

**TESTIMONY OF THE MAYOR'S OFFICE OF SUSTAINABILITY  
BEFORE THE NEW YORK CITY COUNCIL  
COMMITTEE ON ENVIRONMENTAL PROTECTION**

Friday, October 28, 2016

**I. INTRODUCTION**

Good morning, Chair Constantinides and members of the committee. I am John Lee, Deputy Director for Green Buildings and Energy Efficiency in the Mayor's Office of Sustainability, and I am a registered architect in the state of New York. Thank you for the opportunity to testify today on Introduction 835 in relation to establishing requirements for the selection, installation and maintenance of plants for green roof systems. Introduction 835 would amend the building code to add a new reference standard, ASTM E2400, "Standard Guide for Selection, Installation, and Maintenance of Plants for Green Roof Systems" to the New York City Building Code.

The Mayor and the Office of Sustainability applaud Speaker Mark-Viverito, Council Member Constantinides, and the City Council for the continued effort to ensure quality installations of green roofs and the improved sustainability of buildings in New York City.

**II. THE CITY SUPPORTS GREEN ROOFS**

The Mayor's Office of Sustainability, the Department of Buildings, the Department of Environmental Protection, and the Department of Parks and Recreation have long supported the installation of green roofs. *OneNYC*, for example, which outlines out the City's comprehensive climate change adaptation and mitigation agenda, recognizes the contributions that green roofs can make to improving energy efficiency, managing stormwater runoff, reducing greenhouse gas emissions, and providing green spaces.

Green roofs provide insulation that helps keep buildings warm in the winter and cool in the summer, improving energy efficiency and reducing a building's carbon footprint. As roughly 73% of NYC greenhouse gas emissions come from buildings, reducing energy consumption is a critical component to achieving the City's goal of cutting greenhouse gas emissions 80% by 2050.

Green roofs also benefit the environment by combatting the urban heat island effect (UHI), which is caused by the thermal and radiative properties of our buildings and streets. The concrete, asphalt, and metals in our built environment absorb the sun's heat throughout the hottest portions of the day and reradiate it back into the atmosphere, driving the localized

temperatures even higher and increasing demands on cooling systems. As we turn up our air conditioning on the hottest days, this equipment itself pushes extra heat into the air, thereby contributing to a feedback loop that increases localized ambient temperatures and impacts the health of heat-vulnerable New Yorkers. The U. S. Environmental Protection Agency has observed that, in the evening, a city of 1 million people or more can be 22 degrees Fahrenheit warmer than its surrounding rural areas<sup>1</sup>. Green roofs replace the normally dark roof surface with plants, which shade the roof surface and absorb rather than release solar radiation into the surrounding air, and they help keep the air cool through evapotranspiration by releasing moisture into the atmosphere.

Green roofs also serve as a means of reducing stormwater runoff. Much of the stormwater in New York City flows over impervious surfaces into roof drains or catch basins in the streets, and from there into the sewers rather than being absorbed into the ground. Impervious surfaces, including building rooftops, cover approximately 72% of New York City's 305 square miles in land area and generate a significant amount of stormwater run-off. Excessive stormwater can pose challenges to the City by triggering combined sewer overflows, washing pollutants into our waters through the separate storm sewer system, and causing flooding. Green roofs can act as a sponge, storing a portion of rain fall in their membranes and decreasing the demand on the City's stormwater management systems. This becomes particularly important during large storms, where the ability to store and divert stormwater can provide a clear resilience benefit.

Finally, if implemented widely, green roofs can improve the quality of life of our neighborhoods: improving local air quality by reducing greenhouse gas emissions and airborne particulates as dust particles are trapped on foliage and within the soil matrix, and by providing additional green space to a building's tenants. In the country's most dense urban environment, green roofs can provide respite for a New Yorker's urban daily life.

### **III. CITY AGENCIES EXPERIENCE WITH GREEN ROOFS**

The New York City Department of Environmental Protection (DEP), the Department of Parks and Recreation (NYC Parks), and the Department of Buildings (DOB) all have significant experience working with and supporting green roofs.

