Implementing Abu Dhabi’s 21st Century Vision for Sustainability and Livability

Abu Dhabi Urban Street Design Manual
Global Context

• Emirate of Abu Dhabi is the largest of seven nation-states that make up the United Arab Emirates.
• Abu Dhabi controls most of the nation’s oil wealth.
• Abu Dhabi City is the capital city of the Emirate.
• Abu Dhabi seeks to be known as the cultural capital of the Middle East.
Abu Dhabi’s Early Days - A Small Seaside Fishing Village
Villagers walked from place to place... This was only about 40 to 50 years ago.
Then…
Things began to change very rapidly...
Phenomenal growth and change 1960s through the present
Same problems as western cities with sprawling, unchecked growth
It was time for a new vision

Abu Dhabi Plan 2030
Why a Street Design Manual?

• Implementing Plan 2030
• Creating a World Class City
• Enhancing livability, health, and sustainability
• Making the urban environment better for next generations
Why a Street Design Manual?

Providing better urban design guidance to improve street environments
Why a Street Design Manual?

Helping people cross the street safely
Why a Street Design Manual?

Minimizing hazards for pedestrians
Providing accessible sidewalks for all users
Why a Street Design Manual?

Reducing street clutter
Learning from Best Practices around the World

Abu Dhabi Urban Street Design Manual
Collaborative Approach: Technical Advisory Committee

The Urban Planning Council worked together with:

Department of Transport
Department of Municipal Affairs:
  - Al Ain
  - Al Gharbia
  - Abu Dhabi

Civil Defense
Traffic Police
External Technical Experts

Abu Dhabi Urban Street Design Manual
Abu Dhabi
Urban Street Design Manual
Key Principles / Approach
Strong Emphasis on Safety
Strong Emphasis on Safety
Strong Emphasis on Safety
Strong Emphasis on Safety

Vehicle Impact Speed vs. Pedestrian Injury
(initial impact only)

AIS Severity (6=fatal)

Impact Speed (kph)

Small Injuries

Usually Fatal
Strong Emphasis on Safety

![Graph showing reaction and braking distances vs. speed.](image-url)
Studies on lane widths report mixed results, with some studies finding wider lanes are safer, and other finding wider lanes are more dangerous.

In general, safety decreases wider than 3.5 m.

Narrower lanes result in lower speeds, which tend to result in better safety in urban contexts.

Studies consistently find that adding lanes increases crashes, while eliminating lanes though “road diet” projects decreases crashes.

# Land Use Context

<table>
<thead>
<tr>
<th>Street Family</th>
<th>City (7 stories +)</th>
<th>Town (3–6 stories)</th>
<th>Commercial (1–3 stories)</th>
<th>Residential (1–3 stories)</th>
<th>Industrial</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boulevard</td>
<td><img src="image" alt="Boulevard City" /></td>
<td><img src="image" alt="Boulevard Town" /></td>
<td><img src="image" alt="Boulevard Commercial" /></td>
<td><img src="image" alt="Boulevard Residential" /></td>
<td><img src="image" alt="Boulevard Industrial" /></td>
</tr>
<tr>
<td>Avenue</td>
<td><img src="image" alt="Avenue City" /></td>
<td><img src="image" alt="Avenue Town" /></td>
<td><img src="image" alt="Avenue Commercial" /></td>
<td><img src="image" alt="Avenue Residential" /></td>
<td><img src="image" alt="Avenue Industrial" /></td>
</tr>
<tr>
<td>Street</td>
<td><img src="image" alt="Street City" /></td>
<td><img src="image" alt="Street Town" /></td>
<td><img src="image" alt="Street Commercial" /></td>
<td><img src="image" alt="Street Residential" /></td>
<td><img src="image" alt="Street Industrial" /></td>
</tr>
<tr>
<td>Access Lane</td>
<td><img src="image" alt="Access Lane City" /></td>
<td><img src="image" alt="Access Lane Town" /></td>
<td><img src="image" alt="Access Lane Commercial" /></td>
<td><img src="image" alt="Access Lane Residential" /></td>
<td><img src="image" alt="Access Lane Industrial" /></td>
</tr>
</tbody>
</table>
## Typologies - Combinations

