

# Saving Green

## By Going Green:

*The Economics of  
C-PACE Financing and  
Green Roofs*

MODERATOR

**Eric  
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*Partner*

*Moye White LLP*

PANELISTS

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*Greenworks Lending*

**Saving Green by Going Green:**  
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**Michael  
Hughes**

*Principal  
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# **Green Roofs Review Task Force**

From Citizen Initiative to City Council  
Super-Majority in Lightning Speed

Mike Hughes  
Hughes Collaboration  
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## **The Mission of the Green Roof Review Task Force**

“To develop recommended modifications, clarifications, and improvements to the initiative through a collaborative, consensus-based process that will honor the vote.”



## Benefits

- Urban Heat Island
- Green Spaces
- Water Quality and Storm Water Management
- Greenhouse Gas Emission Reductions





# Task Force Membership

## Council Members

Jolon Clark

Mary Beth Susman

## City Staff

Katrina Managan

Scott Prisco

Adam Hernandez

Jon Novick

## Green Roof

### Proponents

Brandon Rietheimer

Jennifer Bousselot

Andy Creath

### Real Estate

Tami Door

Kathie Barstnar

Mark Windhager

Joe Havey

Grant Nelson

Amy Mayhew

Jeannie Renne-Malone

## Additional Experts

Austin Krcmarik

Chris Parr

Christine Brinker

Jamaca Berman

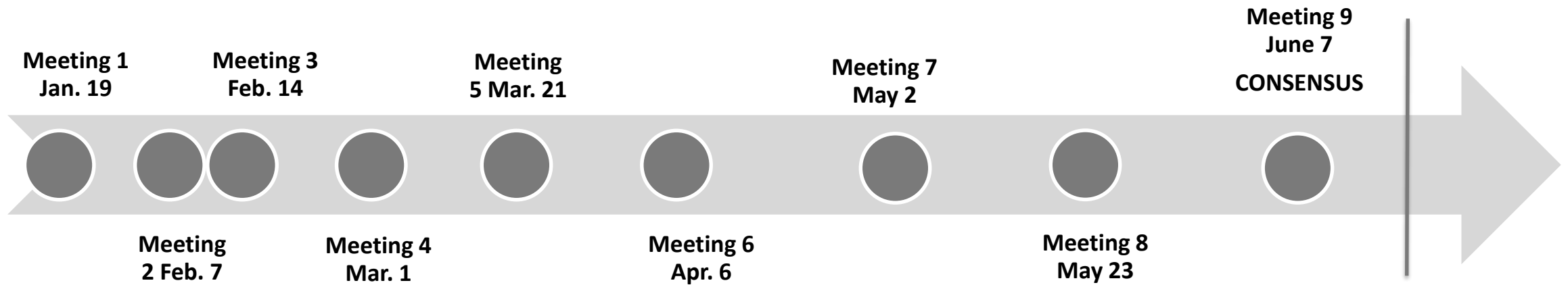
John Bringenberg

Lindsey Arell

Prem Sundharam

Tyler Smith

# Task Force Meeting Timeline





Green Roofs Review Task Force Proposal

# **NEW BUILDINGS PROPOSAL**

# Green Building Ordinance – Proposed Compliance Options **New Buildings**



## **Green Roof / Green Space**

(roof, terraces, podiums, grade-level)

Green area equivalent to:  
10% of roof area x no. of floors  
(max 60% of roof area required)

## **Green**

(roof, terraces, podiums, grade-level, off-site)  
**and Solar**  
(roof, building, site, community)

Green area equivalent to:  
3% of roof area x no. of floors (max 18% of roof area required)  
AND  
On-site renewable energy or community solar total system production equivalent to:  
7% of roof area x no. of floors (max 42% of roof area required)

## **Solar**

(roof, building, site, community)

On-site renewable energy or community solar or Xcel Renewable Connect for a total system production equivalent to:  
70% of roof area

## **LEED v4 BD+C Certification**

Minimum Gold level certification

## **Financial contribution for off-site green space**

Green area equivalent to:  
10% of roof area x no. of floors  
(max 60% of roof area required)  
\$17/sf of required green area

## **Green**

(roof, terraces, podiums, grade-level)  
**and Energy Efficiency**

Green area equivalent to:  
3% of roof area x no. of floors (max 18% of roof area required)  
AND  
Minimum 5% energy savings  
above current City of Denver energy code

## **Energy Efficiency**

Minimum 12% energy savings  
above current City of Denver energy code

## **Enterprise Green Communities Certification**

Minimum certification

\* All buildings will require a Cool Roof unless the roof is a character defining architectural feature.



