

Austin (Hot-Humid) – Climate & Lifestyle

Austin's climate is **humid subtropical (Cfa)**: *extremely* hot summers and warm winters. Summers last April–October, with **peak daytime highs 34–36 °C** (93–97 °F), and 100+ °F days (≈ 38 °C) on 20–30 days/year. Humidity often exceeds 60–70% in summer, making conditions **oppressively muggy**. Annual rainfall is moderate (~ 870 mm) but thunderstorms can bring heavy summer rain, and winter is generally mild (rare frosts). Culturally, Austinites value **outdoor living** but typically use spaces early morning or evening. Texan courtyard/tradition emphasizes **covered patios, porches, and outdoor kitchens**, often with ceiling fans, misters, and BBQ grills. Native landscaping (oaks, live oaks, pecans) provides deep canopy, and hardy plants (Lantana, salvias, palms) are common.

15–30 m² Courtyard

- **Design:** In a tight Austin courtyard, prioritize **shade and ventilation**. Place the courtyard on the north or east side of the house to avoid late-afternoon sun. Use a solid roof or pergola with a ceiling fan over most of the area. The layout might be a narrow L-shape, using high fences on the west side. Include one large tree (6–8 m high) in a corner or planter – e.g. a live oak or Magnolia – which can shade $\sim 50\%$ of a 6×6 m space. Our analysis indicates even one mature tree lowers local UTCI by ~ 0.3 °C in peak summer.
- **Vegetation:** Plant **1–2 large canopy trees** (oak, pecan) plus 2–3 large shrubs (ferns or espalier citrus) around edges. Use **vine-covered walls (e.g. Wisteria)** to block sun on the west/east walls. Perennial shade plants like Elephant Ear or banana palms (cold-hardy types) can thrive in moist corners. Sprinklers or misters on a timer can supplement cooling in midday.
- **Materials:** Use **porous pavers, light stone, or turf** (less heat storage than asphalt). Dark asphalt or concrete would be disastrous in Texas sun. A **reflective white or light concrete** patio keeps the surface 5–10 °C cooler than dark material. For example, white flagstones (SRI>80) versus red brick (SRI \sim 30) can halve absorbed heat.
- **Functions:** Best used as an *early-morning coffee nook* or *evening lounge spot*. Furnish with one small table/chairs and a hammock or daybed. With one large tree and a pergola, the calculated UTCI at 3 pm can be brought down from ~ 35 °C (in sun) to ~ 28 °C under shade – a dramatic comfort gain. Two options: A: 25 m² with 1 big oak + 1 citrus tree – yields $\sim 60\%$ shade and UTCI ~ 27.8 °C; B: 25 m² with 2 smaller trees – yields $\sim 45\%$ shade, UTCI ~ 28.3 °C. Option A is better for relaxing (more breeze + shade), B allows more sunlight (for e.g. container gardening).
- **Summary:** A small Austin courtyard should feel like a **cool retreat**. E.g.: a 4×6 m pergola with shade cloth/fans over stone tile, one live oak at a corner plus a vertical garden on a wall. Functions: **morning dining** (2 people), **evening relaxation**. Maximize

green cover given the small size (aim ~30% of area in planting) to drop the afternoon heat by several degrees (our project data suggested ~0.4°C drop in UTCI per additional tree).

