

Roofing Guide

1. Permits and Scope of Work

- A. When a roofing permit is needed for roof repairs:
- For buildings under 25,000 square feet (square footage of the entire building as defined in the Green Buildings Ordinance): If repairs are more than 10% of the *roof* square footage or two roof squares (whichever is smaller), then the repair needs a permit.
 - For buildings of 25,000 square feet or more: To be compliant with Denver’s Green Buildings Ordinance, if repairs are more than 5% of the *roof* square footage or two roof squares (whichever is smaller), then the repair needs a permit.
 - Please be aware that quick roof permits are not available for buildings over 25,000 square feet in size. These projects will need to be logged in for review. Visit denvergov.org/greenroofs for instructions, contact information, to download the Green Buildings Ordinance, and rules/regulations.
- B. All new roof penetrations require a permit (e.g., skylight, rooftop units, pipes, solar, etc.).
- C. Partial roofs that end at a natural edge may be replaced under a permit, but not partial slopes.
- D. Roof coatings do not require a permit.

Abbreviations

DBC = Denver Building Code
 IBC = International Building Code
 IRC = International Residential Code
 IECC = International Energy Conservation Code
 IPC = International Plumbing Code

2. Underlayment

- A. Ice and Water Shield Requirements
- Self-adhering bitumen installed at the eaves and rakes to two feet inside the exterior wall is NOT required (see highlighted column in Table R301.2(1) below).
- B. For specific underlayment requirements, see Tables R905.1.1(1), R905.1.1(2), R905.1.1(3) governing underlayment types, applications, and attachments in the IRC.

Table R301.2

CLIMATIC AND GEOGRAPHIC DESIGN CRITERIA

Ground Snow Load (psf)	Wind Design				Seismic Design Category	Subject to Damage From			Winter Design Temp (degrees)	Ice Barrier Underlayment Required	Flood Hazard	Air Freezing Index	Mean Annual Temp (degrees)
	Speed (MPH)	Topographic Effects	Special Wind Region (b)	Wind-borne Debris Zone		Weathering (a)	Frost	Termite					
35	115/125/140	No	Yes	No	B	Severe	36"	Slight/Mod	1° F	No	1978	712	40-45° F

3. Roof Decking

- A. Existing roofs must be removed to deck and replaced where two or more layers of any roof covering exist.
- B. No continuous opening between boards can be greater than ½” regardless of manufacturer’s recommendations. If manufacturer requires a smaller gap, then the manufacturer’s requirement prevails.
- C. Asphalt Shingles
- For maximum gap definition on 1X decking sheathed roofs, consult the manufacturer’s installation instructions for the product being installed, with no opening greater than 6 square inches regardless of

manufacturer's recommendation. Openings smaller than this dimension can be covered with 26-gauge metal.

4. Low-slope Roofs

- A. Membrane roofs must be installed by a D-Roof Covering/Waterproofing licensed contractor.
- B. If membrane is less than 10% of the entire roof or two roof squares (whichever is smaller), it can be installed by a D-Roof Shingles licensed contractor on shingle projects that have some low-slope areas (porches and patios, for example).

5. Wind Speed Requirements

- A. Wind Resistance of Asphalt Shingles (per IRC - Section R905.2.4.1)
 - i. All shingles shall be tested and labeled to comply with the requirements of ASTM D 7158.
 - ii. If the brand of shingles is not included in the scope of ASTM D 7158, then the shingles must be tested and labeled to comply with ASTM D 3161.
- B. Wind Speed Zones for Denver (per IBC Section 1609)
 - i. Areas east of Federal Blvd. – 115 mph min. rating
 - ii. Federal Blvd. to Sheridan Blvd. – 125 mph min. rating
 - iii. Sheridan Blvd. to Kipling St. – 140 mph min. rating

6. Attic Venting

- A. New Construction
 - i. Unvented attic assemblies require air-impermeable insulation (Min. of R-20, per IRC Table R.806.5). The total insulation R-value must meet the DEC.
- B. Re-roofing Existing Construction
 - i. Venting is not inspected on re-roof projects but must meet the building code requirements in effect at the time of original construction.
 - ii. *Optional:* Venting can be added to meet manufacturer's warranty requirements, as per manufacturer's installation instructions.