# New Coverage Requirement

Size of Building (Gross Floor Area)	Required Area. Percent of Roof Space Required to be Covered under Ordinance that was on the ballot.
25,000 – 49,000 sq ft	20%
50,000 - 99,000 sq ft	30%
100,000 - 149,999 sq ft	40%
150,000 – 199,999 sq ft	50%
200,000 sq ft or greater	60%
New Industrial Building	10%



Height of Building	Percent of Roof Space Required to be Covered under New Proposal
1 story	10%
2 stories	20%
3 stories	30%
4 stories	40%
5 stories	50%
6 stories and higher	60%

# New Building Cost Analysis

Cost Evaluation

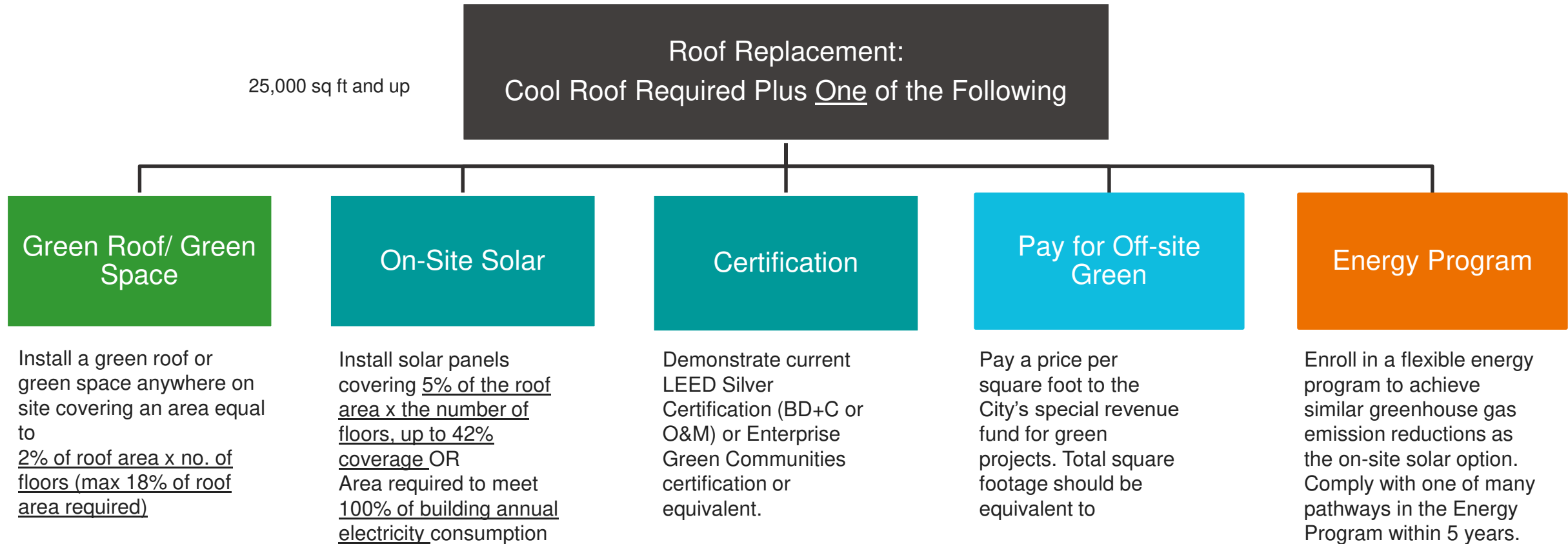
Building	Cost Reduction From Ordinance as Adopted to New Proposal
Office, 55,000 sq ft	~45%
Office, 300,000 sq ft	~20%
Industrial, 150,000 sq ft	~80%
Retail, 70,000 sq ft	~90%



Green Roofs Review Task Force Proposal

# **EXISTING BUILDINGS PROPOSAL**

# Green Building Ordinance – Proposed Compliance Options **Existing Buildings**



# Existing Building: Office

55,000 square feet, 5 floors, roof is 11,000 sq ft.

Current Law Coverage: 30% or 3,300 sq ft.

New Proposal Options: 10% Green –or- 25% solar –or- Energy Program

Description	Current Law	New Proposal
Conventional Roof Replacement Cost (\$)	-\$137,700	-\$137,700
Additional Cost (\$)	-\$52,581	-\$3,750* to -\$19,250**
Cost Increase (%)	38%	3%-14%
Most Positive NPV (\$)	-	\$117,900*

\*Energy Program: retro-commissioning

\*\*10% Green

Note: Net Present Value (NPV) considers energy cost savings, costs (capital, maintenance, replacements), discount rates, and energy escalations rates for a time period of 32 years (i.e. up to year 2050).

# Existing Building: Office

300,000 square feet, 15 floors, roof is 20,000 sq ft.

Current Law Coverage: 60% or 12,000 sq ft.

New Proposal Options: 18% Green –or- 42% solar –or- Energy Program

Description	Current Law	New Proposal
Conventional Roof Replacement Cost (\$)	-\$337,500	-\$337,500
Additional Cost (\$)	-\$132,300	-\$62,117* to -\$65,000**
Cost Increase (%)	39%	18%-19%
Most Positive NPV (\$)	-	\$664,906**

\*18% Green

\*\*Energy Program: retro-commissioning

Note: Net Present Value (NPV) considers energy cost savings, costs (capital, maintenance, replacements), discount rates, and energy escalations rates for a time period of 32 years (i.e. up to year 2050).

# Existing Building: Industrial Roof

150,000 square feet, 1 floor, roof is 150,000 sq ft.

Current Law Coverage: 50% or 75,000 sq ft.

