SHADE STRUCTURES

Shade structures are a vital component of Scottsdale's citywide approach to comfort, livability, and heat resilience. Together with trees and landscape design, they form the city's built canopy system, expanding usable outdoor spaces, improving comfort, and enhancing visual quality in both public and private settings.

This section provides technical guidance and design direction for integrating shade structures in Scottsdale. While trees remain the city's primary source of natural canopy, built structures play an essential complementary role, offering immediate, durable shade in areas where vegetation is limited or where high activity levels demand year-round comfort.

The Shade Structure Guidelines establish a unified framework for designing, locating, and maintaining shade structures that respond to Scottsdale's climate, architectural character, and community expectations. They are intended to inform project planning and review, ensuring that new and retrofitted structures contribute to broader shade goals.

Well-designed shade structures extend the usability of public and private spaces, promote outdoor activity, and contribute to shade goals. These guidelines balance function, aesthetics, and performance, ensuring that structural shade integrates seamlessly with surrounding landscape, architecture, and site design.

Design and Implementation Framework

The Shade Structure Guidelines outline expectations for coverage, performance, and material resilience, while allowing flexibility for innovation and context-sensitive solutions. Rather than prescribing a single style, they establish a shared understanding of what effective, functional, and durable shade looks like across Scottsdale.

This framework complements the Trees and Water Harvesting Guidelines, together forming the three technical foundations of the Shade & Tree Plan. Each works in tandem—the tree canopy providing natural cooling and ecological benefits, the shade structures supplying immediate and adaptable protection, and the water harvesting systems ensuring efficient irrigation and runoff capture.

Partial shade reduces direct midday sun.

The Shade Structure Guidelines provide detailed direction organized under three primary categories:

Functional Design & Orientation defines how shade structures should be positioned and configured to respond to solar conditions. It introduces principles for analyzing sun angles, determining optimal placement, and achieving effective shade coverage at peak heat hours.

Integration & Context establishes how shade structures relate to their surrounding environment, including trees, landscapes, buildings, and public spaces. It emphasizes consistency, visibility, pedestrian comfort, and coordination with utilities, circulation, and architectural character.

Materials & Maintenance outlines recommended material types, coatings, and construction methods suited to Scottsdale's desert climate. It provides guidance on durability, heat performance, and long-term maintenance practices that ensure structural safety and lifespan.

Shade Canopy Balance

The most effective shade designs layer tree canopy and shade structures to maintain coverage consistency throughout the day and across seasons.

FUNCTIONAL DESIGN & ORIENTATION

Design shade structures to respond to solar patterns, reinforce site function, and work with natural canopy to provide effective, comfortable, and well-oriented shade where people need it most.

SS 1 Design shade structures to respond to sun path.

SS 1.1 Prioritize south- and west-facing areas for shade coverage.

SS 1.2 Incorporate both horizontal and vertical shading elements to address shifting solar angles — vertical structures for morning and late-afternoon sun, and overhead structures for midday protection.

SS 1.3 Optimize shade coverage between 10 a.m. and 4 p.m.

SS 1.4 Assess seasonal shade patterns to ensure maximum summer protection while providing intentional winter solar exposure.

Overhead shade structure provides midday protection.

SS 2 Balance shade structures with natural canopy to achieve site coverage goals.

SS 2.1 Provide a minimum of 50% shade coverage over hardscape surfaces through a combination of trees at maturity and structures.

SS 2.2 Place structures to strengthen overall shade coverage and serve sites where tree planting or root space is limited.

SS 2.3 Coordinate structural placement with water-harvesting and irrigation systems to prevent conflicts and ensure trees can grow and function alongside structures to meet sitewide shade coverage goals.

Shade structures and tree canopy strengthen shade coverage.

HORIZONTAL SHADE

Horizontal shade structures moderate direct overhead sunlight by creating cool, usable spaces during the hottest portions of the day. Their effectiveness depends on how well they are aligned with activity patterns, seasonal comfort needs, and sun path.

Paired with vertical elements, horizontal shade ensures consistent comfort across the solar cycle.

