



# Green Roofs Review Task Force

City Council Briefing on the Task Force's  
Green Building Policy Proposal

June 25<sup>th</sup>, 2018



# OVERVIEW OF THE AGENDA

Briefing on the Task Force Proposal - 30 minutes

- The Task Force Process Since May 7<sup>th</sup>

- Review of Current Law and Benefits

- New Buildings, Task Force Proposal and Cost Analysis

- Existing Buildings, Task Force Proposal and Cost Analysis

- Next Steps

Public Comment – 15 minutes

Questions – 45 minutes



# **TASK FORCE PROCESS**



## 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.”



# Who is on the Task Force

## 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

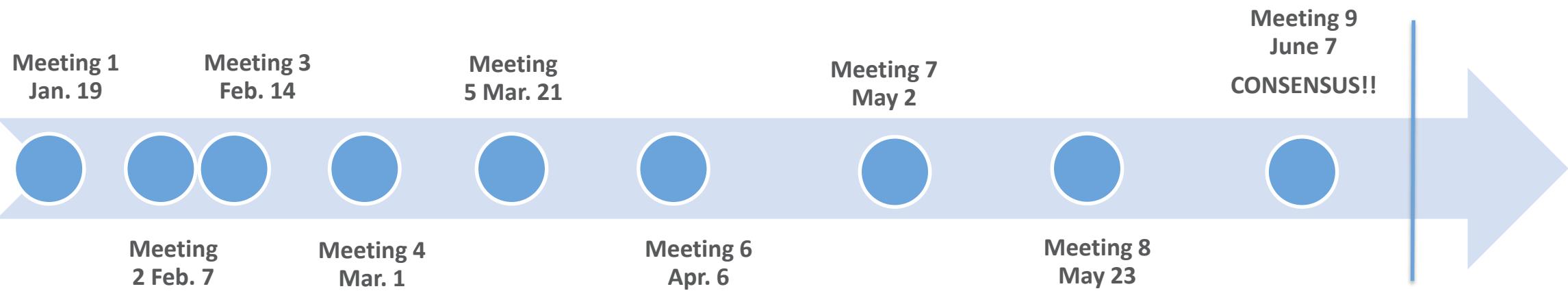
Lindsey Arell

Prem Sundharam

Tyler Smith



# Task Force Meeting Timeline





# PUBLIC INPUT PROCESS

May 3<sup>rd</sup> - June 3<sup>rd</sup>

**Two public briefings and input sessions, 15-20 people attended each:**

Friday, May 11<sup>th</sup>, 9:00 a.m. – 10:30 a.m.

Monday, May 14<sup>th</sup>, 9:00 a.m. – 10:30 a.m.

