

**City of Houston**

**Design Manual**

**Chapter 10**

**STREET PAVING DESIGN REQUIREMENTS**

## Chapter 10

**STREET PAVING DESIGN REQUIREMENTS**

## 10.01 CHAPTER INCLUDES

- A. Geometric design guidelines for streets, criteria for street paving, and standard paving notes for drawings.

## 10.02 REFERENCES

- A. Refer to the list of references in Chapter 1, General Requirements.
- B. AASHTO - American Association of State Highway and Transportation Officials
- C. ASTM - American Society for Testing and Materials
- D. ITE – Institute of Transportation Engineers
- E. TMUTCD – Texas Manual on Uniform Traffic Control Devices, Texas Department of Transportation.
- F. IBC - International Building Code
- G. MTFP - Major Thoroughfare Plan

## 10.03 DEFINITIONS

- A. CMP – City Mobility Plan
- B. Curb-and-gutter Sections - Full width concrete pavement with doweled on 6-inch curbs or monolithic curb-and-gutter sections for asphaltic concrete pavement. Curb-and-gutter sections require inlets and underground storm sewers.
- C. Geotechnical Engineer – A licensed Professional Engineer in the State of Texas who is practicing in the field of geotechnical engineering. Assignment of geotechnical or material testing by a geotechnical engineer shall be performed by a laboratory accredited by the American Association for Laboratory Accreditation (A2LA).
- D. HMAC - Hot-mix asphaltic concrete
- E. Intersection Sight Distance – Provides an unobstructed line of sight in each direction at intersections. The unobstructed line of sight allows for vehicles on side streets to observe approaching traffic on the main roadway and to safely enter an intersection from a side street.

The unobstructed line of sight allows for vehicles on the main roadway sufficient distance to observe vehicles entering from side streets.

- F. Local Streets – Provide access to individual single-family residential lots, provide entry and exit to the neighborhood, and provide connectivity to collectors and thoroughfares.
- G. Roadside Ditch Sections - Ditch sections adjacent to either full width reinforced concrete pavement or asphaltic concrete pavement. Roadside ditch sections do not require underground storm sewers; however, the ditch sections must be designed to accommodate storm runoff.
- H. Type 1 Permanent Access Easement - A permanent access easement at least 50 feet in width that is designed and constructed like a public street in accordance with the design manual and contains one or more public utilities in an unpaved portion of the easement. Refer to Chapter 42 of the Code of Ordinances No. 1999-262.
- I. Type 2 Permanent Access Easement - A permanent access easement at least 28 feet in width that is designed and constructed like a private street serving a development that has no public utilities other than a public water line connected only to one or more fire hydrants that provides no domestic water services. All private utilities within a Type 2 permanent access easement must be designed to public utility standards outlined in the Infrastructure Design Manual. Refer to Chapter 42 of the Code of Ordinances No. 1999-262.

#### 10.04 HOT MIX ASPHALTIC CONCRETE (HMAC) PAVEMENT DESIGN REQUIREMENTS:

- A. HMAC Surface Minimum Thickness – Pavement design shall be prepared by a Professional Engineer based on current AASHTO design methodology (Guide for the Design of Pavement Structure). Minimum thickness shall be as shown on Standard Detail 02741-01.
- B. Flexible Base Minimum Thickness – Pavement design shall be prepared by a Professional Engineer based on current AASHTO design methodology (Guide for the Design of Pavement Structure). Minimum thickness shall be as shown on Standard Detail 02741-01.
- C. Subgrade Treatment
  - 1. Subgrade stabilization, stabilization design, and method of stabilization shall be determined by a geotechnical engineer.
  - 2. For subgrade conditions of cohesive soils, subgrade treatment or stabilization shall be no less than 6 inches unless otherwise permitted in this document or specified by a geotechnical engineer.

## 10.05 CONCRETE PAVEMENT DESIGN REQUIREMENTS:

The following requirements are applicable to pavement within City street rights-of-way.

