

Green Roof Review Task Force
Agenda – Meeting #6 – April 6, 2018 – 10:00-1:00
200 W 14th Ave, 2nd Floor, Grand Mesa Room

Meeting Objectives:

- Existing Buildings – Consensus-Building – Moving toward a Proposal Everyone Can Live With
-

10:00 Opening

- Welcome – Opening – Introductions – Preliminary Matters – Agenda Preview and Operating Protocol Reminder
- Update from Council Committee-of-the-Whole – If Any

10:15 Latest Version – Options and Proposals

- Presentation
- Stantec analysis of cost
- Q&A ---- No discussion-disguised-as-a-question – only ‘what I don’t understand is...’

10:50 Consensus-Seeking Discussion

- How does the current option serve the core principles and the interests of all stakeholders?
- In what ways does it fall short?
- What do we do to improve the viability of the option; what may have to change to get everyone on board?
- What happens at roof replacement?
- How can building owners spread their costs over time and bank ‘points’?
- What’s the best way to calculate the required roof coverage for each building type?
- Is the system striking the right balance of flexibility and performance?
- How might this change for existing buildings if they are part of a campus, an affordable housing project, an addition, an emergency roof replacement, an historic building?

12:40 Recap – How Close are We to a Meeting-of-the-Minds?

12:45 Next Steps

- What data and scope of work do you need from Stantec and other experts?
- What else needs to happen before Meeting #7?
- Meeting – Wednesday, May 2 9:00 – 12:00
- Other?

1:00 Adjourn

**Green Roof Review Task Force
Summary – Meeting #6 – April 7, 2018**

Meeting Objective: Address Existing Buildings

I. Current Version of Approach to Existing Buildings

- For existing buildings – achieve the ordinance benefits in a more cost-effective way:
 - o Green or Cool Roof Requirement: Get the heat island and green benefits through cool roof + green. ~\$17/sqft for a financial contribution for off-site green, but expect that to change with additional analysis
 - applies to buildings 25,000 sqft and larger
 - o Energy Program: Get the climate benefits of solar, as in the ordinance, or over the course of 10 years through solar, energy efficiency, or LEED
 - applies to buildings 50,000 sqft and larger, has a 10-year compliance timeline and sets an exemption for energy star of 85 or higher
 - We built a calculator that will allow the task force to see options and that can achieve the target CO2 reductions and can vary building size, compliance timeline and exemption levels for high-performing buildings
 - o Possible to adjust the timeline, the size threshold, etc. as long as we are achieving the same benefits

Q: How did the 30% green space requirement become 3%?

A: If we assume that 10% of building would be able to support a green roof, and the other 90% would qualify for an exemption for major structural reasons, then apply the 10% to the 30% coverage requirement and you get 10% of 30% which is 3%

Q: When would energy program compliance happen?

A: Within 10 years of 2018

Q: Cool roof + green AND energy program?

A: Yes – both columns – the energy program column over 10 years and the cool + green at roof replacement – two separate programs – we tie to roof replacement those things that make sense to tie to roof replacement and un-link the other things from roof replacement to prevent owners from wanting to delay roof replacement

Q: Cool roof – 100% coverage?

A: Yes, not a partial roof – full coverage with cool roof

- Net present value calculation for energy efficiency items calculates savings that comes from reduced energy costs treated as revenue /savings?

Q: Is retro-commissioning the analysis or the analysis and the changes?

A: the analysis and the changes

Q: Can we get review of and more detail about the costs of compliance under this option?

A: Yes, staff will double check and dig into the numbers assuming this option gets traction; To do: review the cost analysis

