plenary and Keynotes:
Sabine O'Hara, UDC
10:30 AM - 12:00 PM Programming: Session 1
12:00 PM - 2:00 PM Lunch on Trade Show Floor
12:00 PM - 2:00 PM Poster Sessions on Trade
Show Floor
12:00 PM - 7:00 PM Trade Show Floor Opens
2:00 PM - 3:30 PM Programming: Session 2
3:45 PM - 5:15 PM Programming: Session 3
5:30 PM - 7:00 PM Hospitality on Trade Show Floor
7:30 PM - 10:30 PM Local Host Reception -
Capitol View at 400*

Thursday, November 3

8:30 AM - 10:30 AM Programming: Session 4
10:45 AM - 12:45 PM Programming: Session 5
1:00 PM - 2:45 PM Awards of Excellence Luncheon
3:00 PM - 6:00 PM Tours*

Friday, November 4

8:30 AM - 12:30 PM Tours*
8:30 AM - 4:30 PM Anacostia Green
Infrastructure Charette*

* Ticketed Events; Registration Required

Programming includes Design, Research, and Policy Track Sessions, as well as 'On the Roof with' Discussion Panels

Note: Agenda is subject to change without notice

CONFERENCE VENUE

CONFERENCE HOTEL



RISING TO THE STORMWATER CHALLENGE

Since the annual CitiesAlive Green Roof and Wall Conference was last in Washington DC in 2005, the market in the nation's capital has exploded. For five years in a row, Washington DC has led North America in green roof installation, and is on the forefront of supportive policy.

Stormwater management is a critical factor driving this policy, both in Washington DC and in many other jurisdictions. Join up to 800 delegates in Washington DC to focus on stormwater management: policies, technologies, design and best management practices.

PROGRAM HIGHLIGHTS

Learn from over 60 expert speakers at North America's only conference dedicated to green roofs and walls:



George Hawkins, Esq., CEO & General Manager, DC Water on DC Water's exciting new Green Infrastructure Plans, operating the world's largest advanced water treatment plant, and more!



Dr. Sabine O'Hara, Dean and Director of Landgrant Programs for the College of Agriculture, Urban Sustainability and Environmental Sciences at the University of the District of Columbia on Green Roofs, Job Creation, and Urban Food Production at UDC.

Kevin Kampschroer, Chief Sustainability Officer, US GSA: *Green Roof and Wall Research Panel*

Hallie Boyce, Partner, OLIN & **Jason Long**, Partner, OMA: *11th St. Bridge Park Project*

Dr. Alan Darlington, Founder & Owner, Nedlaw Living Walls: *Water, Indoor Plant Walls and Building Performance*

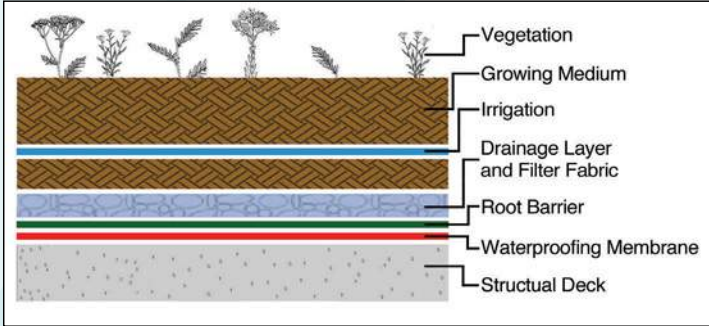
Barbara Deutsch, Executive Director, Landscape Architecture Foundation: *High Performing Green Roof Case Studies*

Dr. Bill Retzlaff, Associate Dean & Professor, SIUE: *Green Roof Maintenance and Plant Performance*

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NEW! STORMWATER TECHNICAL WORKSHOP

Join us for the first-ever stormwater technical workshop, where we explore how each green roof layer plays a role in stormwater management, how green roofs fit in stormwater policy, and the costs and benefits of green roofs versus other stormwater BMPs.



NETWORK with like-minded professionals at the trade show and other events, and enjoy the spectacular view of Washington DC's landmarks at the Local Host Committee Reception at the Capitol View at 400.



TOUR DC's boldest green roof and wall projects, like the I-395-spanning US Tax Court Plaza.



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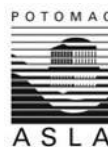
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POLICY: BY THE NUMBERS

>400

Jurisdictions in North America have some form of impervious surface fee

\$15/ft²

Green roof rebate for targeted subwatersheds in Washington, DC

100%

Grant to cover design and construction costs for eligible green roofs in NYC

25%

of costs covered as a tax rebate for eligible green roof projects in Philadelphia

2.6m

Square feet of green roofs built in Toronto as a result of the mandatory Green Roof Bylaw

3 ft²

Bonus floor area possible per square foot of green roof in Portland

>20

Jurisdictions in North America with dedicated green roof policy

\$30.4

50-Year Net Present Value of Community Benefits per ft² of green roof

\$1.90 to \$2.55

Market value of one gallon of retained stormwater in Washington, DC

0

Jurisdictions in North America with dedicated green wall policy

REFERENCES (from top to bottom, left to right)

1. National Resources Defense Council, *Rooftops to Rivers II, 2011* Learn more
2. Anacostia Watershed Society – *Riversmart Rooftops* Learn more
3. New York City Department of Environmental Protection – *Green Infrastructure Grant Program* Learn more
4. City of Philadelphia – *Business Privilege Tax – Green Roof Tax Credit* Learn more
5. City of Toronto – *Green Roof Bylaw* Learn more
6. City of Portland – *Portland Ecoroofs* Learn more
- 7/10. Green Roofs for Healthy Cities
8. US GSA – *The Benefits and Challenges of Green Roofs on Public and Commercial Buildings, 2011* Learn more
9. Karimi, Hamid – *DC's Innovative Stormwater Management Model: A Mix of Regulations and Incentives – Living Architecture Monitor, Spring 2016* Learn more

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ON THE ROOF WITH: POLICY EXPERTS SHARE THEIR INSIGHTS

TOM LIPTAN, GRP, CONSULTANT, PORTLAND OREGON AND KEVIN SCHAFER, P.E.,
EXECUTIVE DIRECTOR, MILWAUKEE METROPOLITAN SEWERAGE DISTRICT (MMSD)

Photo Courtesy of Vegetal i D

Tom Liptan won a GRHC Award of Excellence in 2004 for his pioneering research and policy work on green roofs and stormwater while working at Portland's Bureau of Environmental Services. He has since retired and is now working on a book. Kevin Schafer runs the MMSD and was recognized as a Civic Award of Excellence winner in 2015 for his work to support green infrastructure implementation in Milwaukee. Here's what they have to say about the art of policy making.

Responses edited for length and clarity.

LAM: Briefly describe the policies you currently have in place which directly support green roof and/or green wall implementation on new or used buildings?

TL: In 1999, Portland included ecoroofs as an option to meet stormwater management requirements, which are still in effect today. In 2001, Portland added ecoroofs to its Zoning Floor Area Bonus options, although still in effect today, all bonus options are proposed to be eliminated with the city's new comprehensive plan amendments. However, ecoroofs are proposed in the plan, to be made a requirement of development in the central city, which is about 9 square miles of area. There are several non-profits pushing for the requirement citywide, 130 square miles. The final decisions are expected in fall 2016. In 2005 and 2009,

Portland City Council passed resolutions that require ecoroofs on all city owned facilities when practical. Some bureaus have made this standard practice and some try to get out of it, and have. It is still in effect. There are no policies for green walls. In 2014, BES constructed a large stormwater vegetative wall and is monitoring its rain management performance.

