

Chapter 19.73 – City Center Overlay Zone (CCOZ)

Planning Commission Review Draft – 11 November 2019

Amend 19.04.448 as follows:

“Commercial recreation” means ~~one or more recreational facilities~~ activities or uses, either indoor or outdoor, operated as a business and open to the general public for a fee, ~~such as golf driving ranges and baseball batting range.~~ “Commercial recreation” does not include the following indoor or outdoor recreational, gaming or amusement uses: firearm ranges; target shooting of all kinds; paintball; motorized activities of all kinds, irrespective of power source; mechanical, video, electronic or computerized recreational or amusement arcades. **Temporary events approved by the City pursuant to....shall not be limited by this language.**

19.73.010 – Purpose and Intent

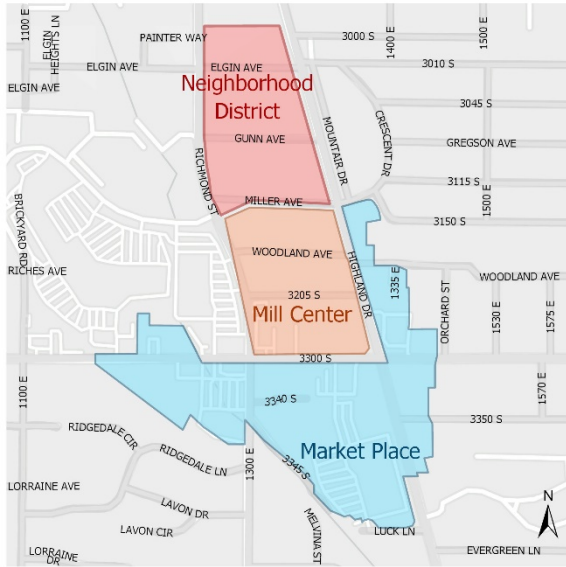
The purpose of the City Center Overlay Zone (CCOZ) is to supplement and modify the standards of the existing commercial and multifamily zones to promote the creation of a walkable mixed-use city center for Millcreek. The City Center is located approximately between Highland Drive and 1300 East, and 3000 South and along 3300 South and as particularly set forth on the Map 1 below and the official Millcreek Zoning Map. The CCOZ zone is intended to facilitate development that promotes quality growth, fosters harmonious development and outstanding design, increases property values, and creates new retail, residential, and other commercial opportunities.

19.73.12 Applicability and Use of the CCOZ

Any new development, exterior remodeling covering more than 50% of the building, or building expansions exceeding 15% of the gross square footage of the existing building, shall conform to the City Center Overlay Zone. Conformity shall not be required for maintenance, exterior painting, or interior remodeling of a building. New signs or sign replacements shall also comply with the CCOZ.

The CCOZ area is composed of three districts – the Neighborhood, the Mill Center, and the Market Place. The CCOZ covers the area shown in the map below:

Map 1 – City Center Overlay Zone Boundaries



19.73.15 CCOZ application processing

1. Preapplication conference meeting with representatives from the Community Development Department is required.
2. Application – an application and associated fees, shall be submitted and reviewed by staff for completeness. An incomplete application, that does not address the required CCOZ and other City ordinance required information, as determined by staff, will be returned to the applicant and not be processed until all information required by the City ordinances is provided. The City will provide a list of application requirements. The initial application will generally consist of concept plans with the following minimum requirements:
 - a. The applicant's name, address, telephone number, e mail, and interest in the property.
 - b. The property owner's name, address, e mail, and telephone number, if different than the applicant, and the property owner's signed consent to the filing of the application.
 - c. A property survey, property boundaries, right-of-way center lines, utility access, and recorded easements. The survey shall also include the street address and legal description of the subject property.
 - d. The current zoning classification, zoning district boundaries, and present use of the subject property.
 - e. A conceptual site plan or plans, drawn to scale, including sketches of the types of buildings proposed, floor plans, elevations of proposed buildings, materials, landscaping, parks, plazas, pedestrian pathways, parking, low impact design stormwater techniques to be applied to the site, known faultlines and recommended setbacks, oblique sketches of the project to show any view related issues (Valley and Mountains), and conceptual street cross sections using the requirements of [sections 19.73.40 and 19.73.50 of this chapter](#).

f. A written explanation of the project that describes the thematic elements of the project, the place making concepts, one or more signature features, commercial and mixed-use designs (if applicable), potential tenants, its' relationship to the goals for the City Center and other details that will provide reasons that the development will create a long term benefit to the City and proposed techniques to mitigate any anticipated detrimental effects.

h. A preliminary traffic study that defines potential traffic generation, the integration of the new development with the adjacent street corridors, traffic capacity/level of service issues on adjacent roads and intersections, and suggest mitigation solutions for anticipated traffic congestion problems. The traffic study may also address parking demands, if the applicant believes that the standards found in the Parking Chapter are inappropriate. Applicants shall follow the requirements of 19.80.040 to create a parking study. Such studies shall be commissioned by the City and paid for by the applicant.

i. Provide letters from all utility companies providing service to the project site describing their ability to serve the project.

j. A site-specific geologic hazard study and report, if required by MKC 19.75.

k. A summary table showing floor area by use, required parking by use, materials percentages, percentages of doors and windows, residential amenities if required, and open space requirements.

l. Other information or documentation the Community Development Department and/or Public Works may deem necessary, as described on the application form, for proper review and analysis of a particular application and its potential detrimental effects.

2. Application processing and review – the initial application and fee, composed of the concept plan information as described above and the conceptual development agreement, shall be reviewed by staff and discussed with the applicant in an internal pre-development review meeting. Subsequent to that meeting, changes may be made to the submittal documents, if needed.

Staff will assess the application for its' compliance with the regulations of this chapter and determine if any potential detrimental effects need mitigation to include the following list of potential issues and standards, that may need to be addressed:

1. Decreased street service levels and/or traffic patterns including the need for street modifications such as dedicated turn lanes, traffic control devices, safety, street widening, curb, gutter and sidewalks, location of ingress/egress, lot surfacing and design of off-street parking and circulation, loading docks, as well as compliance with off-street parking standards.
2. Negative impacts on the adequacy of utility systems, service delivery, and capacities, including the need for such items as relocating, upgrading, providing additional capacity, or preserving existing systems.
3. Negative impacts on connectivity and safety for pedestrians and bicyclists.
4. Detrimental effects by the use due to its nature, including noise that exceeds sound levels normally found in residential areas, environmental impacts, dust, fumes, smoke, odor, noise, vibrations; chemicals, toxins, pathogens, gases, heat, light, electromagnetic

- disturbances, and radiation. Detrimental effects by the use may include hours of operation and the potential to create an attractive nuisance.
5. Environmental impacts that increase the risk of contamination of or damage to adjacent properties and injury or sickness to people such as waste disposal, fire safety, geologic hazards such as faultlines, soil or slope conditions, liquefaction potential, site grading/topography, storm drainage/flood control, high ground water, environmental health hazards, or wetlands.
 6. Modifications to signs and exterior lighting to assure compatibility within the overlay zone.
 7. Incompatible designs in terms of use, scale, intensity, height, mass, setbacks, character, construction, solar access, landscaping, fencing, screening, and architectural design and exterior detailing/finishes and colors within the overlay zone in which the use will be located.
 8. Reduction in the tax base and property values.
 9. Reduction in the current level of economy in governmental expenditures.
 10. Insufficient emergency fire service and emergency vehicle access.
 11. Reduction in usable public open space
 12. Graffiti prevention applications and designs
 13. Inadequate maintenance of the property and structures in perpetuity including performance measures, compliance reviews, and monitoring.
3. Final Development Plan – this plan submittal, **subsequent to any Planning Commission public hearing** (s) including an associated fee, is a detailed plan that addresses every section requirement of this ordinance, especially **MKC 19.73.40 and 19.73.50**, in a precise manner.
 4. **Conditional use approval** ~~will~~ **shall** be required for any building that meets any **one** of the following criteria:
 - a. A total square footage greater than ~~50,000~~ **25,000** square feet.
 - b. A ground floor footprint greater than ~~25,000~~ **15,000** square feet
 - c. A height greater than 36 feet, not including any element described as a height exception in Table 19.73-4.

The City will provide a checklist of the information required. Final development plans shall be required to the detail required by the City and shall be processed by staff. Building permit applications may be submitted after appropriate assurances in the form of cash escrow bonds are submitted for the public improvements.

19.73.020 – Permitted and Conditional Uses

Permitted uses on any lot in the CCOZ zone shall be the permitted and conditional uses allowed in the C-2 zone, with the addition of **single purpose** multi-family dwellings in the Neighborhood District. Uses shall be located within one of the Building Types, see section 19.73.050 (14) e. except for the use limitations as set forth in Section 19.60.030.

In addition to the conditional uses listed below, any building that meets any one of the following criteria shall be approved using the City's Conditional Use Process:

- a. Any proposed building with a total square footage greater than ~~50,000~~ 25,000 square feet,
- b. Any proposed building with a ground floor footprint greater than ~~25,000~~ 15,000 square feet,
- c. Any proposed building with a height greater than 36 feet, excluding any element described as a height exception in Table 19.73-4.

Such buildings shall be processed using the standards found in this Chapter as well as in Chapter 19.84 Conditional Uses.

Table 19.73-1 – Permitted and Conditional Uses (subject to 19.73.020)

General Categories of Use by District
Neighborhood District - Multi-family, mixed use, neighborhood retail and neighborhood services, office uses(2500 square feet or less), commercial indoor recreation, temporary/seasonal/mobile food businesses
Mill Center – mixed use including residential on upper floors, office, retail, service uses, entertainment, civic uses, commercial indoor recreation/entertainment uses, temporary/seasonal/mobile food businesses
Market Place – retail commercial use, office, mixed use, commercial indoor recreation, temporary/seasonal/mobile food businesses

19.73.030 – Prohibited Uses and Use Limitations

Table 19.73-2 – Prohibited Uses and Use Limitations

The following uses are prohibited or limited in CCOZ zone:

USES	LIMITATION
Automobile Service Station, car wash and detailing businesses	Not allowed
Equipment, Car or Truck Rental or storage	Not allowed, except for car rental as an accessory use to a hotel
Non-Stealth Telecommunications Facilities.	Not allowed. Stealth telecommunication facilities are only allowed on rooftops.
Sexually oriented businesses	Not allowed subject to MKC 19.91.11

Pawnshop, smoke shops and related products, military surplus, and retail tobacco as the principal use	Not allowed
Residential Uses are permitted by district and within the building types specified in section 19.73.050 (14), except that mixed use buildings located within ~~300'~~ 250' of the NW corner of Highland Drive on 33rd South and the NE corner of 13th East on 33rd South shall contain no more than 25% of the building floor area as residential uses. The ~~300'~~ 250' measurement only applies to that same quadrant of the intersection. For the purposes of this chapter, leasing offices, lobbies, required parking, and any required residential amenity spaces are not considered commercial uses.	Shall include mixed uses on corners in the Neighborhood District, and 100% residential buildings are not allowed in the Mill Center and Market Place districts. Residential uses shall include amenities as required by MKC Chapter 19.44.050.
Rooftop Gardens, Patios, and Amenity Space	Not allowed within ~~50~~ 100' feet of a R-1 or R-2 zone boundary in the Neighborhood or Market Place districts, unless the rooftop garden, patio or amenity space is not located above the highest occupied floor of a building, or is obstructed from view from the zone boundary by at least 20 feet of occupied floor space.
Sale or lease of new or used vehicles of all types, watercraft, mobile homes, travel trailers, campers, motorcycles and other recreational vehicles, including licensed and non-licensed mobile construction equipment and other non-licensed mobile commercial equipment.	Not allowed
Secondhand stores including general merchandise, precious metal dealer/processor and/or precious gem dealer.	Limited to a maximum of 2,500 square feet
Commercial indoor and outdoor self-storage facilities of all types as a principal use, including mini-storage units, neighborhood	Not allowed. Self storage, for residents of the building, as part of and internal to a multi-family or mixed use development is allowed, if located on an upper floor.

storage, indoor and temperature controlled storage facilities.	
Tattoo and Other Body Art Businesses	Not allowed
Short term ("payday", "car" title, check cashing and similar) loan services	Not allowed
Drive-Through Uses as an Accessory Use	Not allowed for restaurant or food or beverage services uses in the Neighborhood district Drive through windows, order boxes, or access lanes are not allowed to front on the Millcreek Common Street, and for all other districts drive-through uses shall conform to the requirements of Section 19.62.050 and other applicable requirements of this Title.
Indoor and outdoor gun ranges, both for profit and non-profit	Not allowed
Manufacturing as a principal use	Not allowed, excepting the manufacture of beer and spirits
Freestanding fireworks seasonal sales	Not allowed.
Structured parking, including parking garages and podium parking.	Not allowed to face any street unless wrapped with commercial or office uses on the first floor, street facing facade.
Sidewalk Dining	Allowed on any street except for alleys and woonerfs, to within 5 feet of the curb
Restaurant and Retail uses facing Millcreek Common	Restaurants and retail are the only uses allowed on the first floor facing Millcreek Common

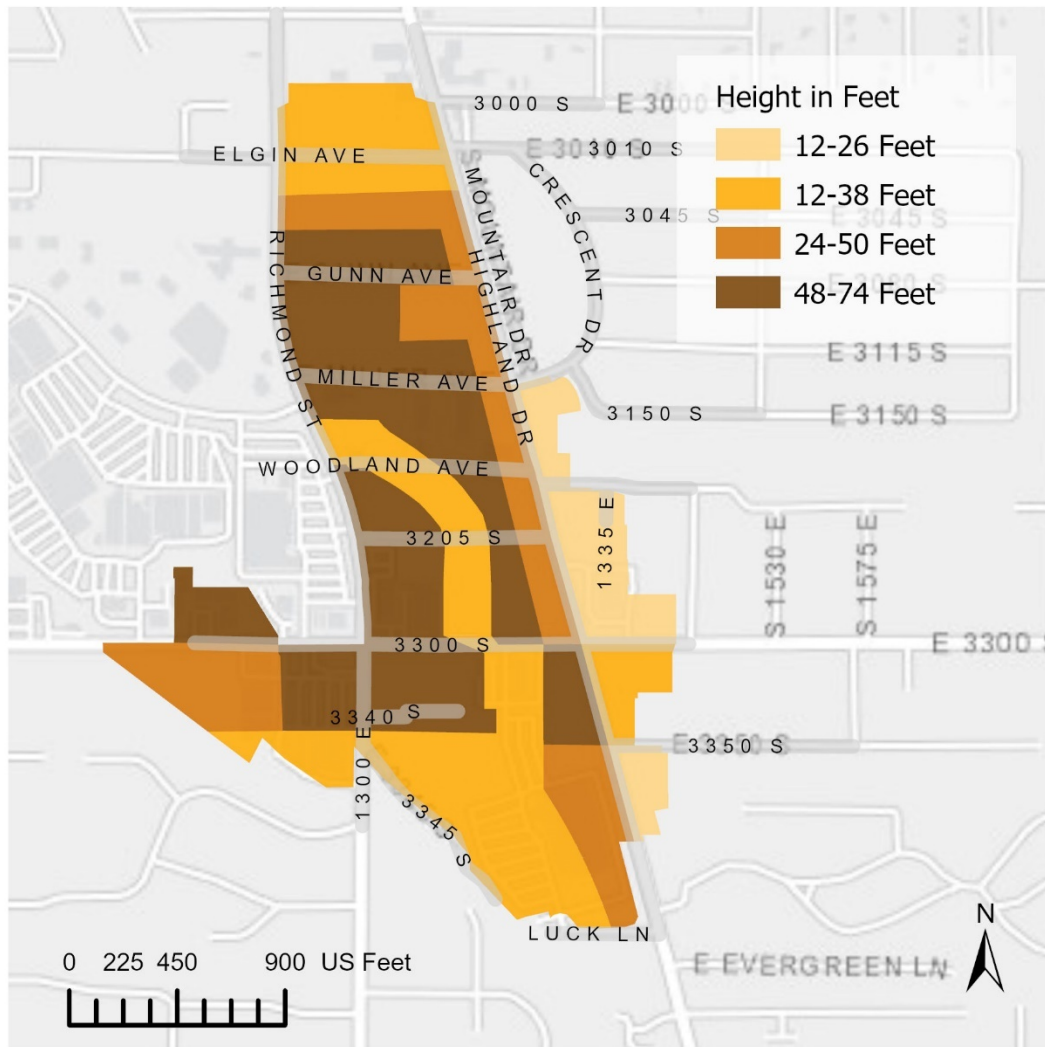
19.73.040 – Bulk and Yard Regulations

The Tables below and Map 2 establish supplemental bulk and yard regulations for all buildings within CCOZ. These regulations modify and/or supersede any conflicting requirements found in the underlying zone.

Building Heights - Minimum and maximum heights are described in Map 2 below and in the chart below, and on the ~~public~~ Official Planning and Zoning maps published by the City. Any proposed development that overlaps a defined height line that represents a change in building heights, on the ~~public~~ Official Planning and Zoning map, shall use the lower standard or may step up the building height as per the ~~public~~ Official Planning and Zoning map, at that height line.

Table 19.73-3 – Height Requirements and Map

Height Requirements		Minimum	Maximum
East of Highland Drive, north of 33 rd South	Tan area	12'	26'
North end of the Neighborhood District and south end of the Market Place	Yellow area	12'	38'
Various areas along Richmond, Highland near 33 rd , and along 33 rd . This area along Highland Drive is 75' wide, as measured from the west ROW line as of the adoption date of the ordinance.	Yellow Brown area	24'	50'
Areas along Millcreek Common and 33 rd	Dark Brown areas	48'	74'

**TABLE 19.73-4 – Bulk and Yard Regulations**

BULK AND YARD REGULATIONS	
Minimum Building Height	Minimum building heights are described in Map 2 above and in this table
Maximum Building Height	Varies by district – see section 19.73.14 (e) and Note 2 below, and Map 2 above
Height exceptions	Roof structures for the housing of elevators, stairways, ventilating fans or similar equipment required to operate and maintain the building, and fire or parapet walls, skylights, shade structures (awnings, fabric roof coverings, wood and metal open frame structures, etc.), towers (where

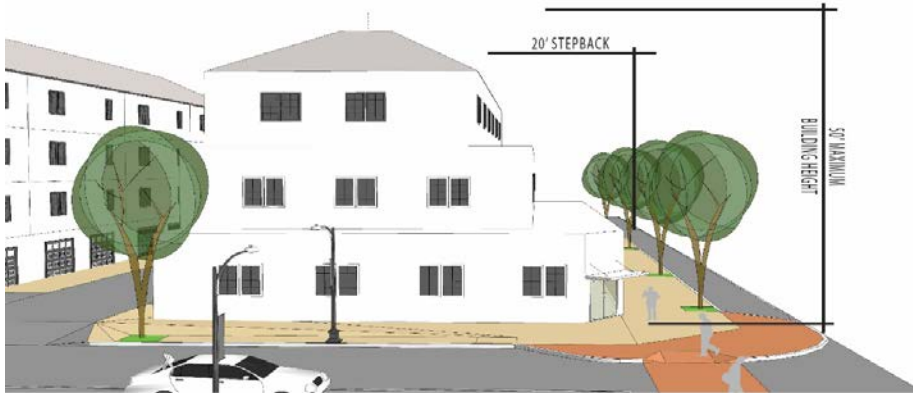
	required by City ordinances), flagpoles, chimneys, stealth wireless or television installations, theater lofts, solar panels, may be erected above the height limits prescribed in this chapter, but no space above the height limit shall be allowed for the purpose of providing additional habitable floor space. No such structures except towers and solar panels, may be located closer than 10' to edge of the building. The maximum increase in height for the above features shall be 12'.
Height Transitions	Height transitions are required for buildings within 100 feet of an R-1 or R-2 zone. See Note 1 and 2.
Maximum Lot Coverage	80 percent
Minimum Lot Coverage	50 percent
Maximum Front Yard	10 feet, subject to the build-to-line (see Note 4) standards established in Section 19.73.050 (8) and (14). The front yard setback is measured from the ROW line, except in the case of a plaza adjacent to the street, where the setback is measured from the edge of the plaza furthest from the street.
Off-Street Parking	Not allowed between front plane of the building and the curb on the street it fronts.
Residential Density	No maximum density is established.