II. Discussion/Reaction to the Approach to Existing Buildings

- We have to decide whether the program ends after 10 years or continues
- Workable, generally
- 3% is based on an important assumption that seems to reduce this far below what those who voted for the ordinance would expect
- Because the ordinance applies at 25,000 sqft and larger, that's a better choice
- On the right path, but water quality is missing
- A step in the right direction
- Energy star score % improvement needs careful thought; the proposal uses EUI – Energy Use Intensity – and a percent improvement in EUI over the 10 years
- The direction is the right one
- Q: Are there complications if the building is sold?
- A: The buyer and seller would have to be aware and exchange information about what was done to meet the 10-year compliance; the city will have benchmarking data that could make that easier
- Katrina: it probably should transfer, but it is up for discussion.
- We should add some form of recognition – at the time that each building meets its target – this would make building owners want to make the changes
- A very good direction; stronger language than the language of the existing ordinance while considering the benefits of the ordinance
- Water quality still has to be addressed
- Note: When the time comes for draft recommendation language, staff will add to the recommendation the necessary change to 'retain and re-use' water so that the recommendation takes care of the state water law problem
- Other items that are in the works: definition of available roof space and a reworking of the percentages for different building types to address height and create a fairer approach among different uses and building types
- This version is a step in the right direction
- The 3% is do-able
- We have to think about relatively new buildings in this existing-building category and whether there is some grace period for the newest existing buildings
- Q: How does LEED work?
- A: It's a point system; certain elements are mandatory; for others, the owner can choose among options that score points; transportation, water, energy are all sources of points
- The math that produced 3% isn't clear; I get 6% when I make the same calculation
- Q: What percentage of existing buildings would get a major structural exemption?
- A: Not possible to know, but the city building division expects the number to be very high
- Very unlikely that existing buildings were designed to take on additional weight unless the owner planned for adding floors at a later date
- We are losing the stormwater benefit with the small green spaces we would get at 3%; 3 is low
- Q: This seems to simplify; for the building inspection staff, how complicated would this be for review team; is it better?
- A: It is better; we will need more staff no matter what because roof permits were very simple before and they can't anymore; this approach will simplify their review; the intake will be faster though, so this is better
- We should anticipate new technologies, so the use of energy intensity and energy scores is good
- This option – 50,000 sqft and larger, ten years and 85 score for the exemption works
- Again, we use EUI because not all buildings can get an energy star score; both are reported to the city every year, so we could have options for both

- Even efficient systems degrade, so there needs to be a check to maintain the score, so we shouldn't sunset the program after ten years
- In the transition, we should consider building that have already received building permits and not change what we require of them
- The timeline needs to be well defined
- It is important to comply in both columns because one addresses the heat and the green and the other the solar
- Remember that all the building codes are becoming stricter – there is a built-in progress toward higher standards
- Intuitively, the 3% doesn't make sense; we aren't doing what the ordinance would do for water quality and green space
- We should allow a compliance path for Enterprise Green Communities score; it works better for affordable housing

Q: Is solar on-roof, on-ground?

A: We use on-site so that either would comply, and the owner has the flexibility to choose

- It makes sense to have 25,000 sqft buildings and larger in both columns for simplicity and match the ordinance
- We need to add a campus option
- We can do some math to compare on-roof green space and on-ground green space for any water quality difference and we can look into what size is necessary to make the green space worthwhile
- We should see the numbers of the dream of the ordinance – how much green space would the ordinance have produced if all of the existing buildings complied
- We also need to compare the cost of this entire new proposal against the cost of compliance with the current ordinance

III. Testing the Calculator

- Let's start with the proposed 50,000 sq ft and up – owners of these building are more able to comply
- We need to think about how many buildings and what share of the square footage are in buildings 25,000-50,000; there are only a small number of retail buildings that are larger than 50,000
- The smaller buildings add 10% more square footage; they are more likely to be small businesses with fewer resources (funds and expertise) and will need more help with compliance
- The savings are smaller for the smaller buildings
- Most of the retail in Denver are under 25k
- 25,000 would simplify it since they have to do the roof replacement and the ordinance was written that way; 25,000 is still medium size
- Ten percent in 10 years seems really easy
- Industrial building owners don't have control over the energy use in their buildings if there is an energy-intensive manufacturing operation that runs 24/7
- Manufacturing doesn't get energy star scores; we need a different way to deal with different uses
- If we exclude any building – for size or for use – we have to make up the emission reduction from the rest of the building inventory

Q: Do we know how building size relates to efficiency?

A: The inventory doesn't suggest that smaller buildings are less or more energy efficient

- We have to reconcile two different measures – the 70% solar in the ordinance and Xcel's limitation on solar
- Xcel's limits apply to single meters, so buildings are unlikely to reach their limit
- We have to translate these targets into costs

- 50,000 sqft and larger is the more realistic threshold; those are the more sophisticated owners who can comply readily
- If the average Energy Star score is 68, 75 seems like a low bar for exemption; 85 as proposed make sense
- Energy Star scores, because they are averages that get updated, have a baseline that moves up over time
- Building leases roll over every 5-10 years; as a result, owners are spending money to update their buildings and as they do, they have to comply with updated codes; the level of efficiency goes up every time

Q: Is there another option besides energy star?