Since 2011, DEP has funded a number of green roof projects as a stormwater management practice through the Green Infrastructure Grant Program. To date, the Grant Program has funded approximately \$14 million dollars for 32 projects. Of those funded projects, 16 have included green roofs. DEP's goals for the Grant Program are to manage 1 inch of stormwater runoff from impervious surfaces on private property within the combined sewer areas. DEP utilizes green infrastructure to retain and manage stormwater where it falls and divert it from the City's wastewater system. Green roofs are one of several tools used to achieve this as many properties are site constrained and the only feasible place to manage 1 inch of rain is on the roof. In addition to the stormwater benefits, green roofs offer other environmental benefits to building owners and are an attractive building amenity.

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<sup>1</sup> US Environmental Protection Agency, Heat Island Effect  
<https://www.epa.gov/heat-islands>

Since 2007 NYC Parks has installed and maintains 46 green roof systems citywide, including the Citywide Services Five Borough Complex green roof on Randall's Island, Ranaqua, the Bronx Borough Parks Headquarters, and a partnership with Columbia University to install 12 green roof plots at 10 Recreation Centers Citywide. NYC Parks and Columbia University are currently trialing 45 New York City native species under controlled greenhouse conditions, to test their suitability for green roof applications. Trials are in commercial green roof soil medium, under two watering regimens. Drought tolerance, growth rate and transpiration rate for each species will be quantified. Transpiration rates will indicate which species are best at taking up water, an indication of their usefulness in mitigating stormwater runoff from city rooftops. NYC Parks uses the information from its green roofs to develop a model to project long-term impact and to evaluate and design other green roofs.

The 2014 New York City Building Code provides standards for the installation of green roof systems and requires compliance with ANSI/SPRI RP-14, "Wind Design Standard for Vegetative Roofing Systems," and ANSI/SPRI VF-1, "External Fire Design Standard for Vegetative Roofs," or with FM DS 1-35, "Factory Mutual Data Sheet – Green Roof Systems." These standards do include some guidelines for vegetation and media selection, but they are in place primarily to ensure that a green roof is safe in terms of wind resistance, fire resistance, and structural considerations.

#### **IV. INTRO 835**

While the Mayor's Office and the City Agencies are enthusiastic in supporting green roofs, there are a number of concerns with Introduction 835.

First, ASTM E2400 provides information and general guidance only for plantings installed and maintained as part of a green roof system. ASTM E2400 does not include any specific performance standards, prescriptive requirements or benchmarks that would be enforceable by the Department of Buildings, nor are the general performance characteristics and criteria outlined in ASTM E2400 specific to New York City. For example, section 6.2.3.2 of ASTM E2400 states that the microclimate of a specific location must be considered, but does not identify which plants are appropriate for different conditions, or the criteria for a green roof to be considered an acceptable, code compliant installation in New York City.

Second, ASTM E2400 includes maintenance and seasonal considerations for plantings that are vague and beyond the scope of the Department of Building's purview. For example, the installation, methods, maintenance irrigation guidelines outlined in sections 7.1, 8.1 and 8.1.1 respectively speak in wide-ranging terms to: propagating and installing plant material, the frequency of watering during the first year of planting, the monitoring of rainfall, as well as options available for passive and active irrigation. Each of these terms are fairly ambiguous, making them impossible to enforce, and therefore inappropriate to be written into the Building Code.

Finally, currently chapter 15 of the 2014 New York City Building Code requires compliance with aforementioned engineering standards that are in place to ensure that a green roof is

installed safely, whereas ASTM E2400 is published as a guide for vegetation selection and does not purport to establish enforceable standards.

Notwithstanding how the DOB would enforce the proposed guidance, the benefits of adding this language in the code is not entirely justified. Through DEP's experiences, the City has learned that each green roof design is unique to the individual building's circumstances and project objectives. The Building Code should allow design decisions to meet the goals for each project while foremost ensuring public health and safety. Professional architects, engineers, and green roof professionals are the best people to help guide these decisions, rather than imposing restrictions through the building code.