New Proposal Options: 2% Green –or- 5% solar –or- Energy Program

Description	Current Law	New Proposal
Conventional Roof Replacement Cost (\$)	-\$1,539,900	-\$1,539,900
Additional Cost (\$)	-\$725,445	-\$55,750* to -\$255,000**
Cost Increase (%)	47%	4%-17%
Most Positive NPV (\$)	-	\$247,579**

\*2% Green

\*\*Energy Program: LED lighting

Note: Net Present Value (NPV) considers energy cost savings, costs (capital, maintenance, replacements), discount rates, and energy escalations rates for a time period of 32 years (i.e. up to year 2050).



# Existing Building: Retail

70,000 square feet, 1 floor, roof is 70,000 sq ft.

Current Law Coverage: 30% or 21,000 sq ft.

New Proposal Options: 2% Green –or- 5% solar –or- Energy Program

Description	Current Law	New Proposal
Conventional Roof Replacement Cost (\$)	-\$769,950	-\$769,950
Additional Cost (\$)	-\$348,370	-\$27,050* to -\$119,000**
Cost Increase (%)	45%	4%-15%
Most Positive NPV (\$)	-	\$125,645**

\*2% Green

\*\*Energy Program: LED lighting

Note: Net Present Value (NPV) considers energy cost savings, costs (capital, maintenance, replacements), discount rates, and energy escalations rates for a time period of 32 years (i.e. up to year 2050).

# NPV Parameters

Parameter	Assumption	Source
Analysis Period (years)	32 (i.e. till year 2050)	
Discount Rate (%)	7	Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs ( <a href="https://www.wbdg.org/FFC/FED/OMB/OMB-Circular-A94.pdf">https://www.wbdg.org/FFC/FED/OMB/OMB-Circular-A94.pdf</a> )
Energy Escalation Rate (%)	2	Colorado, 1.5% Inflation, Commercial Energy Escalation Rate Calculator ( <a href="https://energy.gov/eere/femp/energy-escalation-rate-calculator-download">https://energy.gov/eere/femp/energy-escalation-rate-calculator-download</a> ):
Electricity Blended Rate (\$/kWh)	0.098	Colorado, Commercial U.S. Energy Information Administration ( <a href="https://www.eia.gov/electricity/monthly/epm_table_grapher.php?t=epmt_5_6_a">https://www.eia.gov/electricity/monthly/epm_table_grapher.php?t=epmt_5_6_a</a> )
Energy Savings	12% for LED 16% for Retro-Commissioning	Calculated based on site energy use intensity (EUI) of DOE Commercial Reference Buildings in Denver, Post-1980 Construction. Building types used were Mid-rise Apartment, Warehouse, Stand-alone Retail, and Medium Office.

# New Building: Office

**55,000** square feet, 5 floors, roof is 11,000 sq ft.

Coverage requirement on the ballot: 30% or 3,300 sq ft.

New proposed coverage requirement: 50% or 5,500 sq ft

Description	Current Law	New Proposal
Cost (\$) to construct the building	-\$6,990,500	-\$6,990,500
Additional Cost (\$)	-\$91,911 to -\$193,475	-\$63,003 to -\$93,500
Percent Cost Increase	1.3%-2.8%	0.9%-1.3%
Cost description	Lowest: green roof + solar Highest: solar only	Lowest: green area Highest: green covering an area equal to 15% of roof and 5% above code energy efficiency

~45% reduction in average costs for the new proposal

# New Building: Office

**300,000** square feet, 15 floors, roof is 20,000 sq ft.

Coverage requirement on the ballot: 60% or 12,000 sq ft.

New Proposed Coverage Requirement: 60% or 12,000 sq ft.

Description	Current Law	New Proposal
Cost (\$) to construct the building	-\$56,007,000	-\$56,007,000
Additional Cost (\$)	-\$275,315 to -\$405,562	-\$204,000 to -\$341,235
Percent Cost Increase	0.49%-0.72%	0.4%-0.6%
Cost description	Lowest: green roof + solar Highest: green roof only	Lowest: green area Highest: green covering an area equal to 18% of roof above code energy efficiency

~20% reduction in average costs for the new proposal

# New Building: Industrial

150,000 square feet, 1 floor, roof is 150,000 sq ft.

Coverage requirement on the ballot: 10% or 15,000 sq ft.

New proposed coverage requirement: 10% or 15,000 sq ft.

Description	Current Law	New Proposal
Cost (\$) to construct the building	-\$19,642,500	-\$19,642,500
Additional Cost (\$)	-\$303,604 to -\$1,739,897	-\$174,713 to -\$255,000
Percent Cost Increase	1.5%-8.9%	0.9%-1.3%
Cost description	Lowest: green roof + solar Highest: solar only	Lowest: green area Highest: green covering an area equal to 3% of roof and 5% above code energy efficiency

~80% reduction in average costs for the new proposal



# New Building: Retail

70,000 square feet, 1 floor, roof is 70,000 sq ft.

Coverage requirement on the ballot: 30%, or 21,000 sq ft.