KS: Milwaukee Metropolitan Sewerage District (MMSD) is a regional governmental agency that services 28 municipalities, each of which has their own policies regarding storm water management. MMSD does have a Chapter 13 Storm and Surface water rule which these municipalities must comply with. A key provision of this rule requires any new construction or renovation that disturbs 0.5 acres or more must reduce their

runoff rate. One option to reduce runoff is to implement green infrastructure, such as green roofs, to meet this requirement. MMSD does have funding programs that could support these efforts. MMSD has a vision of capturing the first half inch of rainfall in our service area via green infrastructure. This amounts to 740 million gallons and is known as our FreshCoast 740 Initiative. In order to reach that goal we offer programs available to all sectors. These programs fund a variety of green infrastructure strategies of which green roofs are an eligible choice.

LAM: *If you use public funds for green roofs, how did you justify making these expenditures to politicians and the general public?*

TL: Portland had public funds for special ecoroof grants from 1999 to 2000, and financial incentives were made available to almost any proposed ecoroof from 2008 to 2013. Small grants are still available today from the Watershed Stewardship Program, but are limited to educational projects with specific criteria, ecoroofs can be included.

KS: MMSD believes that green infrastructure serves as a viable complement to traditional grey infrastructure and an effective means of diminishing the likelihood of combined or separate sewer overflows. Implementing green infrastructure to manage water where it falls can often be more cost effective. This vision is supported by our governing Commission.

LAM: *Are you tracking the square footage of green roofs and/or green walls and if so how are you doing this?*

TL: Tracking is done occasionally by one person in the Bureau of Environmental Services. There isn't a formal system.

KS: Yes, square footage is tracked ongoing project by project. Through 2015, MMSD has awarded funding to support 11.75 acres with 9.5 of those acres currently installed.

LAM: *Do you have any minimum requirements for green roof coverage related to policy and if so what are they?*

TL: Not currently, but the new comp plan has a goal of 18 per cent coverage of existing and proposed roofs and with that hopes to achieve approximately 408 acres (of the 2,267 roof acres in Central City) by 2035. There are no other government agency

THE EXPERTS



Tom Liptan won a GRHC Award of Excellence in 2004 for his pioneering research and policy work on green roofs and stormwater while working at Portland's Bureau of Environmental Services. He has since retired and is now working on a book.



Kevin Schafer runs the MMSD and was recognized as a Civic Award of Excellence winner in 2015 for his work to support green infrastructure implementation in Milwaukee.



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goals. However, why can't others have goals, so with that I'm contacting my colleagues at Urban Greenspaces Institute to discuss that very subject... what are our goals for green roofs, green walls, green streets, trees, etc.

KS: Our funding program requires green roofs to have a minimum growing media depth of 3" or a demonstrated ability to retain a 1" rainfall. Green roofs awarded funding are eligible for reimbursement at a rate of \$5/square foot. There is no set limit other than available funding. Any submitted project, including green roofs, must have sufficient green infrastructure to make the reimbursable amount at least \$10,000. Our programs fund a variety of green infrastructure strategies from amongst which green roofs are an eligible choice. We also pay for green roofs if they qualify as a Signature Project. Projects may submit for "Signature" status which would make them eligible for up to 50 per cent funding of eligible project costs. They must meet at least four of the listed criteria to be considered for Signature level funding. Signature Project criteria include:

- Project site has 10,000+ visitors each year.
- Site is generally considered a regional landmark or destination.
- Project must have capture capacity of 10,000+ gallons and/or result in zero discharge.
- Project site is larger than two acres in size.
- Applicant has secured (or can reasonably demonstrate the likelihood of securing) 50 per cent match funding.
- Project provides quantitative monitoring data on the performance, operations, and maintenance of the green infrastructure measure(s).

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LAM: *Do you have any construction and or maintenance standards for green roofs and/or walls?*

TL: If a project is used for stormwater management or to get the Floor Area Bonus it has to meet the requirements of the city's stormwater management manual. No standards exist for green walls except meeting any applicable building codes.

KS: Our funding programs require submission of comprehensive maintenance plans for a minimum of ten years. As of 2014, any project receiving \$25,000 or more is required to have a limited-term conservation easement for ten years to ensure proper maintenance is being performed. Although we currently do not have construction and or maintenance standards for green roofs and/or walls they remain a possibility in the future. Standards are currently being

developed for some green infrastructure strategies; however, green roofs are not included at present.

LAM: *Did you experience any barriers that had to be overcome to put new policies in place and if so, what were they and how did you overcome them?*

TL: Yes numerous barriers came in the form of existing practices and people ignorantly opposed to something they had never heard of and were afraid of. The next barriers, are actually offensives which came in the form of people trying to dismantle the progress that has been achieved. For example a lawsuit was filed against BES for using stormwater funds for green infrastructure which includes ecoroofs. The court was convinced of the appropriateness of BES's expenditures and denied the plaintiffs on the issues.

But the damage was done, because BES became paranoid and has reduced its ecoroof program substantially. The lawsuit has 28 other issues, not all against BES.

We in the non-profit sector have our work cut out for us.

KS: Although we have not necessarily encountered any specific policy barriers, MMSD continues to work on furthering public education and acceptance of green infrastructure strategies as a viable means of managing stormwater.

LAM: *What advice would you give to a policy maker who is investigating green roof and/or wall policy development? What has worked for you?*

TL: Start by making the concept real in your city. Find an existing green roof and document its function and performance relative to issues of concern in your city. Use that information to help inform and persuade others. Find the champion, it may be you. If a champion doesn't exist designate someone. Find support outside of the city government to help.

KS: The best advice I can give on this is that anyone who is working on a green roof program should spend a considerable amount of time reaching out to the impacted stakeholders, listen to their input, and then strive to shape the policies to meet their needs.

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Special thanks to Lisa Sasso and Chris Shultz, MMDS for their input.