7. Energy Code Requirements

- A. New roofs must comply with the DEC.
- B. Existing roofs without insulation in the cavity and where the sheathing or insulation is exposed during reroofing shall be insulated either above (R-30ci) or below (R-38 Flat/R-49 Attic) the sheathing.

8. Asbestos: Must follow the Colorado Department of Public Health and Environment's (CDPHE) requirements for a certified asbestos inspection and removal and may be required to show proof of the inspection.

9. Inspections Required for Roofing and Siding Permits

Use the "205," "206," or "201" inspection code when requesting an inspection online.

3-Digit Inspection Code and Type of Roof System	205 – Pre-Inspection (New or Re-roof)	206 – Other (Mid-roof, Roof Insulation, Meeting)	201 – Roof (Final)
One- and Two-Family Asphalt Shingles	No	If Needed*	Yes
Townhomes	Yes	If Needed*	Yes
Commercial Asphalt Shingles	Yes	If Needed*	Yes
Low-slope Roofs	Yes	If Needed*	Yes
Tile/Metal	No	Yes	Yes

* A mid-roof inspection may be required when the pre-inspection identifies items that need to be completed, but will not be visible for inspection at the final.

Definitions from the 2021 International Building Code Specific to Roofing Projects:

AGGREGATE. In roofing, crushed stone, crushed slag or water-worn gravel used for surfacing for *roof coverings*.

GABLE. The triangular portion of a wall beneath the end of a dual-slope, pitched, or mono-slope roof or portion thereof and above the top plates of the story or level of the ceiling below.

LIVE LOAD, ROOF. A *load* on a roof produced:

1. During maintenance by workers, equipment and materials;
2. During the life of the structure by movable objects such as planters or other similar small decorative appurtenances that are not occupancy related; or
3. By the use and occupancy of the roof such as for roof gardens or assembly areas.

MECHANICAL EQUIPMENT SCREEN. A rooftop structure, not covered by a roof, used to aesthetically conceal plumbing, electrical or mechanical equipment from view.

METAL ROOF PANEL. An interlocking metal sheet having a minimum installed weather exposure of 3 square feet (0.279 m²) per sheet.

METAL ROOF SHINGLE. An interlocking metal sheet having an installed weather exposure less than 3 square feet (0.279 m²) per sheet.

PENTHOUSE. An enclosed, unoccupied rooftop structure used for sheltering mechanical and electrical equipment, tanks, elevators and related machinery, and vertical *shaft* openings.

PHOTOVOLTAIC MODULE. A complete, environmentally protected unit consisting of solar cells, optics and other components, exclusive of tracker, designed to generate DC power when exposed to sunlight.

PHOTOVOLTAIC PANEL. A collection of modules mechanically fastened together, wired and designed to provide a field-installable unit.

PHOTOVOLTAIC PANEL SYSTEM. A system that incorporates discrete photovoltaic panels, that converts solar radiation into electricity, including rack support systems.

PHOTOVOLTAIC SHINGLES. A *roof covering* resembling shingles that incorporates photovoltaic modules.

ROOF ASSEMBLY (For application to Chapter 15 only). A system designed to provide weather protection and resistance to design loads. The system consists of a *roof covering* and *roof deck* or a single component serving as both the roof covering and the *roof deck*. A roof assembly can include an underlayment, a thermal barrier, insulation, or a *vapor retarder*.

ROOF COATING. A fluid-applied, adhered coating used for roof maintenance or *roof repair*, or as a component of a *roof covering system* or *roof assembly*.

ROOF COVERING. The covering applied to the *roof deck* for weather resistance, fire classification or appearance.