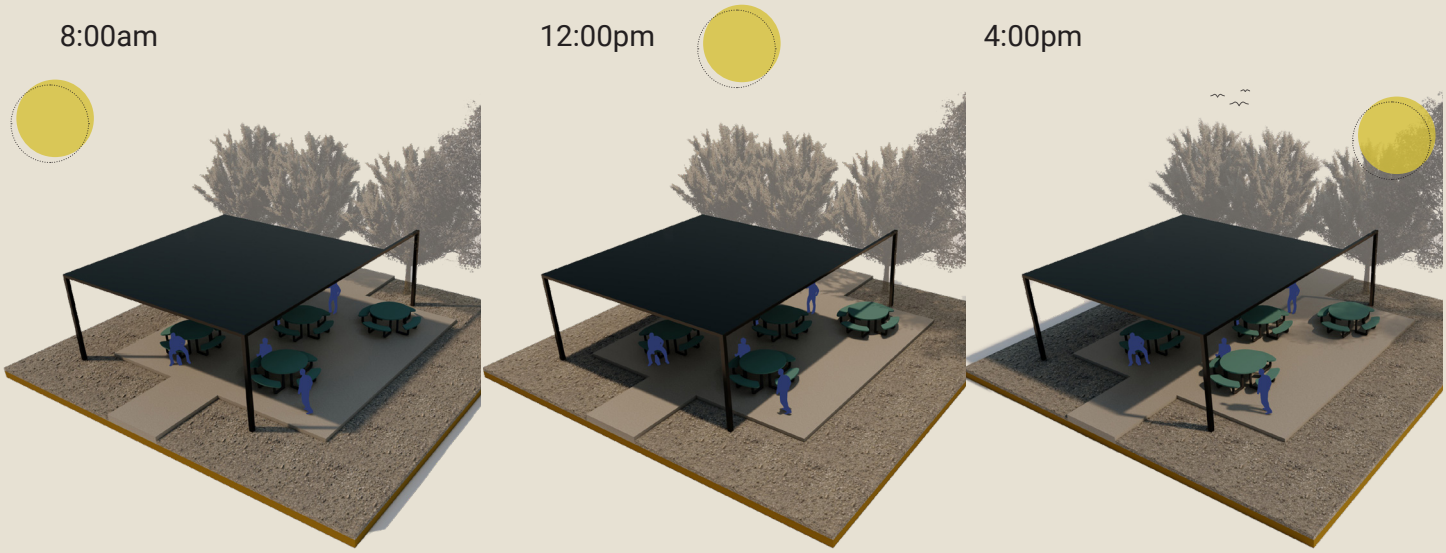


Figure 3-1. Horizontal shade structure performance relative to sun path.

Horizontal Shade

Horizontal shade structures, such as canopies, pergolas, fabric systems, and solar-panel arrays, provide broad overhead protection and are most effective during the middle of the day, when the sun is highest and radiant heat peaks. They are well suited for plazas, walkways, patios, playgrounds, and outdoor seating areas, where reducing direct overhead exposure significantly cools surfaces and improves comfort.

Because the sun's position shifts throughout the day and across seasons, fixed horizontal structures must be carefully placed to align with the intended use of the space. The diagram above demonstrates how a fixed horizontal structure casts shade throughout the day. While this can be effective for midday activity, horizontal systems provide little to no shade in the early morning or late afternoon when the sun is low on the horizon.

Louvered Shade Systems: A Flexible Year-Round Strategy

Louvered systems offer adaptable, climate-responsive shading across seasons. By adjusting tilt, spacing, or rotation, louvers can balance effective summer shade with desirable winter sunlight, supporting year-round comfort, visibility, and usability. Their flexibility makes them well-suited for plazas, walkways, seating areas, and other locations with continuous activity throughout the year.

VERTICAL SHADE

Vertical shade elements target the low-angle morning and late-afternoon sun, reducing glare and heat when overhead structures offer limited protection. Their effectiveness depends on how they are oriented in relation to the sun's path and nearby site features, particularly along southwest and west exposures.

Used alongside horizontal shade, vertical elements complete the full range of daily sun protection.

