Denver Community Goals, Green Buildings Ordinance, Successful Existing Building Submittals

Christy Collins / Green Buildings Ordinance Specialist - City and County of Denver: Community Planning & Development
Agenda

Green Buildings Ordinance: Existing Buildings

1. Denver Community Goals
2. GBO – successful submittals
Uncertainty + Denver Development
Denver’s long term viability
Denver Community Goals
Denver Community Goals + Priorities

- Equity
- Respond to Climate Change
- Affordability
- Resiliency
- Health
- Inclusive
- Connected
- Safe
- Accessible
- Economically vibrant
- Active
- Authentic neighborhoods
Denver’s Long Term Viability

- Economic
- Social
- Sustainable
  - Equitable
  - Viable
  - Afforable
- Environment
  - Viabile
  - Affordable
# Resiliency: What is this for Denver?

**What are Denver’s vulnerabilities + threats?**

- Air quality / pollution
- Drought
- Heat
- Fire
- Ecosystem instability

**Affordability**

- Loss of equity + gentrification
- Loss of inspiration, beauty + health
Denver 80x50 Plan

80 x 50 Climate Action Plan
July 2018

GHG emissions 80% below 2005 levels by 2050
Homes + buildings = 63% of Denver’s GHG Emissions
40% new by 2050
Green Buildings Ordinance: Essentials

Support our Denver community’s goals + the health + welfare of Denver’s citizens

Honor the vote
Green Buildings Ordinance: Essentials

- Mandatory if 25,000 GSF+
- Existing buildings
- New buildings
- Additions
- Campuses

- 1 Cool roof +
- 2 Additional green building options

- Denver specific
- November 2, 2018

- Modest improvements over base code through:
  - green space
  - energy efficiency
  - renewables
  - broad sustainability
Green Buildings Ordinance: **1. Cool Roof**

- **Mandatory**
- **Solar reflectance**
  (white, tan, gray)
- **Covering, pavers,**
  (Membrane, metal, rock, concrete, clay, ceramic, glass)
- **Condensation**
  - air barrier
  - vapor retarder
  - ventilation
- **Exceptions**
GBO Existing Buildings: 2. Options

a. Green space: at grade or vegetated roof
b. On-site renewables
c. Building certification
d. Energy Program
   1. Energy Star 85
   2. Building certification
   3. On-site renewables
   4. Off-site renewables
   5. Energy efficiency
e. Off site green space
GBO Exceptions

Full
• < 25,000 GSF
• One + two family IRC
• 3+ 3 story dwellings
• Temporary, air supported, greenhouses

Cool roof
• Recover maybe
• Character defining
• Covered or shaded
• Ballast
• Visible

Options
• Recover
• 5 story 62.5’ residential
• Wind/fire emergency
• Hail – no longer
• Ext’g vegetated roof
Green Buildings Ordinance: Submittals

What does a successful submittal look like?

Information provided represents specific examples and is not fully complete and comprehensive. Submittals must include all information required to illustrate full compliance with all applicable provisions of the Green Buildings Ordinance and Rules and Regulations.
Existing Buildings!

Part 1a  General
Part 1b  Cool Roof
Part 2  Additional Green Buildings Options
GBO Submittals: Existing Buildings: Green Building Declaration Form as a Tool

I. Project Description

- Project number:
- Address:
- Building(s) (20,000 - 49,999 sf or GFT):

II. Roof Requirement

- Roof replacement only:
- New roof:
- Additions (20,000 - 49,999 sf or GFT):

III. Exemptions from Additional Green Building Requirements

- Low-slope roof (slope less than 2:12):
- Steep-slope roof (slope 2:12 or steeper):
- New roof material(s) and manufacturer:
- Initial solar reflectance:
- Initial solar reflectance index (SRI):
- Solar reflectance at three years or (N.A. if unknown):
- Solar reflectance at six years or (N.A. if unknown):

IV. Compliance Options

- Total roof area / Additions:
  - 2% of the building or additions' GFA
  - 15% of the total roof area, or
  - All available roof area:

- Payment to the green building fund of $50 per square foot of green space required but not provided. Make sure to select a green space amount from option A. If selecting "all available roof area," please specify the available square footage:

- Solar panels located on the building or lot amounting to at least (choose one):
  - 2% of the building or additions' GFA
  - 42% of the total roof area, or
  - An amount capable of generating 100% of the building's estimated annual electricity use:

- Green building certification, e.g., LEED Silver, Enterprise Green Communities, the National Green Building Standard (NGBS) Silver, or an equivalent program:

V. Exclusions from Additional Green Building Requirements

- Roof replacement only:
- Roof replacement/recover for 50% or less of the total roof area or section in any calendar year:
- Residential building for five or fewer stories or less than 6,000 sf in height:
- Emergency roof replacement due to fire or wind damage, hail damage is not considered an emergency:
- Emergency green roof will not be reimbursed:
- Existing permit number for green roof:
- The building or campus has already complied with the ordinance and is still in compliance. Building permit or project record number (e.g., COMMERCIAL Project Master, SDP, Energy Master Plan):

Review the Energy Program requirements located online at www.denvergov.org/Energy/ Denver + Energy Programs. Enrolling in the Energy Program is valid for 20 years or through roof replacement, whichever is longer.