## A. Minimum Pavement Thickness, Reinforcing, and Subgrade Stabilization Requirements:

1. Pavement thickness and reinforcement shall be designed by a Professional Engineer based on a current soils analysis, roadway use, traffic loadings, and life span of proposed pavement. Pavement design shall be prepared by a Professional Engineer based on current AASHTO design methodology (Guide for the Design of Pavement Structure). However, in no event shall the pavement thickness be less than the minimums stated below.
2. For Concrete Pavement Widths Less Than or Equal to 27 Feet Face-to-Face of Curb:
  - a. Minimum concrete slab thickness shall be 6 inches.
  - b. Minimum concrete strength shall be  $f'c = 3500$  psi.
  - c. Minimum reinforcing steel strength shall be  $f_y = 60,000$  psi.
  - d. Refer to City of Houston Standard Detail 02751-01 for concrete reinforcement details.
  - e. Minimum stabilized subgrade thickness shall be 6 inches.
  - f. The type and depth of subgrade shall be as determined by a geotechnical engineer.
3. For Concrete Pavement Widths Greater Than 27 Feet Face-to-Face of Curb and Not Major Thoroughfares:
  - a. Minimum concrete slab thickness shall be 7 inches.
  - b. Minimum concrete strength shall be  $f'c = 3500$  psi.
  - c. Minimum reinforcing steel strength shall be  $f_y = 60,000$  psi.
  - d. Refer to City of Houston Standard Detail 02751-01 for concrete reinforcement details.
  - e. Minimum stabilized subgrade thickness shall be 6 inches.
  - f. The type and depth of subgrade shall be as determined by a geotechnical engineer.
4. For Major Thoroughfares Constructed With Concrete Pavement:

- a. Minimum concrete slab thickness shall be 8 inches.
  - b. Minimum concrete strength shall be  $f'c = 3500$  psi.
  - c. Minimum reinforcing steel strength shall be  $f_y = 60,000$  psi.
  - d. Refer to City of Houston Standard Detail 02751-01 for concrete reinforcement details.
  - e. Minimum stabilized subgrade thickness shall be 8 inches.
  - f. The type and depth of subgrade shall be as determined by a geotechnical engineer.
5. Paving headers shall be placed at the end of all concrete pavements..

B. Curb Requirements:

1. 6 inch Vertical Curb:
  - a. 6 inch curb is the standard curb design.
  - b. Collector streets and streets allowing cut-through traffic in residential areas require construction of 6 inch vertical curb.
2. Laydown Curb:
  - a. Laydown curb shall be in accordance with City Standard Details.
  - b. Shall be 4 inches in height.
  - c. Is only allowed as an option for street projects on single family residential streets within the City.
  - d. Laydown curb shall not be permitted if sidewalk is to be constructed immediately adjacent to the curb.
  - e. Laydown curb construction shall provide for necessary transition lengths at curb inlets to go from laydown curb to standard vertical curb section.
  - f. Standard 6 inch vertical curb shall be extended a minimum of 10 feet beyond curb sections before beginning transitions.

10.06 GEOMETRIC DESIGN REQUIREMENTS:

A. Roadway Cross Sections:

1. The City of Houston utilizes the basic roadway cross sections shown in City of Houston Standard Drawing Nos. 10.06-01, 02 and 03, respectively. ALL variations to these three standards require the approval of the City Engineer.
  
2. Street Hierarchy:
  - a. The City's street hierarchy is described in the Major Thoroughfare and Freeway Plan (MTFP).
  
  - b. MTFP street classifications are:
    - (1) Principal Thoroughfare
    - (2) Thoroughfare
    - (3) Major Collector
    - (4) Transit Corridor
  
  - c. Where existing conditions or proposed adjacent development warrant the consideration of alternatives to serve specific needs such as enhanced pedestrian environments, on-street parking, and bicycle traffic, optional design sections are available in the CMP. Examples of these optional design sections are shown in Appendix 2 of this chapter.
  
3. Local Street Classifications (not applicable in ETJ)
  - a. Local street classification are:
    - (1) Residential Standard Density – Provides access to individual lots equal to or greater than 40 feet in width.
    - (2) Residential High Density – Provides access to individual lots less than 40 feet in width.
    - (3) Residential Main – Serves multiple streets and can be described as the “neighborhood feeder/collector.”
    - (4) A summary of the design characteristics for the three local street classifications above is included in Table 1 below. Traffic volumes shown in column “Traffic ADT” are provided as general guidelines.