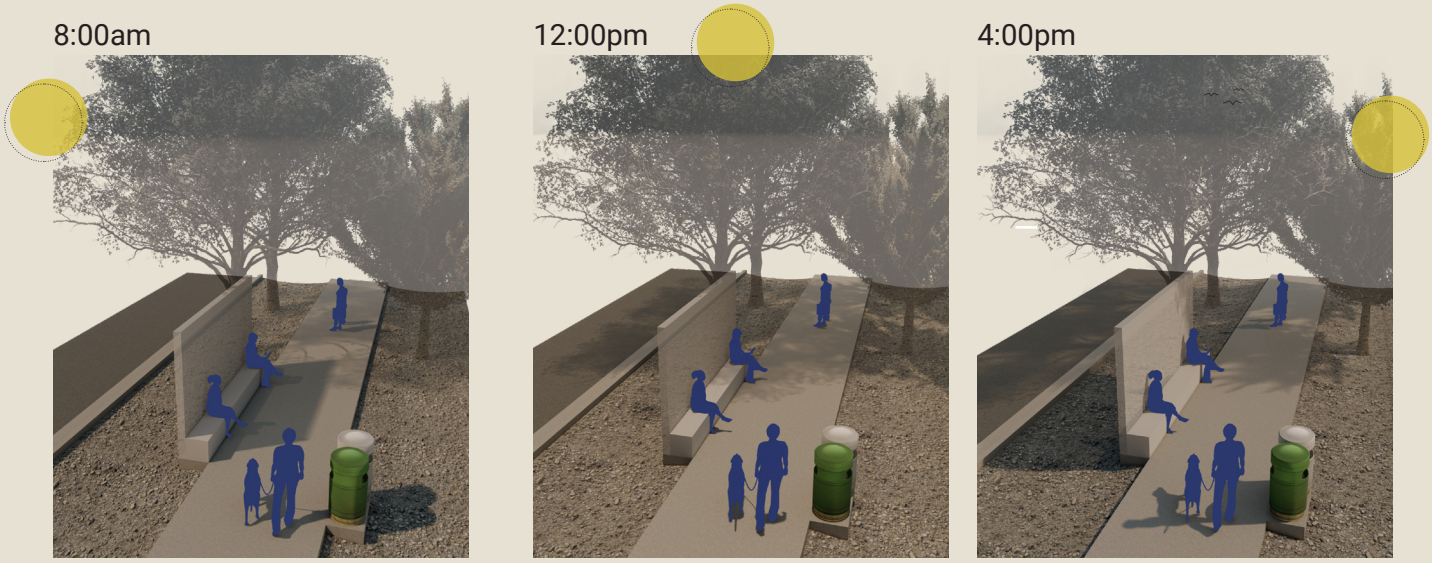


Figure 3-2. Vertical shade structure performance relative to sun path.

Vertical Shade

Vertical shade elements are highly effective at blocking low-angle morning and late-afternoon sun, when heat and glare are most intense. Their performance relies on proper placement, further, vertical screens, slats, and louvers should be oriented perpendicular to southwest and west-facing exposures to intercept the strongest sun angles while maintaining airflow and visibility.

The diagram above illustrates how orientation influences shadow patterns throughout the day. Aligning vertical elements with the sun's path during these periods significantly improves shade coverage and comfort.

To maintain safety and clear sightlines, especially in public spaces, vertical shade features should provide at least 60% openness, allowing for adequate transparency, ventilation, and surveillance.

SS 3 Design shade to enhance pedestrian comfort and connectivity.

SS 3.1 Use shade structures to link major pedestrian routes and activity areas—including transit stops, crossings, seating, playgrounds, and building entrances—to provide continuous shade.

SS 3.2 Integrate seating and lighting within shade structures to improve comfort and usability.

SS 3.3 Avoid obstructing important sightlines for visibility, particularly near intersections and active plazas.

SS 4 Provide shade levels appropriate to the use, comfort needs, and exposure of the site.

SS 4.1 Provide **Full Shade** in high-exposure or high-dwell-time areas.

SS 4.2 Provide **Partial Shade** in moderate-activity locations.

SS 4.3 Provide **Filtered Shade** in open, transitional, or visually sensitive environments.

SS 4.4 Select shade levels based on expected user duration, directional exposure, orientation, and surface material temperatures.

SS 4.5 Use layered shade (structures and trees) in high-demand areas to maintain comfort throughout the day and across seasons.