**Comments Received:**

85 people filled out our comment form online

25 people sent in depth email comments



Green Roofs Review Task Force Proposal

# **NEW BUILDINGS PROPOSAL**



# 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%

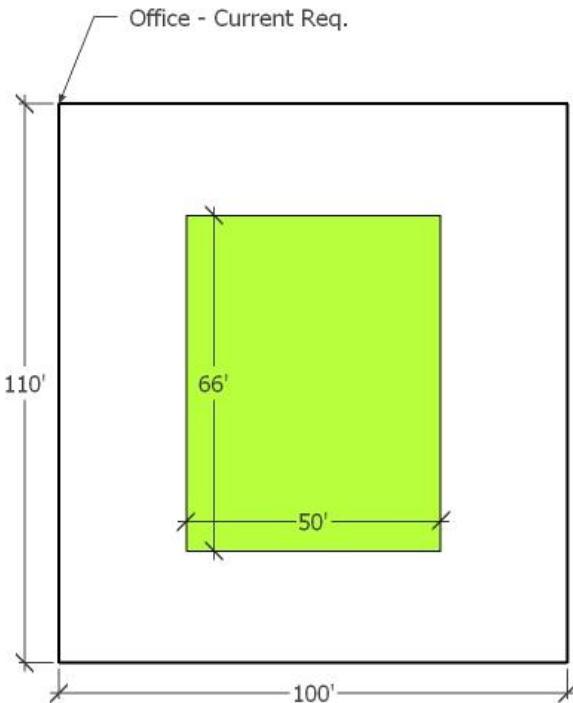
## Coverage Requirement

# New Building: Office

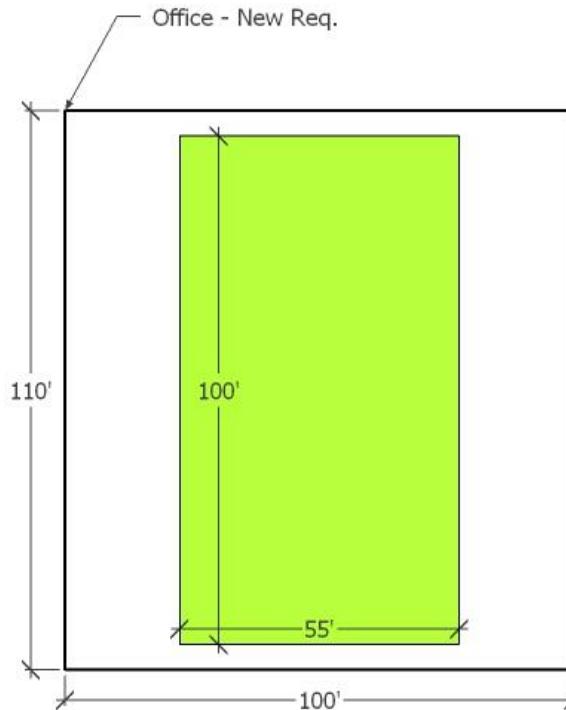
55,000 square feet, 5 floors, roof is 11,000 sq ft.

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

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



Existing Requirement



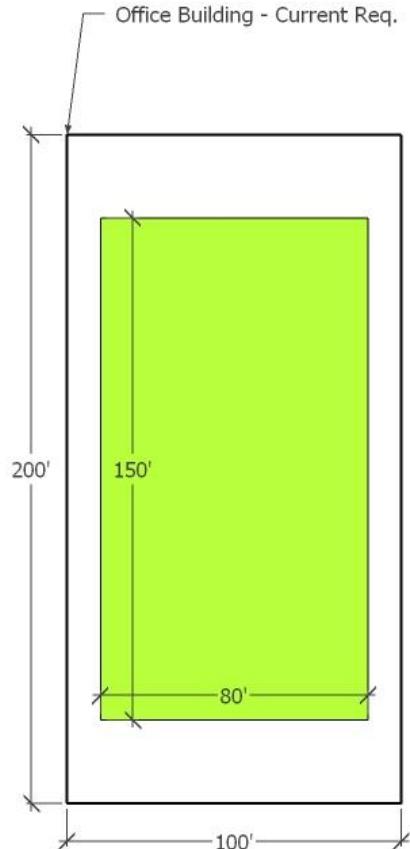
Proposed Requirement

# New Building: Office

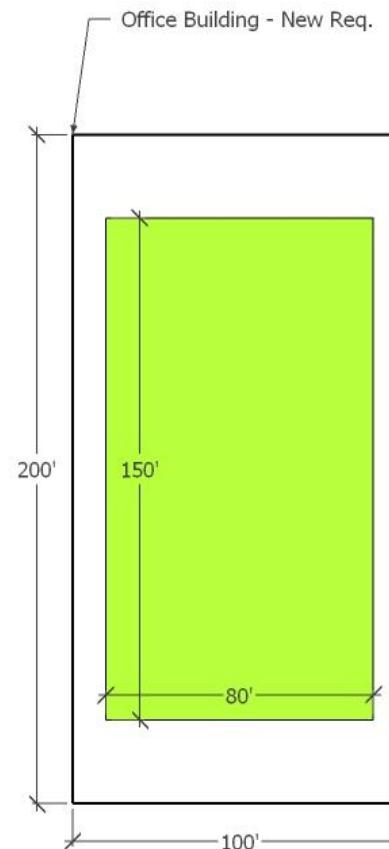
300,000 square feet, 15 floors, roof is 6,000 sq ft.

Coverage requirement on the ballot: 60% or 3,600 sq ft.

New Proposed Coverage Requirement: 60% or 3,600 sq ft.