<table>
<thead>
<tr>
<th>Street Family</th>
<th>Transport Capacity</th>
<th>Land Use Context</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Vehicle Priority</td>
<td>City (7stories +)</td>
</tr>
<tr>
<td>Boulevard</td>
<td>High</td>
<td>City Boulevard</td>
</tr>
<tr>
<td>Avenue</td>
<td>Medium</td>
<td>City Avenue</td>
</tr>
<tr>
<td>Street</td>
<td>Low</td>
<td>City Street</td>
</tr>
<tr>
<td>Access Lane</td>
<td>Very Low</td>
<td>City Access</td>
</tr>
</tbody>
</table>

|               | Travel Lanes       |                   |                   |                   |                   |                   |                   |
| Boulevard     | 3+3                |                   |                   |                   |                   |                   |                   |
| Avenue        | 2+2                |                   |                   |                   |                   |                   |                   |
| Street        | 1+1                |                   |                   |                   |                   |                   |                   |
| Access Lane   | 1+1 1 shared       |                   |                   |                   |                   |                   |                   |
# Elements of the Street

<table>
<thead>
<tr>
<th>Section</th>
<th>Example 1: Avenue with Transit Median</th>
<th>Example 2: Boulevard with Frontage Lane</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Pedestrians</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Transit Users</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Bicyclists</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Motor Vehicles</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>Median</td>
<td></td>
</tr>
</tbody>
</table>

<p>| | | | | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Figure 5.1 Street Design Elements Prioritization**

Abu Dhabi Urban Street Design Manual
Coded to Land Use and Street Type

5.3.4 Residential Context

**Definition**
Areas that provide a variety of housing opportunities, allowing for densities varying from villa to multi-dwelling residential buildings.

**Design Considerations**
Pedestrian safety is of paramount importance. On some Residential Streets and all Residential Access Lanes, children's play should be accommodated in the street by ensuring very low speeds for automobiles. Landscape should provide shade for pedestrians and enhance residential quality of life. High levels of street connectivity, including use of Siklias and other pedestrian-only ways, should be provided to allow direct access for all residents to transit stops, retail centers, mosques, and schools.

**Examples**
Low density residential neighborhoods, including most of Madinat Zayed, Al Mirfa, Al Ain, and Emirati neighborhoods in Abu Dhabi City.

**Development Code Designations**
Low Density Residential (R15A / VR)

### Standard Residential Dimensions

<table>
<thead>
<tr>
<th>Street Family</th>
<th>Pedestrian Realm</th>
<th>Frontage</th>
<th>Through</th>
<th>Furnishings</th>
<th>Cycle Track</th>
<th>Edge</th>
<th>Frontage Lane</th>
<th>Parking</th>
<th>Travel</th>
<th>Side Median</th>
<th>Traveled Way</th>
<th>Center Median</th>
<th>Bus</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boulevard</td>
<td></td>
<td>0.5</td>
<td>2.2</td>
<td>1.5</td>
<td>2.0</td>
<td>0.5 - 1.5</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>3.5</td>
<td>3.3</td>
<td>5.0</td>
</tr>
<tr>
<td>with Frontage Lane</td>
<td></td>
<td>0.5</td>
<td>2.2</td>
<td>1.5</td>
<td>n/a</td>
<td>0.5</td>
<td>2.3</td>
<td>2.8</td>
<td>2.0</td>
<td>n/a</td>
<td>3.5</td>
<td>3.3</td>
<td>5.0</td>
</tr>
<tr>
<td>Avenue</td>
<td></td>
<td>0.5</td>
<td>2.0</td>
<td>1.5</td>
<td>2.0</td>
<td>0.5 - 1.5</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>2.3</td>
<td>2.0</td>
<td>3.5</td>
<td>3.3</td>
</tr>
<tr>
<td>with Frontage Lane</td>
<td></td>
<td>0.5</td>
<td>2.0</td>
<td>1.5</td>
<td>n/a</td>
<td>0.5</td>
<td>2.3</td>
<td>2.8</td>
<td>2.0</td>
<td>2.3</td>
<td>2.0</td>
<td>3.3</td>
<td>5.0</td>
</tr>
<tr>
<td>Street</td>
<td></td>
<td>0.3</td>
<td>1.8</td>
<td>12 - 1.5</td>
<td>n/a</td>
<td>0.5</td>
<td>2.3</td>
<td>2.8</td>
<td>2.0</td>
<td>2.3</td>
<td>3.0</td>
<td>n/a</td>
<td>n/a</td>
</tr>
<tr>
<td>Access Lane</td>
<td></td>
<td>n/a</td>
<td>1.8</td>
<td>n/a</td>
<td>n/a</td>
<td>0.5</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
<td>n/a</td>
</tr>
</tbody>
</table>