Shade Types

Shade types vary in performance and purpose. Selecting the appropriate shade type ensures comfort, usability, and alignment with Scottsdale's heat conditions and site needs.

Full Shade

Maximum sun protection, making spaces significantly cooler.

- Playgrounds
- Transit stops
- Outdoor seating
- Building entrances

Partial Shade

Reduces direct midday sun and allows some sunlight in the morning or late afternoon.

- Community parks
- Outdoor dining and seating
- Major pedestrian routes

Filtered Shade

Dappled lighting maintains natural brightness and visibility, while still cooling an area.

- Neighborhood walkways and playgrounds
- Art plazas
- Scenic view corridors

Figure 3-3. Typical shade types and their use.

INTEGRATION & CONTEXT

Align shade structures with surrounding landscape, architecture, and circulation to create cohesive, accessible, and context-appropriate outdoor environments.

SS 5 Integrate shade structures with their site and surrounding environment.

SS 5.1 Locate structures where they complement existing or proposed trees, plantings, and site features, avoiding conflicts with root zones, water-harvesting areas, and on-site stormwater systems.

SS 5.2 Allow at least 15–20 feet of overhead clearance between structural canopies and expected mature tree canopy.

SS 5.3 Design structures to fit the scale and proportion of their setting, maintaining pedestrian scale in walkable environments and larger open spaces.

SS 5.4 Use placement and orientation to support site organization while maintaining functional shade.

SS 6 Coordinate shade structures with adjacent architecture and public realm design.

SS 6.1 Align structure geometry, scale, and materials with adjacent architectural forms to create a unified composition.

SS 6.2 Connect structural canopies to building façades or courtyard edges to maintain continuity of shade and enclosure.

SS 6.3 Complement existing streetscape palettes to maintain visual coherence.

SS 6.4 In civic and commercial settings, use shade structures to transition between interior and exterior spaces.

SS 6.5 Structures should not obstruct sightlines, building entries, or emergency access.