Existing Requirement



Proposed Requirement

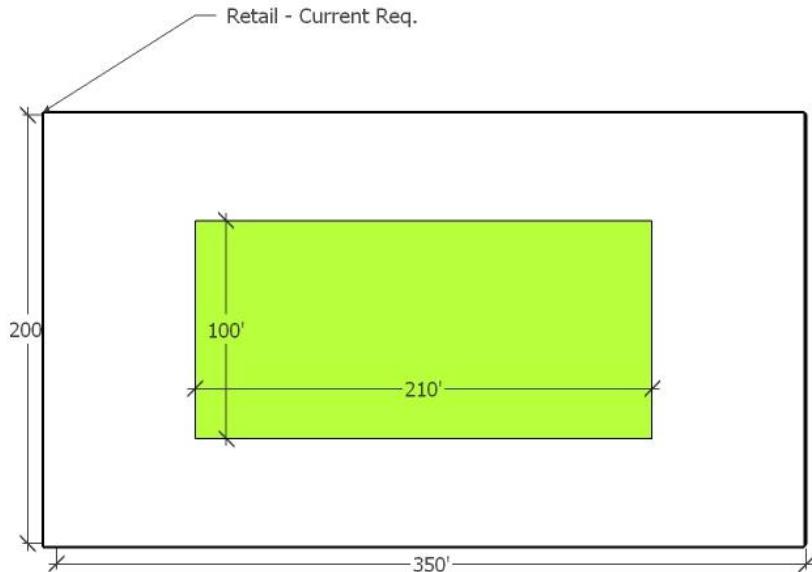
## Coverage Requirement

# New Building: Retail

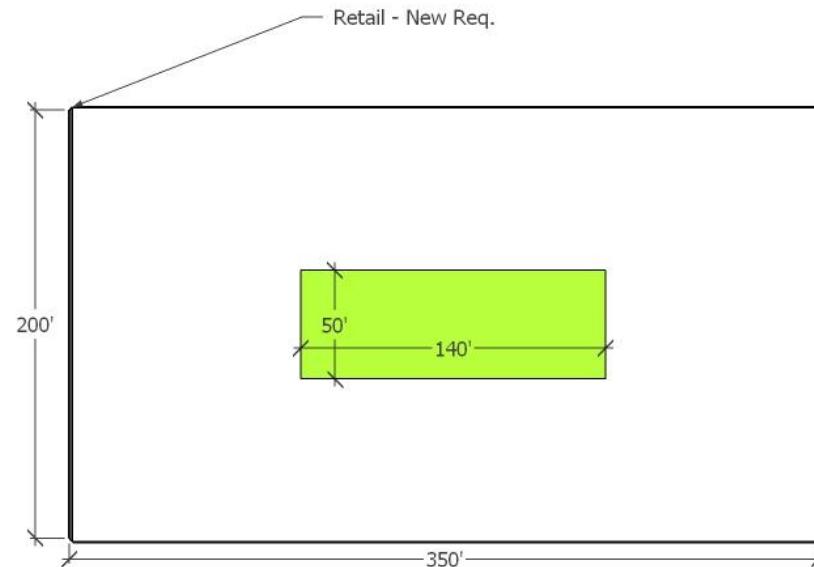
70,000 square feet, 1 floor, roof is 70,000 sq ft.

