

# The Denver Green Roof Initiative

Well, maybe a white roof will do

# Denver Green Roof Initiative

- Approved on Denver's November 2017 ballot
- Requires all Denver buildings over 25,000 square feet to have percentage of roof dedicated to vegetation and/or solar
- Up to 50,000 square feet – 20%
- Up to 100,000 square feet – 30%
- Up to 150,000 square feet – 40%
- Up to 200,000 square feet – 50%
- Over 200,000 square feet – 60%

# Denver Green Roof Initiative

- Buildings permitted after January 1, 2018 required to have it in construction
- Existing buildings required to install combination of green roof and solar at time of roof replacement to the maximum amount possible so that major structural alterations are not required
- Roof replacement defined as removing more than 10% of roof square footage or two roof squares, whichever is less

# Denver Green Roof Initiative

- “Major Structural Alteration”
  - “...the removal of, alteration of, or installation of the primary structural (green roof) frame...or 30% or more of the secondary roof framing members that would support the green roof”
  - But if some part of the roof can be used without major structural alterations, green roof applies to that part
  - Owner has burden to provide stamped engineering structural analysis to city

# Denver Green Roof Initiative

- Additions
  - Green roof required for additions to industrial buildings only
  - Not required for additions to other existing buildings
  - Additions can have all green or combination green and solar

# Denver Green Roof Initiative

- Green roof combination may be used in some cases
- Combination requires green and solar
- Green roof must be at least 30% of area subject to ordinance
- Roof must also retain or collect for re-use at least the first quarter inch of each rainfall or 50% of the annual rainfall volume on the roof
- Order of water court required

# Denver Green Roof Initiative

- Exemptions are limited
- Residential buildings 4 stories or less, or less than 50 feet excluded
- Commercial greenhouses excluded
- Building if permit application made before January 1, 2018
- Industrial buildings only required to have 10% green roof

# Denver Green Roof Initiative

- Added costs
  - Roof design
  - Roof construction
  - Maintenance
  - Roof replacement
  - Consequential costs
    - Insurance
    - Water drainage
    - Root intrusion
    - Mold



# Denver Green Roof Initiative

- Green roof hard costs
  - Green roof installation is currently about \$25 a foot
  - Irrigation system and maintenance costs
  - Demolition or relocation of existing infrastructure
  - Addition of hard infrastructure such as decking, shade structures, planter boxes, etc
  - Permits for lifts and cranes

# Denver Green Roof Initiative

- Initiative requires
  - Root repellant systems
  - Anti-shear measures
  - Engineer reports on wind uplift pressures
  - Leakage testing
  - Water retention mats
  - Growing media of at least four inches
  - \$1,000 a day fines for non-compliance

# Denver Green Roof Initiative

- Four comparative scenarios:
  - Apartment building 55,000 square feet, 5 floors, 11,000 square foot roof. Green roof coverage 30% or 3,300 square feet
  - Industrial building 150,000 square feet, 1 floor, 150,000 square foot roof 10% green roof 15,000 square feet
  - Retail building 150,000 square feet, 1 floor 150,000 square foot roof 50% green or 75,000 square feet
  - Office building 300,000 square feet, 15 floors, 6,000 square foot roof 60% green or 3,600 square feet

# Denver Green Roof Initiative

- Fee in lieu of compliance (\$25/foot)
  - Apartment building \$82,500
  - Industrial building \$375,000
  - Retail building \$1,875,000
  - Office building \$90,000

# Denver Green Roof Initiative

- Replacement cost

	Normal	Green	Combo
Apartment	\$137,700	+\$149,636	+\$134,634
Industrial	\$1,539,000	+\$490,000	+\$533,000
Retail	\$1,539,000	+\$2,224,000	+\$2,548,000
Office	\$101,000	+\$132,000	+140,000

# Denver Green Roof Initiative

- New cost adds

	Green	Combo
Apartment	\$140,636	\$134,634
Industrial	\$490,000	\$534,000
Retail	\$2,225,000	\$2,548,000
Office	\$132,300	\$140,000

# Denver Green Roof Initiative

- Annual maintenance costs

	Green	Combo
Apartment	\$2,383	\$5,715
Industrial	\$19,372	\$13,312
Retail	\$21,210	\$19,363
Office	\$2,221	\$5,686