TABLE 10.1  
LOCAL STREET CLASSIFICATION

Street Classification	Gross Density DU/ac <sup>(5)</sup>	Traffic ADT <sup>(1)</sup>	Min. Pav't Width(ft)	Traffic Flow Cond <sup>(2)</sup>
Residential Std <sup>(3)</sup>	0-6	250-350	27	Yield
Residential HD <sup>(4)</sup>	6-27	350-750	32	Slow
Residential Main	0-27	≥1500	36	Free

Notes

1. ADT – average daily traffic.
2. Based on parallel on-street parking two sides.
3. Lot widths equal to or greater than 40 feet.
4. Lot widths less than 40 feet.
5. DU/AC – dwelling units (DU) per acre.

b. Design Considerations:

(1) Factors that affect the number of trips per residence include:

- (a) Number of dwelling units per acre (density).
- (b) Location of services within or near the neighborhood.
- (c) Pedestrian and bicycle facilities within the neighborhood.
- (d) Connectivity to the collector and thoroughfare network, and other factors.

(2) Traffic volume guidelines (ADT) are based on full development density.

(3) Refer to the ITE Trip Generation Information Report for further discussion of single family residential trip generation rates.

c. Design Example:

Table 2 summarizes design information for developments of various size with a density of 6 dwelling units (DU) per acre. This example is based on long block length of 700' (centerline to centerline of street), short block length of 260', typical lot size of 50' wide by 100' long, and street rights-of-way of 60'. For this example, gross acreage per block is 4.18 acres (700' x 260'), net acreage of lots is 2.94 acres (640' x 200'), number of lots per block is 25 (640/50 x 2), and gross density is 6 DU/ac (25 lots/4.18 ac) Estimates of ADT are based on a trip generation rate of 10 trips/DU/day.

TABLE 10.2  
DESIGN EXAMPLE

Size (acres)	Gross Density DU/ac	No. Lots	No. Entrances	Estim ADT Resid. Street	Estim. ADT Entry/Exit Street <sup>(1)</sup>
25	6.0	150	1	250	1500 <sup>(2)</sup>
25	6.0	150	2	250	750 <sup>(3)</sup>
75	6.0	450	3	250	1500 <sup>(4)</sup>
75	6.0	450	4	250	1125 <sup>(5)</sup>

Notes

1. Based on even distribution of traffic per entry/exit.
2. Residential Main (150 lots x 10 trips/DU/d = 1500 ADT)
3. Residential Standard Density (150 lots x 10 trips/DU/d / 2 entrances = 750 ADT)
4. Residential Main (450 lots x 10 trips/DU/d / 3entrances = 1500 ADT)
5. Residential Standard Density (450 lots x 10 trips/DU/d / 4 entrances = 1125 ADT)

B. Horizontal Geometric Requirements:

1. Curb Radii:

a. Cul-de-Sac Curb Radii:

- (1) For approved cul-de-sac curb radii, refer to City of Houston Standard Drawing No. 10.06-09.
- (2) Curb radii around cul-de-sacs shall be 42-feet for single family areas.
- (3) Curb radii around cul-de-sacs shall be 50 feet for cul-de-sacs in areas other than single family areas.

b. Street Intersection Curb Radii:

- (1) For approved street intersection curb radii, refer to City of Houston Standard Drawing No. 10.06-04.
- (2) Variances to the standard presented in City of Houston Standard Drawing No. 10.06-04 require approval by the City Engineer.
- (3) Street intersection curb radii are a composite of needs to serve pedestrian and vehicular traffic.

2. Right-of-Way Corner Cut-Backs:

- a. For approved right-of-way corner cut-back dimensions, refer to City of Houston Standard Drawing No. 10.06-04.
- b. Right-of-way shall be dedicated for corner cut-backs on principal thoroughfares, thoroughfares, transit corridor streets, major collectors, collectors and local streets

as a requirement for subdivision platting of adjacent properties under Chapter 42 of the City of Houston Code of Ordinances.