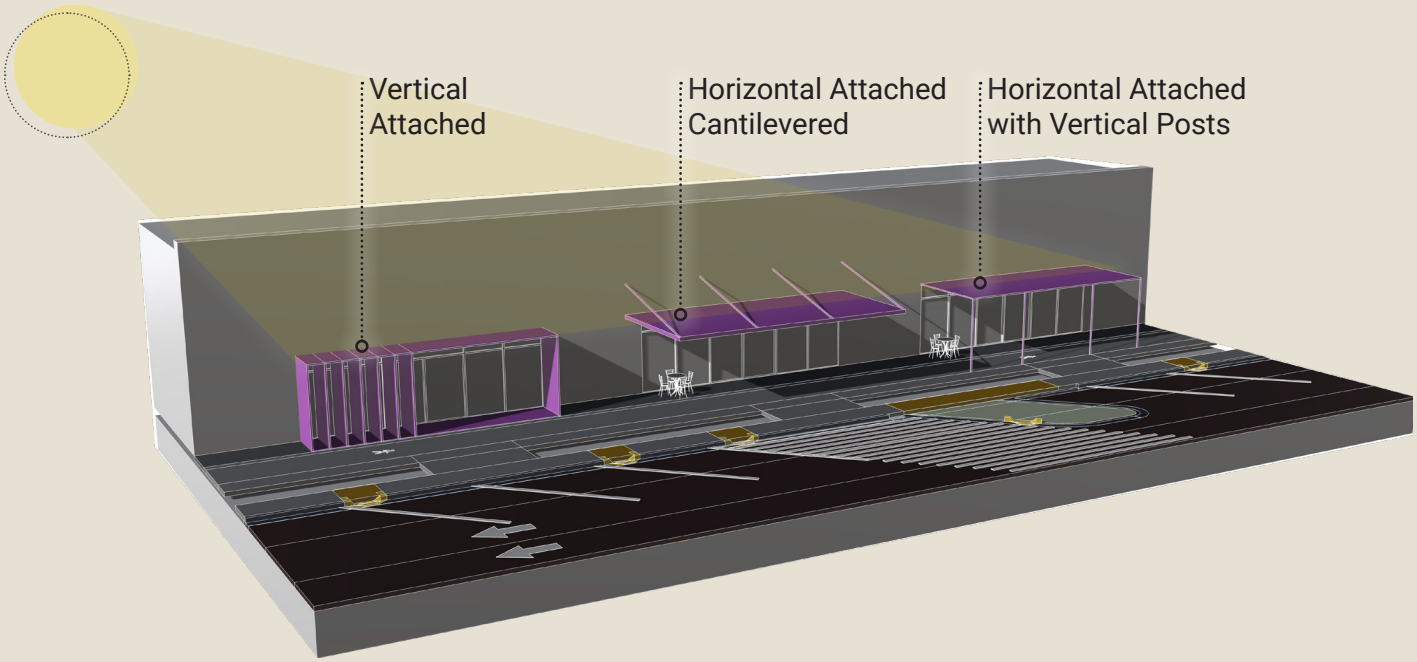


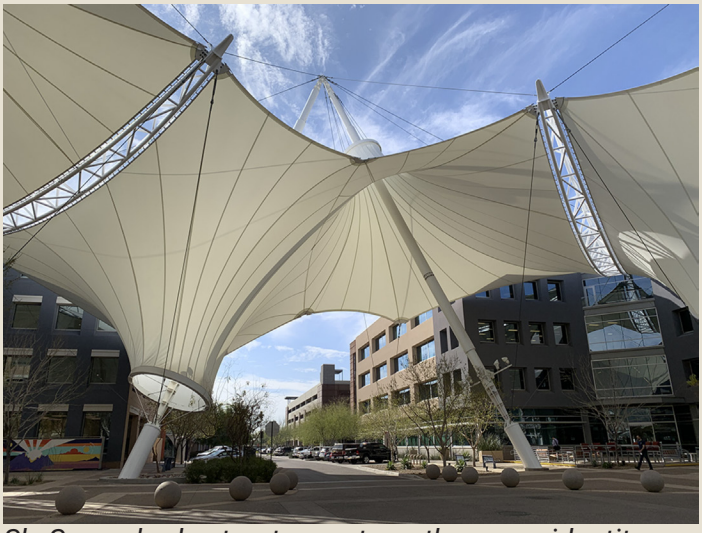
Figure 3-4. Integrating shade structures along a building frontage.

SS 7 Use shade structures to strengthen placemaking and neighborhood identity.

SS 7.1 Incorporate artistic or cultural detailing inspired by Sonoran Desert forms or the distinct character of Scottsdale's built and natural environments.

SS 7.2 Coordinate with Scottsdale Public Art or other community partners when designing large or iconic structures in civic spaces.

SS 7.3 Design structures to act as landmarks or wayfinding cues, aiding pedestrian orientation and highlighting key destinations.



SkySong shade structures strengthen area identity while providing filtered shade.

SS 7.4 Use lighting and signage integration to enhance visibility, orientation, and safety.

SS 7.5 In historic or design-sensitive areas, use materials, finishes, colors and detailing that are visually compatible with the surrounding architecture and landscape.

SS 8 Promote universal access and comfort for all users.

SS 8.1 Comply with ADA standards for clear width, head clearance, and maneuvering space beneath and around structures.

SS 8.2 Provide shade near amenities such as benches, transit stops, and play areas.

SS 8.3 Maintain visual openness (minimum 60% transparency for vertical elements) to ensure safety and natural surveillance.

Transit stop provides vertical and horizontal shade.

SS 8.4 Design shade structures to maintain horizontal airflow and avoid heat buildup.

SS 8.4.1 Provide openings along at least two sides of the structure.

SS 8.4.2 Avoid fully enclosed or low-clearance designs that trap heat.

SS 8.5 Incorporate cool-surface materials and airflow openings to maintain thermal comfort.

MATERIALS & MAINTENANCE

Select durable, climate-appropriate materials and establish proactive maintenance strategies to ensure long-term performance, safety, and visual quality.

SS 9 Select materials that perform well in Scottsdale's desert climate.

SS 9.1 Use UV-resistant metals, treated woods, masonry, or high-performance composites that can withstand temperature extremes, sun exposure, and seasonal weather variations.