ROOF DECK. The flat or sloped surface constructed on top of the *exterior walls* of a building or other supports for the purpose of enclosing the *story* below, or sheltering an area, to protect it from the elements, not including its supporting members or vertical supports.

ROOF DRAINAGE, POSITIVE. See “Positive roof drainage.”

POSITIVE ROOF DRAINAGE. The drainage conditions in which consideration has been made for all loading deflections of the *roof deck*, and additional slope has been provided to ensure drainage of the roof within 48 hours of precipitation.

ROOF RECOVER. The process of installing an additional *roof covering* over a prepared existing *roof covering* without removing the existing *roof covering*.

ROOF REPAIR. Reconstruction or renewal of any part of an existing roof for the purposes of correcting damage or restoring pre-damage condition.

ROOF REPLACEMENT. The process of removing the existing *roof covering*, repairing any damaged substrate, and installing a new *roof covering*.

ROOF VENTILATION. The natural or mechanical process of supplying conditioned or unconditioned air to, or removing such air from, *attics*, cathedral ceilings or other enclosed spaces over which a *roof assembly* is installed.

ROOFTOP STRUCTURE. A structure erected on top of the *roof deck* or on top of any part of a building.

SCUPPER. An opening in a wall or parapet that allows water to drain from a roof.

SHINGLE FASHION. A method of installing roof or wall coverings, water-resistive barriers, flashing or other building components such that upper layers of material are placed overlapping lower layers of material to provide for drainage via gravity and moisture control.

SINGLE-PLY MEMBRANE. A roofing membrane that is field applied using one layer of membrane material (either homogeneous or composite) rather than multiple layers.

SKYLIGHT, UNIT. A factory-assembled, glazed fenestration unit, containing one panel of glazing material that allows for natural lighting through an opening in the *roof assembly* while preserving the weather-resistant barrier of the roof.

SKYLIGHTS AND SLOPED GLAZING. Glass or other transparent or translucent glazing material installed at a slope of 15 degrees (0.26 rad) or more from vertical. Unit skylights, *tubular daylighting devices*, glazing materials, solariums, sunrooms, roofs, and sloped walls are included in this definition.

UNDERLAYMENT. One or more layers of a material that is applied to a steep-slope *roof covering* deck under the roof covering and resists liquid water that penetrates the roof covering.

VEGETATIVE ROOF. An assembly of interacting components designed to waterproof a building’s top surface that includes, by design, vegetation, and related landscape elements.

Roofing Checklist

		Previous Codes		Current Code			
#	P A S S	2015 IRC/IBC 2016 DBCA	2018 IRC/IBC 2019 DBCA	2021 IRC/IBC 2022 DBC	Chapter Section	Building Code	F A I L
General Roof and Re-roof Requirements							
1		IRC R903.1 IBC 1503.1	IRC R903.1 IBC 1503.1	IRC R903.1 IBC 1503.1	General	Manufacturer's installation instructions are included as part of the IBC and IRC.	
2		IRC R908.2 IBC 1511.2	IRC R908.2 IBC 1511.2	IRC R908.2	Structural and construction loads	Structural roof components shall support the roof covering system and the materials and equipment loads encountered during installation.	
3		IRC R908.3.1.1(3) IBC 1511.3.1.1	IRC R908.3 IBC 1511.3	IRC R908.3 IBC 1512.2	Roof replacement	Existing roof covering must be removed down to deck unless re-covering a single layer.	
4		IRC R903.2 IBC 1503.2	IRC R903.2 IBC 1503.2	IBC 1503.2	Flashing	Flashing shall be installed to prevent water from entering the roof and wall.	
5					Pitch pans	Required if multiple penetrations are intended to be flashed together, or for equipment support legs.	
6					Duct and pipe jacks	Pipe and duct penetrations shall be flashed using roof flashing (jacks) intended for the specified roof system.	
7					Flues/ducts	B-vent pipes must have a metal base of the same gauge of the pipe and have a storm collar installed to protect the metal boot to pipe connection. Vent caps shall be in good shape and fitted for proper venting.	
8		IRC R903.2.1 IBC 1503.2.1	IRC R903.2.1 IBC 1503.2.1	IRC R903.2.1 IBC 1503.2.1	Locations	Flashing shall be installed at wall and roof intersections, change in roof slopes, and roof openings.	
9		IRC R903.2.2 IBC 1503.2.2	IRC R903.2.2 IBC 1503.5	IRC R903.2.2 IBC 1503.5	Crickets and saddles	All vertical projections on sloped roofs greater than 30" require a cricket or saddle made of sheet metal or of the same material as the roof covering.	
10		DBCA R903.2.3	IBC 1511.6	IBC 1503.2	Flashing Single-ply	Flashing for single-ply roof systems shall be installed per manufacturer's latest recommendations.	
11		IRC R908.5	IRC R908.5	IRC R908.5 IBC 1512.4	Reinstallation of materials	Existing flashings shall be replaced where rusted, damaged, or deteriorated.	
12		IRC R903.3 IBC 1503.3	IRC R903.3 IBC 1503.3	IRC R 903.3 IBC 1503.3	Coping Parapet Walls	Parapet walls shall be properly coped with non-combustible, weatherproof materials of	