We wholly support simplifying the DOB and Fire Department approvals requirements for green roofs in order to enable more installations on rooftops throughout New York City. With respect to the existing referenced standards in the Building Code, the agencies have identified specific provisions in the referenced standards that hinder practical implementation of green roof systems and limit the use of certain construction materials. The Mayor's Office and the agencies would welcome the opportunity to work with the City Council to refine the requirements in the existing standards to allow for more installations while improving the quality of green roof systems and preserving the safety and welfare of building occupants.

## **V. CONCLUSION**

Based upon the collective experience with many types of building owners and operators and green roof professionals, we believe that regulation of green roofs must be flexible, and a clear path to enforcement must be identified in order to be successful. The Mayor's Office and the agencies represented here today look forward to working with the Council to find ways to ensure quality in green roof installation, while preserving flexibility for architects and designers to create solutions specific to each building owner's needs. We also see opportunity in learning more from stakeholders and advocates. Ultimately we hope that by working with Council and other partners, we can ensure that any regulation on green roofs is efficient, clear, and enforceable while providing the flexibility necessary for innovation in design and construction.

Thank you for the opportunity to testify on this important legislation. We share your goals to ensure that green roof systems installed in New York City are high quality and deliver on our shared resiliency and sustainability goals. I am happy to answer any questions that you may have at this time.



Statement by Jane Winkel, Director of Stewardship, Roofmeadow to The New York City Council

Meeting Name: Committee on Environmental Protection

File #: Int. 0835-2015

Name: Establishing requirements for the selection, installation and maintenance of plants for green roof systems

Title: A Local Law to amend the building code of the city of New York, in relation to establishing requirements for the selection, installation and maintenance of plants for green roof systems

Summary: This bill would mandate that the New York City building code is amended by adding a new reference standard ASTM E 2600, in appropriate order, specifically the Standard Guide for Selection, Installation, and Maintenance of Plants for Green Roof Systems. 2400M-06(2015)e1.....1507.16.5

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Testimony: I'd like to thank the Committee on Environmental Protection for inviting Roofmeadow to testify at this hearing today. Roofmeadow is a landscape architecture and civil engineering firm specializing in the design of green roofs and has been designing green roofs for almost two decades making Roofmeadow one of, if not the, first North American design firm to bring German-style green roofs to the United States. Charlie Miller, Roofmeadow's president, was a contributor to sections of the *Guidelines for the Design and Construction of Stormwater Management Systems* (2012) that pertain to

green roofs. I am Roofmeadow's Director of Stewardship and I have been with the company since 2008.

Our comments are as follows:

- 1) Int. No. 835 refers to bill ASTM E 2600 and that guide is titled *Standard Guide Vapor Encroachment Screening on Property Involved in real Estate Transactions*, which is not relevant to the design, construction or maintenance of green roofs.
- 2) The ASTM standards are intended as guidance only. Section 5.1.1. of E 2400 states "This guide provides general guidance only. It is important to consult with a professional horticulturist, green roof consultant, or work with similar professionals that are knowledgeable, experienced, and acquainted with green roof technology and plants." Standards and guides are subject to continual review and updating and the ASTM E 2400 is no exception. We find E 2400 to be deficient in some of its recommendations, based on more recent information and experience with green roof horticulture. In particular:
  - a) Section 6.1.2 states "Extensive green roofs generally require less maintenance ... than intensive green roofs." It is my experience that extensive green roofs perform best when they are cultivated and subject to a regular maintenance program.
  - b) Section 6.2.2 contains guidance on perennials and ornamental grasses under the heading Aesthetics, that many horticulturalists would disagree with including the appearance of summer perennials and the timing of grass pruning.
  - c) Section 8.2.2 Advises against the use of fertilizers stating "These chemicals could potentially hasten degradation of the roof membrane." In almost two decades of green roof work we have never seen a waterproofing membrane suffer damage because of amendments added to promote the horticultural performance of a green roof. Furthermore, waterproofing systems selected for use in green roofs should be resistant common horticultural preparations and also to damage to microbial activity and root action.