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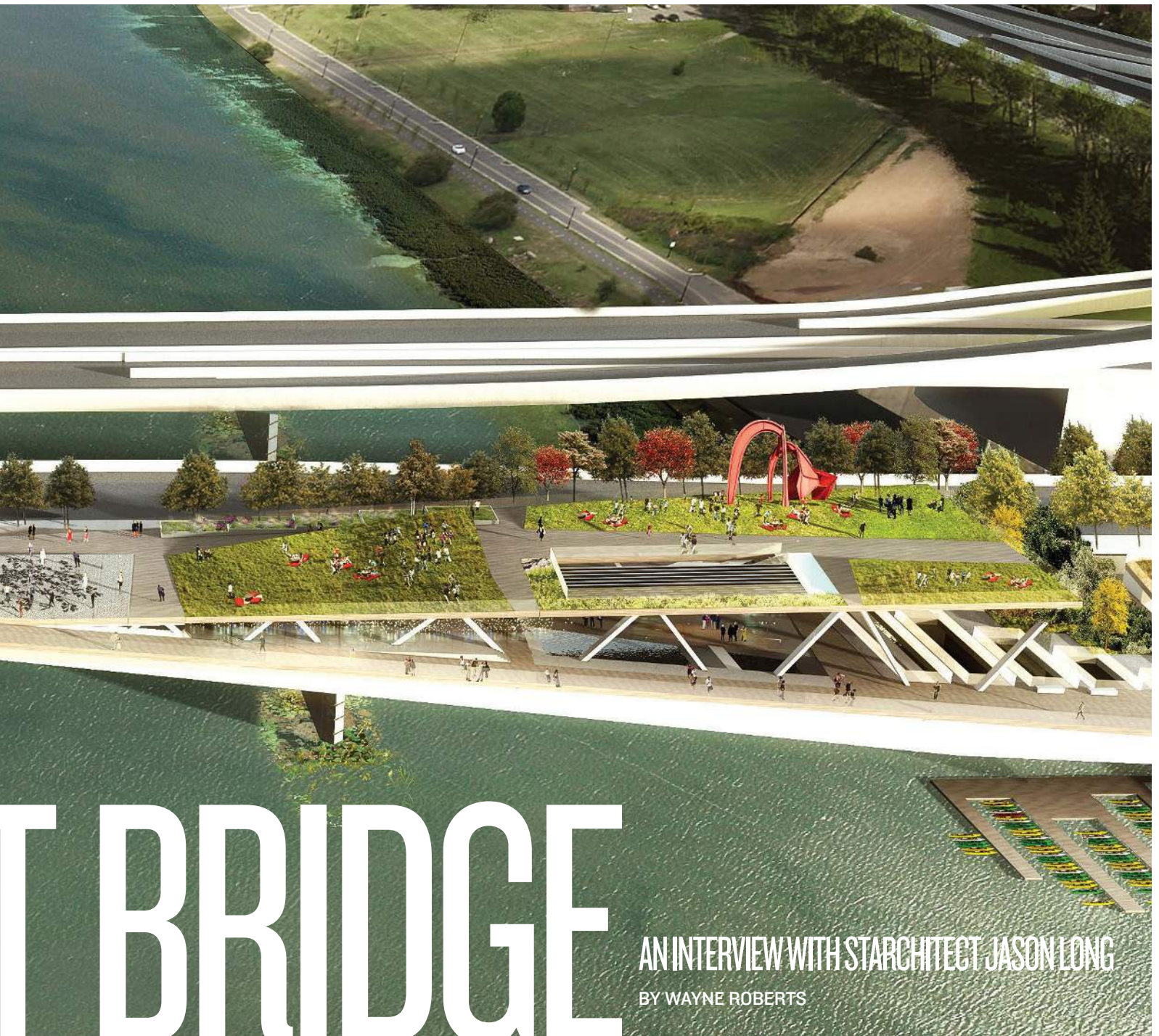


DESIGN LEADERSHIP:

THE 11TH STREET



Jason Long doesn't want to talk about green roofs. He wants to talk about how greens roofs will “talk” with nearby buildings, landscapes and people. Jason Long is one of nine international partners of OMA, a global architecture and design firm. Jason is currently leading the development of 11th Street Bridge Park, an elevated park in Washington DC.



AN INTERVIEW WITH ARCHITECT JASON LONG

BY WAYNE ROBERTS

OMA's Jason Long has been responsible for many prominent and controversial installations, including Washington's 11th Street Bridge Park, the Cornell Architecture building and, soon to be unveiled, Quebec City's National Beaux-Arts Museum. He holds a Bachelor of Arts in Philosophy from Vassar College, and a Master of Architecture from Harvard University's Graduate School of Design. He has practiced in several places, including Beijing, Shanghai and Rotterdam. He spoke with us from his New York office.

LAM: *Your work on the 11th Street Bridge Park in Washington has been widely acclaimed for creating a bridge for social diversity. To my eyes, that project also stands out for its use of green space and green building techniques. Are green and environmentally sustainable approaches something you and your firm are known for?*

JL: Our firm has used green roofs on many projects, going as far back as 1997 with the Educatorium, a building we did in Utrecht in the Netherlands. That was before my time. More recently, I worked on an extensive green roof for Milstein Hall, the architecture building we did for Cornell University in 2011. We're also doing a large extensive green roof on the National Beaux-Arts Museum in Quebec City, which opens this

June. Both of those are extensive sedum green roofs that are not really meant to be occupied. They help with stormwater issues and insulation, and of course provide a visual benefit for the people who can look down on them. I think those things are very important.

In both cases, we proposed green roofs to the client. At Cornell, the green roof helped connect the architecture school to nearby buildings and to the

campus as a whole. We wanted our project to sit in a grey area within the figure-ground of the campus. It's lifted off the ground so you can pass underneath it, and also has a green roof on top. So, it's almost as much a part of the landscape as it is a building on the campus. We wanted a particular relationship to the nature of campus and beyond – to the gorge that lies to the north.

WR: *Do you design for visual beauty or sustainability, or both?*

JL: The two are interlocked. A green roof is a beautiful design feature, and it also gives us a palette to work with. With the green roof on the Cornell architecture building, we responded to the conjunction of the manicured campus with the wild nature of the gorge – by creating a gradient pattern of differently-colored plantings on the roof.

We always design with an eye toward sustainability. But I have to say that, typically, our main drivers are program, functionality and aesthetics in general; then we coordinate those things with a sustainability agenda – using aspects such as façade-performance, building orientation, and a green roof. We're not typically putting in green just for the sake of it. For us, we have to see a clear benefit to the users, and a clear conceptual purpose.

LAM: *What do you see as the main obstacle to more widespread use of greener or more sustainable building approaches?*

JL: I would say there's not a lot of resistance, typically, because the systems have been so proved out. There are sometimes concerns in terms of more intensive green roof applications, where you potentially have to compromise a program on the interior in order to get more soil depth, or face more areas of risk in terms of tree roots and roof stability.

But the main thing I see hampering more widespread use of green roofs is the same thing that makes clients hesitate to create any roof terrace – it's a cost that is to some degree tangential to the key function of the building. So when budgets start getting tight, the owner asks: "Do I really need this roof

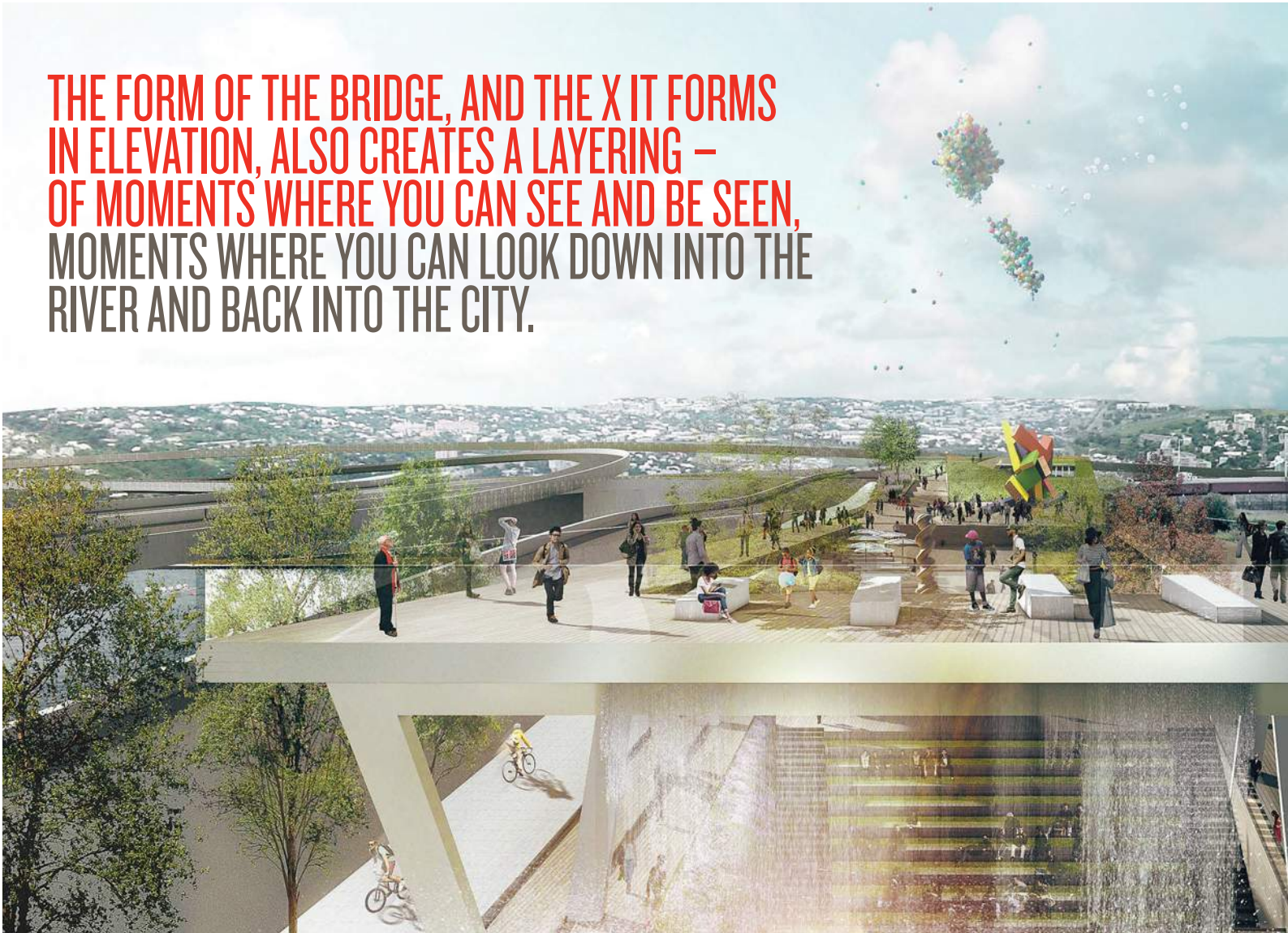
terrace?" or "Can't we just do something cheaper?"