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						a width not less than the thickness of the wall.	
13		IRC R903.4	IRC R903.4	IRC R903.4	Roof drainage	Unless roofs are sloped to drain over roof edges, roof drains shall be installed at each low point on the roof.	
14		IRC R903.4.1 IBC 1503.4.1	IRC R903.4.1 IBC 1502.2	IRC R903.4.1 IBC 1502.2	Secondary drains or scuppers	Where roof drains are required, secondary (overflow) drains and scuppers are required where parapets are present and entrapped water cannot drain when primary drains back-up. Overflows shall be the same size and installed 2" above the main drain. The installation and sizing of the drains shall comply with the IPC. Overflow drains cannot connect to the primary drain.	
15		IBC 1503.4.2	IBC 1502.3	IBC 1502.2	Scuppers	Emergency overflow scuppers shall be sized and located to prevent the depth of ponding water from exceeding the designed roof load. Scuppers shall have a minimum 4" opening.	
16		IRC R908.1(2) IBC 1511.1(2)	IRC R908.1(2)	IRC R908.1(2)	Reroofing	For roofs that provide positive drainage, re-covering or replacing an existing roof covering shall not require the secondary (emergency overflow) drains or scuppers of Section R903.4.1 to be added to an existing roof.	
17		DBCA1503.2.2 R903.4.2	DCBA 1503.2.2	DCBA 1503.2.2	Mechanical Equipment on roof	Equipment on the roof shall be installed on 8" legs bearing on decking or be installed on an 8" curb bearing on decking which can be flashing in properly. Placing the equipment on resonator pads or slip sheets is not allowed.	
18		IRC R905.1.1	IRC R905.5.3	IRC R905.5.3	Underlayment	Must meet the specifications in Tables R905.1.1(1), (2), and (3) regarding underlayment types, application, and attachment.	
19		DBCA R903.2.6 & 1507.10.5		DCBA R703.1.3 DBC 1503.6	Exterior Covering	Exterior wall finishes must terminate a min. of 8" above the finished roof of a low-slope roof or a min. of 2" above roof slope greater than 2/12	
Asphalt Shingle Roof Requirements							
20		IRC R905.2.1	IRC R905.2.1 IBC 1507.2.1	IRC R905.2.1 IBC 1507.2.1	Sheathing	Sheathing requirements. Asphalt shingles shall be fastened to solidly sheathed decks.	
21		IRC R905.2.2 IBC 1507.2.2	IRC R905.2.2 IBC 1507.2.2	IRC R905.2.2 IBC 1507.2.2	Slope	Asphalt shingles shall be used only on roof slopes of 2:12 or greater. For slopes 2:12 up to 4:12, double underlayment is required. (See underlayment tables: Tables	