G. Option for roof replacements only: This building is already enrolled in the Energy Program.

H. Option for roof replacements only: By checking this box, this building is enrolling in the Energy Program. The building owner will receive five years, starting from June 1, following their enrollment date, to achieve one of the following options:

- An EEXL ENERGY score of 80 or higher:
- Installation of solar panels located on the roof, as detailed in option B (below), or on an site solar purchase equivalent to 20% of the building's estimated annual electricity use:
- A 10% improvement in energy use intensity in 2016 for buildings between 25,000 and 49,999 square feet:
- A 25% improvement in EEXL for buildings of 50,000 square feet or more.
GBO Submittals:
Existing Buildings:
Part 1a: General

For roof permit

1. Green Building Declaration Form
2. Roof plan with area indicated on it
3. Roof assembly / detailed scope description
4. Roof permit application

II. Cool Roof Requirement

Submittal requirements for cool roofs, character-defining roofs, and condensation analyses are listed in the Rules and Regulations at www.denvergov.org/greenroofs. Include that documentation with this application to ensure a timely start to your review. Attach additional pages if more space is needed. Exemptions from cool roof requirements are very limited. If one of these is claimed, substantiation must be submitted. It is not adequate to only check a box on the GBRF.

- Exempt: This is a roof recovery only, and an analysis of the roof system shows a cool roof will cause condensation.
- Exempt: This roof replacement/recuperation is for 5% or less of the total roof area or section in any calendar year.
- Other exception as listed in Article III of the Rules and Regulations. List and submit appropriate documentation:
  - Any character-defining roof, fully shaded roof area, ballasted
  - Low-sloped roof (slopes less than 2:12)
  - Steep-sloped roof (slopes 2:12 or steeper)
  - New roof material(s) and manufacturer(s)
  - GAF EverGuard TPO
  - Initial solar reflectance: 84
  - Solar reflectance at three years (or N/A if unknown)
  - Initial solar reflectance index (SRI)
  - SRI at three years (or N/A if unknown)

III. Exemptions from Additional Green Building Requirements

If this project meets one of the exemptions stated below, refer to the end, Section V. Signatures and Contact Information.

- Roof recovery only
- Roof replacement/recuperation for 5% or less of the total roof area or section in any calendar year
- Residential building with the live floor space less than 50,000 square feet
- Existing roof replacement due to fire or wind damage, which is not considered an emergency
- Existing green roof that will be reinstated, Existing permit number for green roof
- The building or campus has already complied with the ordinance and is in compliance. Building permit or a proof of record number (e.g., COMMON, Project Master, SPD, Energy Master, Plan)

Before November 2, 2018, only this roof is being replaced due to hail damage directly caused by a storm that occurred after the Green Building Ordinance became effective November 2, 2018, and the property owner is documentating that hail damage is the cause of the building damage. The insurance coverage is insufficient to meet the costs of this ordinance and the policy is not yet set due for removal insurance policy commitment and substantiation of date of hail damage (e.g., indemnity certificate).

For additional information on the requirements of this ordinance, you must also submit all applicable documentation.
GBO Submittals:  
Existing Buildings:  
Part 1a: General

For roof permit

1. Green Building Declaration Form
2. Roof plan with area indicated on it
3. Roof assembly / detailed scope description
4. Roof permit application
GBO Submittals: Existing Buildings: Part 1a: General

For roof permit

1. Green Building Declaration Form
2. Roof plan with area indicated on it
3. Roof assembly / detailed scope description
4. Roof permit application
GBO Submittals:
Existing Buildings:
Part 1a: General

For roof permit
1. Green Building Declaration Form
2. Roof plan with area indicated on it
3. Roof assembly / detailed scope description
4. Roof permit application
GBO Submittals: Existing Buildings: Part 1a: General

For roof permit

1. Green Building Declaration Form
2. Roof plan with area indicated on it
3. Roof assembly / detailed scope description
4. Roof permit application
GBO Submittals: Existing Buildings: Part 1a: General

For roof permit

1. Green Building Declaration Form
2. Roof plan with area indicated on it
3. Roof assembly / detailed scope description
4. Roof permit application

SCOPE

Roofing contractor’s letterhead is preferred but not required

Date

Project location:

### Street Name

Denver, CO ####

Roof Replacement Scope Description:

Low slope roof replacement assembly – 60 mil white TPO on existing metal deck

- Remove and properly dispose of all existing roof system – EPDM and ISO – over steel deck
  - Install 60 mil Carlisle Sure-Weld white TPO roof system
  - Loose lay 5/8” DensDeck Prime substrate board over the metal deck
  - Apply VapAir Seal 735 TR self-adhered vapor retarder / air barrier to substrate board
  - Commonly fasten (2) layers of 2.6” InsuBase (R value 30) with InsuFast fasteners + ISO plates at a rate of 8 per 4x8 board through system to the steel deck
  - Adhere tapered insulation to achieve 3” per foot slope to existing roof drains
  - Adhere a layer of 1/16” Adl DensDeck Prime in FlexibleFAST LBF adhesive
  - Fully adhere 60 mil Carlisle Sure-Weld white TPO in CavGrip III adhesive per 20 year warranty requirements
  - Install new 24 gu coping, counterflashings, and new pre-finished or TPO coated metal scuppers
For *roof* permit:

1. **Green Building Declaration Form**
2. **Roof plan with area indicated on it**
3. **Roof assembly / detailed scope description**
4. **Roof permit application**

---

### GBO Submittals: Existing Buildings: Part 1a: General

<table>
<thead>
<tr>
<th>Item</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Roof permit</td>
<td><strong>For roof</strong> permit</td>
</tr>
<tr>
<td>2. Green Building Declaration Form</td>
<td><strong>Green Building Declaration Form</strong></td>
</tr>
<tr>
<td>3. Roof plan with area indicated on it</td>
<td><strong>Roof plan with area indicated on it</strong></td>
</tr>
<tr>
<td>4. Roof assembly / detailed scope description</td>
<td><strong>Roof assembly / detailed scope description</strong></td>
</tr>
</tbody>
</table>

---

**General Permit for Roofing, Soffit/Facia, Blown Insulation & Exterior Wall Covering Input Form (ROOF/FACE)***

*As of Nov. 2, 2018, roofs on buildings or additions of 35,000 square feet or more must meet the Denver Green Buildings Ordinance unless exempted. These roof permits cannot be issued as a quick permit. Please visit www.denvergov.org/greenbuild for instructions.*

---

**Property Address:**

<table>
<thead>
<tr>
<th>Name of Street, Denver, CO</th>
<th>Bldg Dept Log #:</th>
</tr>
</thead>
</table>

---

**Class of Work:**

- [ ] New Bldg
- [X] Addition
- [ ] Repair/Replace
- [ ] Alteration/Tenant Finish

---

**Contractor License #:**

- [ ] LIC####

**Company Name:**

- [ ] Name of Roofing Contractor

---

**Supervisor Certificate #:**

- [ ] CERT####

---

**Building or addition gross floor area:**

- [ ] 26,000 sq. ft.

---

**Site Contact to Gain Entry for Inspection:**

<table>
<thead>
<tr>
<th>First + last name</th>
<th>Phone #:</th>
</tr>
</thead>
</table>

---

**Landmark/historic district?:**

- [ ] Yes
- [X] No

---

**Use of Building:**

- [ ] Single-family Res.
- [ ] Duplex
- [ ] Garage
- [X] Multi-family Res.
- [ ] Commercial

---

**Scope of Work:**

- [ ] Remove existing steel deck
- [ ] Replace 5/8" substrate board, vapor retarder / air barrier, R30 ISO, 1/2" cover board, 60mil white TPO

---

**Type of Activity:**

**Roofing Details:**

- [ ] Only 2 layers of roofing are allowed. If you tear off layers, you must remove all previously laid layers.

- [ ] 3-Tab
- [ ] T-12
- [ ] Built-up
- [ ] Sheet Metal
- [ ] Modified Bitumen
- [ ] Dimensional Architectural Shingles
- [ ] Cedar Shake - Light
- [ ] Shake - Medium
- [ ] Shake - Heavy
- [ ] Membrane
- [ ] Other

---

**3 of squares:**

| 270 |

---

**Brand name:**

- [ ] Carlisle

---

**Spec. #:**

- [ ] 600245

---

**Exterior Wall Covering Details:**

- [ ] # of square feet:

---

**Blown-In Insulation Details:**

- [ ] # of Bags:

---

**Soffit/Facia Details:**

- [ ] # of square feet:

---

**Contractor Remarks:**

- [ ] For City Services Visit [Call DenverGov.org | 311](https://www.denvergov.org) Updated October 30, 2018

---

**Cost:**

- [ ] $265,000.00
GBO Submittals:
Existing Buildings: Part 1b: Cool Roof

15. Cool roof covering + paver product data with solar reflectance value identified

6. Air barrier + vapor retarder product data when applicable

7. Steep sloped roof ventilation detailing when applicable

8. Condensation considerations:
   - prescriptive assembly / details, or
   - dewpoint analysis by registered professional, or
   - note stating replacing existing cool roof

9. Partial exemption(s): substantiation

Show compliance
GBO Submittals:
Existing Buildings:
Part 1b: Cool Roof

For roof permit
5. Cool roof covering + paver product data with solar reflectance value identified

6. Air barrier + vapor retarder product data when applicable

7. Steep sloped roof ventilation detailing when applicable

8. Condensation considerations:
   - prescriptive assembly / details, or
   - dewpoint analysis by registered professional, or
   - note stating replacing existing cool roof

9. Partial exemption(s): substantiation
   Show compliance
GBO Submittals:
Existing Buildings:
Part 1b: Cool Roof

For roof permit
5. Cool roof covering + paver product data with solar reflectance value identified
6. Air barrier + vapor retarder product data when applicable
7. Steep sloped roof ventilation detailing when applicable
8. Condensation considerations:
   - prescriptive assembly / details, or
   - dewpoint analysis by registered professional, or
   - note stating replacing existing cool roof
9. Partial exemption(s): substantiation

Show compliance
GBO Submittals:
Existing Buildings:
Part 1b: Cool Roof

For roof permit
5. Cool roof covering + paver product data with solar reflectance value identified
6. Air barrier + vapor retarder product data when applicable
7. Steep sloped roof ventilation detailing when applicable

8. Condensation considerations:
   a. prescriptive assembly / details, or
   b. dewpoint analysis by registered professional, or
   c. note stating replacing existing cool roof

9. Partial exemption(s): substantiation

Show compliance

Reference Part 1a: General 3. Roof assembly / detailed scope description

No additional drawings or narratives are necessary beyond roof assembly details / descriptions for the project team to illustrate that all required components described in GBO R+Rs Section 3.03(b)(i)(2) or (3) for low sloped roofs will be provided.