LAM: *Do you have any advice for your architects hoping to feature green building approaches?*

JL: I have two things to suggest. One, on a practical level you need to incorporate things like growing media depths, and ceiling heights, and ceiling packages early in your thinking. When you think of an accessible roof, for example, know that you will immediately face problems of egress and security. You need to be realistic, and know from the outset what you want to achieve.

Secondly, a green roof can really help a building engage and have a dialogue-like relationship with its own exterior

THE FORM OF THE BRIDGE, AND THE X IT FORMS IN ELEVATION, ALSO CREATES A LAYERING – OF MOMENTS WHERE YOU CAN SEE AND BE SEEN, MOMENTS WHERE YOU CAN LOOK DOWN INTO THE RIVER AND BACK INTO THE CITY.



and with the buildings around it. It's one piece of a larger dialogue. It's not enough to have a green roof that just covers the building in broccoli! Other elements of that dialogue include programmatic adjacency -- what you put next to what, what you locate next to a terrace, and how you give it a facade that is truly operable. Good decisions can't be made on the basis of one building alone.

LAM: *Your work at 11th Street Bridge has been compared to both the Highline in New York and Frank Lloyd Wright's Falling Water masterpiece. What do you say to that?*

JL: Wright created an intense dialogue between building and wilderness at Falling Water. I can only hope that we have that level of complexity with the bridge. We do have a similar layering and engagement with nature, I hope.

The Highline in New York City is incredibly successful in terms of its popularity, and is a strikingly beautiful place that echoes back to the almost otherworldly nature that grew along that rail line. It's a real standard to live up to. We're in a very different situation, although we're both reusing infrastructure.

We're trying to make something a little wider, less like a linear boulevard and more like a park, where you have events along the way: places to sit, places to have a wedding, or a performance. The Highline is a real tourist attraction, but we also want the 11th

Street Bridge to be a place where locals want to hang out -- a place that is even primarily for locals, who own the park in that sense. The bridge is a bridge between two very different communities who don't often cross the river -- one largely low income, and African American. So trying to build a bridge gives the design a certain mission.

The form of the bridge, and the X it forms in elevation, also creates a layering -- of moments where you can see and be seen, moments where you can look down into the river and back into the city.

LAM: *What are your thoughts about living architecture?*

JL: We design all our projects so they can be used over time in

many different ways, including ways we didn't design for. We try to build so the building can be reconfigured. That's one way to make living architecture -- the ultimate form of sustainability. But we also need to design and make buildings that can breathe, that have a good environmental impact and minimize carbon emissions. Being part of that revolution is also part of living architecture.

Wayne Roberts is an author, journalist and consultant. His recent works include The No Nonsense Guide to World Food and Food for City Building. Jason Long and Hallie Boyce, OLIN will be presenting at Cities Alive in Washington DC.



All Photos and Images Courtesy of OMA and OLIN



OVERVIEW: THE NEW ASTM GUIDANCE FOR GREEN ROOFS

WRITTEN BY BRUCE DVORAK

In June, 2014, the American Society for Testing and Materials (ASTM) published E2777 – 14, Standard Guide for Vegetated (Green) Roof Systems. It was written by a sub-committee of some of the top green roof experts in North America. This marks the first comprehensive North American guideline for green roofs from a major guidelines publisher.

Guidelines are particularly important where the articulation of green roof properties and performance measures are required for nonproprietary competitive bidding. This article reviews one of the major advances of the new guideline for the North American green roof industry: the articulation of green roofs at the system level.

Understanding green roofs as systems developed out of Europe, the first and most commonly cited and used guidelines for green roofs worldwide are the Guidelines for the Planning, Construction and Maintenance of Green Roofing, commonly referred to as the German FLL Guidelines for green roofs.

Prior to the publication of ASTM E2777 – 14, the one existing guideline and four standards published from ASTM covered individual aspects of green roofs such as guidance for selecting vegetation, a standard practice for structural weight calculations, and standard tests for inspecting growth and drainage media porosity and weight. These methods are critical for those involved with design, policy, permitting, construction and performance evaluation, but in isolation they don't provide comprehensive support because the healthy functioning of a green roof is much more than the performance of an individual component, it is the long-term systematic interdependence of its parts.

There are more than a few examples of green roofs that have had complete or partial collapse of plant communities because system components were not well integrated. Substrates held too much moisture, were not stable and slumped over time, drainage layers were insufficient for the selected vegetation, and substrate depths were not adequate to support the root systems of the selected forms of vegetation. The new ASTM guideline addresses many of these issues. Although much guidance is provided, it is not a cookbook approach to the design of a green roof. It functions as a set of common factors from which to understand and specify as needed.

The scope of ASTM E2777 – 14 is to define terminology, principles and fundamental concepts including goals for sustainability, construction and the integration of materials. There are over 38 terms defined with discussion and references to more than 30 other standards and guideline documents. Its fourteen pages address technical aspects regarding vegetation, growing media, wind scour resistance, soil reinforcement, separation or filter layers, drain layers, water retention layers, protection layers, and root penetration barriers. The guideline makes great progress to integrate the knowledge and recommendations of the existing ASTM green roof guidelines and standards by addressing the layers of green roofs, construction methods, critical issues,

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concepts, challenges and benefits.

The core of the guideline covers the integration of sustainability and performance measures for green roof systems defined in 5.3.2: 1) dead loads, 2) moisture retention capacity, 3) system longevity, 4) assurances of foliage cover and survival, and 5) assurances regarding roofing/waterproofing compatible with the green roof; however these concepts are quantified in section 7 Technical Requirements. One of the limitations of the previous ASTM guidelines is the lack of a systems guideline to address some integration and discussion

regarding tolerances for growing substrate and drainage in context with vegetation. The new ASTM guideline covers upper and lower limits of substrate particle sizes, proportions of granular materials, organic content and the like.