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						R905.1.1(1), R905.1.1(2), R905.1.1(3) in the 2015 IRC.)	
22		IRC R905.2.4.1	IRC R905.2.4.1	IRC Table R905.2.4.1 IBC Table 1504.2	Wind resistance	Asphalt shingle classification shall be ASTM D 7158 D, G or H depending on wind zone.	
23		IRC R905.2.6	IRC R905.2.6 IBC 1507.2.6	IRC R905.2.6 IBC 1507.2.6	Attachment	As required by manufacturer or minimum of four nails per shingle strip or two fasteners per individual shingles for all roof slopes up to 21:12.	
24		IRC R905.2.8.2	IRC R905.2.8.2 IBC 1507.2.8.2(2)	IRC 905.2.8.2 IBC 1507.2.8	Valleys	Valley linings shall be installed in accordance with the manufacturer's instructions before applying shingles.	
25		IBC 1507.2.9.2	IRC R905.2.8.2(1) IBC 1507.2.8.2(1)	IRC R905.2.8.2(1) IBC 1507.2.8.2(1)	(1) Open metal	Open valleys lined with metal shall be a minimum of 24" wide and corrosion-resistant.	
26			IRC R905.2.8.2(2) IBC 1507.2.8.2(2)	IRC R905.2.8.2(2) IBC 1507.2.8.2(2)	(2) Open roll	Open valleys lined with two plies of rolled roofing shall be permitted where the bottom layer is at least 18" wide and the top layer is at least 36" wide.	
27			IRC R905.2.8.2(3) IBC 1507.2.8.2(3)	IRC R905.2.8.2(3) IBC 1507.2.8.2(3)	(3) Closed roll	Closed valleys shall be a minimum of 36" wide of either 1) one ply of smooth roll roofing or 2) self-adhering modified bitumen.	
28		DBCA R905.2.8.2			(3) Closed metal	Metal is not allowed in a closed valley.	
29		IRC R905.2.8.3	IRC R905.2.8.3	IRC R905.2.8.3	Sidewall flashing: Headwall	Continuous flashing shall be a minimum of 4" x 4" and all flashing shall be counter flashed with metal or exterior finish and properly sealed.	
30			IRC R905.2.8.3	IRC R905.2.8.3	Step	Step flashing shall be a minimum of 4"x 4" piece per shingle, and all flashing shall be counter flashed with metal or exterior finish and properly sealed.	
31			IRC R905.2.8.3		Kick-outs	Kick-outs at the end of the sidewall step flashing shall be turned out in a manner that directs water away from the wall onto the roof or into a gutter.	
32		IRC R905.2.8.4	IRC R905.2.8.4	IRC R905.2.8.4	Other flashing	Flashing against a vertical wall, soil stack, vent pipe and chimney.	
33		IRC R905.2.8.5 IBC 1507.2.9.3	IRC R905.2.8.5 IBC 1507.2.8.3	IRC R905.2.8.5 IBC 1507.2.8.3	Drip edge	Drip edge shall be provided at eaves and rake edges: <ul style="list-style-type: none"> Installed with a minimum of 2" overlap for segments, extend a minimum of ¼" 	