For steep sloped roofs ventilation details are required per GBO R+Rs Section 3.03(b)(i)(1) and item 7 directly above.
GBO Submittals: Existing Buildings: Part 1b: Cool Roof

For roof permit
5. Cool roof covering + paver product data with solar reflectance value identified
6. Air barrier + vapor retarder product data when applicable
7. Steep sloped roof ventilation detailing when applicable
8. Condensation considerations:
   a. prescriptive assembly / details, or
   b. dewpoint analysis by registered professional, or
   c. note stating replacing existing cool roof
9. Partial exemption(s): substantiation

Show compliance

From Green Buildings Ordinance Rules and Regulations Article III Section 3.03(b):

(i) Where a roof recovery or roof replacement project introduces a cool roof where none previously existed, the roof shall be demonstrated, or modified, to meet one of the following designs:

1. Steep sloped roofs shall be designed and installed to meet IBC 1203.2 Ventilation Requirements.
2. Low sloped roofs shall be designed and installed to include at least a Class III vapor retarder at the roof deck in addition to an air barrier at the roof deck, a single layer may be used to provide both preventative measures. The roof shall also be installed with insulation on top of the roof deck that exceeds the R-value of any interior insulation by a minimum of R-18 thermal insulating value, and all other requirements of the International Energy Conservation Code, as amended.

Building Exterior

Fully adhered 60 mil white TPO

1/4" Primed Densdeck

2 Layers of R15 (2.6" Each) ISO Board Staggered

1 Layer of loose laid Class 3 vapor retarder and air barrier

Building Interior

Existing metal deck

1 Layer of 5/8" DensDeck Prime substrate board
GBO Submittals: Existing Buildings:

Part 1b: Cool Roof

For roof permit

5. Cool roof covering + paver product data with solar reflectance value identified

6. Air barrier + vapor retarder product data when applicable

7. Steep sloped roof ventilation detailing when applicable

8. Condensation considerations:
   a. prescriptive assembly / details, or
   b. dewpoint analysis by registered professional, or
   d. note stating replacing existing cool roof

9. Partial exemption(s): substantiation

Show compliance
GBO Submittals:
Existing Buildings:
Part 1b: Cool Roof

For roof permit
5. Cool roof covering + paver product data with solar reflectance value identified
6. Air barrier + vapor retarder product data when applicable
7. Steep sloped roof ventilation detailing when applicable
8. Condensation considerations:
   a. prescriptive assembly / details, or
   b. dewpoint analysis by registered professional, or
   d. note stating replacing existing cool roof
9. Partial exemption(s): substantiation

Show compliance
GBO Submittals: 
Existing Buildings: 
Part 1b: Cool Roof

For roof permit
5. Cool roof covering + paver product data with solar reflectance value identified
6. Air barrier + vapor retarder product data when applicable
7. Steep sloped roof ventilation detailing when applicable
8. Condensation considerations:
   a. prescriptive assembly / details, or
   b. dewpoint analysis by registered professional, or
   d. note stating replacing existing cool roof
9. Partial exemption(s): substantiation

Show compliance

- We observed areas of the existing roofing assembly where insulation boards have begun to curl and delaminate the roof membrane (Photo 4).

DEW POINT ANALYSIS, DISCUSSION and CONCLUSIONS

To evaluate the potential for condensation to occur within the proposed new roofing assembly, we utilized the Dew Point Method to calculate the variations in temperature and vapor pressure of the interior air as it moves through the new roofing assembly towards the exterior. Company Name has developed an Excel spreadsheet to perform the necessary calculations for determining the temperature, vapor pressure and saturation vapor pressure at each material surface throughout the proposed new roofing assembly. This analysis method is described in The American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) Fundamentals Handbook and is based on vapor diffusion theory. Assuming steady-state conditions, the temperatures can be calculated at points within the assembly from indoor and outdoor temperatures and the thermal resistances (R-values) of each layer of material. Each temperature corresponds with a saturation vapor pressure at that point. Similarly, actual vapor pressures at those points can be computed from indoor and outdoor vapor pressures and the vapor flow resistance of each material, which can be derived from the inverse of its permeability (perms). If the calculated vapor pressure is above the saturation vapor pressure, condensation occurs.
GBO Submittals: 
Existing Buildings: 
Part 1b: Cool Roof

For *roof* permit

5. Cool roof covering + paver product data with solar reflectance value identified

6. Air barrier + vapor retarder product data when applicable

7. Steep sloped roof ventilation detailing when applicable

8. Condensation considerations:
   a. prescriptive assembly / details, or
   b. dewpoint analysis by registered professional, or
   d. note stating replacing existing cool roof

9. Partial exemption(s): substantiation

Show compliance
GBO Submittals:

Existing Buildings:

Part 1b: Cool Roof

For roof permit

5. Cool roof covering + paver product data with solar reflectance value identified

6. Air barrier + vapor retarder product data when applicable

7. Steep sloped roof ventilation detailing when applicable

8. Condensation considerations:
   a. prescriptive assembly / details, or
   b. dewpoint analysis by registered professional, or
   d. note stating replacing existing cool roof

9. Partial exemption(s): substantiation

Show compliance
GBO Submittals: Existing Buildings: Part 1b: Cool Roof

For roof permit

5. Cool roof covering + paver product data with solar reflectance value identified

6. Air barrier + vapor retarder product data when applicable

7. Steep sloped roof ventilation detailing when applicable

8. Condensation considerations:
   a. prescriptive assembly / details, or
   b. dewpoint analysis by registered professional, or
   d. note stating replacing existing cool roof

9. Partial exemption(s): substantiation

Show compliance

---

temperature variations, we can locate within the assembly where the temperature will drop below the dew point temperature for the interior air, which is based upon where the temperature and relative humidity values fall on the psychometric table.

In each analysis case the interior air temperature drops below the dew point temperature within the polyisocyanurate insulation, a closed-cell material. Due to its low water absorption properties, condensation is unlikely to form within the insulation. Since the new layers of insulation will be adhered together, as well as the new TPO membrane, there is not much concern for where the temperature within the assembly drops below the dew point temperature beyond the 5" HD polyisocyanurate cover board. However, since the cover board will be secured to the existing metal deck with mechanical fasteners penetrating through the existing roofing assembly, these metal fasteners will introduce surface area within the lower portion of the assembly on to which moisture could condense when the interior air temperature falls below the dew point temperature. This potential is evident in cases 5 through 7 in the Temperature Analysis graphs at the end of this report.

Recommendations

Based on our observations and analysis we recommend that the following repairs, new design elements, maintenance and operating procedures be implemented to minimize the potential for condensation to occur within the proposed new re-cover roofing assembly:

- Areas of failed, curling insulation boards should be replaced with new insulation, as well as a new EPDM membrane to act as a continuous vapor barrier within the new assembly.
- Raise mechanical equipment where necessary to achieve a minimum curb height of 8". This is recommended by the National Roofing Contractors Association (NRCA) and is a typical requirement for roofing manufacturers to provide a warranty.
- Since the existing EPDM membrane will be functioning as a vapor barrier within the new assembly, it shall remain continuous throughout the re-cover installation. During re-cover installations, the existing membrane is typically cut at the inside corners where it transitions from horizontal to vertical surfaces (parapets, curbs, etc.). A flexible membrane splice should be installed at these corners to maintain continuity of the vapor control layer provided by the existing EPDM membrane.
- Due to the potential for condensation below the existing EPDM membrane, provide mechanical fasteners with high corrosion resistance properties, preferably stainless steel. An acceptable alternate option would be hot-dipped galvanized fasteners.
- During periods of extreme cold temperatures, we would advise facilities maintenance staff lower the temperature and relative humidity levels within the cultivation rooms as much as possible to minimize the amount of vapor drive through the new roofing assembly, while still maintaining an acceptable interior environment for their production operations.
- Conduct annual maintenance inspections to verify the condition of the roof and detect potential damage that might occur due to maintenance of the mechanical equipment, extreme weather events or the condensation potential mentioned in this report. Repair any deficiencies immediately after they are observed.
For roof permit
5. Cool roof covering + paver product data with solar reflectance value identified
6. Air barrier + vapor retarder product data when applicable
7. Steep sloped roof ventilation detailing when applicable
8. Condensation considerations:
   a. prescriptive assembly / details, or
   b. dewpoint analysis by registered professional, or
   d. note stating replacing existing cool roof
9. Partial exemption(s): substantiation
Show compliance
GBO Submittals:
Existing Buildings:
Part 1b: Cool Roof

For roof permit
5. Cool roof covering + paver product data with solar reflectance value identified
6. Air barrier + vapor retarder product data when applicable
7. Steep sloped roof ventilation detailing when applicable
8. Condensation considerations:
   a. prescriptive assembly / details, or
   b. dewpoint analysis by registered professional, or
   d. note stating replacing existing cool roof
9. Partial exemption(s): substantiation

Show compliance
GBO Submittals:
Existing Buildings:
Part 1b: Cool Roof

For roof permit
5. Cool roof covering + paver product data with solar reflectance value identified
6. Air barrier + vapor retarder product data when applicable
7. Steep sloped roof ventilation detailing when applicable
8. Condensation considerations:
   a. prescriptive assembly / details, or
   b. dewpoint analysis by registered professional, or
   d. note stating replacing existing cool roof
9. Partial exemption(s): substantiation

Show compliance
GBO Submittals:
Existing Buildings:
Part 1b: Cool Roof

For roof permit
5. Cool roof covering + paver product data with solar reflectance value identified
6. Air barrier + vapor retarder product data when applicable
7. Steep sloped roof ventilation detailing when applicable
8. Condensation considerations:
   a. prescriptive assembly / details, or
   b. dewpoint analysis by registered professional, or
   d. note stating replacing existing cool roof
9. Partial exemption(s): substantiation

Show compliance
GBO Submittals:

Existing Buildings:

Part 1b: Cool Roof

For *roof* permit

5. Cool roof covering + paver product data with solar reflectance value identified

6. Air barrier + vapor retarder product data when applicable

7. Steep sloped roof ventilation detailing when applicable

8. Condensation considerations:
   a. prescriptive assembly / details, *or*
   b. dewpoint analysis by registered professional, *or*
   d. note stating replacing existing cool roof

9. Partial exemption(s): substantiation

*Show compliance*
GBO Submittals: 
Existing Buildings: 
Part 1b: Cool Roof

For roof permit
5. Cool roof covering + paver product data with solar reflectance value identified
6. Air barrier + vapor retarder product data when applicable
7. Steep sloped roof ventilation detailing when applicable
8. Condensation considerations:
   a. prescriptive assembly / details, or
   b. dewpoint analysis by registered professional, or
   d. note stating replacing existing cool roof
9. Partial exemption(s): substantiation

Show compliance
GBO Submittals:  
Existing Buildings: 
Part 1b: Cool Roof

For roof permit
5. Cool roof covering + paver product data with solar reflectance value identified
6. Air barrier + vapor retarder product data when applicable
7. Steep sloped roof ventilation detailing when applicable
8. Condensation considerations:
   a. prescriptive assembly / details, or
   b. dewpoint analysis by registered professional, or
   d. note stating replacing existing cool roof
9. Partial exemption(s): substantiation

Show compliance
GBO Submittals: 
Existing Buildings: 
Part 1b: Cool Roof

For roof permit
5. Cool roof covering + paver product data with solar reflectance value identified
6. Air barrier + vapor retarder product data when applicable
7. Steep sloped roof ventilation detailing when applicable
8. Condensation considerations:
   a. prescriptive assembly / details, or
   b. dewpoint analysis by registered professional, or
   d. note stating replacing existing cool roof
9. Partial exemption(s): substantiation

Show compliance
GBO Submittals:
Existing Buildings:
Part 1b: Cool Roof

For roof permit
5. Cool roof covering + paver product data with solar reflectance value identified
6. Air barrier + vapor retarder product data when applicable
7. Steep sloped roof ventilation detailing when applicable
8. Condensation considerations:
   a. prescriptive assembly / details, or
   b. dewpoint analysis by registered professional, or
   d. note stating replacing existing cool roof
9. Partial exemption(s): substantiation

Show compliance
GBO Submittals: Existing Buildings:

Part 1b: Cool Roof

For roof permit
5. Cool roof covering + paver product data with solar reflectance value identified
6. Air barrier + vapor retarder product data when applicable
7. Steep sloped roof ventilation detailing when applicable
8. Condensation considerations:
   a. prescriptive assembly / details, or
   b. dewpoint analysis by registered professional, or
   d. note stating replacing existing cool roof
9. Partial exemption(s): substantiation

Show compliance
GBO Submittals:
Existing Buildings:
Part 1b: Cool Roof

For roof permit
5. Cool roof covering + paver product data with solar reflectance value identified
6. Air barrier + vapor retarder product data when applicable
7. Steep sloped roof ventilation detailing when applicable
8. Condensation considerations:
   a. prescriptive assembly / details, or
   b. dewpoint analysis by registered professional, or
   d. note stating replacing existing cool roof
9. Partial exemption(s): substantiation

Show compliance
GBO Submittals:

Existing Buildings:

Part 1b: Cool Roof

For *roof* permit

5. Cool roof covering + paver product data with solar reflectance value identified

6. Air barrier + vapor retarder product data when applicable

7. Steep sloped roof ventilation detailing when applicable

8. Condensation considerations:
   a. prescriptive assembly / details, *or*
   b. dewpoint analysis by registered professional, *or*
   c. note stating replacing existing cool roof

9. Partial exemption(s): substantiation

Show compliance
GBO Submittals:

Existing Buildings:

Part 1b: Cool Roof

For roof permit

5. Cool roof covering + paver product data with solar reflectance value identified

6. Air barrier + vapor retarder product data when applicable

7. Steep sloped roof ventilation detailing when applicable

8. Condensation considerations:
   a. prescriptive assembly / details, or
   b. dewpoint analysis by registered professional, or
   d. note stating replacing existing cool roof

9. Partial exemption(s): substantiation

Show compliance
GBO Submittals:  
Existing Buildings:  
Part 1b: Cool Roof

For roof permit
5. Cool roof covering + paver product data with solar reflectance value identified

6. Air barrier + vapor retarder product data when applicable

7. Steep sloped roof ventilation detailing when applicable

8. Condensation considerations:
   a. prescriptive assembly / details, or
   b. dewpoint analysis by registered professional, or
   d. note stating replacing existing cool roof

9. Partial exemption(s): substantiation

Show compliance
GBO Submittals:
Existing Buildings:
Part 1b: Cool Roof

For roof permit

5. Cool roof covering + paver product data with solar reflectance value identified

6. Air barrier + vapor retarder product data when applicable

7. Steep sloped roof ventilation detailing when applicable

8. Condensation considerations:
   a. prescriptive assembly / details, or
   b. dewpoint analysis by registered professional, or
   d. note stating replacing existing cool roof