Although much is covered in the guidelines, there are opportunities for future updates including: a broader discussion regarding regional context, meadow-based systems, and further expansion of performance guidelines. Vegetative systems in the new ASTM guideline are loosely defined to perhaps capture diverse approaches to extensive green

roofs in North America. Some green roofs have distinctive designs with formal lines or planting designs imbedded. Some green roofs have no geometric design and plants are intended to migrate freely across the system with no clear formal appearance. So the guideline states that an extensive green roof “features plants that can be sustained in shallow media layers (pg. 2, ASTM E2777-14)”. This is a good aim to achieve for any green roof. In the FLL Guidelines the aim is specific to ecosystem services including partial recovery of natural systems lost to building development. The FLL guideline states its purpose for extensive green roofs, “...accelerate the natural self-generating process and to use the natural vegetation development to establish a long-lasting population (pg. 8, FLL 2008)”. The FLL goes on further to mention the use of “regionally native and naturalized vegetation.” I think the approach in Europe is a good one because it seems the right thing to do for long term sustainability of the green roof and is a way to improve habitat corridor continuity and reduce habitat fragmentation. Over the next decade, our understanding of green roofs as ecosystems will likely continue, and this knowledge would be a valuable addition to

HIGHLIGHTS OF THE ASTM E2777 – 14 STANDARD GUIDE FOR VEGETATED (GREEN) ROOF SYSTEMS

System topic	ASTM Previous Guide or Standard	ASTM E2777 – 14 Standard Guide for Vegetated (Green) Roof Systems
Planting Media	E 2399-05 and E 2397-05 determine dead or live weight of media.	Section 7.3 provides technical guidance for planting media including mineral properties, nutrient retention, longevity, water retention, permeability, drainage, organic content, density, depth, capillary potential and more.
Drainage	E 2396-05 and E 2396-05 determine test methods for drainage media and geocomposite layers.	Section 7.7 provides technical guidance for granular and geotextile classes of drainage layers including: materials selection, discharge facilitation, hydraulic transmissivity, compressive strength, water retention, and discussion of additives such as polymer gels.
Environmental Impacts	None	Includes discussion of how green roofs improve air quality, carbon sequestration, manage storm water, noise/acoustic attenuation, urban heat island mitigation, energy, habitat creation, social and economic impacts.

guidelines to address North America’s diverse climates.

Regarding meadow-based green roofs (grasses, herbs; annual and perennial vegetation), the FLL Guidelines have a separate designation for them as semi-intensive systems. The semi-intensive category is not formally recognized in the ASTM E2777 – 14. For some, there is a clear distinction between an extensive green roof designed to be lightweight with shallow growing media. Extensive green roofs are typically three to five inches thick with succulent vegetation exclusive to the shallowest applications. This is not to say that some grasses or forbs could persist in some climates without irrigation, but grasses and wildflower systems that are diverse, typically need at least six inches of substrate and with up to ten inch depth to support a much greater range of vegetation. The treatment and articulation of semi-intensive systems may be needed, because they have different soil and moisture requirements compared to succulent-based systems. The ASTM guideline does discuss herbaceous vegetation, but with limited content. Intensive green roofs are typically articulated as roof gardens with woody plants and need regular maintenance. Meadow and prairie-based systems can be designed to be low maintenance and considerations for these systems would be an important addition.

Finally, one of the highlights of the new ASTM guideline is that it includes tolerances for defining performance expectations for growing medium particle size, drainage properties and such. If meadow-based systems become treated independently in a future issue, tolerances and performance aspects could be further articulated

for meadow-based systems, especially designs that consider varied and non-uniform soil depths to create biodiverse habitats.

The FLL green roof guidelines have been reissued several times over the past thirty years, including input from those involved with research, industry and maintenance. The FLL guidelines have become a universal starting point for many green roofs outside of the temperate climates of Europe. Green roof substrates in some climates may need to become more porous to allow for intense storms or less porous to retain water or be considerate of other local factors. Over time, with research and development North American green roof guidelines may become more regionally responsive regarding climate or function. Because green roofs are being used to

grow food, treat grey and black water and function as habitat for rare or endangered species, new forms of guidance may be needed. Until then, the ASTM E2777 – 14 is a solid foundation and point to begin. Many experts from the industry, research community and design professions contributed and volunteered hours over the more than seven years in its making. Regional experts will be needed to help shape and inform future updates to the guideline.

Bruce Dvorak is an Associate Professor in the Department of Landscape Architecture and Urban Planning at Texas A&M University, coordinator of the Master of Landscape Architecture Program and cofounder of the Interdisciplinary Green Roof Research Group at Texas A&M University: <https://tamugreenroof.wordpress.com/>



ARE YOU READY FOR BUILDING INTEGRATED ALGAE PRODUCTION?

WRITTEN BY CHRIS CHOPIK

Is building integrated algae production the next wave of living architecture and food production? Building integrated algae production could be a significant part of the solution to both carbon capture and local food production.

Buildings That Live.

Algae is not only a remarkable life form, it is a foundational life form with fossilized species reaching back more than 1.5 billion years. 'Algae' is a term that refers to many different species of creatures that are an interesting hybrid of animal and plant. Algae are both single and multicellular creatures able to photosynthesize and create oxygen and food, but are fundamentally different from land plants. Microscopic forms of algae found in water are called phytoplankton and form the base of the marine food chain.

According to Geoff Wilson, founding director of Australia-based Qponics Limited, "the global move towards algae as a basic human food has great nutritional importance. Much of the omega-3 oils we need come only from algae. About 70 per cent of humanity has a dietary deficiency in omega-3 oils. Fish is a species that collects algae based omega-3s in their flesh and is the primary source in our diets, but fish are in decline." With ocean acidification threatening oceanic algae production, he argues that creating alternative nutritional sources of omega-3 oils will become paramount to maintaining healthy human diets. Qponics is intending this year to set up *Nannochloropsis oculata* algae production for human foods – omega-3 algal oils (DHA and EPA) plus algal protein. Consumer spending on omega-3 products is projected to exceed \$34 billion in 2016. Qponics plans to use an efficient and cost-effective modular compact, computer-controlled LED-lit photo-bioreactor system to grow algae on a commercial scale indoors.

While Mr. Wilson is contemplating how to preserve healthy human diets on a global scale, other pioneers are exploring the integration of algae food and energy production with buildings. In 2013, the world's first algae-powered building in Hamburg, the BIQ House, featuring a bio-adaptive algae façade was premiered. International design firm Arup worked with Germany's SSC Strategic Science Consultants and Austria-based Splitterwerk Architects to develop the BIQ House, which launched as part of Hamburg's International Building Exhibition. The design team created bio-fasade technology

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called the SolarLeaf Bio-Reactor. Solar Leaf Bio-Reactor is both a building skin and energy producer. SolarLeaf's Bio-Reactors have four glass layers. The two inner panes have a 24-litre capacity cavity for circulating the growing medium. Either side of these panes, insulating argon-filled cavities help to minimise heat loss. The front glass panel consists of white antireflective glass, while the glass on the back can integrate decorative glass treatments. Compressed air is introduced to the bottom of each bioreactor at intervals. The gas emerges as large air bubbles and generates an upstream water flow and turbulence to stimulate the algae to take in CO₂ and light. At the same time, a mixture of water, air and small plastic scrubbers washes the inner surfaces of the panels. The maximum temperature that can be extracted from the bioreactors is around 40 degrees celsius, as higher levels would affect the microalgae. The system can be operated all year round. The efficiency of the conversion of light to biomass is currently 10 per cent and light to heat is 38 per

cent. For comparison, photovoltaic systems have an efficiency of 12-15 per cent and solar thermal systems 60-65 per cent.

The project is the first of its kind, and the bio-responsive façade was praised as a key achievement in building innovation. SolarLeaf brings building envelope and lighting management together with an algae based energy generation system. SolarLeaf has emerged as a demonstration of the potential of building-integrated algae-based technologies. While this is a very

different value proposition to the traditional benefits delivered from living walls and green roofs, the Algae House demonstrates the possibility and potential.