1. Parking along pedestrian realm.
2. Designers should determine type of bicycle facility per Section 5.9 and consult with the DOT. If cycle track is used, the edge zone will be 1.5 ft. If a bicycle lane is used, the edge zone will be 0.5 ft. Trails and Access Lanes may have bicycle lanes or bicycles may share the curb lane. Where there is on-street parking, the edge zone will be 1.5 ft.
3. Use 3.5 ft if bike use curb lane as part of a regular transit route.
4. Median dimensions include 3.0 ft left turn lane.
Abu Dhabi
Urban Street Design Manual
Design “Toolbox”
6.1 Introduction

Streetscapes are important public resources, and collectively they are an essential part of the open space of urban areas. They are a representation of a city's vitality and livability.

Improving urban streetscapes throughout the Emirate of Abu Dhabi will achieve an important objective: to develop a high-quality, connected pedestrian realm. The design guidelines presented in this chapter apply primarily to the pedestrian realm, but may also be applicable to other areas within the right-of-way, such as medians.

6.1.1 Streetscape Design Principles

Streetscapes should be designed to be complete systems that blend all components into a safe, functional, attractive, and cohesive place. Follow the design guidelines of this chapter to develop the details of the streetscape. Customize the design and aesthetics to strengthen and reinforce the desired character of the municipality, district, and neighborhood. Apply the guidelines with flexibility to adapt to the specific conditions of the design project. Use innovation balanced with functionality and practicality to produce a high quality design. The following important principles will guide all streetscape design in the Emirate of Abu Dhabi.

Figure 6.1 Streetscape as a Complete System
Pedestrian Realm Composition

**Pedestrian Realm Zones**

The Frontage, Through, Furnishings, and Edge zones of the pedestrian realm shall be designed to fit the district and neighborhood context and adjacent land uses along the street. Refer to page 5-X for design guidelines related to these zones of the pedestrian realm.

**Frontage**
Space along the right-of-way that functions to provide space between the building façade, wall or fence and the through zone of the sidewalk.

**Through**
Obstacle-free space for clear pedestrian through travel that is often the primary walking area of the sidewalk.

**Furnishings**
Primary buffer space between the active pedestrian walking area of the through zone and adjacent thoroughfares.

**Bike Way**
Designated travel way for bicyclists.

**Edge**
Interface between the on-street parking or motor vehicle travel lane.
Bicycle Facilities

Figure 5.10 Examples of Bicycle Facilities

- Typical Cycle Track
- Typical Bicycle Lane with Parking and Door Zone
- Typical Yield Lane with “Sharrow” Making for Shared Lane
Metro – Tram – Bus Rapid Transit

Advantages and Disadvantages Of Center, Side, and Sidewalk-Running Tram

<table>
<thead>
<tr>
<th></th>
<th>Center</th>
<th>Side</th>
<th>Sidewalk Plaza</th>
</tr>
</thead>
<tbody>
<tr>
<td>Conflicts with Other Traffic</td>
<td>●</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Tram Speed</td>
<td>●</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Pedestrian Waiting Comfort</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Pedestrian/Cyclist Interference</td>
<td>●</td>
<td>○</td>
<td>○</td>
</tr>
<tr>
<td>Right Turn Interference</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Driveway Interference</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Left Turn Interference</td>
<td>●</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>Pedestrian Realm Vitality</td>
<td>○</td>
<td>●</td>
<td>●</td>
</tr>
<tr>
<td>More Right-of-Way Required for Platforms</td>
<td>○</td>
<td>●</td>
<td>●</td>
</tr>
</tbody>
</table>