TABLE 19.73-4: NOTES

1. For any development in CCOZ that is directly abutting an R-1 or R-2 zone, the maximum height for structures within 100 feet of the residential zone boundary shall not exceed 30 feet, as measured from the property line abutting the residential zone. If the residential zone abuts the CCOZ at a property line, the setback is measured from that property line. Buildings may step up after the 100' transition requirement has been met.
2. For any building over 40 feet in height or for any development on properties fronting on the Millcreek Common Street, 33rd South, Richmond and/or with frontage on Highland Drive, a twenty-foot stepback of the building façade, facing the street, is required between bottom of the first story and the top of the third story and upper stories. This stepback shall be segmented, such as, a ten foot initial stepback between the first and second floors and then an additional

ten foot stepback between the second and third floors or shall create a stepback of 20' between the first and second floors, that should be utilized as a usable space for residents or businesses within of the building (See Figure 1).

Figure 1 Building Stepbacks and Setbacks



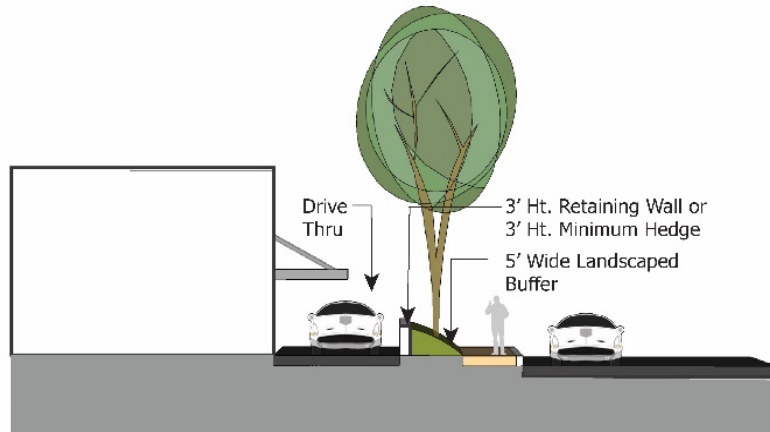
3. For the purposes of this chapter, where setbacks are measured from a right-of-way (ROW) containing a fully improved sidewalk, setbacks from a right of way shall be measured from the edge of the sidewalk that is directly abutting the public right-of-way.
4. Build-to-lines are defined as the line at which construction of a building façade is to occur on a lot, running parallel to the front property line, and ensuring a uniform (or more or less even) building façade line on the street. The flexibility provided in this Chapter is intended to allow for additional sidewalk space and façade variation, seating, for outdoor uses such as restaurants and to promote sidewalk dining.

19.73.050 – Design Standards

1. **Objectionable Conditions and Violations of Applicable Law.** All uses shall be free from unsafe, unhealthy, objectionable and or unreasonable odor, dust, smoke, emissions, noise, vibration, or similar problems, nor be in violation of any federal, state or local law.
2. **Landscaping on Public Right-of-Way.** Where a development directly abutts a public right-of-way, the development is required to install the street tree, curb, gutter, and sidewalk, pavement matching, street lights, landscaped planters, and street furniture as per the appropriate street cross section as shown in sub-section 6 below. This landscaping shall not be included any required open space.
3. **Drive-Through Uses as an Accessory Use.** Drive through uses are permitted as an accessory use in CCOZ, except that drive-throughs associated with a restaurant are not allowed in the Mill Center District and the Neighborhood District. Existing restaurants in the Mill Center District continue to be a legal use. Drive through facilities shall include a canopy or roof that is architecturally integrated and attached to the building and that mirrors the roof form of the primary building. Drive through windows are not permitted on facades that face a right-of-way,

unless existing site or access conditions prohibit a drive through window on a façade that does not face a right-of-way. In situations where a drive through window is required on a street facing façade, the building shall incorporate a five-foot wide landscaped buffer, either sloped to a 3' tall retaining wall or a minimum 3' hedge, between the drive-through lane and the adjacent parking or right-of-way.

Figure 2 Drive-Through requirements



- 4. Requirements for Residential Uses.** Requirements for any residential use established in CCOZ shall comply with the requirements established in Chapter 19.44 Multi-Family Residential and Chapter 19.78 Planned Unit Development of the Code, unless modified by this chapter.

5. Street Trees

General street tree standards can be found in subsection 9, Landscaping General below. Additionally, to recognize the orchards that once stood in this area:

Neighborhood Streets shall be planted with groups of **flowering** ornamental trees **that are non-fruit bearing**. Trees from the following list **are suggested**:

- Spring Snow Crabapple, *Malus 'Spring Snow'*
- Chanticleer Pear, *Pyrus calleryana 'New Bradford'*
- **Kwanzan Flowering Cherry, *Prunus Serrulata***
- **Eastern Redbud, *Cercis canadensis***
- **Fruitless Mulberry, *Morus alba***

Highland, Richmond, and 33rd South street trees – wherever possible trees that consume greater CO₂ should be planted in expandable grates within the park strip. The London Plane tree “*Platanus x acerifolia*” or the Sycamore “*Platanus occidentalis*” is required, **except for any medians on Highland Drive where the Japanese Lilac (*syringa reticulata*) is recommended**.

6. Street Types

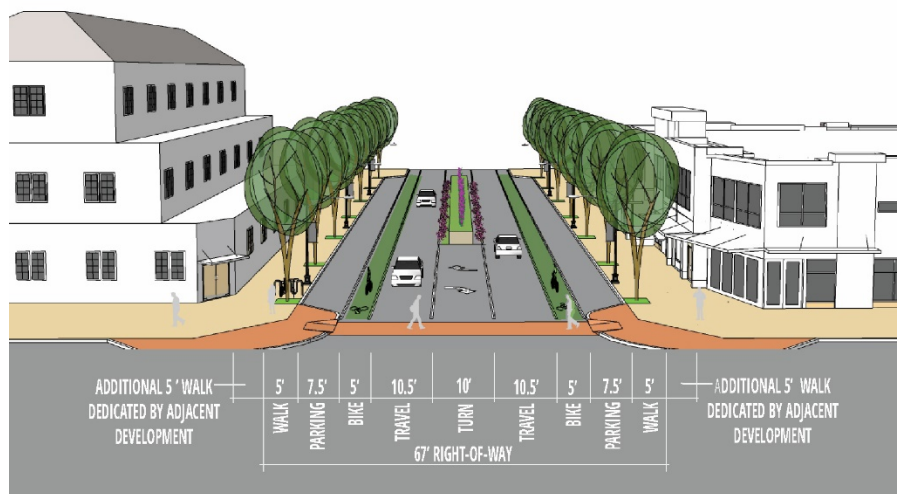
The seven street types identified below are intended to create a specific identity for the City Center District. All public sidewalks shall be colored a consistent tan color with complimentary accent colors at intersections and mid-block crossings. Exact dimensions and requirements will need to be coordinated with Public Works.

A. Highland Drive

Highland Drive serves as the primary eastern collector through the district. This street section is characterized by narrow travel lanes, dedicated bike lanes, on-street parking (where feasible), generous sidewalks, and curb bulb outs at intersections for traffic calming. The intent is to slow traffic through the district, accommodate all modes of travel and focus on pedestrian connectivity.

Requirements	
Vehicular Zone	
ROW Width	67'
Travel Lanes	2
Center Turn Lane	1
Lane Width	10.5'
Center Median	Permitted mid-block and low turn demand areas
Parking Lanes	7.5' On-street parallel required on each side
Bicycle	5' Dedicated bike lanes each side using green thermoplastic or colored concrete
Pedestrian Zone	
Walkways	10' min. attached colored concrete sidewalk on each side with complementary enhanced paving at intersections and mid-block pedestrian crossings (5' within ROW, 5' dedicated by property owner)
Street Buffer	Trees in grates within the 10' walkway dimension noted above
Furnishings	Bike racks, seating, lighting, planters

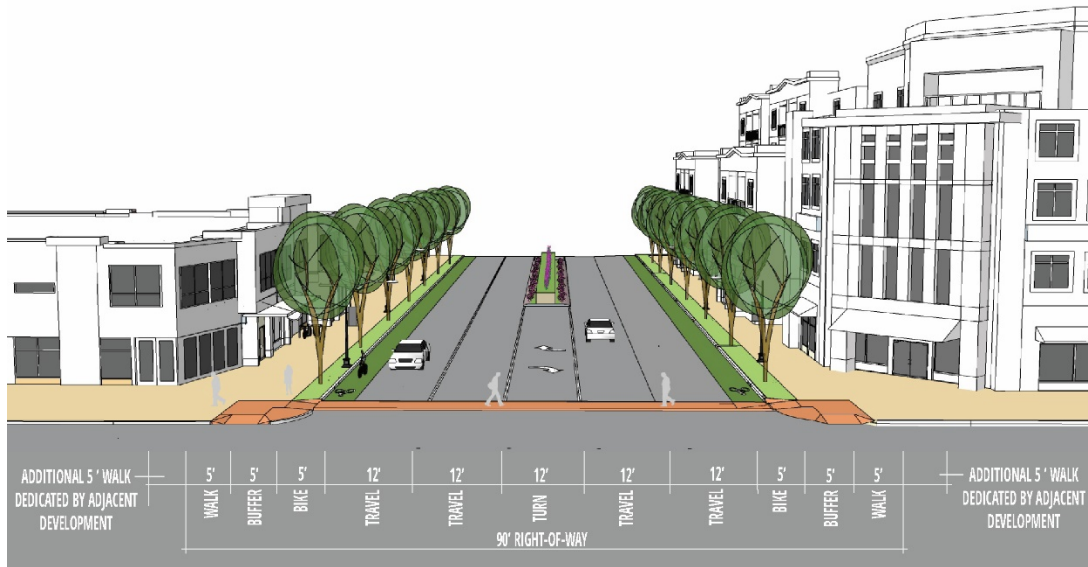
Figure 3 Typical Cross Section for Highland Drive

**B. Richmond/13th East Boulevard**

A minimum of two lanes in each direction with a median turning lane, punctuated with landscaped medians in areas not needing left turns, these streets are envisioned as grand boulevards.

Requirements	
Vehicular Zone	
ROW Width	90'
Travel Lanes	4
Center Turn Lane	1, 12'
Lane Width	12'
Center Median	Permitted except at intersections, 12'
Parking Lanes	No parking on street
Bicycle	5' Protected bike lanes each side, using green thermoplastic or colored concrete
Pedestrian Zone	
Walkways	5' min. attached colored concrete sidewalk on each side with complementary enhanced paving at intersections and mid-block pedestrian crossings (5' within ROW, 5' dedicated by property owner which can be dedicated to Cty or provided through a public pedestrian easement and can encroach on the setback)
Street Buffer	5' park strip xeriscape with large trees
Furnishings	Bike racks, bus shelters, lighting

Figure 4 Typical Cross Section for Richmond/13th East Boulevard

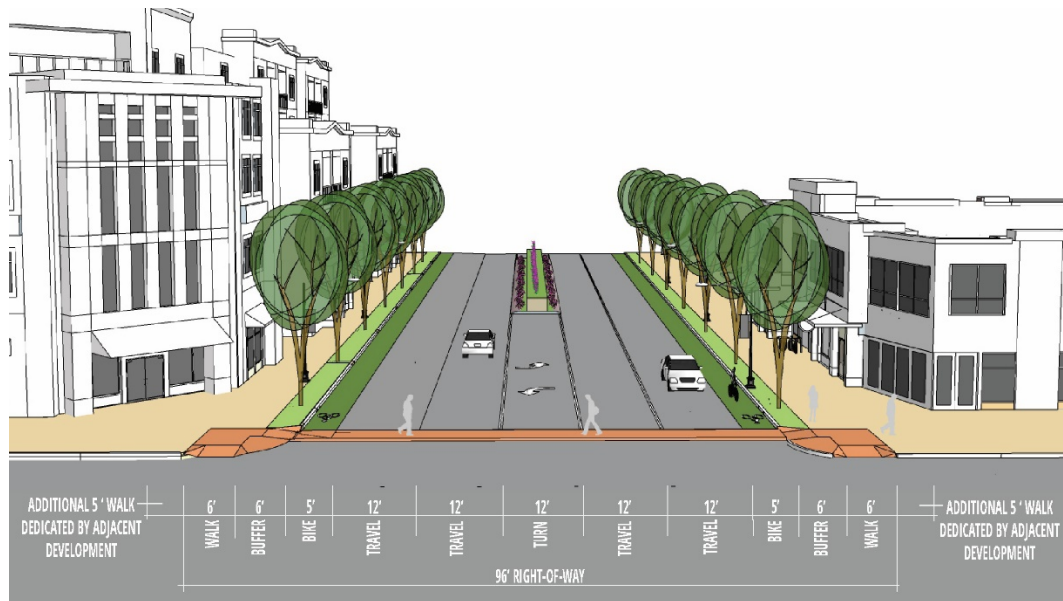


C. 33rd South Boulevard

This street is controlled by UDOT but plays an important role in the recognition of the City Center and the flow of major volumes of traffic in an east/west direction. To facilitate mobility with the City Center area, protected bike lanes are recommended to create better connections, between Highland and Richmond streets.

Requirements	
Vehicular Zone	
ROW Width	96'
Travel Lanes	4
Center Turn Lane	1, 12'
Lane Width	12'
Center Median	Permitted except at intersections, 12'
Parking Lanes	No parking on street
Bicycle	5' Protected bike lanes each side, using green thermoplastic or colored concrete
Pedestrian Zone	
Walkways	6' minimum attached colored concrete sidewalk on each side with complementary enhanced paving at intersections and mid-block pedestrian crossings (5' within ROW, 5' dedicated by property owner which can be dedicated to city or provided through a public pedestrian easement and can encroach on the setback)
Street Buffer	6' park strip xeriscape with large trees
Furnishings	Bike racks, bus shelters, lighting

Figure 5 Typical Cross Section for 33rd South

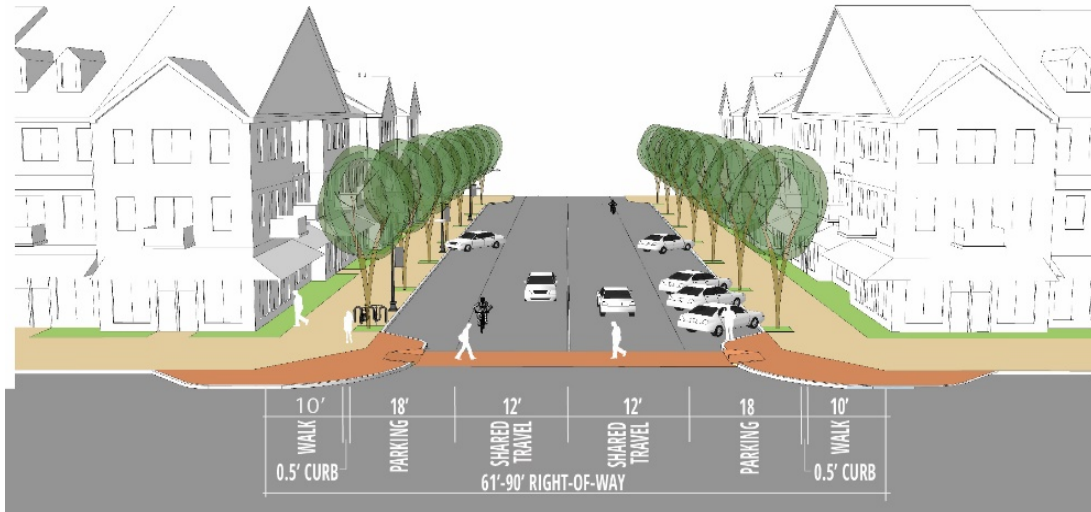


D. Neighborhood Streets

Connecting neighborhood streets include all of the streets that run east and west between Highland and Richmond Street/1300 East through the City Center. These streets are characterized by narrower right-of-way widths with similar goals of accommodating all modes of local traffic.

Requirements	
Vehicular Zone	
ROW Width	61' to 80'
Travel Lanes	2
Center Turn Lane	None
Lane Width	12'
Center Median	Not permitted
Parking Lanes	8.5' On-street parallel, 18' for angled head in, or head out on each side, depending on ROW
Bicycle	Shared with travel lanes
Pedestrian Zone	
Walkways	5' min. attached sidewalk on each side
Street Buffer	5' min. landscape area with trees
Furnishings	Bike racks, seating, lighting, planters

Figure 6 Typical Cross Section for a Neighborhood Street

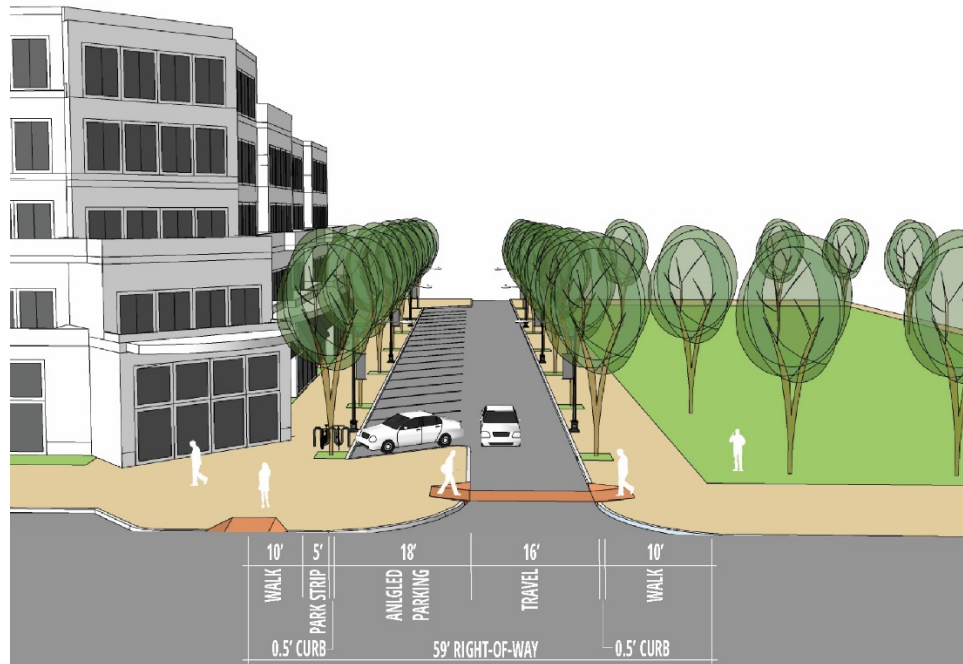


E. Millcreek Common Street and Frontage

If vehicular access and parking is provided between any building and Millcreek Common, it must meet the following requirements:

Requirements	
Vehicular Zone	
ROW Width	varies
Travel Lanes	1
Center Turn Lane	None
Lane Width	16'
Center Median	Not permitted
Parking Lanes	8.5' On-street parallel parking, both sides – or angled on the building side
Bicycle	Shared with travel lanes
Pedestrian Zone	
Walkways	10' min. outside edge, 5' inside edge
Street Buffer	5' min. landscape area, with trees
Furnishings	Bike racks, seating, lighting, planters, sculptures

Figure 7 **Potential** Cross Section for Millcreek Common Street



F. Laneway

Laneways are to be used as access to parking, rear loaded buildings, loading and delivery areas, services areas for refuse and utilities at the rear of lots, and as connectors for pedestrians. Laneways are intended as a shared vehicular access to the rear of buildings that allows the front façade to remain tied to the pedestrian realm.