According to Adam Friedburg, of Arup Engineering, "algae has the potential for integration in many building applications, but it comes with a need for capacity building in terms of system maintenance, and market understanding. Unlike green roofs, which have been around for hundreds of years, these algae systems don't yet offer a clear economic payback.

IN 20 YEARS I ANTICIPATE THAT ALGAE AND BIOFUEL PRODUCTION WILL BE A LEGITIMATE INGREDIENT IN FUELLING BUILDINGS AND POTENTIALLY PROVIDING ENERGY FOR EXTENDED SERVICES SUCH AS TRANSPORTATION AND ELECTRIFICATION.

GEOFF WILSON, FOUNDING DIRECTOR OF AUSTRALIA-BASED QPONICS LIMITED

As capacity grows and we see more applications explored, I can foresee a time when algae becomes an accepted integrated bio-engineering solution." Still others are less convinced. "The notion of integrating algae into a building is brilliant, I'm just not certain of its practicality," said Craig Applegath, Principal at DIALOG, a large architecture and engineering firm, remarking on his visit to Hamburg's Algae House.

While building integrated algae is still very much at the experimental stage the potential is significant. According to Mr. Wil-

son "there are over 70,000 species of algae and humanity is only making use of about 12". Adam shares his optimistic outlook - "In 50 years I imagine that waste management will be entirely building integrated. In 20 years I anticipate that algae and biofuel production will be a legitimate ingredient in fuelling buildings and potentially providing energy for extended services such as transportation and electrification."

The emerging opportunities represented by algae for food and energy production like those demonstrated with SolarLeaf

and Qponics will become increasingly prevalent on the heels of the mainstream acceptance of living architecture and onsite waste treatment. Adam urges "It is incumbent on industry players to find a way to improve market capacity by sharing knowledge and experience more freely." The collaborative industry attitude proposed by Adam may help accelerate the integration of these world changing biotechnologies and unique forms of living architecture.

Cbris Chopik is a consultant and journalist.

FIND OUT MORE

algae-architecture.com

arup.com/projects/solarleaf/details

The panels can be purchased through Colt International. Panels are not plug and play and you need to design an energy concept for the project early in the process to maximize the system.

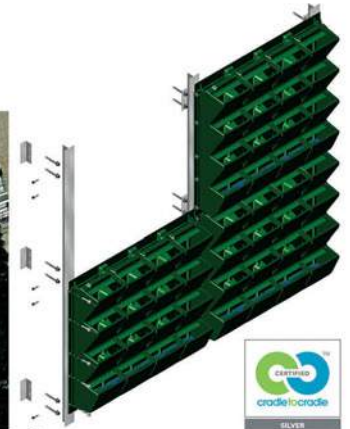
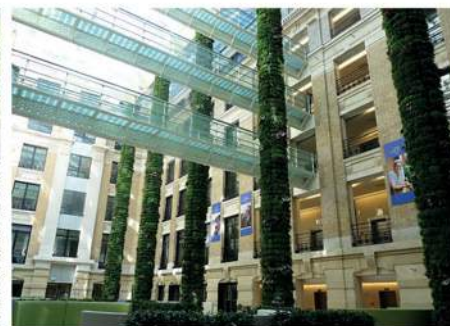


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SUPPORTING POLLINATORS ON U.S. COAST GUARD HEADQUARTERS ROOF, WASHINGTON DC

GENERAL SERVICES ADMINISTRATION (GSA) INTRODUCES POLLINATORS POLICY

WRITTEN BY LANCE DAVIS

In June of 2014, the President issued the Presidential Memorandum—Creating a Federal Strategy to Promote the Health of Honey Bess and Other Pollinators. This memorandum called on Executive departments to take immediate measures to support pollinators.

The U.S. General Services Administration (GSA) released in the 2015 Facilities Standards P100, a new section for Pollinators. The intent of this section is to provide opportunities for pollinators to thrive through the intentional design and management of Federal landscapes. During early project planning stages, project teams shall identify known pollinators in their immediate subject area and pollinators native to or likely to inhabit their region and climate zone, and identify design strategies for

creating and preserving viable foraging and nesting areas to the maximum extent feasible.

The pollinators section focuses on design aspects including nesting and foraging.

By carefully considering the design of a facility and its landscape, the impact to nesting pollinators is minimized and can be enhanced. The foraging section focuses on native plants in a landscape with diverse color, shapes, sizes and bloom times that span the growing season.

To achieve these results, GSA is requiring a new submit-

GSA HAS TAKEN A UNIQUE APPROACH TO POLLINATORS BY INCORPORATING REQUIREMENTS INTO A PERFORMANCE STANDARD. THIS STANDARD IS ANOTHER BUILDING BLOCK AS GSA CONTINUES TO EXPAND LANDSCAPES AS NATURAL PERFORMANCE SYSTEMS THAT WORK WITH THE MANUFACTURED SYSTEMS OF A BUILDING.

tal that focuses on pollinators. This plan requires that pollinator plants be identified with bloom quality, bloom time, and targeted pollinators. Nesting areas are to be identified, and if offsite, should be annotated on the plan.

The supplemental section identifies the need to purchase plants free of pesticides as these chemicals can kill or limit the number of offspring that a female pollinator can produce. GSA has utilized integrated pest management for years and this is emphasized in this section in relation to pollinators. A maintenance plan must identify areas that require special management and assigns pollinator sensitive zones.

GSA has taken a unique approach to pollinators by incorporating requirements into a performance standard. This standard is another building block as GSA continues to expand landscapes as natural performance systems that work with the manufactured systems of a building.

Lance Davis, AIA, LEED, Program Manager for Design Excellence Architecture+Sustainability, GSA. Lance will be speaking at CitiesAlive in Washington.

FIND OUT MORE

White House Memo - goo.gl/AAxQxY
P100 - gsa.gov/portal/content/104821



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GREENING HARLEM: CITIESALIVE NYC 2015 LEAVES ITS LEGACY AND PLANTS SEEDS FOR THE FUTURE OF THIS HISTORIC COMMUNITY

WRITTEN BY ROHAN LILAUWALA

Imagine what could be? Harlem in New York City is a neighborhood that has many positive opportunities: it is vibrant, historic, rich in art and culture, and located in the nation's financial and cultural capital. At the same time, poverty, unemployment, displacement, and a lack of green space are all ongoing challenges.

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In March, 2015, the Green Infrastructure Foundation (a charitable organization affiliated with Green Roofs for Healthy Cities) embarked on Greening Harlem, the legacy project of the 2015 CitiesAlive Conference to address these very challenges.

In partnership with the Canaan Baptist Church, Crauderueff & Associates and other community leaders, the project engaged stakeholders and design experts in a design charrette in order to reimagine Harlem transformed through the intensive application of green infrastructure, as well as renewable technologies like solar panels. Interdisciplinary teams worked to redesign three study areas with fifteen types of green infrastructure, ranging from a few buildings owned by the Canaan Baptist Church to ten-block sites containing a mix of uses.

Charrette participants had many bold ideas, including the large-scale implementation of green roofs and establishing an intensive urban farm featuring green roof and aeroponic food production to bring jobs and economic activity to Harlem. The boldest vision, however, was the conversion of St. Nicholas Avenue into a pedestrian and cyclist-oriented 'greenway', called the New Harlem Lane, which would be lined with bioswales, street trees, and cafes, creating a natural connection from Central Park to Morningside Park and Marcus Garvey Park.