- **High quality Metro station entrance**
  - Paris, France

- **High quality tram station**
  - Minneapolis, USA

Abu Dhabi Urban Street Design Manual
Bus – Taxis – Private Transit

Comparison of Near, Far, and Midblock Bus Stops

Bus Rapid Transit on boulevard
Mexico City, Mexico
Examples to Fit Land Use and Street Types

Standard City Avenue
- Cycle track proposed
- Minimum standard dimensions used for furnishing zone suitable for projected volumes of pedestrian activity
- Maximum standard edge zone dimensions used to provide space for parking meters, street lighting, street signs, and utilities
- Pedestrian lighting in furnishing zone

Standard Residential Street
- Furnishings zone and edge zone combined to provide space for parking meters, lighting, street signs, and utilities
Pedestrian Crossings

Crosswalk “Zebra”

Crosswalk is off-set in median so pedestrians will be oriented toward oncoming traffic

Turn Lane

Stop line

Overhead mast arm w/lighted pedestrian sign or signal

Abu Dhabi Urban Street Design Manual
Crossing Design

Guidelines for Installing Pedestrian Midblock Crossings

<table>
<thead>
<tr>
<th>Street Family</th>
<th>Vehicle ADT &lt; 9,000</th>
<th>Vehicle ADT 9,000 to 12,000</th>
<th>Vehicle ADT 12,000 to 15,000</th>
<th>Vehicle ADT &gt; 15,000</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>≤ 30 km/h</td>
<td>40 km/h</td>
<td>60 km/h</td>
<td>≤ 30 km/h</td>
</tr>
<tr>
<td>STREET</td>
<td>∗</td>
<td>∗</td>
<td>N/A</td>
<td>∗</td>
</tr>
<tr>
<td>AVENUE</td>
<td>∗</td>
<td>∗</td>
<td>O</td>
<td>∗</td>
</tr>
<tr>
<td>BOULEVARD</td>
<td>O</td>
<td>O</td>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>

- ∗ Acceptable to use marked uncontrolled crossing
- O Consider traffic calming, signal or other
- Do not use marked crosswalk without a signal and consider additional traffic calming measures
Access Management

5.9.4 Access Management

Access management techniques shall limit vehicle movement, manage driver behavior, and otherwise support pedestrian, transit, and bicycle-friendly design.

- Limit the size, quantity, and frequency of driveways to reduce conflict points in the pedestrian realm, as illustrated in Figure 5.14.
  - Combine access points
  - Restrict within 30 m or greater of major junctions
  - Restrict within 15 m of other junctions, crosswalks, etc.
- Construct alternate routes to disperse traffic.
- Limit turns onto and off of main streets.
- Manage access to construction sites and other temporary conditions.
- Design driveways and minor street crossings to favor pedestrians and bicyclists, as they are the most vulnerable users.
Driveway Design

- Driveways designed as a curb cut, not a junction
  Washington, USA

- Stop sign for drivers at pedestrian crossing
  Washington, USA

- Midblock crossing – requires curb ramps and marked crosswalk
  Abu Dhabi

• Curb Heights
• Slopes & Grade
Curb Ramps

New Construction Permissible exception if 8.33% slope is technically infeasible

Ramps are aligned with crosswalks

Ramp Design

Permissible exception if 8.33% slope is technically infeasible
Accessibility/Urban Braille

Figure 3.2 Wheelchair User Passing and Turning Dimensions
### Shade and Streetscape Treatments