- c. When right-of-way corner cut-backs are not feasible on local streets, cut-back easements will be required.
  - d. For Type 1 Permanent Access Easements, cut-back easements shall be provided.
  - e. Corner cut-backs of right-of-way at street intersections are necessary to provide sufficient public space for pedestrian sidewalk facilities and ramps (compliant with Americans with Disabilities Act – ADA and Texas Accessibility Standards-TAS), traffic control devices, street signs, street lighting, traffic signal equipment, and all surface encroachments which could prevent the future installation of such equipment within the cut-back area.
3. Intersection Sight Distance:
- a. Dedicated right-of-way or easements are required to meet the intersection sight distance triangle requirements.
  - b. Design Basis
    - (1) Design Vehicle – Passenger Car
    - (2) Design Standard – AASHTO “A Policy on Geometric Design of Highway and Streets”
    - (3) Lane Widths – 12 foot wide travel lanes
    - (4) Level Road Surface
    - (5) Sight Distance – Is measured to the center of the outside lane on main roadway approaching from the left and to the center of the inside lane of traffic on the main roadway approaching from the right.
    - (6) The intersection of local streets serving residential properties only, meeting at an angle of 85 degrees or more. Within 250 feet of the intersection, each of the uncontrolled approaches to the intersection of two local residential streets will:
      1. Have land uses adjacent to the street that are exclusively single family residential lots (or unoccupied reserves of limited size, such as landscape reserves, drainage reserves or utility reserves).
      2. Residential lots with driveway access to the uncontrolled approach street
      3. A posted (or prima facie) speed limit of 30 mph or less
  - c. Design Procedures:
    - (1) Determine design speed of main roadway. Refer to Figure 1 of Appendix 2 for design speeds of street classifications in the MTFP and CMP.
    - (2) For the appropriate design speed, determine the minimum sight distance from the following Table 10.3:

TABLE 10.3 Triangle Applicability

<b>Triangle Applicability</b>		
Highest classification/greater width street	Sight triangle driver’s eye setback distance	Sight triangle dimension on uncontrolled street (Design speed)
High speed major thoroughfare (>45 mph posted speed)	25 ft	sight-specific analysis
Major thoroughfare or major collector on MTFP map	25 ft	500 ft (45 mph)
Divided streets and 41 ft. streets	15 ft	500 ft (45 mph)
28 ft. local and collector streets	15 ft	390 ft (35 mph)
28 ft., single family residential frontage on both streets (1)	N/A	N/A

(3) Develop a scaled drawing depicting the sight triangle based on the design criteria. Refer to the City of Houston Standard Drawing No. 10.06-05.

d. Exceptions

- (1) Replats and partial replats at the intersections of a local/local street, local/major collector street, and major collector/major collector street are exempt from providing intersection sight distance rights-of-way or easements where existing site conditions for abutting properties preclude compliance.
- (2) Variances or deviations to these guidelines will be considered on a site-by-site basis. An engineering analysis should be prepared to support the proposed sight triangle dimensions, based on criteria in the AASHTO “Green Book”, latest edition. Where the uncontrolled street is existing, design speeds should be based on an analysis of the 85<sup>th</sup> percentile operating speed.

4. Median Design:

a. Minimum Median Width:

- (1) For local streets, refer to City of Houston Standard Drawing No. 10.06-02.
- (2) For street classifications depicted on the MTFP, refer to City of Houston Standard Drawing No. 10.06-02.
- (3) For streets classified as multi-modal under the CMP, please refer to Appendix 2 of Chapter 10.

b. Minimum Median Length:

- (1) Median lengths are based on functional street classification of the main roadway and intersecting street.
  - (2) Refer to City of Houston Standard Drawing No. 10.06-06 for minimum median length requirements.
- c. Median Geometry – Refer to City of Houston Standard Drawing No. 10.06-07
- d. Street Taper Geometry – Refer to City of Houston Standard Drawing No. 10.06-08 for subdivision street taper geometrics.
5. Left Turn Lanes:
- a. Left Turn Lanes are Required:
    - (1) At all signalized intersection approaches on principal thoroughfares and thoroughfares.
    - (2) At all signalized intersection approaches on major collectors and collectors as directed by the City Engineer.
  - b. Left Turn Lane Design Standards:
    - (1) Refer to City of Houston Standard Drawing No. 10.06-07 for left turn bay geometrics.
    - (2) The centerline of left turn lanes shall not be offset greater than three feet horizontally across the intersection, and the offset for through vehicles in all lanes shall not exceed three feet horizontally across the intersection.
    - (3) The volume of left turn movements shall be based on projections developed in the City Mobility Plan or based on traffic studies reviewed and approved by the City Engineer.
  - c. Dual Left Turn Lanes:
    - (1) Are required when left turn movement exceeds 300 vehicles for the peak hour, or when traffic analysis of the intersection indicates existing or projected left turn storage space requires dual left turn lanes before the volume threshold is reached.
    - (2) Where dual left turn lanes are required, right of way for the intersection shall be based on the width required for dual left turns, through lanes, a right turn lane, and minimum landscape/pedestrian zone of ten feet (dimension S) as shown in City of Houston Standard Drawing No. 10.06-02.
  - d. Special conditions or other constraints may require design criteria other than shown herein.
    - (1) Exceptions to the requirements must be demonstrated by submittal of a traffic study encompassing AASHTO criteria.
    - (2) Approval by City Engineer is required for all variances to standard.

