



DENVER
THE MILE HIGH CITY

Green Roofs Review Task Force

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

June 25th, 2018

FOR CITY SERVICES VISIT | CALL
DenverGov.org | **311**

OVERVIEW OF THE AGENDA

Briefing on the Task Force Proposal - 30 minutes

- The Task Force Process Since May 7th

- 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

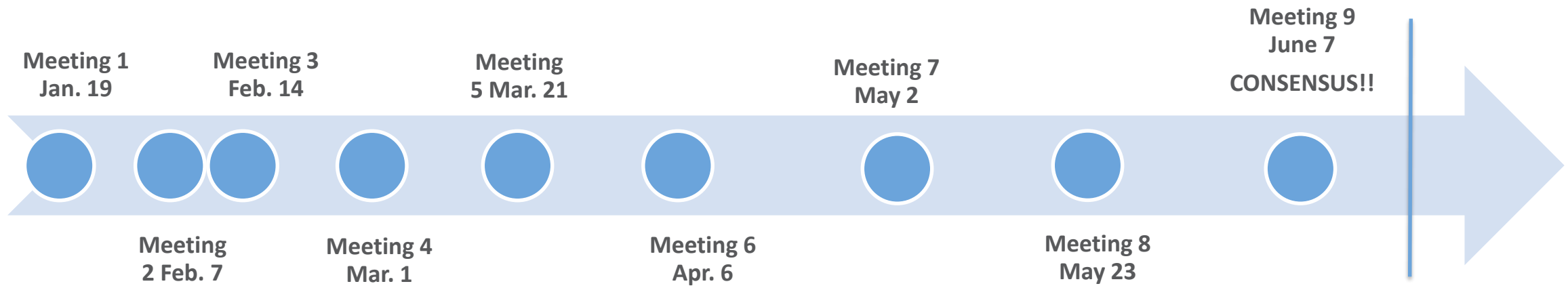
John Bringenberg

Lindsey Arell

Prem Sundharam

Tyler Smith

Task Force Meeting Timeline



May 3rd - June 3rd

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

Friday, May 11th, 9:00 a.m. – 10:30 a.m.

Monday, May 14th, 9:00 a.m. – 10:30 a.m.

Comments Received:

85 people filled out our comment form online

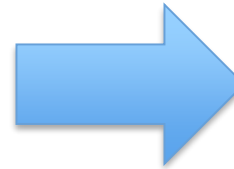
25 people sent in depth email comments

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%



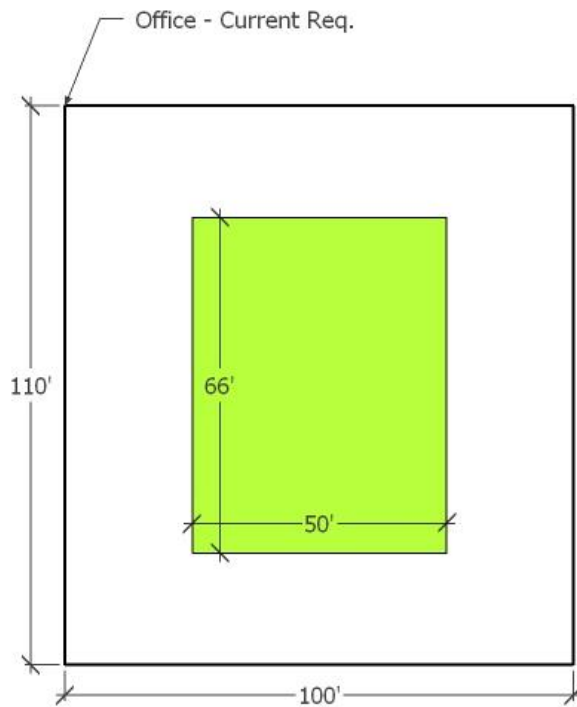
Height of Building	Percent of Roof Space Required to be Covered under New Proposal
1 story	10%
2 stories	20%
3 stories	30%
4 stories	40%
5 stories	50%
6 stories and higher	60%