New Proposed Coverage Requirement: 10% or 7,000

Description	Current Law	New Proposal
Cost (\$) to construct the building	-\$7,000,000	-\$7,000,000
Additional Cost (\$)	-\$648,702 to -\$1,107,275	-\$70,700 to -\$119,000
Percent Cost Increase	9.3%-15.8%	1.0%-1.7%
Cost description	Lowest: green roof + solar Highest: green roof only	Lowest: green area Highest: green covering an area equal to 3% of roof and 5% above code energy efficiency

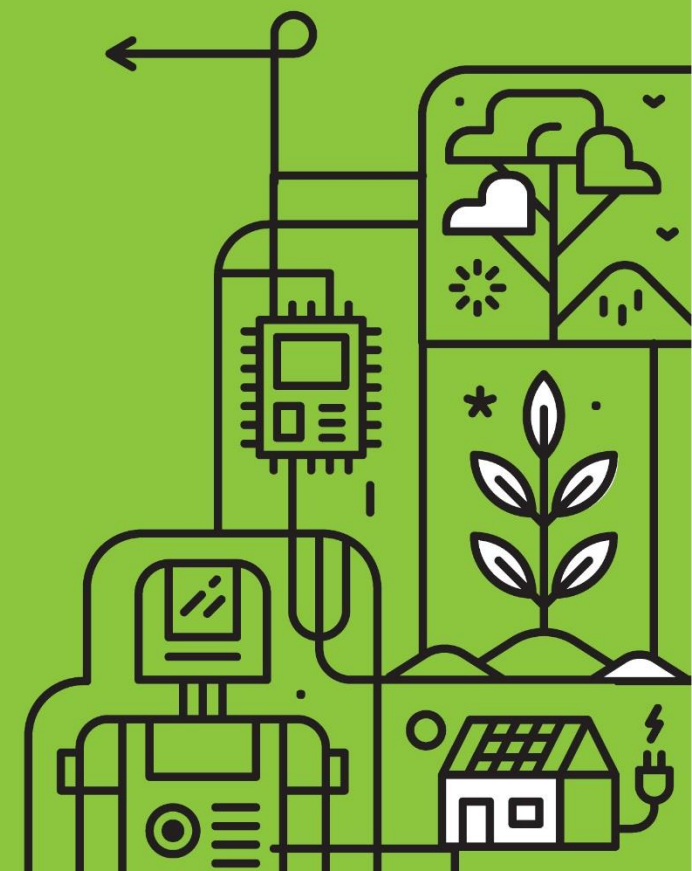
~90% reduction in average costs for the new proposal

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**Andy  
Creath**

*Principal*

*Green Roofs of Colorado, LLC*





Andy Creath

[www.greenroofsco.com](http://www.greenroofsco.com)