- d) The section also include a passage suggesting “Weeds can be controlled by utilizing shallow media layers and forgoing irrigation. Many weeds cannot survive in shallow medium depths.” Anyone who has seen weeds growing through the cracks in a concrete sidewalk can understand that this section of the guide is not supported by general observation. Building owners with green roofs relying on the thickness of the profile to limit weed pressure may be disappointed with the botanical invaders that take over their green roof.
- 3) The success of a green roof depends on a wide variety of factors including the vitality of the plant cover. If the Committee wishes to include an ASTM standard into the building code then ASTM Standard Guide E 2777 offers a much broader set of guidelines and best practices and also incorporates ASTM Standard Guide E 2400 by reference. It provides greater detail and technical depth which can be used by architects, landscape architects etc. to develop significant green roof projects. ASTM E 2777 offers “general information to practitioners in the fields of green roof design and construction. The guide encourages innovative but responsible green roof design with a focus on performance and quality assurance.” E 2777 will not restrict adventurous designers, but will provide parameters for design standards that will lead to safe and long lasting rooftop environments.
- 4) Please keep in mind that ‘guides’ are not ‘standards’ and are subject to interpretation by developers, designers and reviewers. Therefore we recommend including a statement of how the information in the guide is to be used in the context of the Code..
- 5) While ASTM E 2777 is an acceptable guide, today I’d like to recommend that the City consider amending the building code to include the *Guidelines for the Design and Construction of Stormwater Management Systems Developed by the New York City Department of Environmental Protection in consultation with the New York City Department of Building (2012, or most recent)*. The guide was developed specifically for New York City to encourage private

and public implementation of green infrastructure city-wide. The guide contains much of the same information contained in ASTM Standard Guides E 2400 and E 2777. Like these other guides it also should undergo regular review and should be updated as our understanding of the factors influencing green roof performance improves. Roofmeadow worked on the development of the guide and would be pleased to work with the city to update the document to reflect current thinking and best practices in the field of green roof design, construction and maintenance.

- 6) The committee may consider amending the Code to include performance requirements for green roofs that are important to the New York City Department of Environmental Protection. For example the Code might establish seasonally adjusted minimum plant cover requirements.

Testimony submitted by  
Marion Yuen, GRP, LEED Green Associate  
The MYA Group  
901 Ave H #1N  
Brooklyn, NY 11230

10/28/16

Good morning, Mr. Constantinides and Members of the Committee on Environmental Protection:

My name is Marion Yuen from Midwood, Brooklyn.  
I am a certified Green Roof Professional and a real estate broker.

I want to applaud the intention of Intro. 0835 and its progressive direction.

At the same time, I trust you know about a more recent & more comprehensive ASTM Guideline E2777 – 14 which references ASTM 2400. I have brought along an article that explains the guideline published in 2014. Also, in 2012, NYC Dept. of Environmental Protection published *Guidelines for the Design and Construction of Stormwater Management Systems - Developed by the New York City Department of Environmental Protection in consultation with the New York City Department of Buildings* which includes a section on recommended plants for green roofs.

So, how will the guidelines impact reality? I want to share three points.

First, in NYC:

How can we adopt greater use of living architecture which includes green roofs and green walls to address climate change?

And how can we ensure that the living architecture projects actually contribute as much positive environmental impact as possible?

City government can take the lead on this with the portfolio of city-owned properties.  
However, the Dept. of Design & Construction does not directly procure services for green/vegetated roofs.  
I was told this by the Commissioner's office in August.

In the new construction of a public building in Brooklyn, awarded contracts left it to the discretion of the construction manager to find a green roof supplier.  
So, unless I am missing something, how can DDC track the performance of installed green roofs and walls?

Therefore, my second point is:

Without directly working with talented and experienced professionals in New York's living architecture industry, how can the City influence the elevation of performance norms?

Climate change is on everyone's mind. Living architecture projects – green roofs and green walls – are important adaptation tools as the climate changes faster and faster.