New Building: Office

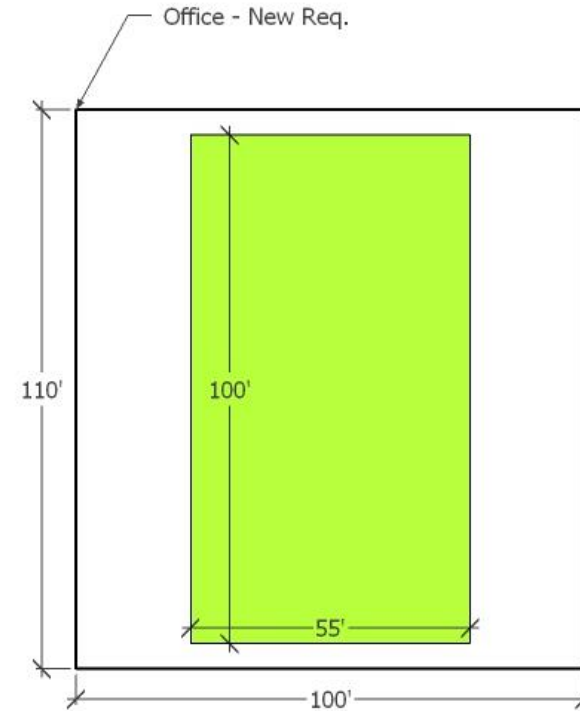
55,000 square feet, 5 floors, roof is 11,000 sq ft.

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

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



Existing Requirement



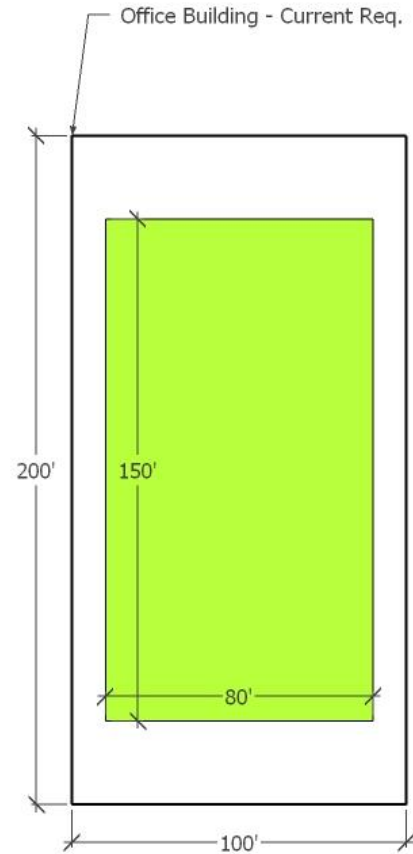
Proposed Requirement

New Building: Office

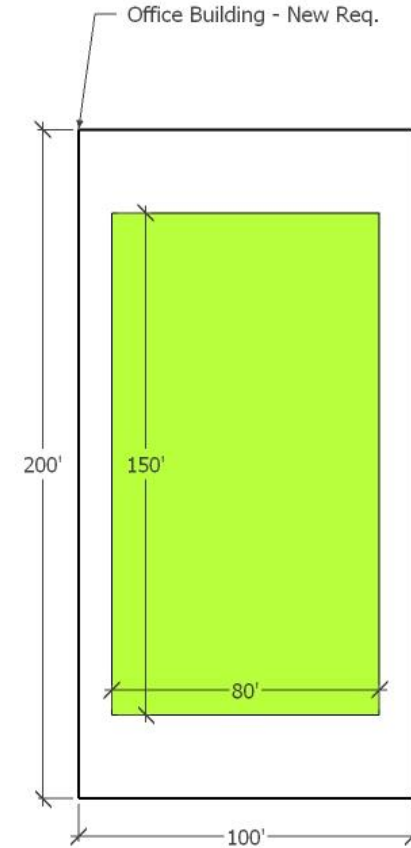
300,000 square feet, 15 floors, roof is 6,000 sq ft.