# Community College of Denver – Confluence Building

Architect: OZ architecture

Landscape Architect – Studio Insite

Contractor: GH Phipps

Green Roof Installer: Green Roofs of Colorado

Green Roof Consultant: Andy Creath, Green Roofs of Colorado

Green Roof System – American Hydrotech

Size – 17,000 sf

Cost - \$20 sf

































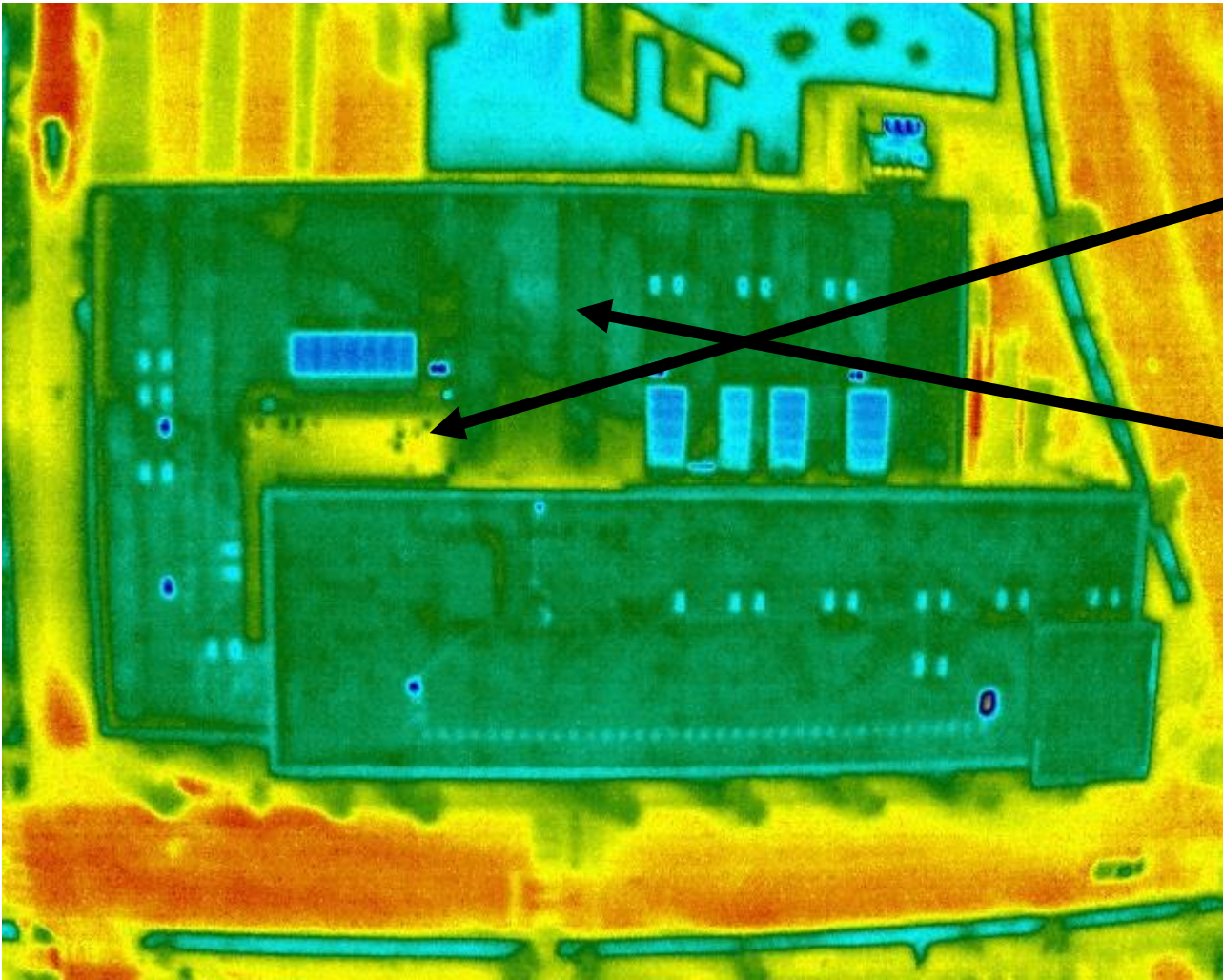








# Ongoing CCD Confluence Infrared Study - with Halkin Aerial Services (8:00pm)



Zone: Area 5 Patio ( in °F )

Min	79.5
Avg	84.3
Max	86.6
Ambient	75 F
Humidity	42 %

Zone: Area 3 Grass ( in °F )

Min	77.2
Avg	78.3
Max	79.5
Ambient	75 F
Humidity	42 %

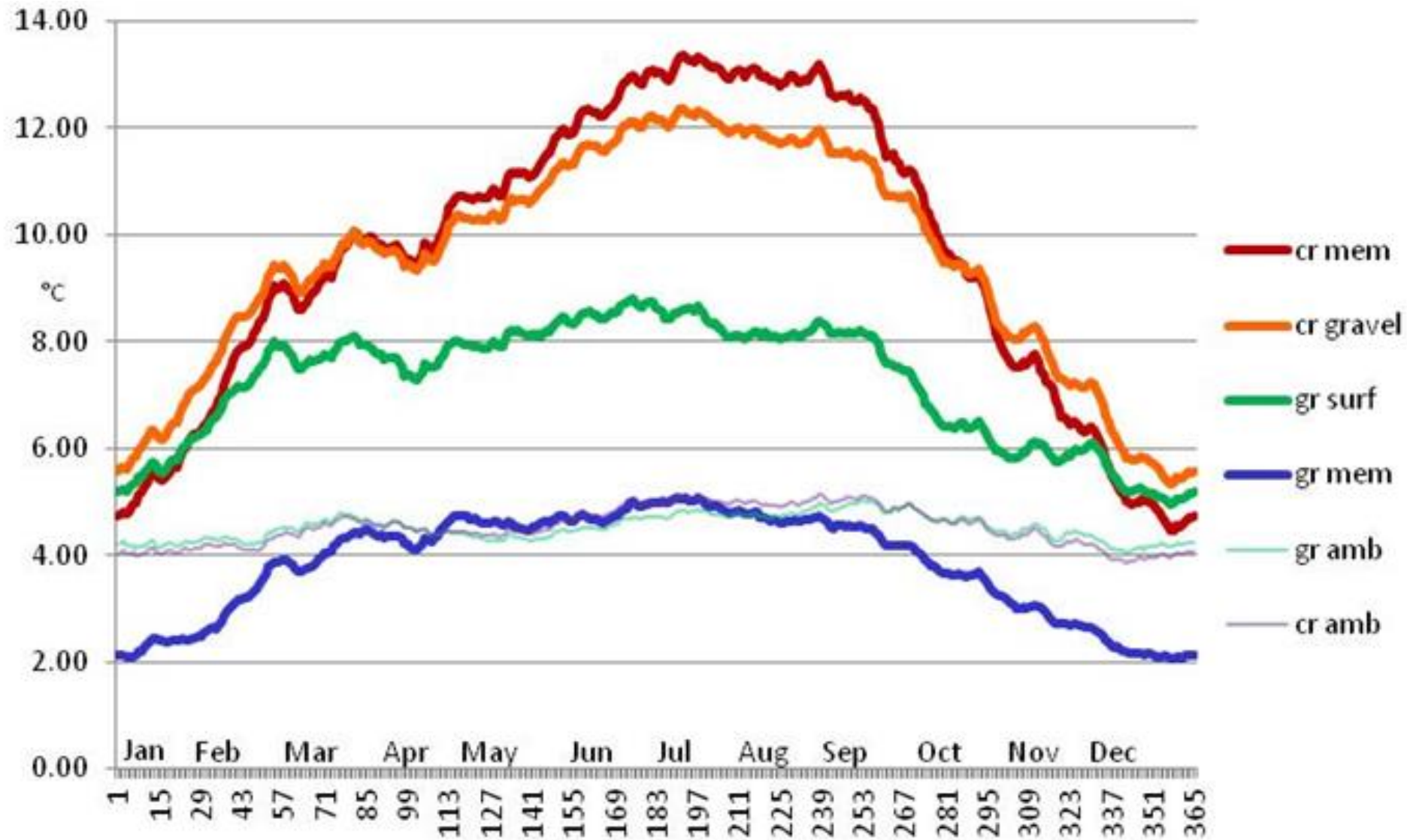


# EPA Region 8 Green Roof

## Green Roofs + Urban Heat Island



# Green Roofs + Urban Heat Island





Andy Creath

[www.greenroofsco.com](http://www.greenroofsco.com)



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# Genevieve Sherman

*Head of New Markets and Partnerships  
Greenworks Lending*





# C-PACE for Retrofit and New Build

Presented to Moya White | October 25 2018

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# C-PACE

C-PACE is a financing structure made possible by a state level policy that has been passed in over 30 states nationally.