## C. Vertical Geometric Requirements:

## 1. For Curb and Gutter Pavement Sections:

- a. Minimum grade line shall be 0.30 percent.
- b. Minimum grade line shall be 1 percent for radii of 35 feet or less around intersection turnouts. Grades for larger radii shall be determined on an individual basis.
- c. Superelevation – Major thoroughfares shall be superelevated in accordance with AASHTO requirements.
- d. Vertical Curves:
  - (1) Shall be installed when the algebraic difference in grades exceeds 1 percent.
  - (2) Elevations shall be shown at 10-foot intervals through vertical curves.
  - (3) Maintain a minimum of 0.03-foot elevation change at 10-foot intervals by altering calculated elevations.
  - (4) Determine minimum vertical curve lengths based on AASHTO design criteria (minimum 3 times design speed) using a minimum design speed of 45 miles per hour for thoroughfares and collector streets and 35 mph for residential streets.
- e. Minimum grade line around a cul-de-sac shall be 0.70 percent.
- f. Pavement Cross Slopes:
  - (1) Cross slopes for pavement shall be a minimum of 1/4 inch per foot.
  - (2) Cross slopes for left-turn lanes and esplanade openings shall be 1/8 inch per foot minimum.

## 2. Railroad Crossings

- a. Maximum Tangent Grade to Vertical Curves At Railroad Crossings:
  - (1) 8 percent for local streets
  - (2) 3.5 percent for major thoroughfares
- b. Roadway grades at railroad crossings shall be zero percent from centerline of the track to 10 feet either side of the track's centerline, and should not cause a drop of more than 6 inches from the top-of-rail elevation at a distance of 30 feet either side of the track's centerline.
- c. For concrete roadways, the roadway shall terminate at a railroad header, 6 feet from the centerline of the track and the roadway cross slope shall be zero from the railroad header to 4 feet before the railroad header.

- d. At railroad track approaches, decrease curbs from 6 inches to zero inches in 2 feet at a distance of 10 feet from the nearest track centerline.

D. Sidewalks and Accessibility Ramps:

1. Accessibility ramps shall be constructed at all intersections.
2. Ramps, approaches and sidewalks shall be comply with ADA and TAS requirements.
3. Approved sidewalk/ramp details are shown in the City's Standard Details. Use of these details are specific to certain field conditions such as ramp direction, driveway crossings, crosswalk locations and the location of the sidewalk with respect to the curb.
4. Where use of standard sidewalk/ramp details is not possible due to field conditions, engineer shall submit proposed design drawings to City Engineer for approval. Design drawings shall include site field survey conditions.
5. Accessibility ramps should cross street at 90 degrees to centerline of street.
6. All ramps constructed on an intersection corner should be interconnected for pedestrian access continuity.
7. Mid-block crosswalks are not permitted without approval by City Engineer. The specific conditions which warrant a mid-block crosswalk must be provided to support the request for a design variance.
8. Sidewalks at intersections are to be provided with unobstructed areas as shown in Standard Drawing No. 10.06-04 and are to be free of obstructions and surface encroachments such as sign posts, power poles and down guy wires within that area.
9. Concrete Sidewalk in Esplanades:
  - a. 6 inch thick reinforced concrete sidewalk shall be constructed in esplanades when curbs are 10 feet face to face of curb or less in width with a minimum length of 6 feet measured from the face of curb of the esplanade nose.
  - b. Reinforced concrete sidewalk in esplanades shall be colored black for concrete roadways.
  - c. Reinforced concrete sidewalk in esplanades shall be uncolored for asphaltic concrete roadways.
10. Sidewalks for Transit Corridor Street and Type A Streets:

- a. Chapter 42, Article IV - Transit Corridor Development, of the Code of Ordinances regulates improvements constructed in the public right of way within 1,320 feet of each transit station (Ch. 42, Sec 401-406).
- b. Mandatory requirements are summarized below and shown in Standard Detail 02775-08. These requirements are required under IBC, Section 3110.
  - (1) Minimum Sidewalk Width – 6 feet (must be located within the public right of way).
  - (2) Minimum Vertical Clear Zone, a continuous obstacle free path, for a minimum width of six feet and a minimum height of seven and one-half feet.
- c. Performance Standards – Refer to Chapter 42 Sections 401-406:
  - (1) Minimum Pedestrian Realm – 15 feet distance from back of curb to a buildings facade or other improvements (can be entirely within public right of way or a combination of public right of way and public access easement).
  - (2) Maximum Softscape area in the pedestrian realm is 20% of the surface area of the pedestrian realm excluding any driveways and shall be located at least two feet from the back-of-curb of any street area used for parking.

