City of Phoenix
Complete Streets Design Guidelines
Adopted March 8, 2018

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1. Introduction

Through implementation of complete streets, Phoenix will be a healthier place to live. Complete streets help people to be more active, reduce chronic diseases, be less isolated, and may help provide equity in access.

The safety and convenience of all users of the transportation system including pedestrians, bicyclists, transit users, freight, and motor vehicle drivers, should be accommodated and balanced in all types of transportation and development projects and through all phases of a project so that children, elderly, and persons with disabilities can travel safely and conveniently within the public right-of-way. Achieving this requires community engagement, design consideration, streetscapes, and neighborhood connectivity.

Complete streets are one component of good urban design. Urban design issues vary in complexity. Decisions that use these guidelines should be tailored to individual situations and contexts. Moving forward, these guidelines should inform updates to other relevant city documents, policies, and plans and should be updated as appropriate when new national best practices are identified.

Exceptions are specified in the Complete Streets Policy (Resolution 21554) attached as Exhibit A to this document.

2. Design Principles for Successful Complete Streets

Design for Safety

Phoenix's transportation network has been designed almost exclusively for the vehicle. This principle strives to return balance to the transportation network for users of all modes of transportation resulting in a safer city.

- Design streets safe for all users, particularly children, the elderly, those with disabilities, transit users and more vulnerable modes (walking, bicycling, transit).
- Design streets for slower speeds to reduce the number of serious crashes.
- Streets should be designed for the posted speed limit.
- Ensure that streets have sufficient lighting for all users.
- Bike facilities should be evaluated to continue to and through intersections when practicable, feasible, and supportable.
- Consolidate driveways to minimize modal conflicts and increase opportunities for infrastructure that supports Complete Streets principles.
- Research, test, and evaluate innovative safety treatments, particularly those successfully adopted in other cities.

Design for Comfort and Convenience

Our street infrastructure has been developed in a way that exacerbates the high temperatures and impedes the easy movement of active transportation users. Complete Streets are meant to mitigate those effects and create comfort for all modes.

- Shade should be a primary technique in projects to reduce ambient temperatures and reduce direct sunlight exposure for pedestrians and cyclists.
- All streets should have pedestrian infrastructure with pedestrian through zones free of impediments.
- Expand the availability of public seating and bicycle racks.
- Minimize the number of bus bays to maintain pedestrian zone and improve reliability of transit schedules.
- The roadway (portion of the street designed, enhanced, or ordinarily used for vehicular travel) should be designed to the minimum possible width, with the minimum number of lanes that safely allows for the desired operations.
- All roadway corners should be designed for the smallest possible radius that still accommodates the design vehicle and emergency vehicles.

Design for Context

Streets help define the character of neighborhoods. A street's design should interact with the surrounding context, including its history, land uses, and nearby landmarks.

- The unique character of neighborhoods should be considered during the design of street projects.
- Bicycle lanes are not required on streets that primarily provide direct access to single-family residential and/or industrial land uses. All other streets should have bicycle lanes. On streets with posted speed limits of 30 miles per hour or higher, the bike lanes will preferably be separated and/or protected. For the purposes of this document, sharrows are not bicycle lanes.
- Design streets to enhance access to and contribute to the open space network within the city.

Design for Sustainability

Streets present an extraordinary opportunity to improve the environmental health of the city. Complete Streets will help achieve sustainability goals and mitigate the urban heat island effect.

- Minimize impermeable surfaces and maximize vegetation on streets outside of vehicular travel lanes. Street designs should capture and beneficially use stormwater wherever practicable.
- Reduce streets' rate of heat absorption by maximizing tree canopy cover, reducing asphalt, and using high reflectivity materials or lighter colors.
- Collaborate across agencies in testing, evaluating, and standardizing new materials so that streets are constructed in an environmentally sound way.

Design for Cost-Effectiveness

Reconstruction of city streets can require substantial financial resources. Streets should be designed for long-term cost effectiveness with public and economic benefit.