The policy classifies building energy-improvement upgrades as a public benefit – like a sewer or road extension - allowing for repayment through a special property tax assessment. **C-PACE law designed to yield commercial economics on capital intensive upgrades like green roofs/solar.**



**100% Financing:** Both hard and soft costs related to energy improvements and/or new infrastructure can be funded



**Long-term:** Payback periods are designed to match the expected useful life of the energy saving equipment (often 20+ yrs)



**Cash flow positive:** Savings from improvements generally exceed the cost of repayment, starting day one

# Powerful Solution



## Cash Flow

- 100% financing
- Long payback period, fixed rate
- Covers all hard and soft costs



## Flexible & Secure

- No personal or corporate guarantee
- Transfers on sale
- Costs can be passed through to tenants
- Preserves borrowing capacity



## Easy to Qualify

- Qualify based on property value
- Funds most energy and water projects
- All standard commercial property types

# RETROFIT: CEAVCO

Commercial office and warehouse building in Arvada. implemented a new roof + solar and efficiency.

**Project Type:** New roof, solar, lighting

**Total Project Cost:** \$ 670,000

**Money Down:** \$ 0.00

**C-PACE Financing:** \$ 670,000

**Term:** 20 years

**Annual Assessment:** \$ 60,000

**Year One Savings** \$ 100,000

**Energy reduction:** 94%



*“We’ve been in business for more than 50 years, and while we’re primarily focused on making our clients look good, we knew the time had come to take care of some in-house maintenance issues. By installing a new roof, solar PV system, and energy-efficient lighting, we were able to modernize our office—making it more comfortable for our employees and tenants—lower our energy costs, and reduce our carbon footprint” - **Matt Emerson, president of CEAVCO Audio Visual***



# NEW BUILD: MAYFLY HQ

An adaptive reuse of a former warehouse in Madison Wisconsin, this 102 year old property, vacant for the past 15 years, is being redeveloped into the Hotel Indigo. The hotel design features new historic replica windows,


**Project Type:** LED lighting, energy-efficient low-emissivity glass (low-e), geothermal ready

<b>Total Project Cost:</b>	\$ 6,500,000
<b>C-PACE Financing:</b>	\$ 1,000,000 (15%)
<b>Term:</b>	20 years

<b>Code Minimum:</b>	IECC 2015
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“We are a leading manufacturer of outdoor products and our new world-class facility will reflect this standard, both inside and out” - **David Dragoo, President of Mayfly**

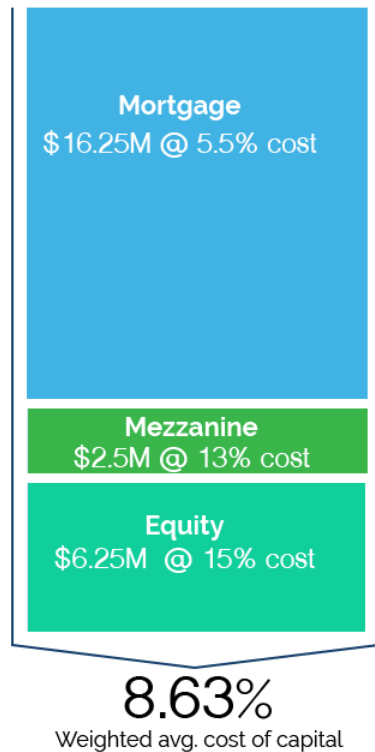
An architectural rendering of a modern, two-story building with a dark, flat roof and large glass windows. The building features a mix of materials, including dark wood slats and light-colored horizontal siding. A prominent glass entrance is visible. In the foreground, a silver SUV is parked on the left, and a white sedan is parked in the center. Several people are standing near the entrance. The sky is a mix of orange and blue, suggesting sunset or sunrise. A red rectangular box with white text is overlaid on the building's facade.