<table>
<thead>
<tr>
<th>TYPE</th>
<th>Sculptural Free Standing and Independent Elements</th>
<th>Trees and Landscaping</th>
<th>Vertical Screens</th>
</tr>
</thead>
<tbody>
<tr>
<td>Photo References</td>
<td>![Image](594x6 to 636x42)</td>
<td>![Image](642x6 to 716x23)</td>
<td>![Image](0x54 to 720x474)</td>
</tr>
</tbody>
</table>
| Examples/Notes | • Large scale shade sculptures and structures  
• Artist-designed shade elements that combine function, form, and creative design  
• Can be particularly responsive to context | • Shade–providing trees (better in bosques and groupings)  
• Provide adequate root zone space  
• Use desert adaptive, drought tolerant species | • Patterned screens of metal, wood, or other materials  
• Vertical lattice work  
• Cast immediate shade for pedestrians in areas where sun is at low angles  
• "Green walls" with vines are psychologically cooling |
| Appropriate Locations | • Streets with wider sidewalks and frequent pedestrian traffic  
• May overhang portions of pedestrian realm or entire streets  
• Intersection locations, curb extensions, transit and taxi stops, etc. | • Streets with narrower sidewalks and frequent pedestrian traffic  
• Typically located in the facadings and edge zones; may be located at edges of through zones with accessible tree grates | • Along pedestrian through zones  
• At transit stops and waiting areas  
• Opportunities for privacy and creating outdoor rooms and corridors  
• Provide transparency for security |
Shade Structures/Placement
## Streetscape Furnishings

### Table 6.2 continued

<table>
<thead>
<tr>
<th>Streetscape Furnishings</th>
<th>Benches/Seating</th>
<th>Bicycle Racks</th>
<th>Bollards</th>
<th>Trash/Recycling Receptacles</th>
<th>Leaning Rails / Protection Railing</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bench</strong></td>
<td><strong>Essential for pedestrian areas</strong></td>
<td><strong>Essential for transit stops and at key bicycling destinations</strong></td>
<td><strong>Delineate pedestrian space</strong></td>
<td><strong>Street/pedestrian realm stays cleaner</strong></td>
<td><strong>Provide protection from vertical drops of 0.7 m or more</strong></td>
</tr>
<tr>
<td><strong>Seating</strong></td>
<td><strong>Provide center/intermediate armrests on benches</strong></td>
<td><strong>See Bicycle Parking in section 5.6.3</strong></td>
<td><strong>Provide protection from vehicle movements</strong></td>
<td><strong>Coordinate recycling containers with municipality programs</strong></td>
<td><strong>Leaning rails are popular at transit stops</strong></td>
</tr>
<tr>
<td></td>
<td><strong>Wide variety of materials and styles</strong></td>
<td></td>
<td><strong>Can be lit or unlit</strong></td>
<td><strong>Wide array of styles, colors, materials</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td><strong>Low heat reflecting</strong></td>
<td></td>
<td><strong>Keep height in scale with pedestrians</strong></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### Streetscape Furnishings

#### Table 6.2 continued

<table>
<thead>
<tr>
<th>Tree Grates and Guards</th>
<th>Custom Manholes/Utility Screens</th>
<th>Kiosks/Pedestrian Signs</th>
<th>Transit Stops/Shelters</th>
<th>Drinking Sinks/Ablution Sinks</th>
</tr>
</thead>
<tbody>
<tr>
<td>- When combined with tree pits/boxes and good sub-structure, grates can provide enhanced growth environment</td>
<td>- Can screen unsightly elements</td>
<td>- Locate in key areas where pedestrians may change their route, pedestrian gathering areas, etc.</td>
<td>- Maximize shade</td>
<td>- Provide only in essential areas, such as pedestrian gathering areas and mosques</td>
</tr>
<tr>
<td>- Guards only needed in areas where trees are susceptible to damage</td>
<td>- Add character and interest to the pedestrian realm</td>
<td>- Should be professionally designed by graphic artists</td>
<td>- Provide lighting for security</td>
<td>- Provide good drainage to avoid wet surfaces</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>- Can be customized with special designs, artist and community involvement</td>
<td>- Provide accessible height drinking fountains</td>
</tr>
</tbody>
</table>
Weblink to Manual:

Shukran!

(Thank You!)