My third point is:

The opportunity exists for NYC to become a leading center of living architecture – not unlike the City's successes we have seen in film & TV production and in Silicon Alley .

As the world plays catch up in our response to climate change, NYC *can* pace set Toronto, Paris, Chicago, Philadelphia, Washington DC, San Francisco, and Cordoba in Argentina.

Green roof & green wall professionals stand ready to work with you all to craft legislation that works for the particular conditions of this City.

Int. No. 835 By Council Members  
Constantinides, Cornegy, Espinal, Koo and Mendez

A Local Law to amend the building code of the city of New York,  
in relation to establishing requirements for the selection,  
installation and maintenance of plants for green roof systems

# Scaling Plant Cover on Green Roofs to Treat Storm and Greywater, Reduce Air Conditioning Cost, and Drop Peak Load

Paul S. Mankiewicz, Ph.D  
The Gaia Institute  
99 Bay Street  
Bronx, NY 10464

Plant cover drops City body temperature,  
*-if and only if:*

- 1) Plants are of the right size  
≈ 2' and taller, & able to produce a canopy  
of sun over shade leaves
- 2) Vegetation is supplied with sufficient  
water

On a 95°F day

Black roofs run @ 160°F+ in summer,

White roofs or sedum 130°F or less

2' plants supplied with water run at 92°F  
at 89% humidity

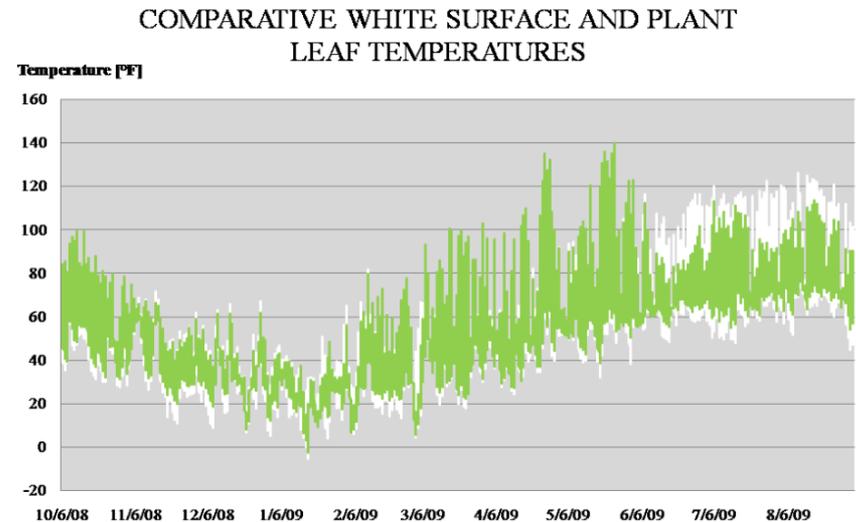
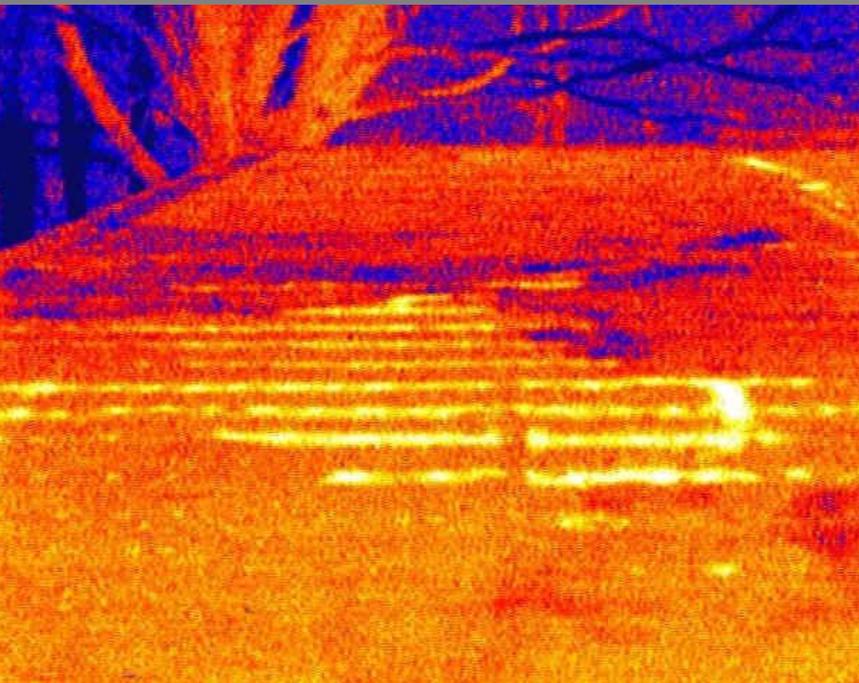