**[CLICK HERE](#) to view video  
or visit  
[youtu.be/JSadXulqTSk](https://youtu.be/JSadXulqTSk)**

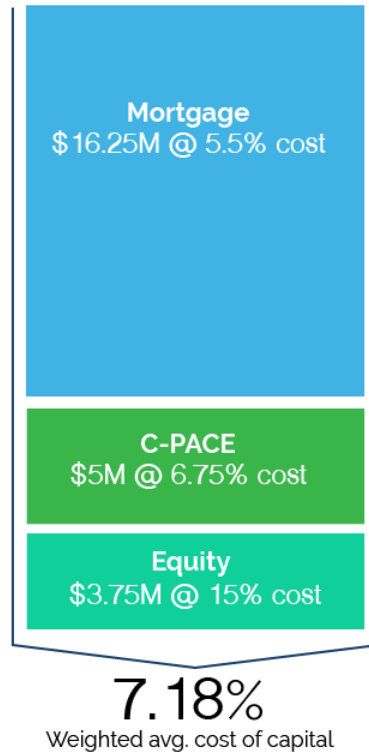


# New Construction Capital Stack

Traditional capital stack



Capital stack with C-PACE



## Increase return on equity:

In this example, ROE improved 46.5% via the replacement of mezzanine debt and reduction in equity



**Decrease weighted cost of capital:** WACC improves with C-PACE financing, in this case 145bps. The scenario at left yielded an estimated \$283k/yr



**Permanent financing from day one:** Long-term fixed rate capital that stays with the property from construction through term

# Thank You

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Genevieve Rose Sherman

**E:** [gsherman@greenworkslending.com](mailto:gsherman@greenworkslending.com)

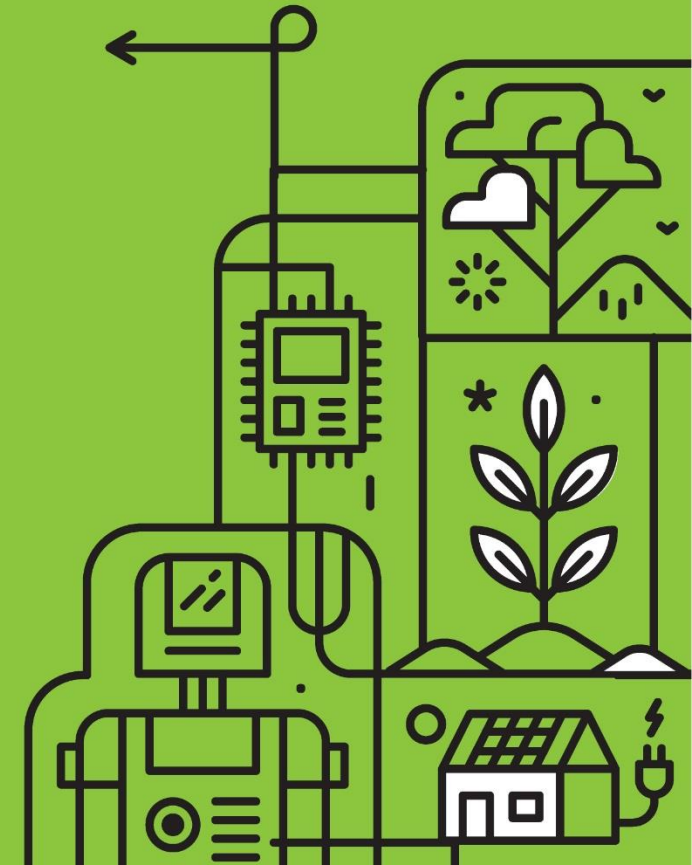
**T:** 917 968 0948



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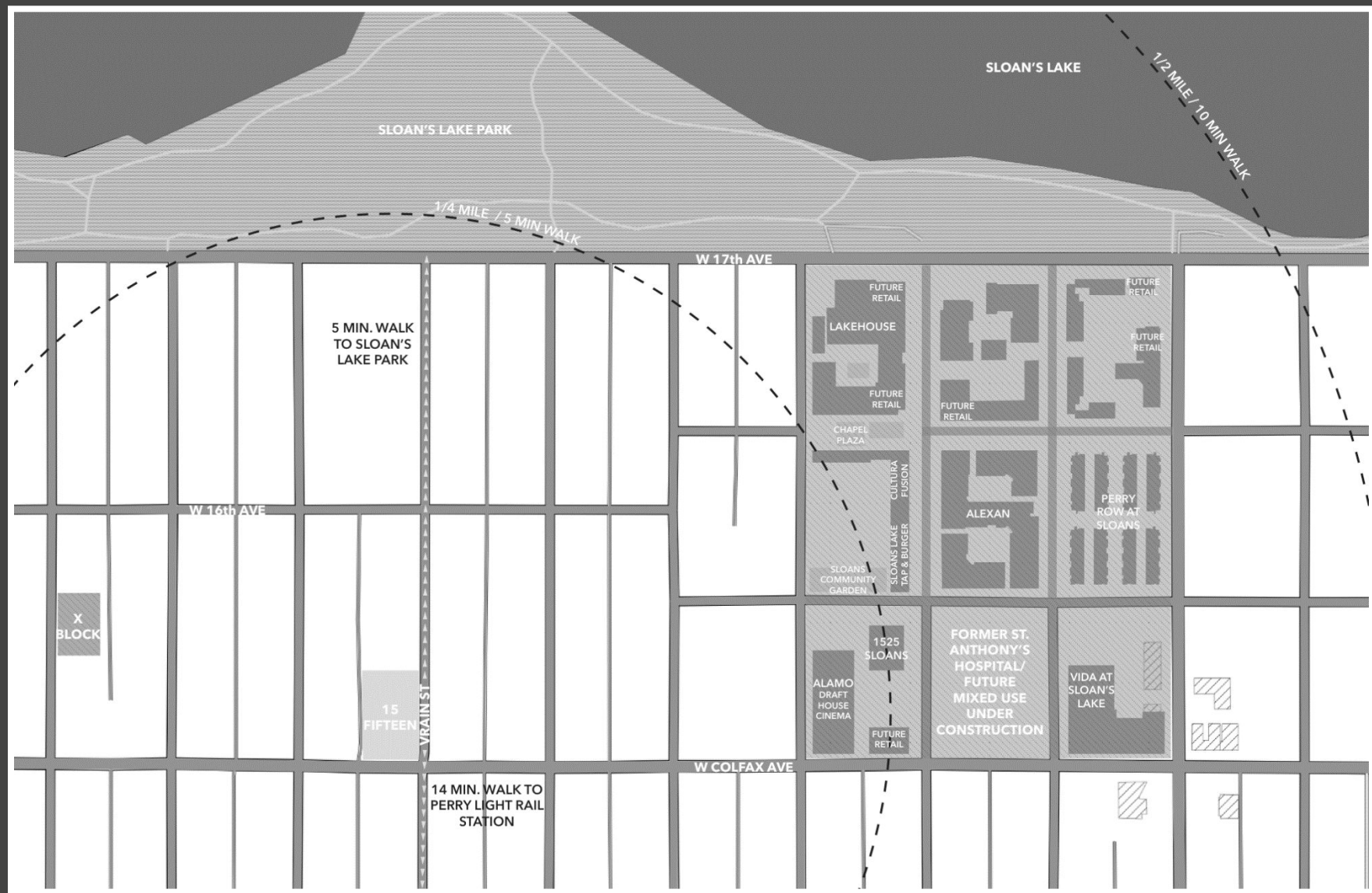