The redesigns were subject to an economic analysis using a customized cost-benefit matrix (see sidebar for results of one redesign), and the Canaan Baptist Church's building portfolio was also analyzed to determine what technologies were feasible in the short term. "A main goal of this effort is to spur economic development and improve quality of life in Harlem through urban sustainable technologies and green infrastructure," said Dakota Pippins, CEO of Pippins Strategies, Adjunct Associate

Professor at New York University, and key member of the project team. Dakota is currently part of a group working to build momentum towards implementing some of the ideas planted as part of this project.

Building on the success of Greening Harlem, the Green Infrastructure Foundation will be bringing this program to the CitiesAlive Conference in 2016 in Washington DC. Join design professionals and local stakeholders as they work to reimagine the Historic Anacostia neighborhood with green infrastructure.

Roban Lilauwala is Senior Researcher at Green Roofs for Healthy Cities.

FIND OUT MORE

For more information about the Green Infrastructure Charrette Program, visit the Green Infrastructure Foundation's website at <http://greeninfrastructure-foundation.org>. To read the Greening Harlem Report, visit http://greenroofs.org/resources/Greening_Harlem_Report_Final.pdf. We are planning a Green Infrastructure Charrette in Anacostia as part of the CitiesAlive taking place in Washington DC, November 4, 2016. Contact Rohan Lilauwala at rlilauwala@greenroofs.org.



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THE FINE ART OF CAMOUFLAGE AND THE EMERGENCE OF GREEN WALLS

WRITTEN BY RANDY SHARP, FCSLA, GRP

Photo courtesy of Randy Sharp

I was born in the woods of upstate New York surrounded by massive beech, maple and oak trees. Me Tarzan, and Jane my neighbor, would swing from tree to tree on grape vines (*Vitus riparian*). Our favorite storybooks were *Katie the Snowplow*, and *Jack and the Beanstalk*. I was Jack. I planted the seed, watched it grow, and climbed to the top. These early years set the stage for my professional work as a green wall educator, designer and advocate. In this article I am offering a big picture view of the green wall industry.



GUILDFORD TOWN CENTRE
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LIVING WALL, BC

Back in 1994, Architect Richard Orne with partner John Souza, adapted a three-dimensional lightweight structural panel, originally manufactured for prefab modular housing, to support climbing plants on green walls. The first installation of ‘greenscreen’ was the circular entertainment plaza at the Universal City Walk in Los Angeles. Around the same time Jakob Rope Systems, from Switzerland, introduced stainless steel cable-net systems for curvaceous furniture, zoo enclosures and green facades.

Meanwhile, Botanist Patrick Blanc built his first hydroponic fabric wall in France inspired by his experience with tropical plants from the Amazon and his early love of aquariums. In Canada, Dr. Alan Darlington developed the bio-filter, an active

living wall system that improves indoor air quality. Toxic volatile organic compounds (VOCs) are consumed by microbes living on the roots of tropical plants growing between layers of synthetic fabric fed by nutrients injected into a recirculating water system.

It was only about 10 years ago, that GSky introduced the first modular living wall system in North America. The award winning green wall at the Vancouver Aquarium demonstrated a new lexicon for the vertical landscape. With GSky, we designed a wall to display indigenous rainforest plants, fed by rainwater stored, filtered and pumped from an underground tank. Sharp & Diamond Landscape Architecture also designed the iconic YVR living wall at the Vancouver International Airport, featuring GSky’s new stainless steel panel system with integrated drip irrigation, remote monitoring by temperature sensors and flow meters, and tough hardy northern groundcovers.

Melissa Daniels at Plant Connection has adapted a soil-media based system requiring lower water use when compared with a fabric hydroponic wall. The G-O2 is fabricated from metal, rather than plastic, and is 100 per cent recyclable. Plant Connection, as an option, offers natural and biological management for living walls applying certified organic water-soluble fertilizers. Nicolas Rousseau, originally from France, now based in Vancouver, is offering ModuloGreen, also a soil-based enclosed panel system that has demonstrated low water metrics.

The largest ‘living wall’ in North America is the Green Over Grey’s 10,000 square foot installation at the Guildford Town Centre, just outside of Vancouver. Patrick Poiraud offers a comprehensive package to manufacture, grow, install, illuminate and maintain (mandatory with supply contracts) a lightweight layered fabric system that does not use toxic materials such as PVC, and components which are 100 per cent recyclable. The City of Surrey, BC required the massive living wall as part of a rezoning for mall expansion. Municipalities such as Langley, BC and Fort Lauderdale, Florida, require green walls to cover blank walls on big box retail stores, tilt-up concrete industrial buildings, parkades and other unattractive structures.

Where do we as an industry go from here? Inspired by the Universal City Walk, there is a huge worldwide growth of entertainment and lifestyle retail centers. People want to meet friends, neighbors or strangers, and be able to touch nature. To be relevant, retail stores need a makeover every 7 to 10 years. Shopping centers have to be fresh, cool and utilize water and plants in innovating ways, as well as screen off any unattractive blank walls prone to graffiti. I call it the ‘The Fine Art of Camouflage’.

However, the industry also needs to focus on the science and metrics of green walls, especially in hot dry climates where water is precious, or in cold wet climates where people spend much of their lives indoors. We still need to address thorny green wall issues such as selecting responsible clients

WATERFLOW DIAGRAM INTO GREEN FACADES AT FLEX WAREHOUSE

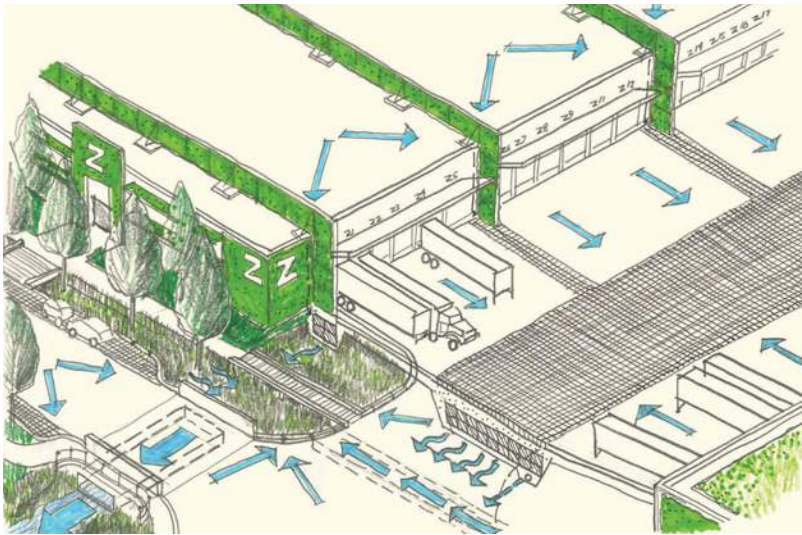


Photo courtesy of Randy Sharp

“DECIDING TO INSTALL A LIVING WALL IS MUCH LIKE STARTING A RELATIONSHIP: IT REQUIRES COMMITMENT AND EFFORT, OTHERWISE IT WILL NOT LAST LONG.”

RON P. SCHWENGER, PRINCIPAL OF ARCHITEK, GRP

(interviews work both ways), standardizing the industry with five-year renewable maintenance contracts (ideal), and sharing our experiences. Green Roofs for Healthy Cities Green Wall Industry Committee is currently preparing the first green wall market survey, which should be available by the summer. It will track green wall installations and their locations and help promote the industry.

We do not need a litany of failures (brown walls) like Vancouver experienced over the previous five years. Consequently, our Vancouver City Council has avoided establishing any regulations or incentives to help developers or green entrepreneurs build more green walls. What policies can be initiated in your city? As a contributor to *Living Architecture Monitor*, I hope to hear back from you on these and other greening issues.