SS 9.2 Apply powder-coated or corrosion-resistant finishes on metal elements to prevent rust and color fading.

SS 9.3 Avoid materials prone to warping, brittleness, or delamination under prolonged heat.

SS 9.4 Design with materials that maintain appearance and function without frequent replacement or refinishing.

Material Selection for Desert Performance

Scottsdale's desert climate presents unique challenges for shade structures: prolonged UV exposure, high summer heat, and monsoonal weather swings. The materials selected must balance durability, maintenance, and thermal comfort.

Legend

Durability (D)
Maintenance (M)
Heat Retention (H)

○ Low ◎ Moderate ● High

Metal

D M H
● ○ ○

Long-life choice for civic and commercial spaces. Use high-performance powder-coated finishes, paired with light colors to reduce surface heat, extend lifespan and reduce maintenance.

Solar Panel

D M H
● ○ ○

Long-term, dual-purpose shade and energy generation for parking or transit sites. Requires periodic cleaning to remove debris that can block sunlight and reduce efficiency.

Wood

D M H
○ ○ ○

Commonly used for pergolas and open-air structures, offering a natural aesthetic that blends well with green spaces. Requires regular maintenance to prevent deterioration.

Fabric

D M H
○ ● ○

Lightweight and flexible for play areas or plazas. Select UV-stable, PVC- or PTFE-coated fabrics with high tear strength. Attachment points should be inspected annually.

Figure 3-5. Shade structure material selection.

SS 10 Align material selection with the intended function and context of the site.

SS 10.1 Use tensile fabric or open-air pergolas for flexible recreation areas, fixed metal or solar canopies for parking and high-use civic spaces, and artistic or sculptural forms for signature public areas.

SS 10.2 Use durable materials such as steel, masonry, or concrete for civic plazas, parking areas, and other high-use spaces.

SS 10.3 In neighborhood or park settings, apply wood, fabric, or hybrid systems that convey warmth and scale appropriate to the context.

Flat roof covered walkway is constructed of wood to reinforce the pedestrian character of Old Town.

SS 10.4 For artful or signature projects, combine sculptural forms, artistic detailing, or cultural motifs.

SS 11 Integrate water efficiency and renewable energy performance into shade structures.

SS 11.1 Where feasible, integrate solar panels or other renewable energy components within shade structures, particularly in parking areas, civic facilities, or commercial properties.

SS 11.2 Design drainage and gutter systems to direct runoff into landscape basins or bioswales, supporting water harvesting and plant irrigation.

SS 12 Select materials that maintain performance and mitigate heat buildup in extreme temperatures.

SS 12.1 For materials regularly touched by users (handrails, seating, support columns), select finishes that demonstrate “safe-to-touch” surface temperatures at or below approximately 140°F during peak summer conditions.

SS 12.2 Prioritize lighter colors, cool-surface coatings, and heat-reflective finishes for metal components to reduce radiant temperatures beneath the structure.

SS 12.3 Avoid dark or high-absorptance materials.

SS 13 Design structures for Scottsdale wind and monsoon conditions.

SS 13.1 Shade structures must be designed to withstand regional high-wind events and monsoon gusts, following certified structural engineering calculations.

SS 13.2 Fabric structures should include engineered tension systems and reinforced anchor points. Redundancy connections are required for structures located in public spaces.

SS 14 Develop a proactive maintenance plan.

SS 14.1 Inspect structures annually for corrosion, loose fasteners, fading, or material deterioration.

SS 14.2 Coordinate maintenance activities with tree pruning and irrigation inspections.

Annual Structural Inspection Checklist

- **Fasteners**: corrosion, loosening,
- **Coatings & finishes**: fading, chalking, peeling, rust
- **Footings & foundations**: cracking, settlement
- **Fabric tensioning systems**: sagging, UV damage, weakened anchor points
- **Cables & turnbuckles**: rust, slack
- **Drainage systems**: clogs, sediment buildup, improper outflow
- **Solar panels**: periodic cleaning to remove dust; mounting integrity and wiring
- **Lighting**: housings, gaskets, brittle wiring

Post-Monsoon Evaluation

- Inspect canopies for wind damage
- Check all bolts for uplift stress
- Confirm that fabric or metal systems have not warped or loosened

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