Requirements	
Vehicular Zone	
ROW Width	30' (one way)
Travel Lanes	1
Center Turn Lane	None
Lane Width	16' (one way)
Center Median	Not permitted
Parking Lanes	Not permitted
Bicycle Lane	shared
Pedestrian Zone - shared	
Walkways	5' one side, 4' other side
Street Buffer	5' with tree grates and trees tied to 5' walkway, and breakable bollards on 4' walkway edge
Furnishings	None

Figure 8 Typical Cross Section for a Laneway



G. Woonerf

A shared street promoting for pedestrian and bicycle use over vehicular use but in an undefined manner. No curbs and weaving vehicular ways, punctuated by landscaped islands, help to create a street that is open for all users but in a very low speed, safe, environment.

Requirements	
Vehicular Zone	
ROW Width	40' (two way)
Travel Lanes	2 but unmarked other than by pavement distinction
Center Turn Lane	None
Lane Width	10'
Center Median	Not permitted
Parking Lanes	One side and purposefully restricts traffic flow to one lane
Bicycle Lane	shared
Pedestrian Zone - shared	
Walkways	10'
Street Buffer	Regular spaced landscaped islands, with trees
Furnishings	Seating within the islands

Figure 8 Typical Cross Section for a Woonerf



7. Corner Lots

Corner lots are deemed to have two front yards. Building corners that face street intersections shall be angled, rounded, setback or otherwise designed to soften the intersection of the perpendicular building facades to ensure vision clearance and create a public space. A corner plaza is required for all street intersections except for internal/mid-block (off of Highland and Richmond) intersections on Neighborhood streets and for laneways and woonerfs. Streets that require a plaza shall design a minimum of 20' wide 15' deep usable public **plaza** space and shall include provisions for shade **and protection from inclement weather** and seating. For sale art sculpture(s) are encouraged.

Figure 9 Corner Plaza



8. Front Yard Setback and Build-to-Line

The front yard setback is the build-to-line within 300' of all public street intersections within the CCOZ boundary. At least 50% of the front elevation of the building(s) must be within 10 feet of the build-to-line, **except for the corners specified above**. A build-to-line is defined as the line at which construction of a building façade is to occur in a lot, running parallel to the front property, and ensuring a uniform building facade line on the street.

9. Landscaping General

Landscaping shall comply with this chapter and MKC 19.77. At a minimum, street trees are required in planting areas or tree grates every 40', **depending on tree type**, on center and within 15' of back of curb. Trees must be **2"** minimum caliper canopy type, at least 30' in height at maturity and maintained with a limb clearance of 8' above the ground. A Street Tree planting plan is required, which may modify the minimum separation requirement above, **depending on the width of the tree canopy at maturity** and shall utilize the trees suggested in subsection 5 above. Landscaping along the street shall comply with the requirements of the street cross sections, the suggested tree list, **the Street Tree Planting plan**, and Chapter 19.77.

10. Garbage and Recycling

The development shall be designed to accommodate and efficiently manage the collection, storage, and removal of garbage in harmony with the neighborhood so as to minimize detrimental effects of the collection, storage, and removal on any use within the development or abutting uses. Dumpster enclosures are required. No refuse dumpster or dumpster enclosure structure shall be located closer than 10 feet to any perimeter property line, unless the dumpster or dumpster enclosure structure is located within a parking structure. Enclosure structures must have a minimum of four sides that reflect or emulate the materials, design, and quality of the overall development. All developments shall provide recycling services.

11. Parking General

General parking requirements are subject to MKC 19.80.40, except as specified below. Parking requirements may be modified as per 19.80.40. These standards do not include guest parking, which shall be as required in 19.80.40.

Requirements	
Studio apartments	1 per unit
1- or two-bedroom apartments	1.5 per unit
3 or more bedrooms	2 per unit
Commercial/retail	3 per 1000 square feet
Service uses	3 per 1000 square feet
Office (excluding call type centers)	3 per 1000 square feet

Bicycle Parking as per Section 19.80.040 (c) with the additional requirement that all such bike racks shall be painted the "blue" used in Millcreek's logo.

12. Parking On-Street

On-street parking, located on the same side of the street in front of the building housing the businesses, in the form of parallel or angled spaces can account for up to two-thirds of the required commercial, retail, or office parking.

13. Parking Off-Street

All off-street and structured/garage parking shall be located to the side or rear of the building to preserve street facing facades for transparency and pedestrian activity. Structured parking that faces a street shall be wrapped with commercial or office uses. Surface parking lots are not allowed if visible from the adjacent street.

Figure 10 Typical Off-Street Parking Locations

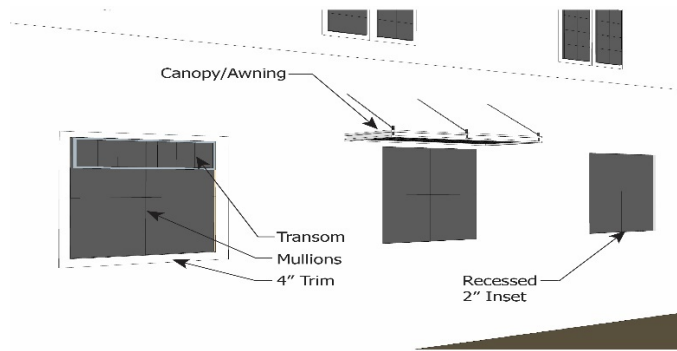


14. Building Design

a. Entrances and Windows

Entrances to the first floor of buildings shall front on the public street. On double or triple frontage lots, entrances are required where the greatest amount of pedestrian traffic is anticipated. Windows shall constitute at least 50% of first floor street-facing facades, and 25 percent of all upper story facades. Windows shall be at least 50 percent transparent. Interior lighting is required. Street facing windows that are not on the same façade as the main building entrance, may cover the first floor windows with nonadvertising window films using a mountain, mill, orchard or mountain related sports theme. Living screens may replace up to 50% of the window requirement for the lowest anticipated pedestrian traffic frontage. Mirrored windows are not allowed. Any east or west facing windows above the third story shall be non-relective to prevent glare. Awnings are required for any buildings facing Millcreek Common Street and on the NW corner of Highland Drive and 33rd South and the NE corner of 13th East and 33rd South.

Windows above the first floor shall conform to the following standards:



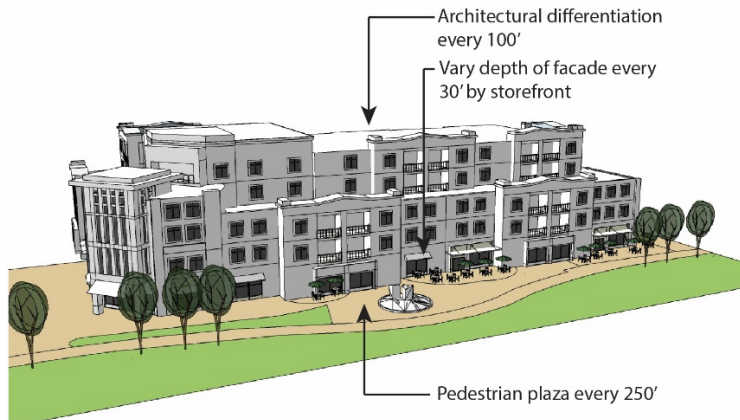
b. Building Materials

Exterior materials of a durable or resilient nature such as brick, stone, composite materials, or other materials of similar quality, hardness, and low maintenance characteristics are required. New development in the CCOZ, shall incorporate common, locally found materials such as granite, stone, sandstone, and brick as part of the first floor of each building for at least 50% of the first floor, excluding the windows. For the Mill Center District this requirement increases to a minimum of 75% for the first floor excluding the windows. For all Districts, all stories above the first floor shall incorporate at least 50% of the above specified materials. Stucco and EIFS are prohibited for use as materials on any façade visible from a right-of-way. Other materials may be considered for soffits, or as accent or unique architectural features. Twenty-five year guarantee, architectural shingles are required for pitched roofs and other longer lasting roof materials for flat roofs are required.

c. Building Length and Facades

No new building elevation along a public right-of-way may exceed 100 feet in length without at least a 3' variation in the depth of the façade along the public right of way and a 2' variation on other faces. Residential unit balconies shall not be interpreted to meet this requirement. No single building shall exceed 300' in length. A separation of a minimum of ten feet is required, which creates a passageway to interior spaces. Such passageways shall be lighted, provide a safe pedestrian space and include vegetation in boxes every 30' of depth. As a minimum, provide pedestrian plazas every 250 feet of building length to break up long building façades along public rights-of-way. Top floors shall have architectural differentiation from the other floors in the building and rooflines shall vary every 100', as a minimum. For first floor uses in the mixed use building type, the appearance of small shops/storefronts with variation in the first floor façade every 30' is required. All buildings fronting on Millcreek Common Street shall include a permanent or retractable fabric awning, extending a minimum of 10' from the storefront/façade to provide shade and refuge from inclement weather. Awnings must be cantilevered from the front façade of the building. Such awnings shall be provided in colors that reflect colors incorporated as part of the exterior of the building or the green or blue found in Millcreek's logo. Only permanent awnings are allowed to meet this requirement for buildings facing the Millcreek Common.

Figure 11 Building Façade Variation



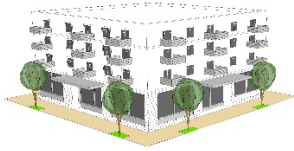
d. Building Massing and Façade Articulation

All buildings shall be designed to have at least three of the following:

- A. Visual breaks along the street-facing façade such as horizontal articulation in the plane of the façade by at least 2 feet.
- B. Change in height at the top of the building by at least 10 feet for every 100 feet of façade length.
- C. Changes in materials, color, texture or pattern for greater than 50% of the building facade.
- D. Indentations/recesses at least 10' in depth along the street facing facades at 100' intervals.
- E. Usable terraces (a larger balcony intended as a private resident leisure space) at least 10' in depth along the street facing facades.
- F. Covered walkways on south, east or west facing facades on street(s) other than Millcreek Common Street.
- G. Except for Millcreek Common Street facing buildings, columns or pilasters with a minimum 4-inch horizontal depth from the plane of the façade and spaced at a minimum interval of 50 feet.
- H. Stepbacks where not otherwise required.

e. Building Types

A. Mixed Use – Intended for a mix of primarily residential with commercial/office or commercial and office uses required to be located on the first floor, and optional above the first floor at or near the front build-to-line with parking to the rear, underground, or podium type. No podium parking is allowed fronting on Millcreek Common Street. This building type may support office, retail, hotel/hospitality or residential uses mixed either vertically or horizontally. For residential units, provide outdoor balconies or patios for 100% of the residential units at a minimum of 6' deep and 60 square feet each. Provide indoor bike storage or bike lockers.



Requirements	
Front Build-to Zone	0'-10'
Minimum Side Yard Setback	10' between buildings
Minimum Rear Yard Setback	10', except when abutting an R-1, R-2, or R-4-8.5 zone the setback is 25'
Minimum Height	See Map 2
Maximum Height	See Map 2
Principal Entrance Location	Front or corner side of facade
Vehicular Access	From alley or rear of building
Minimum Transparency	50% on ground floor
Required First Floor Uses	Office, retail, craftsman industrial or residential (50% must be non-residential use). Any mixed use building that fronts on Millcreek Common Street shall have 100% non-residential uses on the first floor facing that street.
Depth of first floor non-residential uses	30 feet unless at least 40 percent of the habitable floor area of the building consists of nonresidential uses, in which case the depth of first-floor non-residential uses can be reduced to 20 feet.
Upper Story Uses	Any permitted use or conditional use
Where allowed	Corners in the Neighborhood District, the entire Mill Center, and the entire Market Place
Storefront Width	Not to exceed 30 feet

B. Office/Commercial/Civic mixed use – Minimum 2-story building that mixes uses with the primary use of office, retail, civic or commercial use.



Requirements	
Front Build-to Zone	0'-15'

Minimum Side Yard Setback	10' between buildings, ~~except when abutting an R-1, R-2, or R-4-8.5 zone the setback is 25'~~
Minimum Rear Yard Setback	10'
Minimum Height	See Map 2
Maximum Height	See Map 2
Principal Entrance Location	Front or corner side of facade
Vehicular Access	From alley or rear or within the building
Minimum Transparency	50% on ground floor
Ground Story Uses	Office, Retail, Civic, or Commercial
Depth of first floor uses	30' minimum depth
Upper Story Uses	May vary
Where allowed	Mill Center, Market Place

C. Multi-family – ~~Generally characterized by a~~ A multi-story building that contains residential uses internal to the structure with parking to the rear, in a ~~separate~~ structure or podium style below the building. ~~Parking structures shall include one 220 volt electric vehicle charging station for every ten stalls.~~ Provide outdoor balconies or patios for 100% of the units at a minimum of 6' deep and 60 square feet each. Provide indoor bike storage or bike lockers.



Requirements	
Front Build-to Zone	0'-15'
Minimum Side Yard Setback	0' per unit, 10' between buildings
Minimum Rear Yard Setback	~~5'-10',~~ ~~except when abutting an R-1, R-2, or R-4-8.5 zone the setback is 25'~~
Minimum Height	See Map 2
Maximum Height	See Map 2
Principal Entrance Location	Front or corner side of facade
Vehicular Access	From alley or rear of building
Minimum Transparency	40% for ground floor and 15% for other floors
Ground Story Uses	For buildings located on corners; office, residential or live/work units, retail, personal services, or residential (50% of the street facing front facades must be non-residential use)
Upper Story Uses	Residential or parking only
Where allowed	Neighborhood District

D. Townhome – ~~Typically comprised of~~ Horizontally attached multi-story units in a rowhouse configuration. This building type can include live/work units. Parking and private garages shall be to the rear of the building allowing the primary façade to front a public street or public greenspace. Provide outdoor balconies or patios for 100% of the units at a minimum of 6' deep and 60 square feet each. ~~Where private garages are proposed, they shall be wired for at least one 220 volt line for electrical vehicle charging.~~ Guest parking shall not include any driveway that accesses a garage.



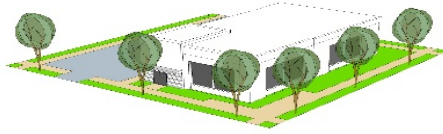
Requirements	
Front Build-to Zone	0'-15'
Minimum Side Yard Setback	0' per unit, 10' between buildings
Minimum Rear Yard Setback	5'–10'
Minimum Height	2 stories
Maximum Height	3 stories
Principal Entrance Location	Front or corner side of facade
Vehicular Access	From alley or rear of building
Minimum Transparency	15%
Ground Story Uses	Residential or live/work units
Upper Story Uses	Residential only
Where allowed	Neighborhood District

E. Adaptive Reuse – There are several existing buildings within the CCOZ that could be reworked into a new use. The following general requirements are required:

- If the character of the existing building is deemed historic or historically significant due to its age or displays a unique architectural style or unique features, as determined by the Zoning Administrator, then reconstruction should attempt to retain as much of that character as possible.
- Windows shall address the street frontage and encompass at least 50% of the first story building facades if structurally feasible.
- Parking shall be located (or relocated) to the rear of the building.



F. Commercial single purpose buildings – Buildings with the primary use being commercial use.



Requirements	
Front Build-to Zone	0'-15'
Minimum Side Yard Setback	10' between buildings
Minimum Rear Yard Setback	10', <i>except when abutting an R-1, R-2, or R-4-8.5 zone the setback is 25'</i>
Minimum Height	See Map 2
Maximum Height	See Map 2
Principal Entrance Location	Front or corner side of facade
Vehicular Access	From alley or rear of building
Minimum Transparency	50% on ground floor
Ground Story Uses	Commercial
Upper Story Uses	Commercial
Where allowed	Mill Center, Market Place

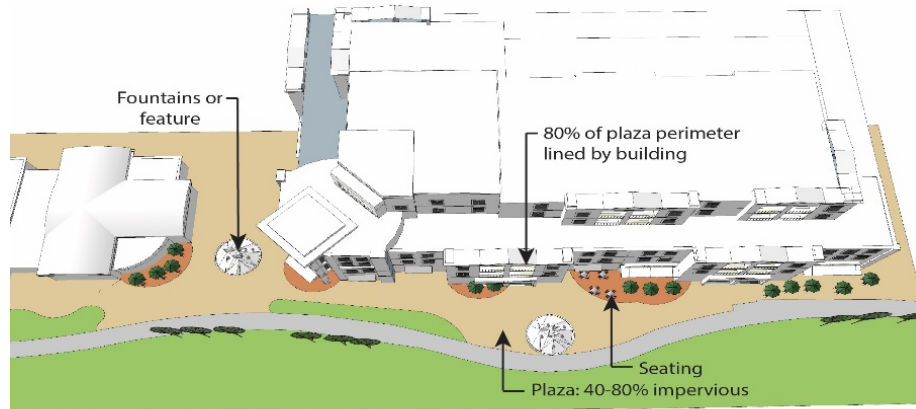
14. Open Space and Plazas

For all development that includes residential uses, the open space requirement is ~~15%~~ 20%. This open space requirement shall be fulfilled through rooftops, terraces for general resident use, plazas and pocket parks. The required common open space shall be for general use by the residents of the building and/or the public, and be usable land areas that are not occupied by buildings, dwellings, structures, parking areas, streets, public park strips, curb-gutter-sidewalk, driveways, or alleys and shall be accessible by all residents of the development. For the purposes of this chapter, gross site area is defined as the total area of the development excluding anything in the public right of way. For development or redevelopment involving sites that are one acre in size or greater, at least 40 percent of required open space must be in the form of a plaza that is located at the front, corner or side of the building, and open and accessible to the public at all times. The following requirements must be met:

- At least 80% of the plaza's perimeter that does not front on vehicular right-of-way shall be lined by building frontages.
- Fully enclosed **permanent** structures are not permitted.
- Playgrounds are not permitted.
- Minimum pervious surface = 40%
- Maximum pervious surface = 80%
- Must include seating, shade structures, and one tree (**2" caliper minimum**) per 800 sf of plaza area

- Special features such as fountains and for sale public art installations are encouraged. Active features should be incorporated into the plaza.