Figure 7: Comparative white and sedum plant leaf temperatures

Two foot plants  
supplied with water  
lower temperature to  
92°F at 89% humidity



Intake air is now 92°F vs. up to 160°F on black roof.

Each 1° F drop in intake air increases AC efficiency by 1%,  
Dropping operation costs and peak load requirements

Daily, New York City treats 1.2 billion gallons of waste water.

Greywater (sinks, showers, laundries) is at least half  $\approx 600,000,000$  gal/day.

We pay \$3/100 cu.ft. to treat this greywater, or  $\approx$  \$2.4 million per day.

Vegetation can reduce the \$2.4 million daily expenditure !

What is the value of 600 million gal/day?

Energy value  $\approx 1.5$  billion kw, or 6 TIMES PEAK LOAD REQUIREMENT

Coolant value  $\approx 18,000,000$  Tons of AC  
(1 Ton of AC cooling = 84.4 kw  $\leftarrow$  \$17.56)

18,000,000 Tons of AC \$315 million per day  
Providing potential savings of \$150 - 300 million per day in cooling costs

Selling Peak Load Reduction by Valuing Greywater in kilowatts

Get number for Con Ed investment

Greywater (sinks, showers, laundries) is at least half  $\approx 600,000,000$  gal/day.

We pay \$3/100 cu.ft. to treat this greywater, or  $\approx$  \$2.4 million per day.