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

New Proposed Coverage Requirement: 10% or 7,000



Existing Requirement



Proposed Requirement

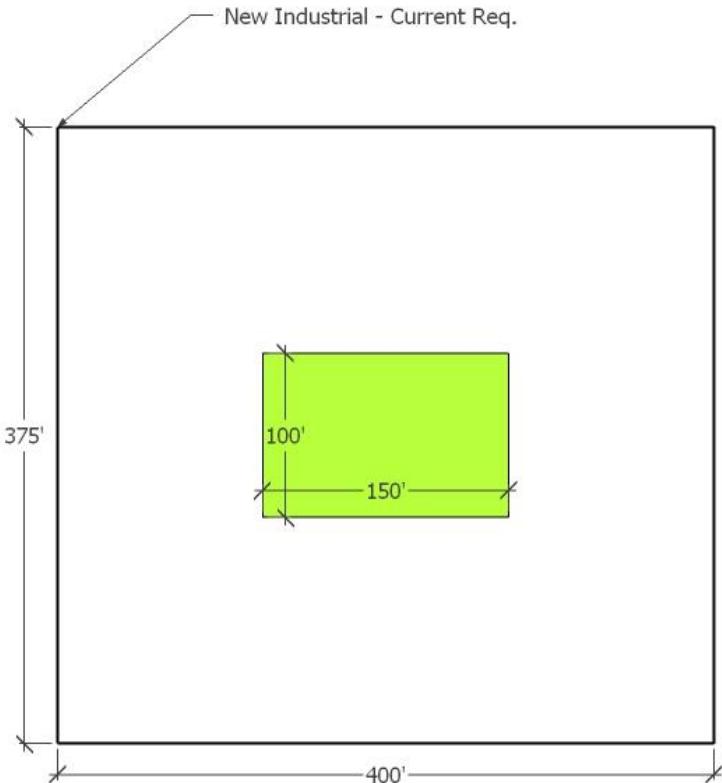
## Coverage Requirement

# New Building: Industrial

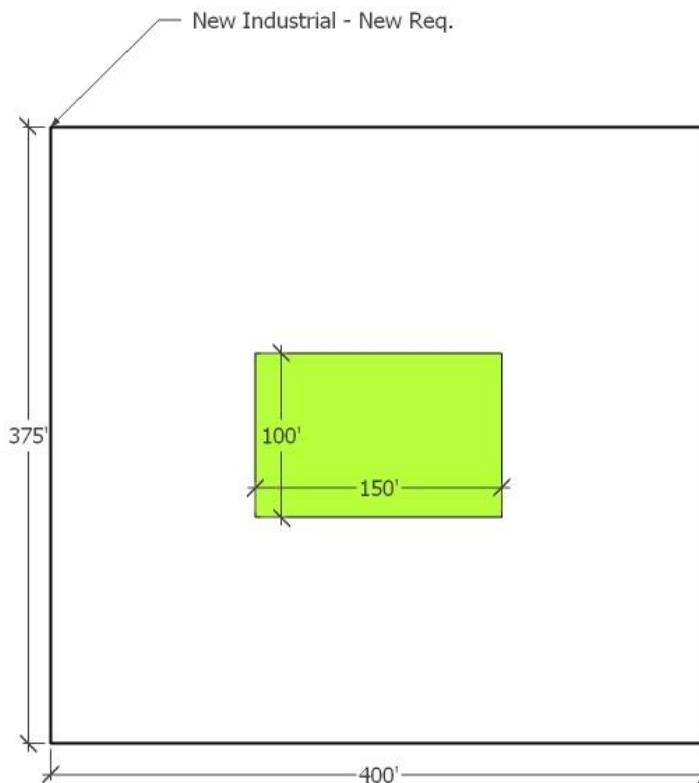
150,000 square feet, 1 floor, roof is 150,000 sq ft.

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

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



Existing Requirement



Proposed Requirement

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

			
<b>Green Roof / Green Space</b> (roof, terraces, podiums, grade-level)	<b>Green</b> (roof, terraces, podiums, grade-level, off-site) <b>and Solar</b> (roof, building, site, community)	<b>Solar</b> (roof, building, site, community)	<b>LEED v4 BD+C Certification</b>
Green area equivalent to: <u>10% of roof area x no. of floors</u> <u>(max 60% of roof area required)</u>	Green area equivalent to: <u>3% of roof area x no. of floors (max 18% of roof area required)</u> AND On-site renewable energy or community solar total system production equivalent to: <u>7% of roof area x no. of floors (max 42% of roof area required)</u>	On-site renewable energy or community solar or Xcel Renewable Connect for a total system production equivalent to: <u>70% of roof area</u>	Minimum Gold level certification
<b>Financial contribution</b> for off-site green space	<b>Green</b> (roof, terraces, podiums, grade-level) <b>and Energy Efficiency</b>	<b>Energy Efficiency</b>	<b>Enterprise Green Communities Certification</b>
Green area equivalent to: <u>10% of roof area x no. of floors</u> <u>(max 60% of roof area required)</u> \$17/sf of required green area	Green area equivalent to: <u>3% of roof area x no. of floors (max 18% of roof area required)</u> AND Minimum <u>5% energy savings</u> above current City of Denver energy code	Minimum <u>12% energy savings</u> above current City of Denver energy code	Minimum certification