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

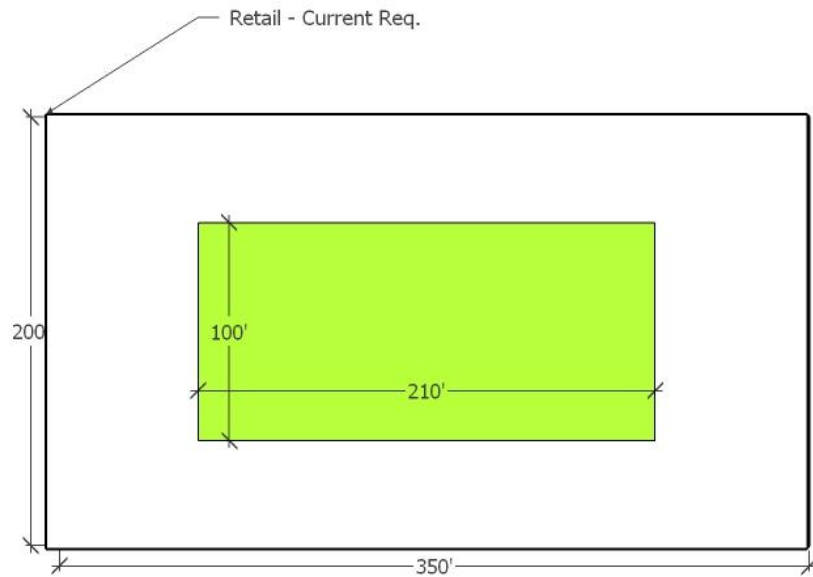
Coverage Requirement

New Building: Retail

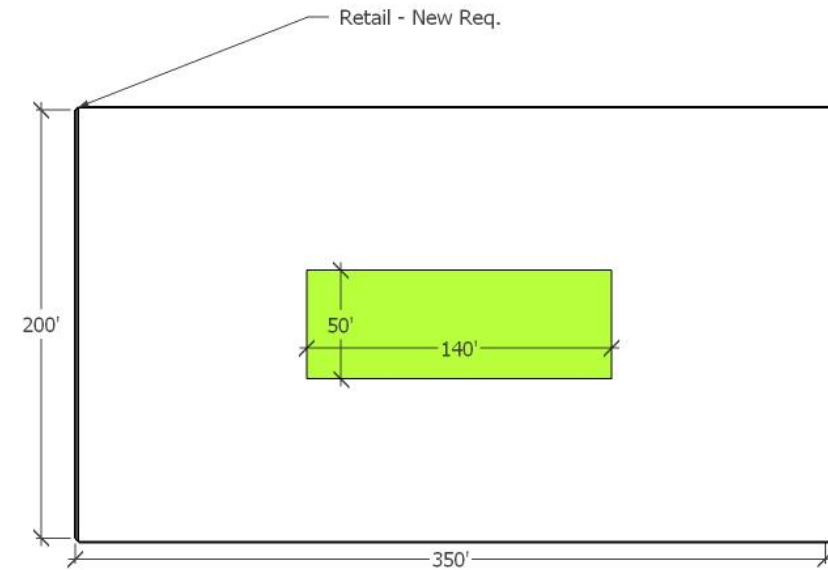
70,000 square feet, 1 floor, roof is 70,000 sq ft.