9. Partial exemption(s): substantiation

Show compliance
GBO Submittals: 
Existing Buildings: 
Part 1b: Cool Roof

For roof permit

5. Cool roof covering + paver product data with solar reflectance value identified

6. Air barrier + vapor retarder product data when applicable

7. Steep sloped roof ventilation detailing when applicable

8. Condensation considerations: 
   a. prescriptive assembly / details, or
   b. dewpoint analysis by registered professional, or
   d. note stating replacing existing cool roof

9. Partial exemption(s): substantiation

Show compliance
GBO Submittals:

Existing Buildings:

Part 1b: Cool Roof

For roof permit:

5. Cool roof covering + paver product data with solar reflectance value identified

6. Air barrier + vapor retarder product data when applicable

7. Steep sloped roof ventilation detailing when applicable

8. Condensation considerations:
   a. prescriptive assembly / details, or
   b. dewpoint analysis by registered professional, or
   d. note stating replacing existing cool roof

9. Partial exemption(s): substantiation

Show compliance
GBO Submittals: Existing Buildings: Part 1b: Cool Roof

For roof permit

5. Cool roof covering + paver product data with solar reflectance value identified

6. Air barrier + vapor retarder product data when applicable

7. Steep sloped roof ventilation detailing when applicable

8. Condensation considerations:
   a. prescriptive assembly / details, or
   b. dewpoint analysis by registered professional, or
   d. note stating replacing existing cool roof

9. Partial exemption(s): substantiation

Show compliance
GBO Submittals:
Existing Buildings:
Part 1b: Cool Roof

For roof permit
5. Cool roof covering + paver product data with solar reflectance value identified
6. Air barrier + vapor retarder product data when applicable
7. Steep sloped roof ventilation detailing when applicable
8. Condensation considerations:
   a. prescriptive assembly / details, or
   b. dewpoint analysis by registered professional, or
   d. note stating replacing existing cool roof
9. Partial exemption(s): substantiation
Show compliance
GBO Submittals: Existing Buildings: Part 1b: Cool Roof

For *roof* permit

5. Cool roof covering + paver product data with solar reflectance value identified

6. Air barrier + vapor retarder product data *when applicable*

7. Steep sloped roof ventilation detailing *when applicable*

8. Condensation considerations:
   a. prescriptive assembly / details, *or*
   b. dewpoint analysis by registered professional, *or*
   d. note stating replacing existing cool roof

9. Partial exemption(s): substantiation

*Show compliance*
Part 2: Additional Green Buildings Options

GBO Submittals:

Existing Buildings:

a. Green Space
b. On-site Solar
c. Building Certification
d-1. Energy Program: Energy Star Score 85+
d-2. Energy Program: Building Certification
d-4. Energy Program: Off-site Solar
d-5. Energy Program: Energy Use Reduction
f. Green Building Fund

All requirements from Part 1a General + Part 1b Cool Roof, plus:

For roof permit:

• Option / enrollment using the Green Building Declaration Form
• Options a, b, c, and f: additional option-specific requirements
GBO Submittals:
Existing Buildings:
Part 2: Additional Green Buildings Options

a. Green Space
b. On-site Solar
c. Building Certification
   d-1. Energy Program: Energy Star Score 85+
d-2. Energy Program: Building Certification
d-4. Energy Program: Off-site Solar
d-5. Energy Program: Energy Use Reduction
f. Green Building Fund

All requirements from Part 1a General + Part 1b Cool Roof, plus:
For roof permit:
- Option / enrollment using the Green Building Declaration Form
- Options a, b, c, and f: additional option-specific requirements

---

For roof permit:
- Option / enrollment using the Green Building Declaration Form
- Options a, b, c, and f: additional option-specific requirements
Part 2: Additional Green Buildings Options

a. Green Space
b. On-site Solar
c. Building Certification
d-1. Energy Program: Energy Star Score 85+
d-2. Energy Program: Building Certification
d-4. Energy Program: Off-site Solar
d-5. Energy Program: Energy Use Reduction
f. Green Building Fund

All requirements from Part 1a General + Part 1b

Cool Roof, plus:

For roof permit:
• Option / enrollment using the Green Building Declaration Form
• Options a, b, c, and f: additional option-specific requirements
GBO Submittals:

Existing Buildings:

Part 2: Additional Green Buildings

Options

a. Green Space
b. On-site Solar
c. Building Certification
d-1. Energy Program: Energy Star Score 85+
d-2. Energy Program: Building Certification
d-4. Energy Program: Off-site Solar
d-5. Energy Program: Energy Use Reduction
f. Green Building Fund

All requirements from Part 1a General + Part 1b Cool Roof, plus:

For roof permit:
- Enrollment using the Green Building Declaration Form
- Options a, b, c, and f: additional option-specific requirements

Show compliance with requirements of Green Buildings Ordinance + Rules and Regulations

- Denvergov.org/greenroofs
- Christy.Collins@denvergov.org
- 720.865.2766
GBO Submittals: Existing Buildings:
Part 2: Additional Green Buildings Options

a. Green space

All requirements from Part 1a General + Part 1b Cool Roof, plus:

For roof permit

- **Site Development Plan** minor modification
  - *If at-grade green space*, maintenance note per GBO R+Rs Section 4.02(b)(v)
  - Statement signed by landscape architect stating design is per GBO
  - Required green space calculations + diagrammatic plan (identical to landscape CDs)