Figure 11 Typical Plaza



15. Pocket **Leisure spaces**

Residential development involving sites 2 acres in size or greater shall include a pocket **leisure space** that fronts on or is easily accessible from a public street, open and accessible to the public at all times, and meets the following requirements:

- Minimum size = 2,500 square feet
- Maximum size = 20,000 square feet
- Include some form of **child** play structure
- Must include seating, shade structures, **turf, hard surfaces**, and one tree (2" caliper minimum) per 800 sf of park area

Figure 12 Typical Pocket Leisure space



16. Rooftop Patios and Gardens

If a rooftop patio or garden is included as part of a development, the rooftop patio or garden shall include a minimum of 25% of its area covered with trees to provide **shade**. This 25% is defined using the canopy of the tree at maturity. Seating, tables, outdoor gas bar-b-ques, solar cells (see #23), and shade structures are

required. All features listed above shall be setback 10' from the roof edge except solar cells. Grow boxes are encouraged.

Private roof top park space is encouraged to take advantage of the mountain and valley views, but shall not include active play spaces.

17. On-site open space/park substitution – in-lieu substitutions

The open space/park requirement may be modified through potential substitutions for any development that faces the Millcreek Common or could benefit from contributing to pedestrian connections to the Commons. Such substitutions are intended to enhance with features or acquire land or improve land that is destined to become part of the “Millcreek Common”. The Millcreek Common is the signature open space in the City Center and is a benefit to all development in the City Center, including improved pedestrian connections to the Common. In-lieu substitutions are encouraged for the benefit of the City Center by application to the Community Development Director, under the following circumstances:

1. In-lieu substitutions of land: are intended to fulfill the requirements for open/park space may be allowed when it can be factually established by a qualified land appraiser, that the substituted land is at least equal to or greater in value than the associated development property, as if it were to be fully developed as proposed. The City will determine with the developer the actual property to be appraised, both in the proposed development and in the “Millcreek Common”. The City will select and employ through a contract, an appraiser. The cost of the appraisal shall be born by the developer, through reimbursement to the City. New appraisals will not be required if recent (within one year) information is readily available.
2. Cash in-lieu: the City may determine that in certain situations, accepting cash as an in-lieu substitution, where it can be shown that acceptance of those funds, is more effective in acquiring open space/park land and improving pedestrian connections within the City Center. Cash in-lieu payments shall not be accepted without a qualified appraisal process as per (1) above. The City shall be obligated, in a timely manner, to use the in-lieu funds within the City Center for land purchases, open space, pedestrian system enhancements, and/or park related improvements.
3. Any land which has been dedicated, set aside, platted, or otherwise approved as open space, may not be substituted or used for any purpose other than those allowed by this chapter.
4. In-lieu substitutions shall be reviewed by the Community Development Director, through an application, however, final approval of the in-lieu substitution rests with the City Council. Such approvals shall occur prior to issuance of a Final Site Plan approval or a building permit.

18. Perimeter Fencing

To ensure maximum pedestrian connectivity, fencing between parcels is not required. No fencing of any kind will be allowed along the Richmond, 33rd, Highland Drive and Millcreek Common Street frontage. Privacy and/or security fencing is only allowed to screen unsightly, utility, or vehicle service areas from public right-of-way.

Fencing along a Neighborhood street frontage is permitted to define front porches and can consist of wrought iron/similar materials, wood or composites. Vinyl is prohibited as a fencing material. a minimum of 50% open at a max height of 42”. Fences may incorporate a max 18” high stone, brick wall at the base.

19. Private Outdoor Lighting and Outdoor Dining

Lighting for streets and parking lots on the interior of the development is required. All lighting fixtures shall be directed downward with mechanisms to prevent dark sky illumination (see guidance from <https://www.darksky.org/our-work/lighting/lighting-for-citizens/lighting-basics/>). The applicant shall submit a plan which indicates the type and location of lights in relation to the development and designed for pedestrian/vehicular safety. Pedestrian lighting may include bollards and all lighting shall follow established themes described in subsection 21 below. Minimum average foot-candles for interior streets shall be 0.3 and the fixture height shall not exceed 25 feet. Such fixtures shall be located a minimum of 10' from the public right-of-way. All parking luminaries, except those required for security, must be extinguished one hour after the end of business hours.

Outdoor seating and dining may be partially or fully covered to extend the outdoor dining experience through the spring and fall months. Outdoor patio heaters and misters are permitted. Restaurant tables and chairs may be movable or permanent and should be reflected on the site plan. If alcohol is served, the restaurant will need to provide signage and decorative fencing per the health department code. Fencing materials shall be wrought iron (or a similar facsimile). Any accommodation for dogs shall be subject to the Salt Lake County Health Department regulations (Paws on the Patio HACCP plan).

20. Access Between Uses

Vehicular and pedestrian access is required between uses that does not force vehicles/~~pedestrians~~ out to the adjacent streets.

21. Signs

Signs are limited to low profile monument signs, ~~externally lit~~ wall signs, projecting signs with a minimum of 8 feet clearance above the ground, and temporary A-frame signs. Any projecting sign along the Mill Common shall be limited to 42 inches in width. ~~Lighting from signs shall be directed downward and generally comply with dark sky philosophies. Illuminated signs along Mill Common may not be backlit.~~ Size, location, and number limitations are defined in MKC 19.82.

22. Street Lighting

All street lights located on 33rd South, Richmond, and Highland Drive, shall incorporate a luminaire (Figure 13) atop a 14' pole. The light shall be low intensity, shielded from uses on adjoining lots, and directed away from abutting properties, yet lighting the street and adjacent walkway. All lighting shall incorporate full cut-off fixtures to minimize light pollution and be dark sky compliant.

All lighting on Neighborhood streets and Millcreek Common Street shall utilize the street light shown in Figure 13 ~~or a suitable substitute approved by the City.~~

All lighting on Laneways, Woonerfs, ~~and required passages between buildings~~ shall use downward directed sconce styles for wall lighting and lit bollards along the street.

Figure 13**23. Solar Rooftops, HVACs, and Charging Stations**

Rooftops may be used as garden type open space, and/or passive recreation space but shall incorporate solar panels for power generation. 50% of the entire rooftop space shall be covered with solar panels.

All Heating, Ventilating, and Air Conditioning equipment (HVAC) shall be recessed by at least 10' from the exterior edge of the building. Such equipment shall be enclosed such that it is not readily recognizable as HVAC equipment.

For the residential portions of a mixed use or multi-family building, one electric vehicle 220 volt charging station is required for every 10 units. For the non-residential portions of mixed use, office, and commercial buildings, two charging stations per floor are required in the parking areas. Charging stations may be located in interior parking garages.

24. Rooftop Cell Service Towers and Overhead Utility Lines

All existing overhead lines shall be located underground as part of any new development in the CCOZ. No new development shall exhibit any above ground utility or communication lines.

Rooftop telecommunication equipment is only allowed as a “stealth” installation. Such facilities shall appear to be an integrated part of the building.

19.73.060 – General Standards of Applicability

1. The use and development of property within CCOZ is also subject to other applicable chapters in the zoning ordinance and the regulations of the underlying zone except where specific regulations are provided in this chapter, including but not limited to applicable health and safety codes, building codes, and engineering standards.
2. Standards in other chapters may apply. In the event there is language elsewhere in Title 19 of this code that conflicts with language in this chapter, the CCOZ standards prevail.

**City Center Overlay Zone
Mixed Use Building Type
Code Compliance Checklist**

Address:

Subdistrict:

Property Size:

Category	Requirement	Project Details	Review Notes – Office Use Only
USE REQUIREMENTS			
Commercial Uses	Required for ground floor facades. Projects on NW corner of 3300 S and Highland and NE corner of 3300 S and 1300 E must have at least 25% of floor area as non-residential uses.		
Page 7			
STREETSCAPE REQUIREMENTS			
Street Type	<< describe applicable street type >>		
Street Tree Plan	Depends on street type.		
Dedication	May be required based on street type.		
Street Furnishing and Lighting			
BULK REQUIREMENTS			

Category	Requirement	Project Details	Review Notes – Office Use Only
Build to Zone	0 to 10 feet – subject to new street standard		
Min Side Yard Setback	10 feet between buildings Pages 10-11		
Min Rear Yard Setback	10 feet, or 25 feet if adjacent to residential zoning. Page 25		
Building Height	Maximum height to be established per the height map in the CCOZ. Applicant to verify by survey the property location with respect to height r Pages 8-9		
Height Transitions	Required for projects within 100 feet of an R-1 or R-2 zone Pages 9-10		
Minimum Lot Coverage	50 percent Page 10		
Maximum Lot Coverage	80 percent Page 10		
Off-Street Parking	Must be located to the side or rear of building or structure Page 10		

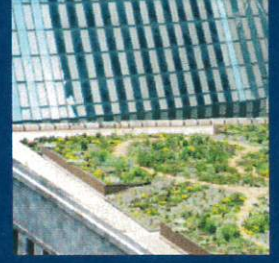
Category	Requirement	Project Details	Review Notes – Office Use Only
DESIGN STANDARDS			
Entrances	First floor entrances must face street. Page 22		
Building step-backs	20 foot street or common facing stepback required between first and third stories. Page 10-11		
Windows	50 percent of street facing facades, and 25 percent of upper story facades. Windows must be designed to standards described in the graphic. Page 22		
Landscaping	Specific street trees required. Submit plan for non-public spaces Page 12		
Garbage and Recycling	May not be closer than 10 feet from a property line, unless in a parking structure. Enclosures are required for waste containers outside of buildings. Page 21		

Category	Requirement	Project Details	Review Notes – Office Use Only
Building Materials	Stucco and EIFS are prohibited for use as materials on any façade visible from a right-of-way. Stone or brick must be 50 percent of ground floor, excluding windows, or 75 percent of ground floor, excluding windows, if the project is in the mill Center District		
Building Length	No single building may exceed 300 feet in length. Page 23		
Building Separation	Buildings must be separated by at least 10 feet. Page 25		
Facade Articulation	Rooflines shall vary every 100 feet. 3 foot depth façade depth variation requires for buildings longer than 100 feet. 2' foot other sides Page 23-24		
Plaza	Sites greater than one acre must have a plaza on the front, corner side, or side of the building. Page 23-24, 28		

Category	Requirement	Project Details	Review Notes – Office Use Only
Open Space	Defaults to lot coverage requirements. Residential open space to be 20 percent not including private balconies.		
Commercial Frontage	Page 28 100% of a ground floor along Mill Common		
	50% of a ground floor facing a street outside of Mill Common area Page 25		
Residential Amenities	3 required per 19,44,050 (11)		
Rooftop Gardens	Allowed in this case, subject to design standards. A ten-foot setback is required for any amenity feature on a roof deck, except for solar panels Page 6		
Balconies	All units must have a balcony of 60 sf and 5' depth. Page 24		
Utilities	Utilities must be buried underground. Page 32		

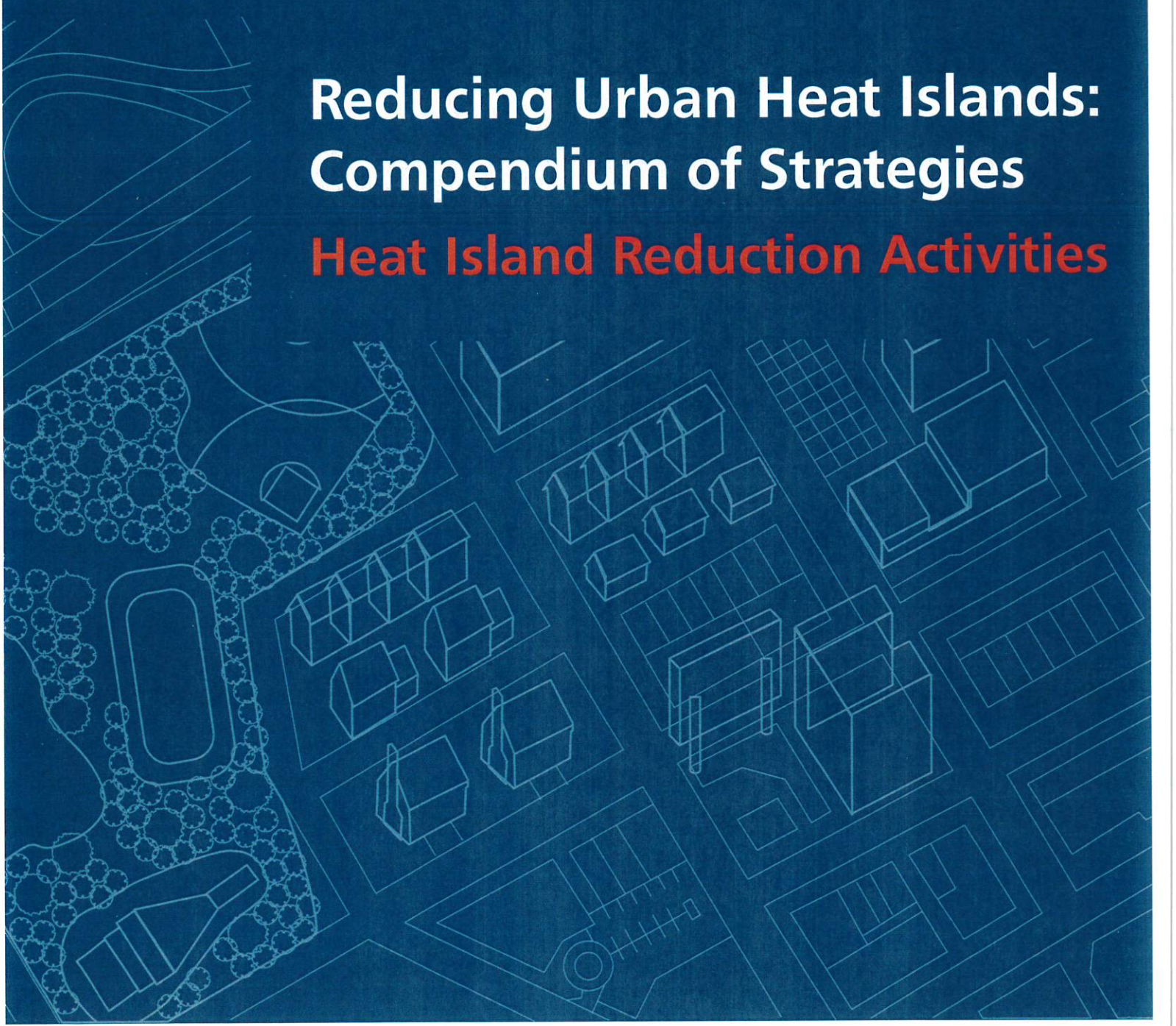
Category	Requirement	Project Details	Review Notes – Office Use Only
Management	24 hour onsite management required. Page 12, 19.44.050 (E)(17)		
Electric Vehicle Charging	Parking structures shall include one 220V electric vehicle charging station per each 10 stalls. 1 per garage in Townhouses Page 26		
Unit Storage	Each unit must provide 100 cuft of unit storage. Page 12, 19.44.050 (E)(24)		
Energy Efficiency	Rooftops must include solar for at least 50% of rooftop area. Page 31		

Category	Requirement	Project Details	Review Notes – Office Use Only
Requirement	1 per unit 1.5 per unit 1.5 per unit 0.33 per unit guest – Private driveways serving individual residences are not countable as guest parking space. 3 per 1000 sf commercial retail 3 per 1000 sf office	PARKING	
	Page 21		



Reducing Urban Heat Islands: Compendium of Strategies

Heat Island Reduction Activities



Acknowledgements

Reducing Urban Heat Islands: Compendium of Strategies describes the causes and impacts of summertime urban heat islands and promotes strategies for lowering temperatures in U.S. communities. This compendium was developed by the Climate Protection Partnership Division in the U.S. Environmental Protection Agency's Office of Atmospheric Programs. Eva Wong managed its overall development. Kathleen Hogan, Julie Rosenberg, and Andrea Denny provided editorial support. Numerous EPA staff in offices throughout the Agency contributed content and provided reviews. Subject area experts from other organizations around the United States and Canada also committed their time to provide technical feedback.

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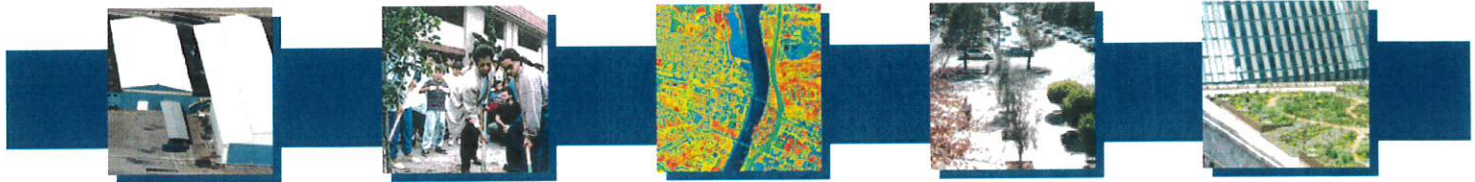
Experts who helped shape this chapter include:

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Heat Island Reduction Activities

Across the United States, a diverse group of stakeholders, from government agencies to corporations, have advanced urban heat island reduction strategies—urban forestry, green and cool roofs, and cool pavements—to lower summertime temperatures and achieve many energy and environmental benefits. Typically heat island mitigation is part of an energy, air quality, water, or sustainability effort,¹ and activities range from voluntary initiatives, such as cool pavement demonstration projects, to policy actions, such as requiring cool roofs via building codes. Some communities have elected to implement both voluntary and policy initiatives. These efforts can complement each other, and sometimes an initiative that begins as a voluntary activity becomes required over time.

This chapter draws from the experience of many different groups and covers a range of initiatives to highlight a variety of urban heat island reduction activities around the country. Examples for the following types of activities are included:

- Demonstration projects
- Incentive programs
- Urban forestry programs
- Weatherization
- Outreach and education
- Awards
- Procurement
- Resolutions
- Tree and landscape ordinances
- Comprehensive plans and design guidelines
- Zoning codes
- Green building standards
- Building codes
- Air quality standards.



Heat Island Mitigation Strategies

For more information on heat island reduction strategies, see the corresponding chapters of this compendium: “Trees and Vegetation,” “Green Roofs,” “Cool Roofs,” and “Cool Pavements.”

1. Voluntary Efforts

Most community strategies to reduce heat islands have relied on voluntary efforts, which can generally be grouped into the following categories:

- Demonstration projects
- Incentive programs
- Urban forestry programs
- Weatherization
- Outreach and education
- Awards.

Many groups choose to conduct just one kind of activity; others combine approaches. For example, some utilities have focused on cool roof rebates to encourage consumers to install reflective roofing products. Some local environment departments have sponsored demonstration projects, conducted outreach and education efforts to publicize results, and have provided grants to support use of mitigation technologies by residents and industry.