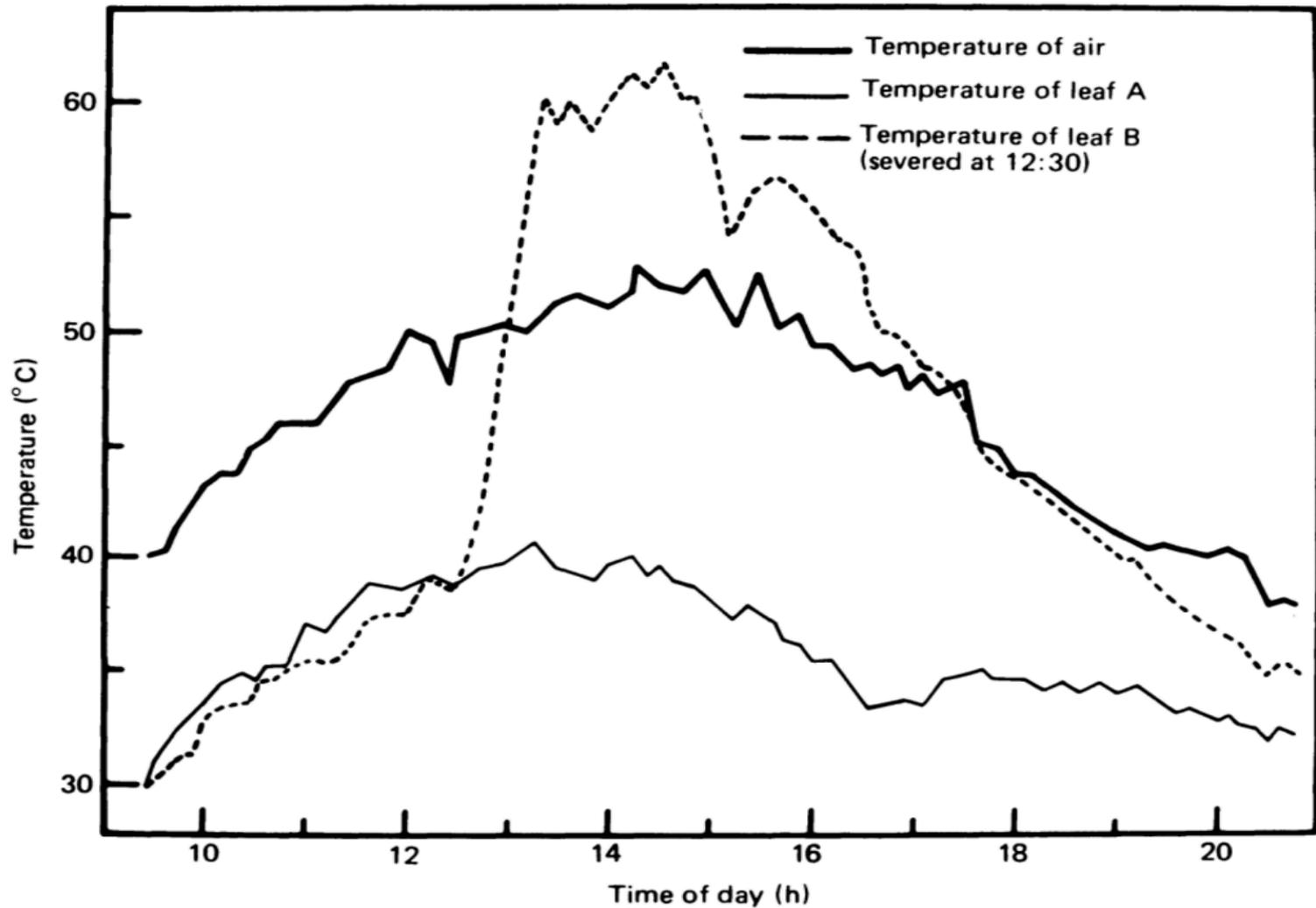
Vegetation can reduce the \$2.4 million daily expenditure!

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(1 Ton of AC cooling = 84.4 kw  $\leftarrow$  \$17.56)

18,000,000 Tons of AC \$315 million per day  
Providing potential savings of \$150 - 300 million per day in cooling costs



**Fig. 1.1.** The temperatures of leaves *A* and *B* are below the air temperature. At 12:30 leaf *B* was severed and the flow of water through the stem was interrupted. Without the influence of transpiration leaf *B* became warmer than the air. (Measurements with *Citrullus colocynthis* under desert conditions in Mauretania, Africa; after Lange, 1959.)

## LindaTool GaiaSoil™ Roof, Brooklyn, New York



### “We’ve Realized Dramatic Water & Energy Savings ”

Three years of monitoring reveals amazing cost reductions with Gaia design systems. Heating oil use down 24%, air conditioning KWH hovering at 40%, runoff reduction about 80%, plus more stabilized roof temperatures.

*“As a bonus we harvest fresh tomatoes.”*



Mike DiMarino, President  
Linda Tool, New York, N.Y.  
[www.lindatool.com](http://www.lindatool.com)

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Appearance Card

I intend to appear and speak on Int. No. \_\_\_\_\_ Res. No. \_\_\_\_\_

in favor  in opposition

Date: 28 Oct 2016

Name: Paul Markiewicz (PLEASE PRINT)

Address: 99 Bay St

I represent: Garment District

Address: 99 Bay Brookx, NY 10464

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in favor  in opposition

Date: Oct 28, 2016

Name: John LEE (PLEASE PRINT)

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I represent: MAYOR'S OFFICE OF SUSTAINABILITY

Address: 253 BROADWAY

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Date: 2016.10.29

Name: Jane Winkel (PLEASE PRINT)

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Please complete this card and return to the Sergeant-at-Arms

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Name: Marion Guen

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I represent: \_\_\_\_\_

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