Randy Sharp, FCSLA, ASLA, LEED AP, GRP recently retired from Sharp & Diamond Landscape Architecture to focus on research, teaching and consulting in ecological development, green building design and water management.

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For information on Green Walls Design 101 and other courses visit: greenroofs.org

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Many professionals are already using this technology to monitor performance of their sites, conduct research, and optimize water use and retention. We provide tools to accelerate research, improve design, monitor infrastructure performance, providing solutions to get the most out of green infrastructure initiatives around the world.



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HOW CLIMATE CHANGE AFFECTS GREEN INFRASTRUCTURE POLICY

WRITTEN BY VANESSA KEITGES

With the recent discussions on Climate Change regulations and their potential effect on national and local policy it leads to the question at hand - how do we find a good solution? While the national government is driving the recent Paris Agreement Initiatives, it is largely cities and their people who will be impacted by the largest storms, heat waves and extended droughts to come. Ultimately, cities will be looked to when deciding the necessary policies and programs required to protect themselves. Leading cities have already begun integrating green infrastructure into their "Building Resiliency" strategies, a necessary part of the solution to climate change. One outstanding example of this is the increasing utilization of green roofs for stormwater management to help mitigate food risk.

Our need to adapt to climate change in cities has helped the Green Building market become the fastest growing market in the U.S. In fact, more than 90 per cent of job growth comes from small businesses and innovation in this sector. The increasing momentum in this market continues to drive cities to implement "green" policies which help stimulate innovation and job growth in the green building sector. This is a seamless example of how policy drives innovation and innovation drives economic development. At the heart of America is entrepreneurship and that being said, the emerging green building market forges a great opportunity for both the private and public sectors to work together in creating innovative companies and expanding job growth across this country and throughout the world.

However, it is critical that as cities begin to roll-out green infrastructure policies and programs they also execute both performance standards and metrics

for these systems. Rolling out systems that fail in the end harms our cities, people and the future of our planet. It is vital that we knowledge share on lessons learned and update city building codes in order to continue producing innovative technologies to meet the climate change challenge and support green building initiatives. You will see great programs such as the C40 and the 2030 Districts in addition to cities sharing policies and programs that work! Climate Change is global and national governments are driving the green building industry forward, however, it will be cities and the private sector taking on the task of addressing these problems by finding and implementing solutions. It is our cities and our progressive leader's obligation to develop green infrastructure programs and policies to mitigate the risks caused by climate change!

Vanessa Keitges is the CEO of Columbia Green Technologies, a leading U.S.A. green roof manufacturer, Founding Member of "We Build Green Cities" and a Member of President Obama's Export Council where she represents the green building sector and small businesses to help promote innovation and job growth.

FIND OUT MORE

The C40 Cities Climate Leadership Group (C40) is a network of the world's megacities taking action to reduce greenhouse gas emissions. C40.org.

2030 Districts are private sector collaboratives working to meet the climate change goals of a 50 per cent reduction in building energy use, water and transportation emissions. 2030districts.org



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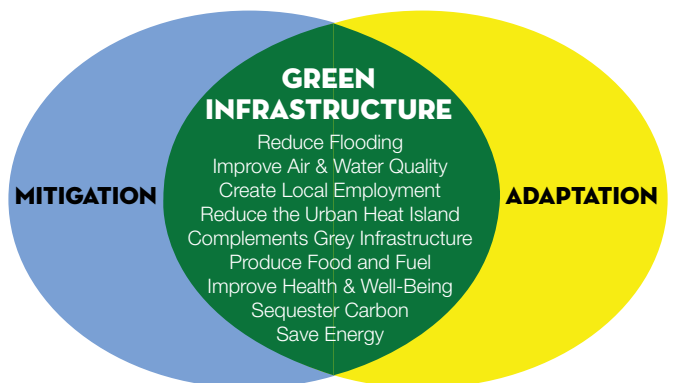
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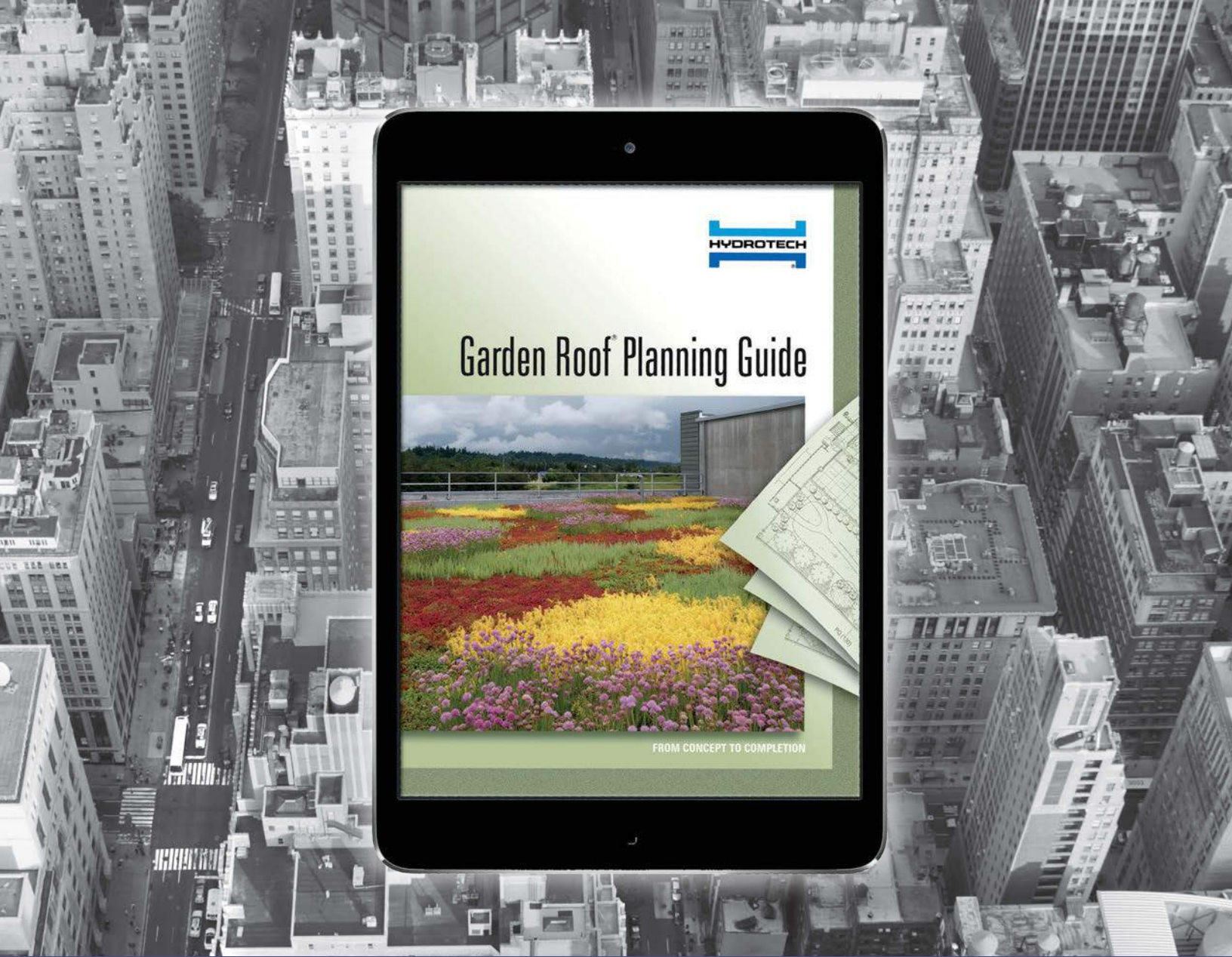
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