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

# Benefits



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



# New Building Cost Analysis

## Cost Evaluation

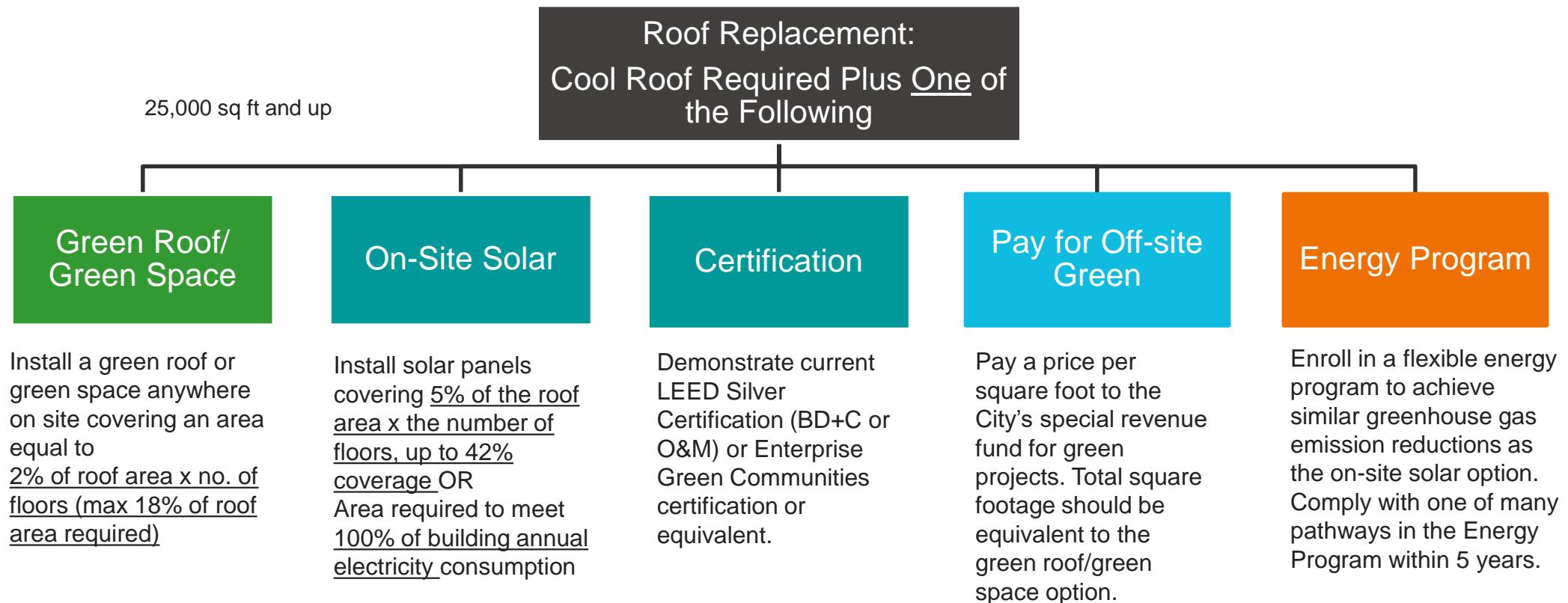
Building	Cost Reduction from New Proposal
Office, 55,000 sq ft	~45%
Office, 300,000 sq ft	~20%
Industrial, 150,000 sq ft	~80%
Retail, 70,000 sq ft	~90%



Green Roofs Review Task Force Proposal

# **EXISTING BUILDINGS PROPOSAL**

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



# Benefits



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



# 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-comissioning

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).

- Additions
- Campuses
- Cool Roof Definition
- Financial Contribution to Off-site Green Space
- Staffing and Resource Needs for Successful Implementation



# NEXT STEPS



# **PUBLIC COMMENT**



# QUESTIONS



# APPENDICES

# 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