1.1 Demonstration Projects

Local governments, universities, and other organizations have used projects to demonstrate a specific heat island mitigation strategy and quantify its benefits in a controlled environment. Documenting the project and its results can provide the data and

publicity needed to develop larger initiatives, promote new technologies and help get them to market, and sometimes even encourage local economic development. (See the “Stimulating Local Economies and Businesses” textbox.)

Communities have found heat island demonstration projects to be most effective when they:

- **Target high-visibility projects.** Focusing efforts on a prominent building or site helps attract attention to heat island mitigation efforts.
- **Measure benefits.** Highlighting anticipated benefits and collecting data on actual impacts provides useful information for planning future activities. These benefits also illustrate to others the reasons and means to act.
- **Convey lessons learned.** Documenting how demonstration projects are conducted makes them easier to replicate and improve.

Lead By Example

“Lead by example” programs involve implementing strategies within local and state government facilities, operations, and fleets, where appropriate. These programs offer energy, environmental, and financial benefits while creating an important opportunity for governments to demonstrate the economic feasibility of the strategies they are promoting. This leadership can raise public awareness of the benefits of urban heat island reduction strategies, which can lead to increased public and private sector support for advancing them.

A variety of organizations can be the chief agents of change and the first to test alternative technologies, often in highly visible, public facilities. Demonstration projects have taken place in parks, schools, and municipal buildings like city hall. These projects often also monitor costs and benefits, such as energy savings. Examples include:

- **Chicago installed a green roof on its city hall** that includes 20,000 plants, shrubs, grasses, vines, and trees. The city expects to save directly more than 9,270 kilowatt-hours (kWh) per year of electricity and nearly 740 million British thermal units (Btu) per year of natural gas for heating. This energy savings translates into about \$3,600 annually, and savings will increase with higher energy prices. In addition to assessing energy impacts, the green roof has been designed to test different types of rooftop garden systems, success rates of native and non-native vegetation, and reductions in stormwater runoff. This city hall green roof has helped to raise the visibility of green roofs and to increase public understanding of them. Chicago's Department of Environment staff has frequently given presentations about the roof, which has won numerous awards. For further information, go to <<http://egov.cityofchicago.org>> and look under the Department of Environment's City Hall green roof project.
- A demonstration project for **Tucson documented how a cool roof reduced temperatures** inside and on the roof of the building and saved more than 400 million Btu annually in energy. A white elastomeric coating was installed over a 28,000-square foot (2,600 m²), unshaded metal roof on one of the city's administration buildings. Following the installation, energy savings were calculated at 50 to 65

Figure 1: Chicago City Hall Green Roof



Katrin Barth-Scholz/Department of Energy

Chicago's commitment to green roofs includes demonstration projects, such as on its City Hall, education, incentives, and policy actions.

Stimulating Local Economies and Businesses

The non-profit group Sustainable South Bronx has developed several goals for the green roof/cool roof demonstration project on top of its office building in Hunts Point. These goals include gathering research on local benefits, establishing a resource for the community, educating New Yorkers on the value of green roofs, and advocating sustainable building practices. The demonstration project has become a springboard for developing a local green and cool roof installation company to provide employment opportunities in the South Bronx area. The group's business is called SmartRoofs and includes a job-training program for local residents. See <www.ssbx.org/greenroofs.html> for more information.

percent of the building's cooling energy—an avoided energy cost of nearly \$4,000 annually. See <www.swenergy.org/casestudies/arizona/tucson_topsc.htm> for more information.

1.2 Incentives

Incentives have proven to be an effective way to spur individual heat island reduction actions. Incentives from governments, utilities, and other organizations can include below-market loans, tax breaks, product rebates, grants, and giveaways. For example:

- Since 2006, **Baltimore County's Growing Home Campaign has provided \$10 coupons** to homeowners toward the purchase of most trees at local nurseries. Each coupon represents \$5 of public funds and \$5 of retail funds. In order to validate their coupons, homeowners provide information including tree type and location planted, which allows the county to integrate the data with future tree canopy studies. The county began the program as an innovative way to increase tree canopy cover as part of its larger "Green Renaissance" forest conservation and sustainability plan. In the first two months of the program, 1,700 trees were planted. See <http://fpum.org/pdf/MD%20managing_forest_resources.pdf> and <www.baltimorecountymd.gov/Agencies/environment/growinghome/index.html> for further information.
- Since 1990, the **Sacramento Municipal Utility District (SMUD) has partnered with the Sacramento Tree Foundation to provide more than 350,000 free shade trees** to residents in the Sacramento area. This program encourages residents to strategically plant vegetation around their homes to reduce energy consumption. Homes with an eastern, western, or southern exposure that heats up during the summer are eligible for this program. SMUD provides trees between four and seven feet tall (1.2-2.2 m), as well as stakes, ties, fertilizer, tree delivery, and expert advice on tree selection and planting techniques free of charge. Homeowners must agree to plant and care for the trees. See <www.smud.org/residential/trees/index.html> for more information. SMUD also offers rebates to residential customers who use cool roofing technologies. The utility offers a 20-cent-per-square-foot (0.09 m²) rebate to customers who own single-family, multi-family, or mobile homes with flat roofs and who install ENERGY STAR® cool roof products.
- After the success of its green roof demonstration project, **Chicago established green and cool roof grant programs**. The green roof program cites the ability of green roofs to "create energy savings for building," "lower surrounding urban heat temperatures," and "reduce storm water runoff, improve water quality, and create conditions for longer-lasting roof systems." Similarly, the city recognizes cool roofs "not only help reduce cooling costs, but can also have a positive environmental impact by reducing the urban heat island effect." In 2005, its first year, the program supported 20 green roof installation projects; in 2006, it helped fund 40. In the fall of 2007, the city announced that it was expanding the program to include cool roofs and expected to provide about 55 \$6,000 grants. Recipients can use grants for residential, commercial, or industrial buildings. See <<http://egov.cityofchicago.org/>>, under the Department of Environment portion of the website, for more information.

- The **Pennsylvania Department of Environmental Protection's Energy Harvest Program** has been providing grants for specific energy saving projects since 2003. In 2007, it dispensed more than \$500,000 to green roof projects across the state. The Energy Harvest Program overall aims to deploy innovative technologies and encourages "proposals that are market-driven, create jobs, and produce economic development within the Commonwealth." See Energy Harvest Program information available at: <www.depweb.state.pa.us/energy/site/default.asp>.
- In addition to green roofs, building owners can also install vertical gardens—sometimes referred to as green or living walls—on exterior walls to shade buildings and provide evapotranspiration.² The **Houston Downtown Management District (HDMD) Vertical Gardens Matching Grant initiative** first gave grants in 2007 to encourage plantings that cover walls. The grants also support exceptional landscaping that adds significant evapotranspiration and shade for blank walls, parking garages, and sidewalks. The program goals include improving overall aesthetics, pedestrian comfort, air quality, and reducing the heat island effect. Grants cannot exceed half of the total project cost or \$20,000, and contributions can be in kind. Tenants, property owners, and registered non-profits can all apply. See <www.houston-downtown.com/Home/Business/DoingBusiness/DevelopmentAssistance/Development%20Assistance.PDF>.
- Since 2002, **Austin Energy** has given **10-cent-per-square-foot rebates for cool roof installations**. Customers must use cool roof products that have a minimum reflectivity of 75 percent, and the project must pass a cost-benefit

analysis. The utility has been promoting cool roof products as a cost-effective and low-risk approach to reducing cooling loads and peak demand. As of 2005, Austin Energy had awarded more than \$164,000 as rebates, representing more than 1.5 million square feet (140,000 m²) of roof area and saving an estimated 1.25 million kWh of energy. See <www.austinenergy.com/Energy%20Efficiency/Programs/Rebates/index.htm> for more information.

Energy Incentives

The Database of State Incentives for Renewables and Efficiency (DSIRE) provides current information on state, local, utility, and select federal incentives that promote renewable energy and energy efficiency. Some of the incentives listed, particularly those that involve energy efficiency and green building practices, include heat island reduction strategies. See <www.dsireusa.org>.

1.3 Urban Forestry Programs

Urban forestry or tree planting programs exist in most large cities and counties in the United States. These programs generally have broad goals that emphasize the multiple benefits trees can provide, including helping to cool cities. Most of these programs unite diverse stakeholders, and their efforts range from short-term, one-time projects to long-term community revitalization. Moreover, many states give grants to communities and organizations that promote or maintain urban forests. For example, Wisconsin will disburse \$530,000 in roughly 40 grants in 2008 as part of a program it has operated since 1993; South Dakota has run a similar program since

1991.^{3,4} As of early 2008, the Washington State legislature was working on several bills that would support and expand local urban forestry efforts in recognition of how urban trees and vegetation improve air quality, reduce temperatures, enhance quality of life, and reduce and filter stormwater runoff.⁵

Frequently, urban afforestation focuses on low-income communities, where tree cover is sparse. For example:

- The **Pennsylvania Department of Conservation and Natural Resources** oversees a project called **TreeVitalize**, which brings together county and local

governments, foundations, trade associations, and private industry to restore tree cover in the southeastern part of the state. TreeVitalize aims to plant more than 20,000 trees in approximately 40 neighborhoods in Bucks, Chester, Delaware, Montgomery, and Philadelphia counties. The \$8 million program targets neighborhoods in older cities, boroughs, and townships in which tree cover is below 25 percent. See <www.treevitalize.net/> for more information.

- **Groundwork Elizabeth**, a nonprofit group in Elizabeth, New Jersey, **works to involve neighborhood residents** in community revitalization projects,

Tree Maintenance and Education

Many urban forestry programs explain that it is easy to plant trees but difficult to maintain them, particularly until they become well established. In order to ensure most trees survive, programs have enlisted and empowered volunteers to care for trees until they are established. Community participation is important because most urban trees are not under public jurisdiction.

Often tree planting programs train participants in proper tree planting techniques and care. In Pennsylvania, TreeVitalize provides nine hours of classroom and field training to community residents who want to become urban forestry leaders. The classes cover tree identification, planting, pruning, mulching, tree biology/physiology, proper species selection, community tree care, and proper pruning. Residents also can learn how to organize community-assisted tree planting projects. Graduates are eligible to participate in advanced training and other events.

Other programs require community members to pledge to maintain and protect the trees that are planted. For example, Los Angeles residents interested in free trees from the Trees for a Green LA program first participate in an online or neighborhood workshop. Then, they complete a site plan and apply for their free trees. Residents pledge on their applications to plant and care for the trees in a proper manner and allow the city to inspect their work for overall program evaluation and quality assurance. See <www.ladwp.com/ladwp/cms/ladwp000744.jsp>.

Please see the “Trees and Vegetation” chapter of this compendium for more information about urban forestry benefits and implementation considerations.

including tree planting at local schools and parks. The organization was instrumental in getting Elizabeth involved in New Jersey's Cool Cities Initiative, which aims to plant trees primarily in the large cities of New Jersey with low tree coverage. See <www.groundworkelizabeth.com> for more information.

1.4 Weatherization

Communities have used weatherization programs as an opportunity to mitigate heat islands, protect public health, and save energy. Weatherization usually involves making the homes of qualifying residents, generally low-income families, more energy efficient at no cost to the residents. States use weatherization funds provided by the U.S. Department of Energy (DOE) Weatherization Assistance Program to help recipients cover heating bills and invest in energy efficiency actions that lower costs. States can also use the funds to install cooling efficiency measures, such as screening and shading devices.

The **Energy Coordinating Agency (ECA) of Philadelphia**, which administers the city's weatherization services, **has applied cool roof coatings** as part of its package of energy efficiency treatments. Through its Cool Homes Program, more than 550 residences in the Philadelphia area have had their roofs coated. ECA commissioned a study that found the cool coatings and increased insulation eliminated 90 percent of the heat gain through the ceiling, reducing top-floor ceiling temperatures by an average of 4.7°F (2.6°C) and chest-height temperatures by 2.4°F (1.3°C). These reduced temperatures lowered air conditioning loads by about one-third in a typical rowhouse.⁶ See <www.ecasavesenergy.org/ses/whiteroof/roof-coolhomes.html> for more information.

Heat Health—An Opportunity to Advance Heat Island Mitigation Strategies

Several large cities have developed programs to minimize health impacts from excessive heat events. These efforts provide an opportunity to educate communities about urban heat islands and promote heat island reduction strategies, particularly shade tree planting and cool roof applications, as a long-term mitigation or adaptation strategy. For example, Philadelphia has long been concerned with reducing heat-related mortality. The city was the first in the United States to implement a Heat Health Watch-Warning System, which has become a worldwide model for heat wave forecasting.

When the Philadelphia Public Health Department educates citizens about excessive heat events and immediate counter-measures, such as using telephone heat hotlines and taking advantage of public air-conditioned buildings, or “cooling centers,” it also provides them information about longer-term heat island reduction strategies.

EPA's *Excessive Heat Events Guidebook* explains how local public health officials and others can assess their vulnerability and develop and implement notification and response programs. See <www.epa.gov/heatisland/about/heatguidebook.html>.

1.5 Outreach and Education Programs

Almost all communities have found that heat island reduction efforts involve some element of outreach and education. For example, **TreeUtah has launched a comprehensive initiative, the MetroGreening Program, that uses advertising, outreach, and educational workshops** to help promote proper planting and maintenance of trees to reduce heating and cooling costs, diminish the heat island effect, and achieve other benefits in Utah's most densely-populated regions. See <www.treeutah.org/statewide.htm> for more information.

Further, the Utah State Energy Program, Utah Department of Natural Resources, and the National Energy Foundation worked together to create the **Utah Kool Kids program to teach elementary and secondary age students about urban heat islands, their impacts on energy and air quality, and heat island reduction strategies.** The program gives teachers lesson plans, overheads, test questions, experiments, and research tools to engage students. See <<http://www.nef1.org/ea/kool.html>> for more information.

Some outreach and education programs focus specifically on reaching students. The **Cool Schools program in Los Angeles teaches students to become environmental stewards** through hands-on and classroom experience. Through the project, students have helped plant hundreds of trees around Los Angeles schools. Cool Schools creates an opportunity to teach lessons on biology, botany, horticulture, and related topics. See <www.ladwp.com/ladwp/cms/ladwp001087.jsp>.

1.6 Awards

Governments, community groups, and corporations have rewarded exemplary work as a way to highlight innovation and promote solutions to mitigate heat islands across the public and private sectors. Examples of award programs include:

- **Home Depot Foundation's Awards of Excellence for Community Trees.** Since 2005, this foundation has recognized public/private collaborations for their leadership and development of successful tree planting initiatives. Winning projects in large and small city categories receive \$75,000 and runners-up receive \$25,000. Though the city and nonprofit winners are both recognized, the award money is given to the nonprofit for continued tree planting work.
- **Green Roofs for Healthy Cities' Green Roofs Awards of Excellence.** Since 2003, this nonprofit has recognized a variety of green roof projects for integrated design and implementation. The program rewards extensive and intensive green roof projects, as well as research teams and citizens who have advanced the implementation of green roofs through public policy.
- **ENERGY STAR Awards.** Since 1993, EPA has hosted the ENERGY STAR Awards to recognize outstanding participants in the ENERGY STAR Program. National Coatings Corporation, a manufacturer of cool roof materials, was recognized in 2000. The San Diego Unified School District (SDUSD) won an award in 2007 because more than 140 of its 200 buildings met ENERGY STAR criteria. Some of those buildings included cool roofs combined with photovoltaic cells that could produce more than 3.5 MW of electricity.⁷

Figure 2: Cool Roofs with Solar Panels in San Diego



The San Diego Unified School District won an ENERGY STAR award in 2007 because almost 70 percent of its buildings, including this elementary school with a cool roof and solar panels, met ENERGY STAR specifications.

- **EPA's Regional Office in New England's Environmental Merit Award Program.** For more than 30 years, EPA Region 1 has honored teachers, citizen activists, business leaders, scientists, public officials, and others who have made outstanding contributions to public health and the natural environment. Awards are given across environmental disciplines and have highlighted heat island reduction strategies, such as cool roofs. In 2005, Sarnafil Roofing Systems, Inc., received a Merit Award for its highly reflective roofing products.⁸

2. Policy Efforts

Some local and state governments have included urban heat island mitigation strategies in policies or regulations, which range from purchasing guidelines to building codes. A number of these actions have helped remove barriers or provide incentives for implementing mitigation strategies. Others have prescribed minimum requirements, especially for new construction. Policy efforts can include:

- Procurement
- Resolutions
- Tree and landscape ordinances
- Comprehensive plans and design guidelines
- Zoning codes
- Green building standards
- Building codes
- Air quality standards.

2.1 Procurement

Many local governments interested in mitigating heat islands started by procuring cool technologies for municipal buildings. Since state and local governments usually put construction work and material supplies out for bid, they can revise bid specifications to include cool products.

For example, **Tucson, Arizona, requires that air-conditioned city facilities use cool roofing materials** for most new construction and roof replacements. The city revised its general bid criteria to ensure that materials used are equivalent to those on the ENERGY STAR Roofing Products list. When a local government requires contractors to use cool products in this manner, it becomes easier to encourage additional use of these products on private projects.

After successfully demonstrating the use of permeable pavements, Chicago began a Green Alley initiative that encourages use of porous paving whenever an alley needs to be re-paved. Forty-six alleys were renovated under this initiative in 2007, and ultimately, almost 2,000 miles of alleyways will be made permeable. The "Chicago Green Alley Handbook" can be found through the website < <http://egov.cityofchicago.org/> > under the City Department of Transportation programs.

Figure 3: Permeable Pavement in Chicago Alley



Raking gravel into a Gravelpave2 system.

2.2 Resolutions

A resolution is a document stating a group's awareness of and interest in an effort, such as a heat island mitigation project. Generally, a city or county council, or organizations such as air quality boards or planning commissions, issue resolutions. A resolution does not necessarily indicate that a program will be supported financially, but it can be the first step in getting an initiative started.

In May 2001, **the Austin City Council adopted a heat island mitigation resolution** that committed the city manager to review recommendations for a variety of activities to diminish heat islands. In September of that year, the city council awarded \$1 million toward implementing the recommendations, which ranged from developing a cool roof strategy to increasing enforcement of the city's tree-saving ordinance. See <www.ci.austin.tx.us/trees/res_985.htm> for more information.

In October 2006, **Annapolis, Maryland, adopted a comprehensive energy efficiency resolution** that included general goals and specific long-term targets for adopting a range of energy efficiency measures. One recommendation was to

Model Resolutions and Policies

The International Council for Local Environmental Initiatives (ICLEI), a nonprofit organization, runs an Urban Heat Island Initiative program that provides assistance to local governments. ICLEI hosts a website <www.hotcities.org> that provides policy information, such as sample language for developing a heat island resolution and a model policy framework.

ICLEI works with local governments to coordinate workshops throughout the United States to help understand heat island impacts and mitigation strategies. These workshops can help communities develop a heat island mitigation project or program. See <www.hotcities.org/Workshops/index.htm> for more information.

increase tree shading so that the city could sequester carbon dioxide (CO₂), reduce the urban heat island effect, and lower ozone levels. In 2007, the city adopted a new tree protection ordinance as one step towards protecting existing shade trees, discussed below. See <www.annapolis.gov/upload/images/government/council/Adopted/R3806.pdf> for more information.