A: Yes, we will look into it

- 25,000, 12%, and 75 score exemption – that reaches the same level as the ordinance
- Yes, that’s a good option
- Raise the exemption and lower the percentage
- Hard to support at 25,000; a higher percentage and 50,000 is better; not impacting small owners
- Maybe the way to bring everyone together is to set a different % of energy reduction for 25,000-50,000 from the percentage for 50,000 and above
- More time is easier financially; more time would have more support; 10 years works
- 50,000 and 10 years

IV. Available Roof Area

- Staff are thinking through the details of fairer coverage requirements
- It’s necessary to find ways to calculate the roof coverage requirements that are fair to low, long buildings and tall, thin buildings
- The goal is a number or set of numbers that can be multiplied by the number of floors

V. Conclusions and Next Steps

- Staff will refine the approach to existing buildings using today’s discussion; these elements need attention:
 - Ensuring that the proposal fully realizes the water quality benefits of the existing ordinance
 - Using the water quality considerations to consider whether 3% is the right number or whether that number has to go higher
 - Finding a middle ground on the calculator for energy efficiency
 - Revisiting/reconfirming cost information and all of the calculations
 - Examining the cost of compliance with the current ordinance and comparing it to the cost of compliance with the next iteration of the proposal
- The next meeting will include new buildings and major renovations and the next iteration on existing buildings
- Next meeting – May 2, 2018 – 9:00-12:00

Existing Building Green Roof Policy Proposal

Overview

The Green Roofs Ordinance would have benefits in the following four areas:

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

The Green Roofs Review Taskforce recommends City Council honor those benefits, while reducing the challenges with implementing the ordinance, by passing a replacement policy that has the following two components:

	Green or Cool Roof Requirement When: At roof replacement Who: All buildings over 25,000 sq ft Benefits: Green, Urban Heat Island, Stormwater	Energy Program When: Action required in 10 years Who: All buildings over 50,000 sq ft Benefit: GHG Emission Reductions
Option 1	Green Roof – Covering 30% of the required area	Onsite Renewable Energy – Covering 70% of the required area
Option 2	Cool Roof + Small Amount of Green <ul style="list-style-type: none"> • Green on the ground equivalent to 3% of required area, or a minimum of 20 square feet, whichever is greater; or • Financial contribution for off-site local green space. \$17/sq ft. 	Other options in an Energy Efficiency and Renewable Energy Program – Program will be designed to achieve similar emission reductions citywide as what was on the ballot.
Option 3	100% of available roof space covered in solar panels	
Option 4	LEED Gold	

‘Small Amount of Green’ Details:

Green covering 3% of required area or a minimum 100 square feet, whichever is greater. Could be completed ahead of roof replacement. 3% is an attempt to keep the actual outcomes of the ordinance the same. 3% is proposed because many existing buildings would have received a major structural alterations exemption for the 30% green requirement.

The following are allowable strategies that could be implemented anywhere on the site to achieve 3% of required area:

- Trees (new)
- Green walls and hedges
- Ground cover and shrubs
- Ground-level food production
- Multi-functional green space (water quality, detention, amenity)
- BMPs with infiltration to subgrade
- BMPs with infiltration to subgrade
- Reduce WQCV through unconnected impervious area (MDCIA)

- Treatment offsite flow
- Provide excess urban runoff volume (EURV)

Financial Contribution for Local Off-site Green Details:

Financial contributions for off-site green space should be in proximity to the development and support Denver Parks & Recreation’s initiative to create a more resilient and environmentally-sustainable city. Projects may include:

- Water quality protection and management (i.e., conversion to native landscapes, irrigation upgrades, pollinator gardens and shoreline restoration)
- Urban forest protection and expansion (i.e., tree plantings)
- Wildlife habitat and ecosystem protection and restoration (i.e., native plantings, invasive species control)
- Operational sustainability (i.e., maintenance facility performance upgrades, energy efficient park amenities)
- Open space acquisition, where applicable

\$17 per square foot for on the ground on-site green. (\$17 is the landscaping cost from three recent projects completed by a local contractor based on native species, including crusher fines, plants, and irrigation.)

Energy Program Details:

All Buildings over 50,000 square feet are enrolled an Energy Efficiency and Solar Program to honor the Climate/Energy/Emission Reduction benefits. The program will be designed to achieve similar emission reductions citywide as what was on the ballot, which would have required 70% solar coverage of the required area.

- Approximately the same emission reductions as the ballot language would be achieved by including all buildings over 50,000 sq ft and requiring them to improve 10% in 10 years.