- **Landscape Construction Documents** by a licensed landscape architect
  - Detailed calculations of green space required including dimensioned roof plan(s) if applicable
  - *If at-grade green space*: dimensioned site plan illustrating green space + detailed calculations outlining what’s taken credit for
  - General note underscoring applicability of GBO landscape requirements
  - *If vegetated roof*: roof plan identifying + dimensioning all GBO R+Rs required clearances
  - *If vegetated roof*: details + system specification or manufacturer’s product data
  - Additional materials as required to illustrate compliance with GBO R+Rs Section 4.02(a) through (e)
  - Irrigation, plumbing + fire protection plans

- **Separate CD submittals / permits** when applicable
  - Fire protection systems
  - Plumbing / backflow preventer
  - Irrigation system
  - Zoning
  - Vegetated roof system – *include a maintenance plan*
b. On-site solar

All requirements from Part 1a General + Part 1b Cool Roof, plus:

For roof permit
- SDP minor modification
  - Required PV coverage calculations + diagrammatic site and/or roof plan (identical to CDs)
  - Last year’s energy use data if applicable
- Construction Documents
  - Detailed calculations of PV coverage required including dimensioned roof plan(s) and last year’s energy use data if applicable
  - Dimensioned roof plan illustrating PV coverage provided + detailed calculations
  - Roof plan identifying + dimensioning all GBO R+Rs required clearances
  - PV panel product data including efficiency rating + system capacity (kW)
  - Additional materials as required to illustrate compliance with GBO R+Rs Section 4.03(a)(ii) through (v) + (viii)
- Separate CD submittals / permits
  - Fire protection systems
  - Photovoltaic system
  - Zoning

System must be installed and inspected within 12 months of roof final inspection.
c. Building certification

All requirements from Part 1a General + Part 1b Cool Roof, plus:

For roof permit

- **USGBC documentation** *(LEED BD+C Silver or O+M Silver or higher)* or
- **Enterprise documentation** *(Enterprise Green Communities certification)* or
- **Home Innovation Research Labs documentation** *(National Green Building Standard Silver or higher)* or
- **Third party certification documentation** *(Building official approved LEED equivalent)*
GBO Submittals: Existing Buildings:

Part 2: Additional Green Buildings Options

e. Payment into green building fund

All requirements from Part 1a General + Part 1b Cool Roof, plus:

For roof permit

- Detailed calculations of green space required including dimensioned roof plan(s) if applicable
- Payment when roof permit is pulled
GBO Submittals: Existing Buildings:
Part 2: Additional Green Buildings Options

All requirements from Part 1a General + Part 1b Cool Roof, plus:

For roof permit:
- Indicate exemption on Green Building Declaration Form
- Provide substantiation

Exemptions
Provide substantiation

- Indicate exemption on Green Building Declaration Form
- Provide substantiation

Exemptions
Provide substantiation
GBO Submittals:

Existing Buildings:

Part 2: Additional Green Buildings Options

Exemptions

Provide substantiation

All requirements from Part 1a General + Part 1b Cool Roof, plus:

For roof permit:

- Indicate exemption on Green Building Declaration Form
- Provide substantiation

For roof permit:

- Indicate exemption on Green Building Declaration Form
- Provide substantiation
GBO Submittals:
Existing Buildings:
Part 2: Additional Green Buildings Options

Exemptions
Provide substantiation

All requirements from Part 1a General + Part 1b Cool Roof, plus:
For roof permit:
  • Indicate exemption on Green Building Declaration Form
  • Provide substantiation

For roof permit:
  • Indicate exemption on Green Building Declaration Form
  • Provide substantiation
GBO Submittals:

Existing Buildings:

Part 2: Additional Green Buildings Options

Exemptions

Provide substantiation

All requirements from Part 1a General + Part 1b Cool Roof, plus:

For roof permit:
- Indicate exemption on Green Building Declaration Form
- Provide substantiation

Exemption from additional green building requirements:
The property is zoned as R-2-A and is below 5 stories and 64' high.
GBO Submittals:
Existing Buildings:
Part 2: Additional Green Buildings Options

**Exemptions**
Provide substantiation

*All requirements from Part 1a General + Part 1b Cool Roof, plus:*

For *roof* permit:
- Indicate exemption on Green Building Declaration Form
- Provide substantiation
DENVER'S GREEN BUILDING ORDINANCE

A Green Buildings Ordinance was approved by Denver City Council on June 20, 2019 and took effect Friday, November 2, 2018. On November 15, 2018, Community Planning and Development held an open house discussing the flexible options available for buildings under the new ordinance.

Rules and Regulations
CPD and the Denver Department of Public Health and Environment have developed rules and regulations for implementing the green buildings requirements.

Building Permits for Projects under the Green Buildings Ordinance
- Download GBO overview slide deck (PDF)
- Download GBO project & submittal requirements slide deck (PDF)
- Download summary sheet (PDF)

Questions? Contact Christy Collins at (720) 865-2766 or christy.collins@denvergov.org

Learn more about the origins of Denver's innovative green buildings ordinance >>

Helpful resources?
Successes?
Challenges?
Suggestions?
Comments?

Denvergov.org/greenroofs
Christy.Collins@denvergov.org
720.865.2766