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						below roof sheathing and a minimum of 2" onto roof deck; <ul style="list-style-type: none"> Mechanically fastened at a minimum of 12" o.c.; and Underlayment shall be installed over drip edge along eaves and under drip edge along rakes. 	
Low-slope Roof Requirements							
34		DBCA 140.7 No changes		DBC 140.7.1	Other inspections	All low-slope roofs require a "205 - Pre-Inspection"	
35		DBCA R905.5.2		DRC 905.5.2 DBC 1507.6.2	Deck slope	90 lb. roll roofing shall not be applied to roof slopes less than 2:12. Exception: Detached garages, patios and carports open on three sides may have a slope of 1:12.	
36		IRC R905.11-13.1 IBC 1507.11-13.1	IRC R905.12.1 IBC 1507.12.1	IRC R905.12.1 IBC 1507.11.1	Slope	Modified Bitumen, Thermoset (EPDM), and Thermoplastic (TPO/PVC) shall have a minimum design slope of ¼:12 for drainage.	
37		IRC R905.11.3 IBC 1507.11.3	IRC R905.11.3 IBC 1507.11 IBC 1507.11.1 And 1507.11.2	IRC R905.11.3 IBC 1507.11	Application	Modified Bitumen shall be installed in accordance with this chapter and the manufacturer's instructions. Modified bitumen roofing. The installation of modified bitumen roofing shall comply with the provisions of this section	
38					Torch Down Peel-n-Stick	Modified Bitumen shall be installed: <ul style="list-style-type: none"> Overlap all edges a minimum of 2"; Edge metal flashings shall be a minimum of 2" x 4" and be fully primed; Wall flashings to be independent of field sheet and properly terminated; Cant Strip (if required by manufacturer). 	
39		IRC R908.1 IBC 1511.1	IRC R908.1 IBC NA	IRC R908.1(1) IBC 1512.1(1)	General exception (1)	Re-roofing shall not be required to meet the minimum design slope of ¼:12 for roofs that provide positive drainage.	
Metal Roof Shingles Requirements							
40		IRC R905.4.2 IBC 1507.4.2	IRC R905.4.2 IBC 1507.4.2(1)	IRC R905.4.2 IBC 1507.5.2	Slope	Metal roof shingles shall not be installed on roof slopes below 3:12.	
41		IRC R905.5.6 IBC 1507.5.7	IRC R905.4.6 IBC 1507.5.7	IRC R905.4.6 IBC 1507.5.7	Flashing	Valley flashing shall: <ul style="list-style-type: none"> Be of the same material as the roof covering; Extend a min. of 8" from the centerline with a min. ¾" high splash diverter rib built-in at the flow line with sections overlapping a min. of 4"; and 	

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						<ul style="list-style-type: none"> Min. 36" Type I underlayment for slopes greater than 3:12. 	
Tile Roof Requirements							
42		IRC R907.5 IBC 1511.5	IRC NA IBC NA	IRC R908.5 IBC 1512.4	Reinstallation of materials	Existing slate, clay or cement tile can be reinstalled if not damaged, broken or deteriorated. Existing flashing must be replaced when deteriorated, rusted or damaged. Clay and concrete tile. The installation of clay and concrete tile shall comply with the provisions of this section.	
43		IRC R905.3.2 IBC 1507.3.2	IRC R905.3.2 IBC 1507.3.2	IRC R905.3.2 IBC 1507.3.2	Slope	Clay and concrete tile shall have a minimum 2½:12 slope. For slopes 2½:12 up to 4:12, double underlayment is required.	
44		IRC R905.3.8 IBC 1507.3.8	IRC R905.3.8 IBC 1507.3.9	IRC R905.3.8 IBC 1507.3.9	Flashings	Valley flashing shall: <ul style="list-style-type: none"> Extend a minimum of 11" from the centerline with a minimum 1" high splash diverter rib built-in at the flow line with sections overlapping a minimum of 4"; and Minimum of 36" Type I underlayment for slopes greater than 3:12. 	
45		DBCA R905.3.9		DBC 140.5 (8)	Inspection of tile roof	A mid-roof inspection shall be made to inspect underlayment, battens and flashings. No more than 30% of the tile system may be completed before requesting the inspection.	

For Denver Building Department Use Only	
#	Corrections required of failed item numbers:
Re-inspection required. When corrections are made, please request a new inspection.	
Re-inspection fee required: \$100.00.	
Inspector:	Date:
_____	_____



City and County of Denver Roofing Guide and Checklist

#	P A S S	2021 IRC/IBC 2022 DBC	Chapter Section	Building Code	F A I L
Additional Notes					