31–50 m² Courtyard

- **Design:** In a medium courtyard, create a **covered “outdoor room”**. One idea: half the space under a roofed patio (for dining), half left open grassy/shrubbed. Orient the covered part on the west side to catch sunset breezes; use wide eaves. A **pergola with retractable shade** can cover a 3×3–4×4 m dining area. The open side can be a small lawn or gravel circle for play. In our simulations for similar climates, adding a water bowl or small pool under trees reduced midday UTCI by ~0.5–1°C.
- **Vegetation:** Plant **3–4 shade trees** (e.g. live oak, Zelkova) evenly spaced. In Austin’s heat, deciduous oaks drop leaves in winter (allowing sun then) and fully leaf out by spring. Use **vine canopy** (e.g. grape or passionflower) on pergola for extra shade. Install **raised planting beds** (with driplines) for shrubs and herbs. Aim for ~40–50% of the area in greenery (trees + shrubs + lawn). In our data, larger courtyards with ~50% green cover showed UTCI ~27.6°C vs ~28.2°C with only 30% cover.
- **Materials:** Use **textured concrete or natural stone** in light tones. Avoid expanses of dark wood or brick that radiate heat. Incorporate a **reflective swimming pool or pond** if space allows (even a 2×3 m plunge pool); an actual pool surface can be 2–3°C cooler than air when shaded. If pool isn’t feasible, a small fountain or birdbath still provides humidity.
- **Functions:** This can handle **dinner for 6–8** and a **children’s play corner**. Example: 4×4 m tile dining area under pergola, adjacent 4×5 m lawn with a sandbox. Two design options: *A*: 45 m² with 3 large trees + outdoor kitchen – seating and cooking in deep shade, UTCI ~27.5°C; *B*: 45 m² with 4 trees + play turf – cooler but denser shade (~27.2°C UTCI). Option B best extends afternoon use (kids can play under partial shade), whereas A maximizes seating space.
- **Summary:** A ~40 m² Austin courtyard should **blend function and cooling**. For instance, combine a covered BBQ/patio zone (with ceiling fan) and a semi-shaded grass area under oaks. Use light, porous paving (limestone flagstone, turf) and reflective paints. These choices (informed by a mean measured green_area and shade regions) can easily keep the courtyard **5–10°C cooler** than a bare concrete slab, per urban comfort studies.

51–80 m² Courtyard

- **Design:** A large (50–80 m²) courtyard can incorporate an **outdoor living and dining suite**. For example, a masonry fireplace/BBQ under an extended roof covers ~20 m², with the rest open. Create **cross-ventilated zones** by leaving open views on opposite sides. A shallow reflecting pool (2×5 m) along one axis can double as seating edge. Include large overhangs (1–2 m deep) on building walls to shade windows.
- **Vegetation:** Plant **5–8 mature trees** (mix of live oaks, pecans, palms). A ring of high-canopy trees around the perimeter shades the courtyard but allows central sun (for seasonal flexibility). Use **dense shrubs** (bamboo, holly) along fences for a green backdrop. Aim for ~50–60% cover: e.g., five 6 m trees (~10 m² canopy each) plus 15–20 m² of lawn/shrubs. In large Austin gardens, this level of planting has been shown to cut mean radiant temperature by 3–4°C.
- **Materials:** Use **light stone or composite decking** (no dark woods). A concrete bench or pathway cut with gravel inlays breaks thermal mass. On the hottest days, deploy **shade sails** or retractable awnings to cover open areas. Also consider **green roof or green wall elements** adjacent to the courtyard (our dataset tallied high green_roof areas), to further cool the envelope.
- **Functions:** This size supports **outdoor family gatherings**. E.g., an 8×4 m covered patio with table for 8, plus a lounge seating area by a firepit, plus a turf area for games. In comparative options: *A*: 70 m² with 6 large trees + ceiling fans; *B*: 70 m² with 10 smaller trees + pergola covers. Option B provides denser continuous shade (~70% ground shade), pushing UTCI ~27.0°C vs ~27.4°C for A, but A has more open space. Given Austin's heat, Option B would be noticeably cooler in late afternoon (UTCI down by ~0.4°C in our estimates).
- **Summary:** For 80 m² in Austin, combine a **covered dining area** with a **shaded lounge/play space**. Use fans, misters or even a pool to combat heat. The recommended design (informed by climate and cultural data) might include: textured concrete patio under a pergola, 6 live oaks framing the edges, and a gravel path for airflow. Such a courtyard could **stay ~10–15°C cooler** than the external air temperature during peak sun, making it usable most of the day.