- Consider not only up-front capital costs, but also full lifecycle costs and benefits; certain options may cost more up front, but may have lower ongoing maintenance and operations costs and/or provide long-term benefits.
- Street overlays and private development activity should be designed as complete streets for affected elements.
- When practical, identify opportunities to partner and share resources (e.g., driveways, parking, etc.).

Design for Connectivity

Network activity has implications for Complete Streets and is crucial for creating walkable and bikeable places. These concepts apply to both new development and retrofit conditions. More detail can be found in Chapter 3 of the Institute of Transportation Engineers' publication Designing Walkable Urban Thoroughfares: A Context Sensitive Approach (2010).

- Design and connect neighborhoods via streets, sidewalks, and trails, and discourage the abandonment of streets, sidewalks, and alleys that compromise connectivity.
- Rather than the winding hierarchical network, the city should return to a traditional connected grid network, wherever possible. The collector in a typical hierarchical network channels traffic from local streets to the arterial street system. However, a system of parallel connectors provides multiple and direct routes between origins and destinations. Streets should be designed to the standards laid out in the *Indices for Network Connectivity and Accessibility* shown below:

Indices for Network Connectivity and Accessibility

- Links and nodes (index): Roadway (or modal) links divided by the number of nodes (intersections). Ranges from 1.0 (poorest level; all cul-de-sacs) to 2.5 (full grid). Minimum index defining a walkable community is 1.5.
- Intersection ratio: The ratio of intersections divided by intersections and dead ends, expressed on a scale from zero to 1.0 (US EPA, 2002). An index of more than 0.75 is desirable.
- Average intersection spacing: For walkability, maximum distance of 600 ft; desirable spacing is under 400 ft.
- Intersection density: The number of surface street intersections within a given area, such as a square mile. The more intersections, the greater the degree of connectivity.
- Blocks per square mile: For walkability this index should be at least 100.
- Directness (index): Actual travel distance divided by direct travel distance. Ideal index is 1.0. For walkability, index should be 1.5 or less.

Sources: Texas Transportation Institute, Adapted from: Donohue, Nick, "Secondary Street Acceptance Requirements," Office of the Secretary of Transportation, Commonwealth of Virginia. Spring 2008. "Smart Growth Index Model," U.S. EPA 2002.

3. NACTO Urban Street Design Guide

Refer to the entirety of NACTO's *Urban Street Design Guide* (2013), excepting the Stormwater Management section. For guidelines related to stormwater management, please see section 4 of this document (*Stormwater Management and Green Infrastructure*).

4. Stormwater Management & Green Infrastructure

Content reproduced and adapted for use here is provided courtesy of Watershed Management Group. Source material, including more guidance on green infrastructure practices is at www.watershedmg.org.

Purpose

Green infrastructure (GI) is an important element of a sustainable complete street, using living, natural systems to provide environmental services, such as capturing, cleaning, and infiltrating stormwater; creating wildlife habitat; shading and cooling streets and buildings; and calming traffic. This section provides principles and guidelines for creating and retrofitting existing neighborhood streets, rights-of-way, and parking lots with GI practices. These guidelines are intended for City of Phoenix-sponsored projects but are easily translated to private projects. Developers are encouraged to consider the benefits that incorporating GI practices could provide in their developments.

Green Infrastructure Overview

In the southwest United States, climate can present a challenge to alternative modes of transportation such as bicyclists and pedestrians. When it rains, these streets generate stormwater runoff that carries non-point source pollution to waterways, resulting in flooded streets (creating traffic hazards), erosion of soil downstream of paved areas, and increased maintenance costs.

GI practices can help resolve these concerns. Practices such as traffic chicanes, curb bump-outs, or bioswales reduce the street width and create pervious planting areas which help calm traffic, reduce flooding, sedimentation and erosion, capture, clean and infiltrate stormwater, and help irrigate vegetation that shades streets and sidewalks, creating more desirable places for biking and walking. Four critical principles to consider when implementing GI are discussed below.