2.3 Tree and Landscape Ordinances

Many local governments have enacted tree and landscape ordinances, which can ensure public safety, protect trees or views, and provide shade. Three types of ordinances, in particular, are most useful from a heat island perspective: tree protection, street trees, and parking lot shade.

Tree Protection

Tree protection ordinances prohibit the removal or pruning of trees without a permit. Often, these ordinances apply only to native trees or trees with historical significance. The effectiveness of this type of provision depends on enforcement and how strict the requirements are for granting tree removal permits.

Some ordinances protect not only trees but also the ground under the crown area of a tree to prevent root damage. An ordinance in **Atlanta, Georgia, for example, requires that at least 16 square feet (1.5 m²) of soil around the tree must remain unpaved** and open to the air. Toxic chemicals also must be kept away from the trees. These ordinances are less common than those that simply restrict removal.

Another approach, often linked to a local government's subdivision or development code, is protecting tree stands during new construction. In this case, developers are required to preserve tree stands during site design and protect them once construction commences. The ordinances can require protection based on the percentage of a site, or a minimum point value, with larger, mature trees earning more points.

Annapolis, Maryland, explicitly recognized the environmental value of trees and acted to protect them during construction. The "Tree Protection Ordinance" requires a survey of trees on a proposed development site and fences or other means to mark and protect designated trees during construction. The ordinance also prohibits certain activities, such as trenching or grading, within the dripline of trees, unless specific precautions are followed. More information on this ordinance is available under §17.09 City Code at <http://bpc.iserver.net/codes/annapolis/>.

Figure 4: Fences Protect a Tree During Construction



Fences can protect not just a tree's trunk and branches, but also its root system during construction.

San Antonio, Texas, requires different levels of tree protection based on tree class or location. The ordinance classifies significant trees, heritage trees, and trees within the 100-year floodplain. For example, heritage trees (defined, for most species, as trees 24 inches [60 cm] or greater in diameter at breast height [DBH]), must be preserved. The ordinance, however, generally counts total tree diameter-inches at a site, not individual trees, and gives flexibility in preservation: up to 90 percent of the tree-diameter-inches can be considered preserved if the developer plants an equal or greater number of tree-diameter-inches elsewhere. Developers can also fulfill the preservation requirement by contributing to the city's tree fund. For details, see the ordinance and its amendments at <http://epay.sanantonio.gov/dsddocumentcentral/upload/2003%20Tree%20Preservation%20Ordinance.pdf> and <http://epay.sanantonio.gov/dsddocumentcentral/upload/Revised%20Tree%20Amend%2011-06.pdf>.

Street Trees

Street tree ordinances generally govern how to plant and remove trees along public rights-of-way and land that is privately

owned but accessible by the public. At a minimum, these ordinances designate the numbers or types of trees that should be planted. More effective street tree policies include guidelines on tree selection, installation, and maintenance to lengthen a street tree's life and minimize problems with pavement, electrical wires, and buildings.

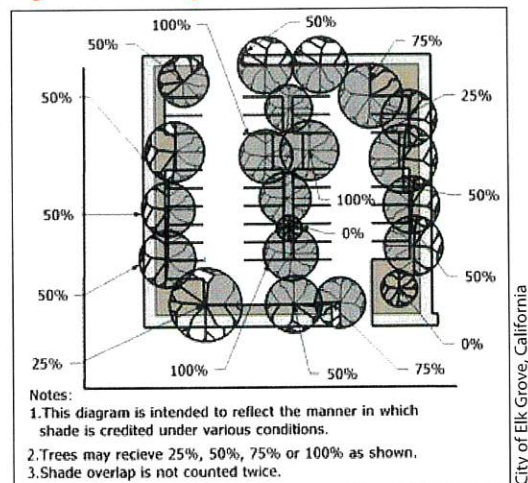
For example, **Orlando, Florida, specifies that trees must be planted along both sides of a street**, with one tree every 50 to 100 feet (15-30 m). The selected trees must eventually be capable of reaching a minimum height of 40 feet (12 m) and a crown spread of 30 feet (9 m). The ordinance is available at <www.municode.com/resources/gateway.asp?sid=9&pid=13349>.

Seattle requires a street use permit before landscaping in a planting strip in a public right-of-way. For street trees, the strip must be at least 5 feet (1.5 m) wide, unless specific approval from the city's arborist is received. Five feet is generally recommended as the minimum width for planting most trees. A guide is available to help property owners select and plant trees in accordance with the city's requirements. See <www.seattle.gov/transportation/tree-planting.htm> for further information.

Parking Lot Shade

Some communities require parking lots be shaded to cool pavement and cars, which increases comfort, reduces the heat island effect, and lowers evaporative emissions from parked cars. For example, since 1983, **an ordinance in Sacramento's zoning code has required that enough trees be planted to shade 50 percent of new, or significantly altered, parking lots** after 15 years of tree growth. A 2001 study found that the lots were only achieving about 25 percent shading because sometimes shade was double-counted, trees did not grow to their expected size under the conditions

Figure 5: Parking Lot Shade Guidelines



Shade diagrams, such as this one from Elk Grove, California, help determine if planned or actual vegetation meet the communities guidelines.

of the lot, or trees were not adequately dispersed.⁹ Thus, Sacramento modified its code in 2003 to improve coverage.¹⁰

Chicago has a landscape ordinance that requires planting trees or shrubs on parkways and landscaping parking lots, loading docks, and other vehicular use areas, both within the sites themselves and to screen their perimeter. The ordinance applies to most new building construction, as well as to repairs, remodeling, and enlargements of a particular size and cost. The Bureau of Forestry, which maintains the standards, must inspect and approve all parkway vegetation prior to planting. The Chicago Department of Zoning reviews all building and zoning permit applications to ensure compliance with the ordinance. See <http://egov.cityofchicago.org/webportal/COCWebPortal/COC_EDITORIAL/11_Landscaping_and_Screening.pdf>.

In 2007, the city of **Baton Rouge strengthened its landscape ordinance**, which requires tree planting on all new developments, excluding single-family residences. The ordinance requires two shade trees for every 5,000 square feet (465 m²) of site, and

one shade tree per 600 square feet (55 m²) of street frontage. Parking lot requirements include one shade tree per 15 parking spaces for a lot with one to 25 spaces; one shade tree per 12 parking spaces for a lot with 25 to 100 spaces; and one shade tree per 10 parking spaces for a lot over 100 spaces. For example, a 10,000-square-foot (465 m²) site with 600 square feet (55 m²) of storefront and 150 parking spaces would require 20 shade trees (i.e., four for the square footage of the site, one for the store frontage, and 15 for the parking lot). For more information on Ordinance 12692, see the city's information bulletin at <<http://brgov.com/dept/planning/udc/pdf/Chapter18.pdf>>.

2.4 Comprehensive Plans and Design Guidelines

Comprehensive plans and design guidelines are another way that communities have incorporated opportunities to promote heat island reduction. Comprehensive plans, sometimes called general plans in California and other states, are adopted by a legislative body of a local government, and set forth policies, goals, and objectives to direct development and conservation that occurs within its planning jurisdiction. They generally have a broad scope and long-term vision. Design guidelines provide a connection between general planning policies and implementing regulations, such as zoning codes and subdivision regulations. Design guidelines convey a sense of the preferred quality for a place by being descriptive and suggestive.

The “**Environmental Planning Element**” in the **Gilbert, Arizona, general plan lists mitigating heat islands as a core goal**. Specific policies under the goal include: 1) developing criteria that will identify projects that might contribute to the heat island effect and will require an evaluation of mitigation techniques; 2) seeking sponsors such as educational institutions,

utility companies, and government entities to promote heat island awareness among landowners, developers, engineers, and architects; and 3) promoting design concepts using engineered green space to maximize shading of surfaces that tend to heat up, promote education and awareness of cool roof materials and construction techniques, and promote alternative pavement technologies in parking areas. For more information see <www.ci.gilbert.az.us/generalplan/chapter07.cfm>.

Design guidelines can take a holistic approach to heat island mitigation or specific mitigation strategies. For example, **Toronto’s Official Plan includes policies to reduce the urban heat island and achieve a wide range of environmental gains**. As part of that plan, the city released draft parking lot guidelines in November 2007 that call for shade trees, permeable and reflective pavements, and other design features to manage stormwater, reduce energy consumption, and lower urban temperatures.¹¹

The town of **Highland, Utah, created a master plan for a 50-acre (200,000 m²) overlay zone** to be privately developed as a town

Figure 6: Portland Eco-Roof



The Portland Bureau of Environmental Services (BES) has a green roof on its headquarters. The city allows denser development for projects that use green roofs, or eco-roofs as the city calls them.

center. The city design guidelines for the zone recommended several heat island mitigation elements, including reflective roofing, reflective parking lot surfaces, and landscaping. Those guidelines were then adopted into the zoning requirements for the town center.

In contrast, **Portland, Oregon, has focused on the use of eco-roofs** in the city center district, primarily for their aesthetic and stormwater management benefits. Design guidelines call for integrating vegetated roofs into central city projects. As discussed in the next section, Portland has taken specific steps in its zoning code to achieve this result.

2.5 Zoning Codes

Zoning codes implement the goals and objectives of a comprehensive plan. These regulations generally dictate function for an area, building height and bulk, population density, and parking requirements. Zoning codes can also promote heat island mitigation strategies in various ways. For example, as noted in Section 2.3, cities such as Sacramento have adopted parking lot shading requirements as part of their zoning codes.

Communities have also allowed density bonuses for construction that adopts mitigation strategies. In 2001, **Portland, Oregon, modified its zoning code to include an “eco-roof development bonus”** for developers to install rooftop gardens or “eco-roofs.” In Title 33 of the Zoning Code there is a floor area ratio bonus for projects that install eco-roofs in Portland’s central district. The bonus amount depends on the extent of the eco-roof coverage. If the eco-roof covers 60 percent or more of the roof surface, developers can build an additional 3 square feet (0.3 m²) for each square foot of green roof. If the green roof covers a lower percent of the surface, the bonus is reduced. See Section 33.510 of the code at <www.portlandonline.com/shared/cfm/image.cfm?id=53363> for specific information.

Chicago also has a similar provision, with the floor area ratio density bonus based on the amount by which a green roof exceeds 50 percent of the roof surface.

2.6 Green Building Programs and Standards

Green building initiatives place a high priority on human and environmental health and resource conservation over the life cycle of a building. Many local, state, and federal governments have adopted green building programs, or standards, that capture heat island reduction strategies.

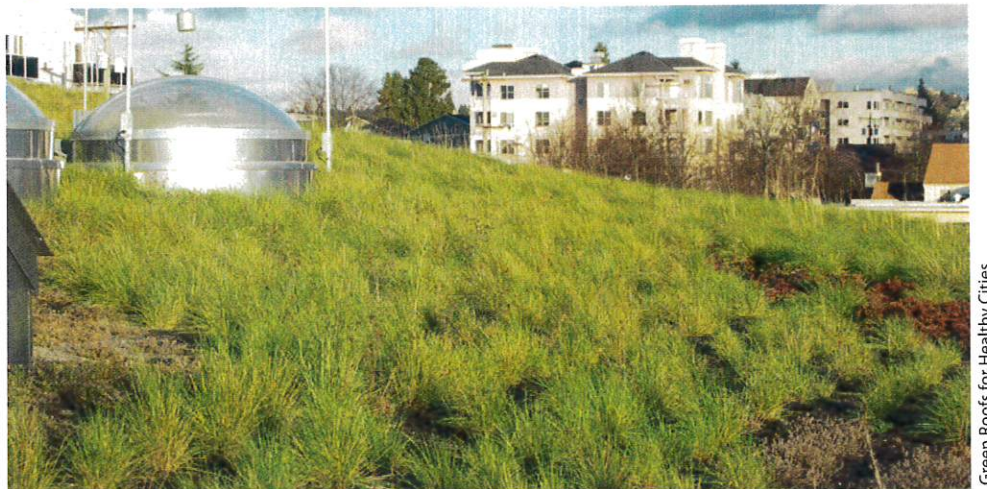
For example, local governments such as **Arlington, Virginia, and San Jose, California**,¹² are basing their municipal green building requirements on the **U.S. Green Building Council (USGBC) Leadership in Energy and Environmental Design (LEED) Rating System™**. **Green Globes**, operated by the Green Building Initiative (GBI) in the United States, is another rating system that communities are using. The **Canadian government** requires all federal buildings to meet the Canadian version of Green Globes, **Go Green** and **Go Green Plus**. States like **Arkansas and Maryland recognize both LEED and Green Globes** in their green building initiatives. Under both rating systems, buildings can earn credits towards certification by providing shade vegetation, installing cool or green roofs, and using highly reflective and emissive pavements or permeable paving products, all measures that reduce the heat island effect.

Specific to homes, programs such as **EarthCraft House**, created by the Greater Atlanta Home Builders Association and Southface Energy Institute, award points for residences that preserve and plant trees, install ENERGY STAR cool roof products, or use permeable pavement. In addition, EarthCraft Houses must meet ENERGY STAR certification. Communities from **Virginia to Florida have constructed EarthCraft homes**.

Seattle Green Factor

Seattle has adopted minimum landscape requirements, known as the Seattle Green Factor, for new developments in commercial areas in the city. This program requires that, as of late January 2007, certain new developments in neighborhood business districts must provide for vegetative cover on the equivalent of 30 percent of the applicable property. The regulations apply to developments with more than four dwelling units, more than 4,000 square feet (370 m²) of commercial uses, or more than 20 new parking spaces. Developers can use a menu of strategies, including planting new trees, preserving trees, and installing green roofs and green walls to meet this target. The regulations are part of the city's Commercial Code and encourage planting of layers of vegetation and larger trees in areas visible to the public. The rules also include bonuses for harvesting rain water and choosing plants that need less water. The city has developed a worksheet to help applicants calculate a "score" that indicates whether various mixes of landscaping measures meet the requirements, which will allow developers to try different combinations of features. See <www.seattle.gov/dpd/permits/greenfactor/> for more information.

Figure 7: Seattle Public Library



Green Roofs for Healthy Cities

Seattle promotes green roofs, such as this one on a city library, through its Green Factor program.

Meanwhile, since 1996, the city's Neighborhood Matching Fund program has provided more than 17,200 trees to more than 600 neighborhood groups for Seattle's streets and parks, and the city has established the Emerald City Task Force, which advises the city on incentives and policies to encourage private property owners—residential and commercial—to improve their land by preserving existing trees and planting new ones. See <www.seattle.gov/trees/> for more information.

Further, the **National Association of Home Builders** is working with the **International Code Council** to develop a **national green building standard for homes** that captures heat island reduction strategies as well.

Whereas the above efforts allow building owners to choose technologies and do not guarantee that heat island reduction strategies will be included in the mix, **some communities, such as Frisco, Texas, have gone so far as to require cool roofs in their commercial green building programs.** In late 2006, the Frisco City Council approved requirements for most new commercial construction to install ENERGY STAR labeled cool roof products.

2.7 Building Codes

Building codes are regulations adopted by local and state governments that establish standards for construction, modification, and repair of buildings and other structures. An energy code is a portion of the building code that relates to energy usage and conservation requirements and standards (see <www.energycodes.gov>). Some cities and states have begun including cool roofing in their building codes because of its potential to save energy, particularly during peak loads. For example:

- In January 2003, **Chicago amended its energy code to require roof installations on or prior to December 31, 2008, to meet a minimum solar reflectance of 25 percent.** The amendments apply to most air-conditioned buildings with low-sloped roofs. After December 31, 2008, contractors must use roofing products that meet or exceed the minimum criteria to qualify for an ENERGY STAR label.
- **Georgia was the first state to add cool roofs to its energy code, in 1995.** Georgia allows a reduced roof

The Foundation for Including Cool Roofs in Energy Codes

The American Society of Heating, Refrigerating, and Air-conditioning Engineers (ASHRAE) has developed energy-efficient design standards that provide minimum requirements for both commercial and residential buildings. The ASHRAE standards underlie most state building and energy codes. ANSI/ASHRAE/IESNA Standard 90.1-1999, *Energy Standards for Buildings Except Low-Rise Residential Buildings*, and ANSI/ASHRAE Standard 90.2-2001, *Energy-Efficient Design of Low-Rise Residential Buildings*, provide guidelines for new equipment, systems, and buildings. These standards originally were developed in response to the 1970s energy crisis and now include credits pertaining to cool roofing. For example, Addendum f to 90.2-2001 allows high-albedo roofs in hot and humid climates as part of the energy efficiency ceiling calculation for a residential building.

insulation level if a cool roof with a 75 percent minimum solar reflectance and 75 percent minimum thermal emittance is installed.¹³ Note that if building owners install a cool roof and simultaneously reduce insulation, there may be no net energy savings.

- **Florida also gives cool roofs credit** in its building energy code. Buildings using a roof with 70 percent minimum solar reflectance and 75 percent minimum thermal emittance are eligible to reduce the amount of insulation needed to meet building efficiency standards, as long as a radiant barrier

is not also installed in the roof plenum or attic space.

- In response to electrical power shortages, **California added cool roofs as an energy efficiency option to its building energy code** (Title 24) in 2001. The code defines a cool roof as having a minimum solar reflectance of 70 percent and minimum thermal emittance of 75 percent, unless it is concrete or clay tile, in which case it can have a minimum solar reflectance of 40 percent. This 40-percent rating incorporates new cool-colored residential products into the standard. In 2005, these cool roof provisions became mandatory requirements for all new non-residential construction and re-roofing projects that involve more than 2,000 square feet (180 m²) or 50 percent replacement.¹⁴ The code allows owners to meet these requirements in a variety of ways.
 - The simplest approach is to apply a cool roof that meets the minimum requirements.
 - Another alternative is to use roof products that do not meet the cool roof criteria and then offset the reduced performance levels by implementing other measures, such as insulation and window improvements, that exceed minimum requirements.
 - The third, and most flexible option, is to use whatever methods are deemed practicable as long as the code's specific performance goal is reached. In this scenario, the building owner creates a model of all the characteristics that affect the energy consumption of the building to determine the mix of measures that will meet the code criteria. The California Energy Commission provides computer software for this compliance option.

Cool Roofs in California

California has a long history of supporting cool roof research and implementation to alleviate peak energy demand. In 2001, the state passed legislation that activated emergency measures, including cool roofs, to reduce peak demand and mitigate the energy crisis. The cool roofs program was subsequently formalized as the Cool Savings Program, which provided rebates to building owners for installing roofing materials with high solar reflectance and thermal emittance. The highest rebate went to roofs on air conditioned buildings, while buildings with rooftop ducts and other non-residential buildings were eligible for a slightly lower rebate. The program was administered by the California Energy Commission but implemented by five organizations directly responsible for promoting the program, recruiting customers, verifying project completion, and paying incentives of 15 to 25 cents per square foot (0.09 m²) of eligible roofing area. The program was so successful that California revised Title 24 to make cool roofs on certain new or renovated buildings mandatory starting in 2005.

California began the process of updating Title 24 in late 2005, with final revised standards due in 2008. As part of this update, California is investigating extending cool roof requirements to houses and buildings with steep-sloped roofs. See www.energy.ca.gov/title24/2005standards/index.html and www.energy.ca.gov/title24/2008standards/index.html for further information.