E. Alleys:

1. Design standards for a Public Use Alley are shown in City of Houston Standard Drawing No. 10.06-10.
2. An offer of dedication of right of way to the public is required for a Public Use Alley and such offer must be formally accepted by the City for implementation of public maintenance services.
3. A log of all public use alleys is maintained by PWE on the GIM's website.
4. The minimum design standards for a Private Use Alley are shown in City of Houston Standard Drawing No. 10.06-11.
5. The right of way for a Private Use Alley is owned and maintained by the abutting property owners.
6. Signs shall be erected by the developer at the entrance to the alley (or by the abutting property owners for existing alleys) which state "PRIVATE ALLEY – NOT A PUBLIC WAY". See City of Houston Standard Drawing 10.06-11 for sign details.

F. Street Terminations:

1. Where cul-de-sac streets are approved, design geometrics shall comply with City of Houston Standard Drawing No. 10.06-09.

2. Where termination of a private street or Type 2 Permanent Access Easement is approved, design geometrics shall comply with City of Houston Standard Drawing No. 10.06-09.
3. Dead-End Streets – Standard City of Houston barricades shall be placed at the end of dead-end streets not terminating in cul-de-sacs. Refer to City of Houston Standard Detail No. 01580-01.
4. Temporary Street Termination:
  - a. Temporary termination of streets (for future extension into adjacent development) shall include construction of street barricades as shown in City of Houston Standard Detail No. 01580-01.
  - b. A sign shall be mounted on the street barricade with the statement: “STREET IS A THROUGH STREET AND WILL BE EXTENDED AT A FUTURE DATE.”

#### 10.07 STREET CONNECTIONS AND TRANSITIONS:

##### A. Street Transition Requirements:

1. For Concrete Streets:
  - a. When transitioning from a proposed concrete street to an existing concrete street, the transition shall consist of concrete, and shall equal the existing concrete pavement thickness with a minimum thickness of 6 inches.
  - b. Refer to City of Houston Standard Detail 02751-01.
2. For Streets Other Than Concrete Pavement:
  - a. When transitioning from a proposed street to an existing street constructed of something other than concrete, the transition shall consist of flexible base paving.
  - b. Refer to City of Houston Standard Drawing No. 10.06-03.

##### B. Proposed Curb and Gutter Street Connecting to an Existing Roadside Ditch Street:

1. The standard transition length for meeting a roadside ditch street is:
  - a. 50 feet for street widths less than or equal to 27 feet face to face of curb.
  - b. 75 feet for street widths equal to 36 feet face to face of curb.
  - c. 100 feet for street widths equal to 40 feet face to face of curb.

- C. Proposed Curb and Gutter Street Connecting to an Existing Curb and Gutter Street:
1. When meeting an existing curb-and-gutter street, top-of-curb elevations shall be designed to meet an elevation 6 inches above the existing gutter.
  2. At existing inlets, top-of-curb elevations shall be designed to match existing top-of-curb elevations.
- D. Construction Requirements for Connecting a Proposed Concrete Street with an Existing Concrete Street:
1. When meeting existing concrete streets at right angles, the existing street should be saw cut in a V-shape extending from the curb returns to a point where the centerline of the proposed pavement intersects the quarter point of the existing concrete street to create a crowned intersection. In the event this construction creates a situation in which traffic on the existing street, at design speed, will bottom out when crossing the proposed street intersection, a special design will be allowed to eliminate this potentially dangerous condition.
  2. Concrete to be removed shall be removed either to an existing joint or a sawed joint. The groove of the sawed joint shall be cut to a minimum depth of 2 inches along the line designated by the Professional Engineer.
  3. When meeting existing concrete pavement, horizontal dowels shall be used if no exposed reinforcing steel exists. Horizontal dowels shall be Grade 60 bars, 24 inches long, drilled and embedded 12 inches into the center of the existing slab with PO ROC, or approved equal. Dowels shall be 12 inches center-to-center, unless otherwise specified.
  4. When concrete is removed for connection with proposed concrete pavement, the pavement shall be saw cut and existing concrete removed to expose a minimum of 15 inches of reinforcing steel. If no reinforcing steel exists, use horizontal dowels per Paragraph 10.07 D.3.
- E. Pavement Connection Special Requirements:
1. At a T-intersection with a street that has not been improved to its ultimate width, concrete shall be stopped either at the right-of-way line or the end of the curb return. The option that will require the least concrete removal at a future date should be chosen.
  2. For roadway turnouts placed at an existing cross street intersection, the turnout should be designed to fit the ultimate pavement width of the intersecting cross street and then transitioned to the existing roadway.
- F. L – Type Street