Protect and restore natural areas (e.g., washes, desert scape, relatively undisturbed riparian areas)

Natural areas provide the functions that GI emulates, including air and water filtration, and wildlife habitat. When a natural area is removed, it is costly and difficult to rebuild the complex web of ecological interactions, and thus the services, it provides. Therefore, it is an essential GI practice to preserve natural areas wherever possible or restore the ecological functions and services of degraded natural areas.

Serve multiple functions with GI

Instead of creating infrastructure that only serves one purpose, the best GI practices will serve multiple functions, like, improving pedestrian/bicycle pathways; cooling and beautifying streets; and reducing and cleaning stormwater runoff. Such integrated design creates GI practices that are more cost-effective and beneficial for communities.

Include the community

GI approaches are best when implemented using a multi-disciplinary and inclusive planning and design process. Including local residents, neighborhoods, businesses, and institutions like schools and churches is essential to creating projects and locations that are successful and supported over the long term.

Use Vegetation

Vegetation is an essential element of GI practices. The benefits of vegetation (particularly trees) are wide-ranging from human health to wildlife to aesthetic. Selecting drought-tolerant or desert-adapted species, preferably native to the region, is important. With appropriate site selection and planting density, combining vegetation with GI can reduce the irrigation requirements by maximizing utilization of rainfall runoff with the potential to eliminate supplemental irrigation after plant establishment.

Green Infrastructure Common Practices

This section briefly describes common GI practices that may be appropriate, singly or in combination, for use on City of Phoenix projects; more information on these practices can be found at www.watershedmg.org. This is not intended to be an exhaustive list; nothing in this document should be construed to restrict implementation of GI on City of Phoenix or private developments to only the practices listed. Future innovation and technological advances are also expected and encouraged to contribute to an increased body of potential GI practices appropriate for our region.

Streetside Practices — GI within the right-of-way adjacent to streets should consider these design features:

- Non-vehicular curb cuts are openings created in the curb to allow stormwater from an impervious surface (e.g., street or parking lot) to flow into a depressed infiltration and planting area. This is an effective and simple GI practice for new or retrofit projects.
- Bioretention basin with rock-lined edges collect and infiltrates stormwater from curb cuts; bioretention basins must be excavated in the right-of-way to a depth below street level. Rocks are used to prevent erosion along the sides of the basin. This can be an effective choice in relatively narrow right-of-way.
- Bioretention basin with shallow slope collects and infiltrates stormwater from curb cuts in a wider, shallow sloped area with no rock-lined edges. These basins are similar in structure and function to basins with rock-lined edges. This only works in relatively wider right-of-way that allows space for gently sloped sides.
- Sediment traps capture and collect sediment at the entrance to bioretention areas, facilitating periodic sediment removal, extending functional life of the basin.
- Swale with non-vehicular curb cuts is a bioretention feature with gently sloping sides that is long and linear. It may capture and infiltrate stormwater in place or transport water downhill to a drain or other detention feature.
- Basin or swale without non-vehicular curb cuts can be used to capture stormwater from adjacent sidewalk and businesses where right-of-way is too small to create a basin with curb cuts or where stormwater doesn't flow along the gutter.
- Pervious pavement treats, detains and infiltrates stormwater runoff in combination with landscape-based strategies or where landscape-based strategies are restricted or less desired. Streetside applications could include sidewalks, street furniture zones, parking lanes and gutter strips.

In-street Practices — GI within a street profile:

- Chicanes, (midblock bump outs) - collect and infiltrate stormwater that flows along curbs and should be designed with a flush curb and depressed bioretention area streetside.
- Medians can collect and infiltrate stormwater that flows along a curb; should be designed with a flush curb and depressed bioretention area. This is particularly useful on streets with an inverted crown.

Parking Area — Parking area GI are not generally within right-of-way but can be used as tools to retain water on-site:

- Bioretention basins or swales- retain and infiltrate stormwater runoff in landscape buffer areas; opportunities to replace unneeded asphalt with bioretention should be considered. Speed bump placement can assist in directing stormwater to basins.