2.8 Air Quality Requirements

As summertime temperatures rise, the rate of ground-level ozone formation, or smog, increases. By lowering temperatures, urban heat island mitigation strategies can help reduce ground-level ozone concentrations. Many cities and counties are struggling to attain national ambient air quality standards (NAAQS), particularly for ground-level ozone. Most of these areas have adopted a wide range of emission control strategies on traditional air pollution sources and are seeking innovative ways to further reduce air pollution levels. Communities are considering urban forestry and cool roofs, in particular, as technologies that can help them reach attainment.

Under the Clean Air Act, State Implementation Plans (SIPs) are federally approved and enforceable plans that identify how each state will meet and maintain federal air quality standards. **EPA has developed three policies that help states to include heat island reduction strategies in their SIPs.** See the “Policies to Advance Heat Island Mitigation in SIPs” textbox.

A few areas have been working to include heat island reduction strategies in their SIPs, including Atlanta, Houston, Sacramento, and the Washington D.C. metropolitan area. In 2006, **Sacramento secured a large Congestion Mitigation and Air Quality (CMAQ) Improvement Program grant to work on including urban forestry in its SIP.** The project, known as the Urban Forests for Clean Air demonstration project, involves the Sacramento Tree Foundation, the USDA Forest Service, the Sacramento Area Council of Governments, and the Sacramento, El Dorado, Placer, and Feather River Air Districts. The project includes three phases: 1) initial estimates of the effects of the urban forest on air quality; 2) development of improved models to analyze these impacts; and 3) a final report on the findings. Under the first phase,

Heat Island Mitigation Strategies Reduce Ground-Level Ozone

Ground-level ozone forms more readily when air temperatures rise. Strategies to mitigate the urban heat island reduce air temperatures and therefore decrease concentrations of ground-level ozone. These strategies also reduce energy demand for cooling, which reduces air pollution and greenhouse gas emissions associated with energy production. When selecting vegetation for a green roof or to plant along a street or other areas, communities in areas with poor air quality may want to consider the volatile organic compound (VOC) emissions from certain plants, because VOCs are a pre-cursor chemical for ground-level ozone. With the right choice of species, the benefits of additional trees and vegetation far outweigh the costs.

the Forest Service’s Center for Urban Forest Research estimated the impacts of trees on air quality using existing models and statistical analyses. That analysis predicted that one million additional trees could lower emissions of NO_x by almost a quarter ton per day and particulate matter by over one ton per day. If trees that emitted low levels of volatile organic compounds (VOCs) were chosen, ground-level ozone could also be reduced by 1.5 tons daily. The long-term goal for the project is to develop the technical support for a SIP revision that includes large-scale, urban tree planting as a ground-level ozone reduction control strategy for the Sacramento region. See <http://www.fs.fed.us/psw/programs/cufr/products/psw_cufr696_SacramentoAirQuality.pdf> and <www.sactree.org> for more information.

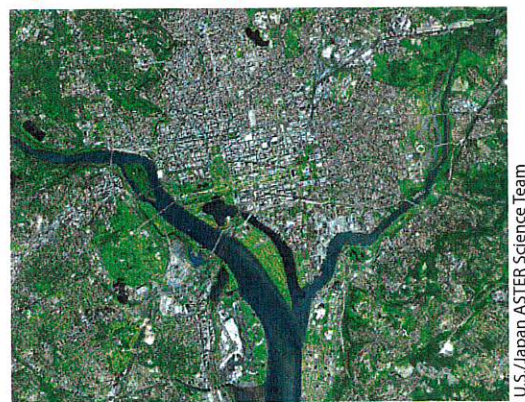
Policies to Advance Heat Island Mitigation in SIPs

Currently, three EPA policies help states to include heat island reduction strategies in their SIPs:

1. The Emerging and Voluntary Measures Policy provides flexibility for states to include in their SIP nontraditional measures, which are measures that do not directly reduce emissions at their source such as a scrubber on a utility smokestack. Heat island reduction strategies can be included under this policy.
2. The Guidance on State Implementation Plan (SIP) Credits for Emissions Reductions from Electric-Sector Energy Efficiency or Renewable Energy Measures provides state and local air quality officials with information on how to incorporate energy efficiency and renewable energy measures into their SIPs. It includes a step-by-step procedure for estimating emission reductions from these measures, a list of tools and resources for more information, and examples of proposed SIP submissions. This policy encourages cool roofs particularly. See <http://www.epa.gov/ttncaaa1/t1/memoranda/ereseerem_gd.pdf>.
3. The Bundled Measures Policy allows a state to combine many projects and programs that individually would not result in large reductions of air pollution emissions. EPA considers the performance of the entire bundle (the sum of the emissions reductions from all the measures in the bundle) for SIP evaluation purposes, not the effectiveness of any single measure. In this way, the responsible agency can include innovative strategies, such as heat island mitigation measures, that may otherwise be overlooked because they do not on an individual basis provide significant air quality benefits.

The **Washington D.C. region's SIP includes a Regional Canopy Management Plan as a ground-level ozone reduction strategy.** The plan involves working with local governments to establish goals for increasing tree canopy coverage and decreasing ground-level ozone pollution. In June 2007, Fairfax County, Virginia, set a precedent by selecting an urban forestry canopy goal of 45 percent. The county developed this target after it determined that current tree management efforts would lead to a decrease in canopy size from 41 percent to 37 percent over the next 30 years. To combat this loss, the county has proposed increasing the average number of trees planted from 21,000 to 84,000, justifying the expense of additional trees by citing the multiple benefits they provide.

Figure 8: Tree Canopy in Washington D.C.



Construction in and around Washington, D.C., has reduced tree cover (green in this image), but many efforts have formed to slow or reverse this trend.

Endnotes

- ¹ Examples of sustainable or low-impact development (LID) initiatives are The Sustainable Sites Initiative (<<http://sustainablesites.org>>), a collaboration between the American Society of Landscape Architects, the Lady Bird Johnson Wildflower Center, the US Botanic Garden, and other groups; and EPA's Low Impact Development Page (<www.epa.gov/owow/nps/lid/>) and Green Infrastructure Action Strategy (<<http://cfpub.epa.gov/npdes/greeninfrastructure/information.cfm#greenpolicy>>).
- ² Bass, B. and B. Baskaran. 2003. Evaluating Rooftop and Vertical Gardens as an Adaptation Strategy for Urban Areas. Report No. NRCC-46737. National Research Council Canada. Toronto, Canada.
- ³ The Wisconsin Office of the Governor. 2008. Governor Doyle Announces \$500,000 in Urban Forestry Grants. 17 January. Retrieved 18 January 2008 from <http://www.wisgov.state.wi.us/journal_media_detail.asp?locid=19&prid=3110>.
- ⁴ South Dakota Department of Agriculture. 2008. Urban & Community Forestry Comprehensive Challenge Sub-grant. Retrieved 18 January 2008 from <<http://www.state.sd.us/doa/Forestry/grantsandloans/uandcf.htm>>.
- ⁵ HB 2844 - 2007-08: Regarding Urban Forestry. Retrieved 26 February 2008 from <<http://apps.leg.wa.gov/billinfo/Summary.aspx?bill=2844&year=2007>>.
- ⁶ Blasnik, M. 2004. Impact Evaluation of the Energy Coordinating Agency of Philadelphia's Cool Homes Pilot Project. M. Blasnik & Associates. Boston, MA.
- ⁷ EPA. 2007. 2007 ENERGY STAR Awards. Retrieved 30 December 2007 from <http://www.energystar.gov/ia/partners/pt_awards/2007_award_winner_profiles.pdf>.
- ⁸ EPA. 2007. 2005 Environmental Merit Award Recipients. Retrieved 15 December 2007 from <<http://www.epa.gov/region1/ra/ema/2005recipients.html>>.
- ⁹ McPherson, E. G. 2001. Sacramento's parking lot shading ordinance: environmental and economic costs of compliance. *Landscape and Urban Planning*. 57:105-123.
- ¹⁰ City of Sacramento. Tree shading requirements for parking lots. §17.68.040 City Code. Retrieved 29 November 2007 from <<http://www.qcode.us.codes/sacramento>>.
- ¹¹ City of Toronto. 2007. Design Guidelines for "Greening" Surface Parking Lots. Retrieved 29 November 2007 from <http://www.toronto.ca/planning/urbdes.gn/greening_parking_lots.htm>.
- ¹² For further information about Arlington's and San Jose's codes, respectively, see <<http://www.arlingtonva.us/departments/EnvironmentalServices/epo/EnvironmentalServicesEpoGreenBuildings.aspx>> and <<http://www.sanjoseca.gov/ESD/natural-energy-resources>> under Green Building.
- ¹³ U.S. Department of Energy, Office of Energy Efficiency and Renewable Energy. 2008. Georgia Energy Code 1995. Retrieved 11 February 2008 from <http://www.eere.energy.gov/states/state_specific_information.cfm/state=GA>.
- ¹⁴ Levinson, R., H. Akbari, S. Konopacki, and S. Bretz. 2002. Inclusion of Cool Roofs in Nonresidential Title 24 Prescriptive Requirements. Paper LBNL-50451. Lawrence Berkeley National Laboratory, Berkeley, CA.

Street Tree Recommendations for Millcreek City Center

by Marv Poulson

11-21-19

Tree Selection

The generally high pH of our clay soils, and culinary and irrigation water, suitable trees for use in the urban environment is somewhat limited. In making tree selections, trees that can adapt to our soil conditions will perform most reliably and remain healthy for long life and pleasing esthetic appeal.

Tree selection should always include consideration of both seasonal maintenance (leaf cleanup) and long term protection and pruning. Few trees are as dirty as Sycamore varieties. These require very frequent cleanup from bark exfoliation, twig breakage, seed ball cleanup, and prolonged leaf cleanup of the very large and problematic leaves, even through the winter.

Natural durability of various trees should be considered. This includes the physical strength of the tree in high winds and the branching structure for durability in snow load. While hardwood trees may not be the fastest growing, they offer the greatest durability against strong winds and snow load. This is why fast growing species such as poplar and willow should not be used in the public landscape. These trees are soft wooded and weak, and quickly become dangerous in strong winds or in heavy snows.

Only well grown, properly balled and burlapped, large caliper trees should be selected from a reputable grower through a reputable local nursery for planting in public places. By large caliper, I mean 3-4 inch trunk diameter, measured at 4 ft. trunk height. Selected trees should have branching at least 6 ft. above grade at planting time. Large caliper prevent vandalism of smaller, breakable trees and affords substantive presence in the landscape with immediate gratification.

Selected Suitable Trees for Northern Utah Valley Urban Landscapes and Street Planting

***Acer grandidentatum* x *saccharum* 'Hipzam': The Highland Park Maple**

A family and is native to Western North America, and in our range is known as Big Tooth Maple for the deeply indented shape of the leaves, and grows on mountain slopes in our canyons.

The Highland Park Maple is part of the Sugar Maple group that is considered a medium size tree, growing between 30 and 50 feet in tall with a spread of 20 to 25 feet. Drought-tolerant, but grows faster with more moisture. Tolerates acid or alkaline soils. Prefers moist, well-drained soil, but tolerates clay or sand. The capability to tolerate dry soils and urban pollution allows it to grow in urban, commercial and residential environments. The ability to resist pests and diseases also add to its allure. Lateral branches typically arise roughly 7-8 feet off the ground. The leaves are sturdy and

tatter-proof. In the spring and summer, they are a rich dark green. In the fall, the leaves change to gorgeous reds, yellows and oranges.

***Carpinus betulus* "Fastigiata": European Hornbeam**

The smooth, gray, rippling bark of *Carpinus betulus* shields extremely hard, strong wood. Fastigiata European hornbeam, the most common hornbeam cultivar sold, grows 30 to 40 feet tall and 20 to 30 feet wide. As a very densely-foliated, columnar or oval-shaped tree it is ideal for use as a hedge, screen, or windbreak. The European hornbeam is usually preferred over American hornbeam as it grows faster with a uniform shape.

***Celtis occidentalis*: Common hackberry, Nettle tree, Sugarberry, Beaverwood, Northern Hackberry, and American Hackberry**

A large deciduous tree native to North America, tolerant of a wide range of conditions, the Hackberry is a good landscape choice. Grows to a broad crown with arching branches to 40-60 feet, not unlike the American Elm. Well-suited to urban areas, it withstands wind and city conditions. This tree grows is considered medium to fast.

Hackberry are moderately long-lived, hardwood trees with cork-like bark with wart-like protuberances. The leaves are distinctly asymmetrical and coarse-textured. It produces small fruits that turn orange-red to dark purple in the autumn, often staying on the trees for several months, and attractive to birds.

***Fagus sylvatica*: Dawyck Purple Beech (*Fagus sylvatica* 'Dawyck Purple')**

The dark purple foliage of this magnificent columnar tree is difficult not to notice. In spring deep reddish-purple leaves emerge and darken to burgundy purple. In winter the strong upright limbs surround a central trunk with smooth pale gray bark create an interesting bare framework. It is one of the most striking and beautiful of all columnar trees.

This European beech can tolerate a wide variety of soil conditions from sand to clay as long as the drainage is adequate. Once established it only needs occasional watering during prolonged dry periods. It is a handsome specimen and should be provided enough space to fully develop as it grows to about 50 feet. It rarely needs pruning to maintain its naturally graceful and majestic form, and are exceptionally long lived, on the order of 120 years.

***Fagus sylvatica* 'Rohanii': Rohan Beech**

A beautiful and stately shade tree with an oval habit of growth and one of the most majestic trees to add to the landscape. The structural beauty of the smooth, gray barked trunk and muscular lateral layered branches is only surpassed by the striking foliage. Deeply lobed, dark red-purple leaves grace this deciduous tree. The fringed margins create a stained glass effect when the glow of sunlight streaks through the canopy. Tolerant of tough urban conditions it is best used as a specimen tree, making a

dominant statement for the garden.

This is a relatively low maintenance tree, particularly deer resistant and will usually left alone in favor of tastier treats. It has no significant negative characteristics.

Ginkgo biloba "Princeton Sentry": Princeton Sentry Maidenhair Tree

The Ginkgo biloba or maidenhair tree thrives in a wide range of soils and is tolerant of urban stresses. "Princeton Sentry" is a narrow, columnar, male form that is excellent for street planting, maturing to 50 feet.

This Ginkgo cultivar is practically pest-free, resistant to storm damage, and casts light shade due to the narrow crown of fan-shaped leaves. The tree is easily transplanted and has a vivid yellow fall color which is second to none in brilliance, even in the South.

Gleditsia tricanthos var. inermis "Shademaster": Thornless Honeylocust

An excellent fast-growing street tree with essentially no fruit and dark green leaves. Many horticulturists consider this to be one of the best cultivars of North America's honeylocust. This is a very adaptable tree tolerant of urban air pollution, heat and drought conditions.

Thornless honeylocust grows to 30-50 feet and is one of the last trees to leaf out in springtime and one of the first to lose its leaves in fall with golden yellow fall color.

Pyrus calleyana "Aristocrat": Aristocrat Callery Pear

The Aristocrat's superior structure, compared to Pyrus calleyana "Bradford," makes it less susceptible to wind breakage and also requires less pruning as it grows to 40 feet at maturity. The tree tolerates pollution and drought. In spring, before the new leaves unfold, the tree puts on an abundant and brilliant display of pure white flowers which, unfortunately, do not have a pleasant fragrance.

Pyrus calleyana "Aristocrat," the Aristocrat Callery Pear has been chosen "Urban Tree of the Year" as determined by responses to an annual survey in arborist magazine City Trees. This magazine serves as the official journal to The Society of Municipal Arborists (SMA) and readers select a new tree each year.

Quercus robur x Q. alba: Crimson Spire™ Columnar Oak

The lovely, dark green, mildew resistant foliage is followed in fall by a dazzling display of red in autumn on this columnar shaped tree. The leaves will turn brown and many will persist through the winter. This is a strong wooded tree that grows moderately fast to 45 feet and 16 feet broad and long lived for many years of enjoyment.

The origin of this oak cross brings the white oak parentage's dark green, mildew resistant foliage and reddish fall color. The fastigate (columnar) growth habit is inherited from the English oak side.

Taxodium distichum: "Shawnee Brave": Baldcypress

This is a deciduous conifer in the family Cupressaceae. It is native to the southeastern United States. Hardy and tough, this tree adapts to a wide range of soil types, whether wet, dry, or swampy. It is noted for the russet-red fall color of its lacy needles. Although the baldcypress is native to wetlands along running streams, its growth is often faster on moist, well-drained soil. The "Shawnee Brave" has a tall, narrow form that reaches 60 feet high and only 15 to 18 feet wide. It has excellent as a street tree.

Baldcypress has been chosen "Urban Tree of the Year" as determined by responses to an annual survey in arborist magazine City Trees. This magazine serves as the official journal to The Society of Municipal Arborists (SMA) and readers select a new tree each year.

Tilia cordata: Littleleaf Linden

Littleleaf linden is valued for its vigor and improved branching habit. It tolerates a wide range of soils but is somewhat sensitive to drought and salt. It is a good specimen tree and is suitable for areas where adequate root space is available.

Architects enjoy using the tree due to its predictably symmetrical shape that grows to 60 feet plus. *Tilia cordata* is a prolific bloomer. Its small, fragrant flowers appear in late June and into July. Many bees are attracted to the flowers and the dried flowers persist on the tree for some time.

Ulmus parvifolia "Drake": "Drake" Chinese (Lacebark) Elm

The Chinese elm is an excellent tree that is surprisingly under-used. It possesses many traits that make it ideal for a multitude of landscape uses. Also known as lacebark elm, *Ulmus parvifolia* is moderately fast-growing to 50 feet and nearly evergreen tree, since leaves tend to remain through the cold season until spring growth pushes off the previous years spent leaves. The mature bark has a lovely, interesting, ornamental quality.

Lacebark elm is extremely tolerant of urban stress and resistant to Dutch elm disease. This elm is long lived and thrives under drought conditions and will adapt to alkaline soil. It is relatively free of pests and diseases.

Zelkova serrata: Japanese Zelkova

Zelkova serrata is a fast-growing, graceful tree growing to 60 feet by 40 feet as a suitable alternate for American elms and tolerant of urban conditions. The tree is resistant to Dutch elm disease. The cultivar "Green Vase" is an excellent selection.

Zelkova has a moderate growth rate and likes a sunny exposure. Branches are more numerous and smaller in diameter than those of the American elm. Leaves are 1.5 to 4 inches long and turn a brilliant yellow, orange, or burnt umber in the fall. This tree is best suited for an area with plenty of room and space.

Columnar Tree Recommendations for Planting in Narrow Spaces and Colonnades

Fagus Sylvatica

Soil Preparation

Proper soil conditions are crucial for the long term health of street trees. To create a healthy planting soil, preparation should begin well before pavement installation with excavation of the planting zones, removal of residual construction debris, both historic and contemporary. Well drained soils are most suitable for healthy tree growth.

Because our prevailing native soils on the lower east bench of Salt Lake Valley are clay remnants from prehistoric Lake Bonneville, amending the planting soil with composed tree chippings, i.e., "soil pep" will enhance soil drainage and moisture retention as well as aide in colonizing of soil mycorrhizal fungi, once established will aide tree roots uptake of nutrients. Proper soil preparation is essential!