The following are strategies that a building owner could implement in the Energy Program:

- Net Zero building
- ENERGY STAR score of 85 or higher
- EUI 12% below baseline from 2017
- Retrocommissioning
- Lighting upgrades to LEDs
- Mechanical system upgrades
- On-site renewable energy (coverage of 70% of required roof area with solar or equivalent)
- Off-site solar PV (12% of energy use offset with solar, min. 10 year contract)
- Electric vehicle charging stations

Challenges not yet addressed in the above proposal:

Credit for past compliance? For example, would any sort of credit be given for a building that previously had a white roof?

Exemptions. Does the proposal above work for everyone, or are there some exemptions needed? In particular, we have heard a lot of concern about the ordinance that was on the ballot from, historic buildings, condos, retail, affordable housing.

How would campuses be handled?

How to adjust the percent coverage requirement for a new definition that excludes mechanical equipment, amenity space, etc?

Percent coverage requirement adjustment ideas:

For reference, the following chart shows what was on the ballot and meant by the above 3% ‘small amount of green’ proposal:

Size of Building (Gross Floor Area)	Percent of Available Roof Space Required to be Covered under Ordinance that was on the ballot.	3% of Required Area might be simplified as follows for the ‘small amount of green’ if we kept percent coverages the same.
25,000 – 49,000 sq ft	20%	0.6%
50,000 - 99,000 sq ft	30%	1%
100,000 - 149,999 sq ft	40%	1.2%
150,000 – 199,999 sq ft	50%	1.5%
200,000 sq ft or greater	60%	1.8%
Industrial Building	10%	0.3%

City staff are working on a proposal regarding how to revise the above required coverage percentages to more equitably distribute coverage across buildings, and to simplify the percent of a percent challenge. The best idea we’ve come up with to date to make coverage more equitable is a Roof Area Ratio (RAR) Method of calculating the required percentage of coverage. Divide the Building Area by the Roof Area to find the RAR. Multiply the RAR by an across-the-board percentage to find the required percentage of coverage for any building. We are currently doing more research to figure out what the ‘across the board percentage’ should be in order to keep total coverage city-wide the same.

The following is an example of how this calculation would work is as follows for a 80,000 square foot building, with 2 floors, if the across the board percentage was 20%. 20% is only a placeholder number until we know what the ‘across the board percentage’ should be:

$$\begin{aligned} \text{Building Area/Roof Area (RAR)} &= 80,000\text{sf}/40,000\text{sf} = 2 \\ \mathbf{20\% \text{ (Across the Board Percentage, tbd)}} \times 2 \text{ (RAR)} &= 40\% \text{ of Available Roof} \\ 40,000 \text{ sf Available Roof} \times 40\% &= 20,000\text{sf Required Roof Coverage} \end{aligned}$$

Task force input on this proposed methodology are very welcome. One critical point will be deciding how to handle buildings where the RAR times the ‘across the board percentage’ is greater than 100%. Should those buildings have a cap on coverage – in which case other buildings might need to do more to hold coverage

whole – or should they have the option to do the additional square footage on the ground or via a financial contribution for off-site green space?

Existing Buildings Green Roof Policy Proposal

Green or Cool Roofs



WHEN: AT OR BEFORE ROOF REPLACEMENT
WHO: ALL BUILDINGS >25K SQ FT
PRIMARY BENEFITS: GREEN, HEAT ISLAND, STORMWATER

Green roof covering 30% of required area

or

Cool roof + small amount of green

GREEN ON OR OFF ROOF COVERING 3% OF REQUIRED AREA, MIN. 20 SQ FT, OR

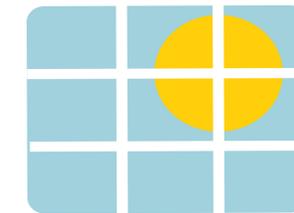
FINANCIAL CONTRIBUTION FOR OFF-SITE GREEN

or

Option that counts for both

100% OF AVAILABLE ROOF SPACE COVERED IN SOLAR;
OR
LEED GOLD OR EQUIVALENT CERTIFICATION

Energy Program



WHEN: WITHIN 10 YEARS
WHO: ALL BUILDINGS >50K SQ FT
PRIMARY BENEFIT: GREENHOUSE GAS EMISSION REDUCTIONS

Solar covering 70% of required area

or

Energy efficiency and/or off-site solar

PROGRAM WILL BE DESIGNED TO ACHIEVE SIMILAR EMISSION REDUCTIONS CITY-WIDE AS BALLOT LANGUAGE

HIGH ENERGY STAR SCORE OR ENERGY USE REDUCTION OF 12% OR OFF-SITE SOLAR

or