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

New Proposed Coverage Requirement: 10% or 7,000



Existing Requirement



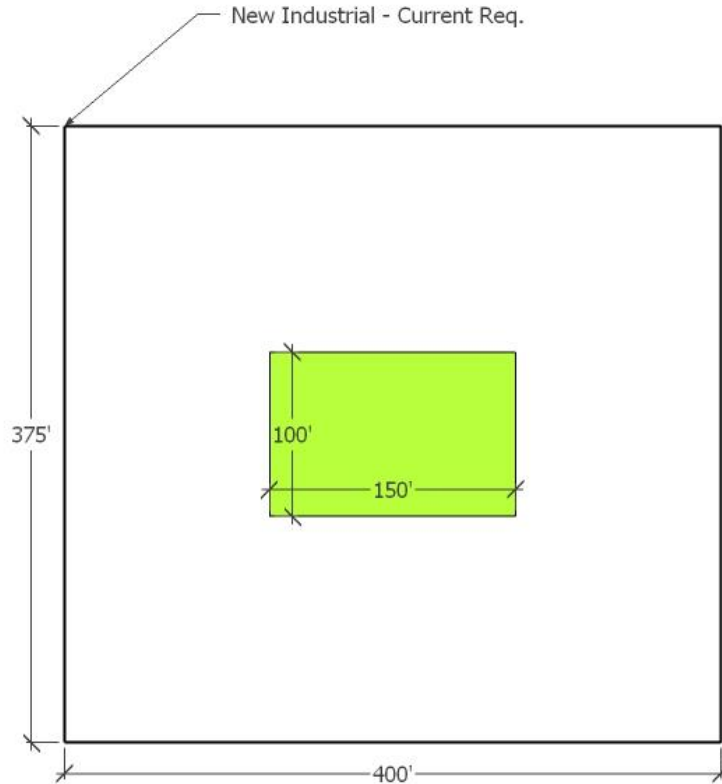
Proposed Requirement

New Building: Industrial

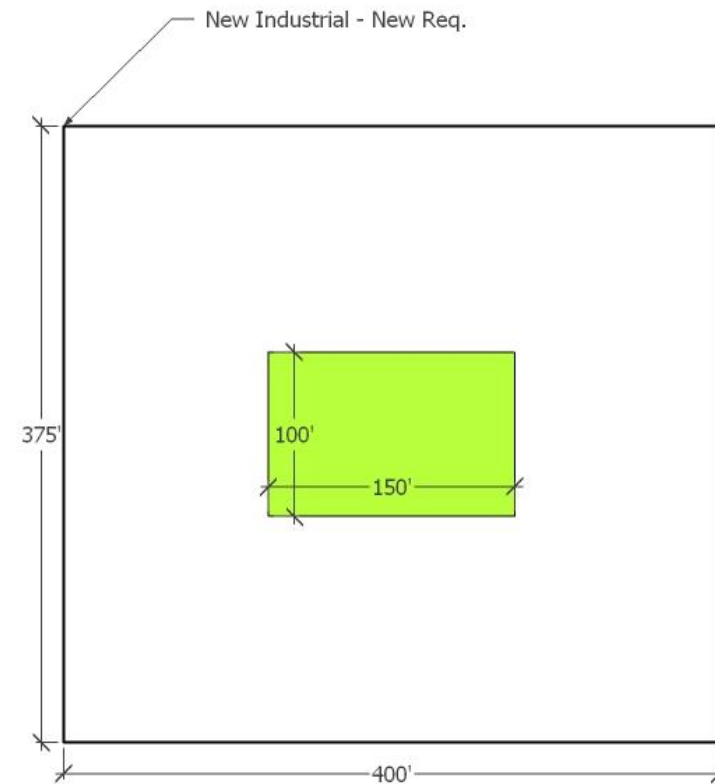
150,000 square feet, 1 floor, roof is 150,000 sq ft.

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**



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.



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



New Building Cost Analysis

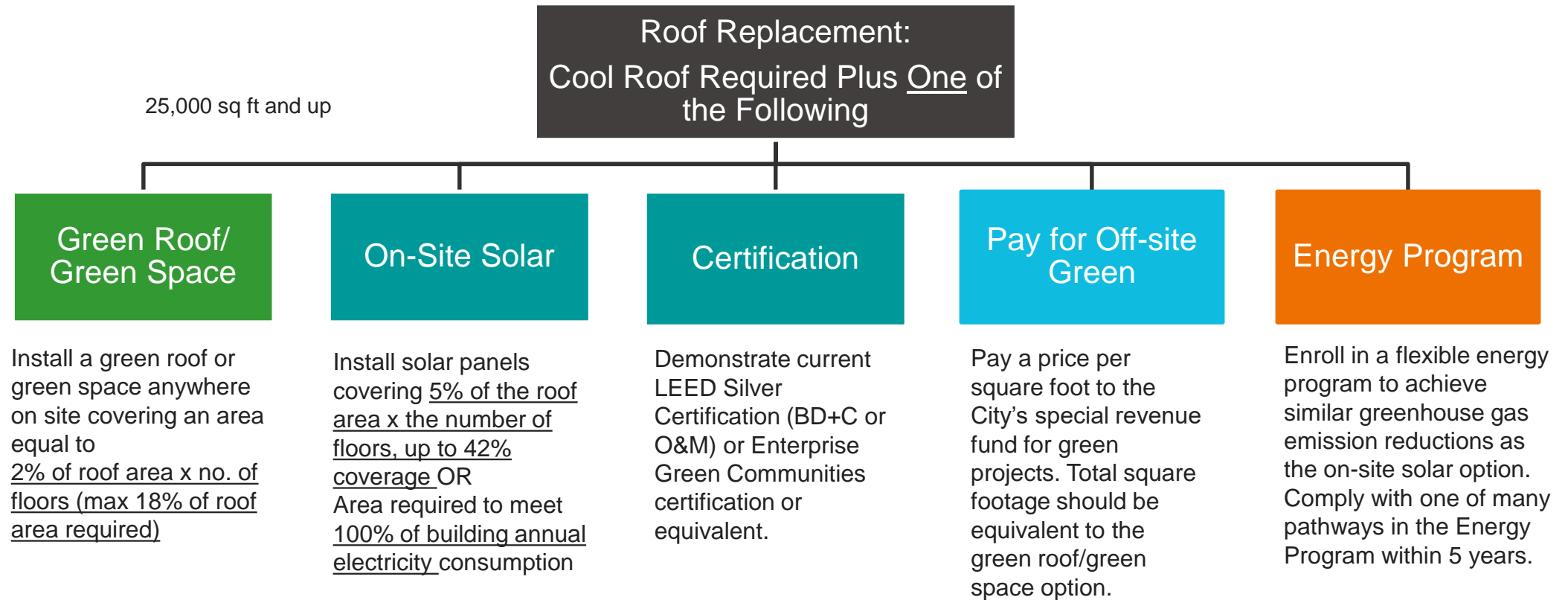
Cost Evaluation

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**





- 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-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).

- 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 (https://www.wbdg.org/FFC/FED/OMB/OMB-Circular-A94.pdf)
Energy Escalation Rate (%)	2	Colorado, 1.5% Inflation, Commercial Energy Escalation Rate Calculator (https://energy.gov/eere/femp/energy-escalation-rate-calculator-download):
Electricity Blended Rate (\$/kWh)	0.098	Colorado, Commercial U.S. Energy Information Administration (https://www.eia.gov/electricity/monthly/epm_table_grapher.php?t=epmt_5_6_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