## C-PACE CASE STUDY: 1515 FLATS

October 25, 2018

Green Roofs/CPACE Panel

Moye White Fall Gathering





## 1515 FLATS OVERVIEW

The building is constructed as 1 floor below grade (unconditioned), podium, 3 floors (10' floor to floor) plus roof.

- CMX 5 zoning
- 89,000 SF building
- 19,000 SF+/- site
- 82 residential units
- 5,600 SF of ground floor retail
- 82 parking spaces

*Exterior detail on East side of building.*



1515  
FLATS

SITE PLAN





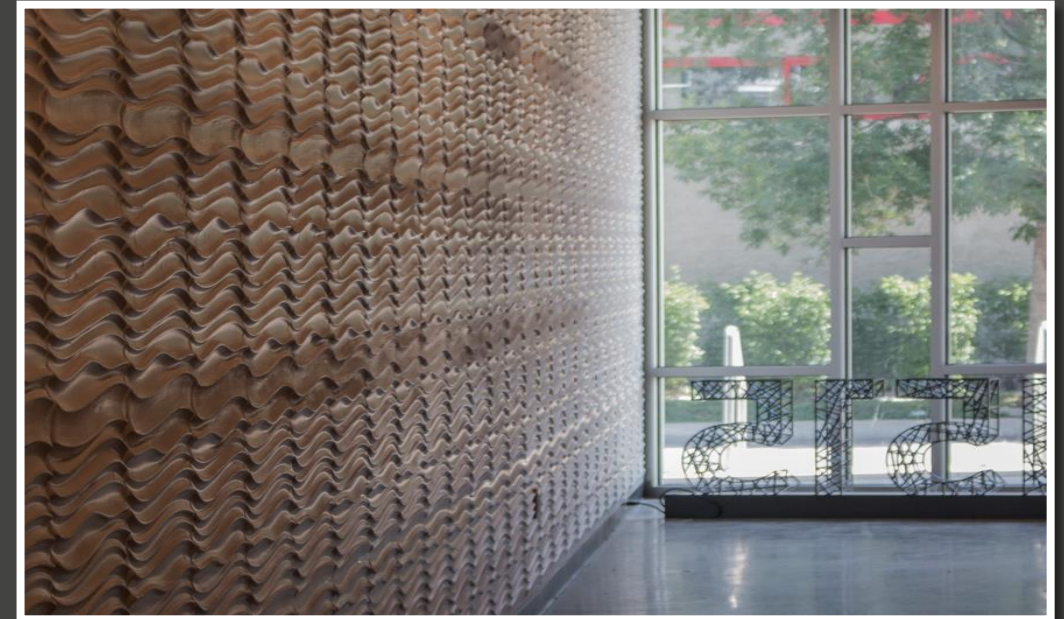
## 1515 FLATS + CSPACE

- Required a min 19% energy savings over baseline to achieve Tier I financing of 15% of total construction costs
- Required a min of 26.5% energy savings over baseline to achieve Tier II financing of 20% of total construction costs
- 1515 Flats achieved 48.3% energy consumption savings over baseline case without Renewables



## Specific energy efficient features:

- Building Envelope (insulation and glazing)
- Lighting and Equipment efficiency upgrades (designed for increased natural light, LED lighting and HE appliances)
- Domestic hot water reductions and efficiency improvements (low flow fixtures, front load washers)
- HVAC system upgrades (upgraded to packaged terminal heat pumps for efficiency, fan coil in common areas)
- Roof mounted renewables (later removed from scope)-would have added an additional 7.8%





1515  
FLATS



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