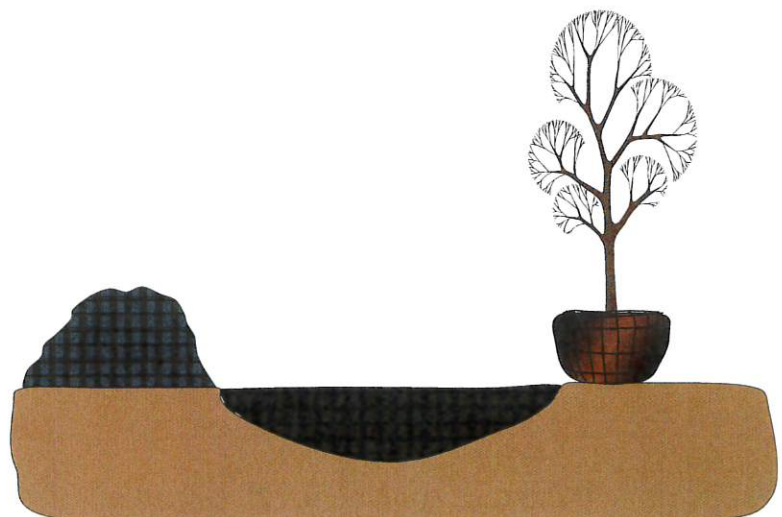
Tree Planting

Initial planting is a very important step to assure long term survival and durability of new trees. Only well grown, properly balled and burlapped, large caliper trees should be selected from a reputable grower through a reputable local nursery.

Tree Planting Recommendations

Design and location of tree planting zones must be at least 6 feet from any buried public utilities to allow sufficient room for tree root development out of danger of utility maintenance excavation.

- 1 Before planting, prepare a broadly tapered hole 3-4 times the diameter of the root ball to allow new roots a rich zone to grow into. Carefully place the exposed root ball of the plant into the newly dug hole taking care to see that the top of the root ball will remain at the original ground level after backfilling. It is usually best to re-use the native soil removed from the planting hole for backfill, unless construction debris or other harmful materials

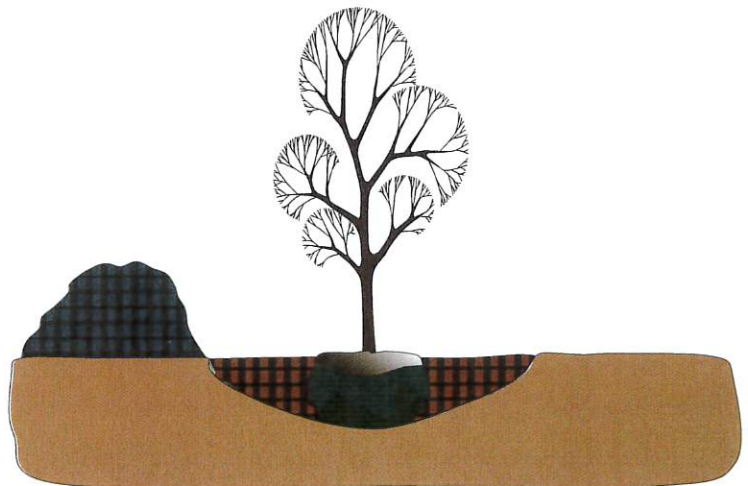


are commonly present in the soil. In this case, use a high quality sandy-loam soil and dig an extra large planting hole.

Plant the root ball with the crown of the plant (where the stem and the top of the roots meet) at the original ground level. Even after soil is mounded in a ring to hold water around the plant soil should not remain against the trunk. This will prevent moist soil from causing trunk damage by stem rot which occurs when a plant is planted too deeply. Stem rot is a fungal disease that can be fatal, even after the plant has been in the ground for several years.

With the root ball in the hole, carefully position the plant. If the root ball is wrapped in burlap, be sure that the material is unfastened and folded back well below soil level. Remove all twine from the root zone, especially plastic twine because it never decomposes and may bind roots, causing unseen damage. Trees and shrubs in a standard open wire basket should remain in the lower portion of the basket. Only remove the top 1-2 rows of wire with bolt cutters to prevent the wire from protruding above ground. The large openings in the basket have been shone to allow root development without hindering long term growth.

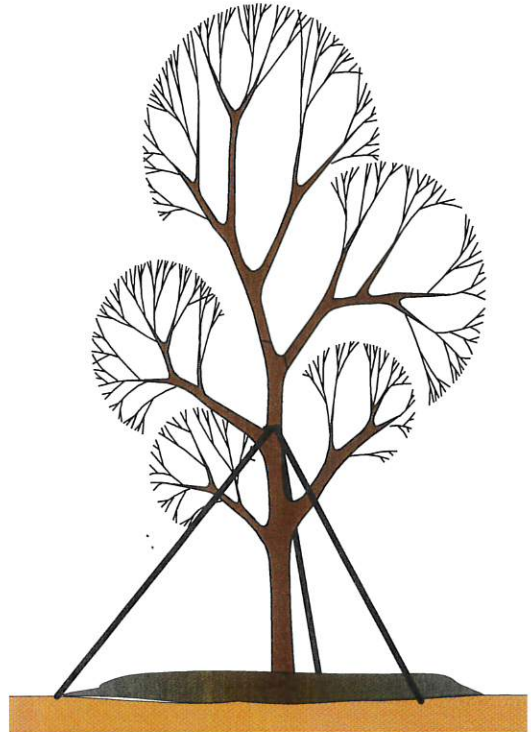
As soil is back filled around the root ball, all of the burlap must be completely buried. Otherwise, the fabric may act as a wick and cause the root ball to dry out prematurely. Buried burlap will decompose naturally.



A water-well, made by the soil ring around the crown of the plant should be about the same diameter as the drip-line of the outer-most branches or just outside the edge of the root ball. The soil should be mounded so that several gallons of water can be applied at once (depending on the size of the plant) and remain until it soaks into the root ball and surrounding soil without running off.

2 It may be advisable for young trees with tender bark to rap the trunk during the winter with a protective, porous material such as burlap or Treesaver to keep the warm sun from warming the bark on a clear day. This helps prevent the trunk from accumulating excess water within that could freeze and split the bark. The wrap should be removed when warm weather returns.

3 Staking a tree is usually not necessary, however, if excessively windy conditions prevail or the plant is not secure and unable to easily stand securely without aid, staking may be required. Care should be taken to drive stakes outside the root ball zone. Use heavy wire, rope or cable to secure the trunk to the stakes. The tether should be loose around the trunk to allow growth without binding. A thick, flexible, protective sheath such as garden hose **must** be used to pad the tie where it goes around the trunk. This will prevent excessive damage to the bark. Tie the plant from 3 points with uniform tension to hold the plant straight. Re-check the condition of the tethers periodically and adjust the tie around the trunk should it become tight or begin to bind. Remove the tethers after 1 year if the plant has become established. If not, readjust the ties for continued tethering and check at 6 month intervals, and remove as soon as the tree has stabilized and stands straight without wobble so the tree's natural hormonal development will be stimulated for proper adaptation to flex against winds.



If a root ball is damaged in handling at any stage, and the tree trunk is not firmly stable, "wiggling" in the root ball, it may be necessary to return the tree for nursery care and replaced with a soundly firm root ball/trunk tree. If staking is necessary, stake on 3 sides using soft material with a protected collar around the tree trunk using the first major lowest branch as a stop to prevent the guyline from slipping down the trunk. Staking should only be done to assure stability during establishment of rooting into surrounding soil. Staking should be removed after no more than 18 month from planting so the tree's natural hormonal development will be stimulated for proper adaptation to flex against winds.

Trunk Protection

After planting, it may be desirable to protect trunks of young trees with thin bark from rodents or impacts from the public. Commercially available plastic designed to spiral around the trunk or wire mesh protectors can provide protection.

Effective Irrigation

Assuring consistent, appropriately periodic deep watering of each tree is critically important in an urban environment. This begins at planting time.

Immediately after planting each tree, it is vital that the tree be deeply watered to saturate the planting zone to the depth and breadth of the entire root ball. The proven initial watering technique for initial watering at planting time and at 10 day intervals thereafter, until the automated watering system is in operation, is to fill the planting water well the diameter of the root ball is filled and allowed to completely soak in at least 3 times. The 3 time fill assures effective deep watering. Skimping on water risks harming the long term viability of the tree. Improper watering is the leading cause of death for newly planted trees.

Protective Tree Grates

When trees are planted within paved walkways, it is important to trees and pedestrians require a certain measure of protection from each other and other elements of urban life. Tree grates offer a decorative flavor and the ability to complement surroundings, more importantly they provide protection and security to the tree, as well as providing a safe extension of the pedestrian walk way. Tree grates must provide a permeable surface to allow water and air exchange to for tree roots. Any tree grate must allow for the growing tree trunk girth. It is crucial that clearance between the inside diameter of the grate and the tree trunk so allow for enlarging the opening in the grate. There are many grate designs available. Those that are made in 2 halves from heavy steel are convenient to remove and periodically adjust to accommodate growth of the tree trunk.

Winter Care Considerations

The tendency to use various salts to "melt" snow as a passive means of removal must be prohibited when it comes to maintaining healthy tree growth. Even though some trees can tolerate some salt in the soil, dissolved solids like salt inhibit the ability of tree roots to uptake water and nutrients.

Snow removal must be by mechanical means only. **No Salt!**

When removing snow with shovels or plows, it should never be pushed against tree trunks. The force of plowing can harm tree trunks and break upper root connection to the base of the tree. Trees have a natural ability to flex the length of their trunk, but not with a sharp impact of force from plowing 1 or 2 feet from the base.

Trees growth increases the value of trees with desirable aesthetically, with shade and for wind breaks, and also building monetary value that can be appraised by qualified (American Society of Consulting Arborists) Tree Appraiser.

Selected Flower Trees for consideration for City Center Planting

compiled by
Marv Poulos
on

Common Name	Mature Height ft.	Mature Width ft.	Growth Habit	Flower Color	Spring Summer Leaf Color	Autumn Foliage Color	Notes
Aristocrat Pear	30	22	Pyramidal	White in spring, showy	Dark green	Deep red	Tolerant of urban conditions. Overplanting is a concern. Prune to develop strong branching structure
Autumn Blaze Pear	20	18	Rounded	White in spring, showy	Emerges with red tint to glossy green	Bright red	Most cold hardy cultivar of parent species. Tolerant of urban conditions. Overplanting is a concern. Prune to develop strong branching structure
Capital Pear	30	10	Columnar	White in spring, showy	Glossy green	Red purple	Availability may be limited.
** Chanticleer Pear	30	15	Upright pyramidal	White in spring, showy	Glossy green	Red	Greater fireblight resistance than other cultivars. Overplanting is a concern. Prune to develop strong branching structure

** Most desirable Flowering Pear Cultivar for Urban Settings.

Few flower trees are suitable for urban tree planing. Flowering pear have the least fruit drop and relatively narrow habit of growth. In determining tree selection, It is advisable to avoid planting a monoculture. Reliance on a single Species of tree invites all the problems associated with one a monoculture. Diversity is a much wiser course in selecting and planting.

For this reason, I would strongly suggest not planting an orchard with all of its maintenance requirements. Of the flowering Pears I have included, Capital Pear, Aristocrat, or Chanticlear** are most preferable. Chanticlear** being the least susceptible to fireblight.

Considerations for Tree Selection in the Urban Forest

Fundamentally, Millcreek must have a professional Urban Forester or at least experienced horticulturist with arboriculture familiarity intimately involved in making ANY tree selection, especially for the Millcreek City Center. Further, as one of the largest cities in the Salt Lake Valley, Millcreek should develop an Urban Forestry policy that at least matches that in Salt Lake City

(<https://www.slc.gov/parks/urban-forestry/urban-forestry-suggested-trees/>). That would at least offer a beginning model for ordinance development. Some other western cities are more advance and serve as regional models. Denver (<https://www.denvergov.org/content/denvergov/en/denver-parks-and-recreation/trees-natural-resources.html>) is probably the most advance when it comes to urban forest public policy, both for city property and rights-of-way and for ordinance to help the communities participation in developing a healthy urban landscape for the long term.

Some basic tree selection/planting considerations:

Location

- Consider Surroundings
- Width of Mature Tree Canopy
- Barraged Utilities or Other Obstacles
- Overhead Clearance
- Rate of Growth

Soil conditions

- Remove Construction Debris or Detritus
- Proximity to Sidewalks or Curb and Gutter
- Soil Permeability

A proper landscape plan takes each tree into consideration:

- Local hardiness zone to match the temperature extremes a specific tree is adapted
- Spacing
 - Height. ...
 - Canopy spread. ...
 - Minimum Spacing Requirements
 - 35' between shade trees
 - 25' between ornamental trees
 - 30' from curb at intersections
 - 20' from street lights
 - 10' from alleys, driveways & fire hydrants
 - 7' from attached sidewalks
 - 5' from water meters
- Is the tree deciduous or evergreen? ...
- Form or shape. ...
- Growth rate. ...
- Soil, sun, and moisture requirements.
- Fruit. ...

- Maintenance regiment of specific tree species
- When possible, obtain trees that have been grown from a local seed source. Locally grown trees will be adapted to our area's highly variable, and often harsh, growing conditions.
- If locally grown trees cannot be obtained, source from locales that have similar growing conditions to our area (precipitation, soil pH, high/low temperatures, etc).
- Moisture requirements are based on observed species averages following root establishment. All trees require supplemental water for root establishment.
- Trees in the approved list are those which, given proper and consistent maintenance including supplemental irrigation, proper pruning, and avoidance of chemical contaminants, will be assets to urban canopy.

Some trees are not desirable in the urban landscape, regulations should reflect this

- Per Forestry Rules and Regulations, the following trees may not be planted in the public right-of-way:
 - Any of the poplar (*Populus*) species including cottonwoods and aspens
 - Any of the willow (*Salix*) species Boxelder (*Acer negundo*) Siberian elm (*Ulmus pumila*) Weeping and pendulous trees Multi-stemmed trees
 - Other trees which, for various reasons, currently have a moratorium on planting in the public right-of-way include:
 - Ash (*Fraxinus*) species Walnut (*Juglans*) species
 - Silver maple (*Acer saccharinum*)
 - Autumn Blaze / Freeman maple (*Acer x freemannii*) Sunburst honeylocust (*Gleditsia triacanthos inermis* 'Sunburst') Bradford pear (*Pyrus calleryana* 'Bradford') Mulberry (*Morus*) species Russian-olive (*Elaeagnus angustifolia*) Tree-of-heaven (*Ailanthus altissima*)

When it comes down to it, most temperate climate trees will be desirable in our landscapes. Those identified in established tree lists of cities with established tree ordinances have proven to be desirable and successfully grown in our urban landscape.

To be overly restrictive in tree selection can lead to undesirable results prevalent in saturations like a monoculture creates with susceptibility to disease and pest spread through the tree population. Variety is important to reduce the need to introduce artificial controls such as pesticides.

With thoughtful tree selection, natural disease resistance and vulnerability to tree breakage due to wind damage or snow load can be avoided. Similarly, considering tree height and spread can prevent the kind of extreme tree pruning that results to keep trees away from power lines which can also result in creating dangerous tree growth that threatens adjacent structures or makes the distortion in tree growth of extreme pruning that increases vulnerability to heavy snows or high winds.

Treeport Cards

How's your Neighborhood Doing?

Pick your Neighborhood

- Select all
- ☒ Athmar Park
 - ☒ Auraria
 - ☒ Baker
 - ☒ Barnum
 - ☒ Barnum West
 - ☒ Bear Valley
 - ☒ Belcaro
 - ☒ Berkeley
 - ☒ Capitol Hill
 - ☒ CBD
 - ☒ Chaffee Park
 - ☒ Cheesman Park
 - ☒ Cherry Creek
 - ☒ City Park

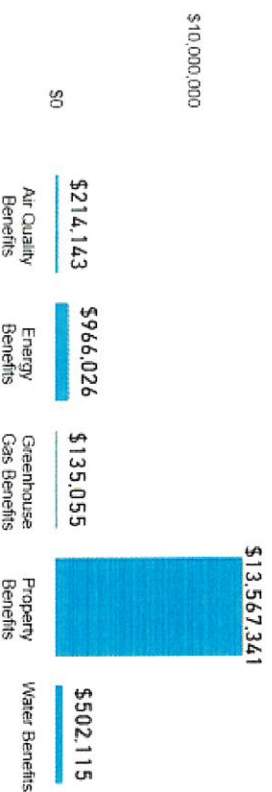
Number of Trees

182,659

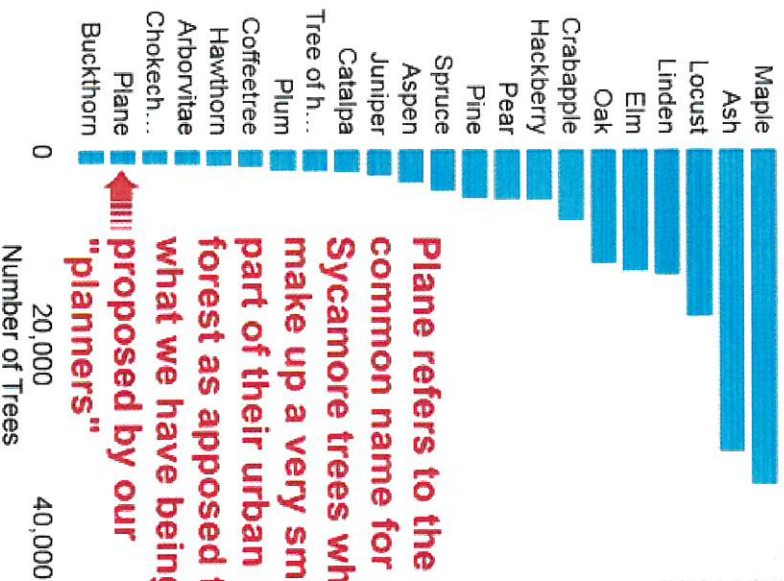
Annual Ecosystem Benefits

\$15,220,438

Savings by Ecosystem Benefits

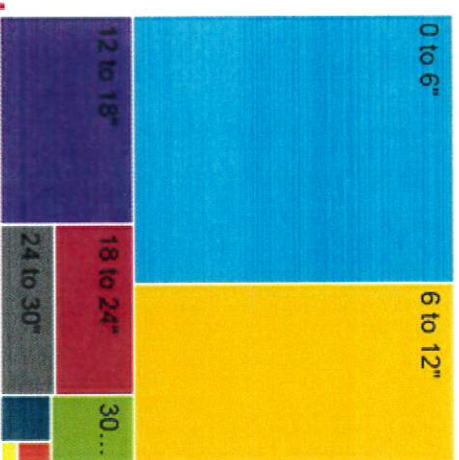


Fifteen Most Common Tree Types



Plane refers to the common name for Sycamore trees which make up a very small part of their urban forest as apposed to what we have being proposed by our "planners"

How big are your trees?



See if your neighborhood meets Denver's citywide goal of 18%

Tree Canopy Coverage %