The minimum grade line around the longest radius on an L-type street shall be 0.40 percent.

#### 10.08 SPECIAL REQUIREMENTS:

- A. Pavement Crossing Pipelines – A Letter of agreement between the City and pipeline company is required when paving is placed over a transmission pipeline.
- B. Thoroughfare Construction Considerations:
  - 1. When the full section of a thoroughfare is located within the city limits and is dedicated on a final plat, the esplanade and all lanes of the thoroughfare shall be constructed at the time of initial construction of the roadway.
  - 2. If approved by the City Engineer, lanes contained within a plat, left-turn lanes and the esplanade to the centerline of the right-of-way shall be constructed at the time of initial construction of the roadway when only one side of a thoroughfare is located on a final plat. The remaining lanes, left-turn lanes and esplanade shall be constructed at the time the final plat containing the opposite side of the thoroughfare is approved.
- C. Inlets and Manholes
  - 1. The inlet spacing and the maximum allowable curb run to an inlet shall be provided in accordance with Ch 9.
  - 2. City approved inlets shall be used on all curbs and gutter sections within the city limits and in the ETJ.
  - 3. Keep proposed inlets away from esplanade opening and out of major thoroughfare intersections. For intersections between a major thoroughfare and minor street, locate inlets at the end of return (E/R) of the side street.
  - 4. Inlets shall be placed at the end of pavement in order to eliminate drainage from the pavement gutter into a road ditch.
  - 5. when curb and gutter streets connects to roadside ditches street, place inlets at end of curb and gutter street with reinforced concrete pipe stubs with rings to collect ditch storm water. See standard detail 02632-11- Side Street Ditch Reception
  - 6. Use only City standard cast iron grates for curb inlets.
  - 7. Adjust existing manhole frames and covers within the limits of the proposed pavement to meet the proposed top-of-slab elevation.
  - 8. Adjust existing manhole frames and covers outside the limits of pavement to conform to the final grading plan.
- D. When a curb and gutter street intersects a drainage ditch, the gutter elevation shall be above

the designed water surface elevation of the ditch.

E. Fill/Cut For Proposed Pavement:

a. Fill Placement For Curb and Gutter Pavement Sections:

- (1) Fill shall be placed to ensure a minimum of 3/8 inches per foot transverse slope toward the curb from the property line. Fill shall be placed between the curb and a point 2 feet outside of the right-of-way.
- (2) Where fill as described above is required, and the pavement is adjacent to a nonparticipating property owner, fill easements shall be obtained, filed, and a copy of the easement shall accompany the final drawings.
- (3) Construction of this nature will require back-slope drainage design to prevent trapping storm runoff.

- b. When pavement or curb grades are established below natural ground, slope lines shall be shown on the drawings.

F. Drawings

1. Construction drawings shall be prepared in accordance with Chapter 3, Graphic Requirements.
2. Top-of-curb grade for the outside lanes shall be labeled except at railroad crossings where gutter grades shall be labeled. Centerline grades are acceptable for sheets with roadside ditch sections.
3. For proposed driveways, call out centerline stations, widths, and radii.

END OF CHAPTER

# APPENDIX 1

## CHAPTER 10

### GEOMETRIC DESIGN GUIDELINES FOR SUBDIVISION STREETS

#### HARRIS COUNTY CITY OF HOUSTON

The Guidelines presented in Appendix 1 include the most often requested information regarding geometric design of subdivision streets. Designated Major Thoroughfares and Collector Streets shall be considered for special design features such as presented in Appendix 2 of this Chapter. Design features not shown in Appendix 1 should be considered special design features. Agency Engineer as used throughout this section shall mean City Engineer for the City of Houston and the designated representative for Harris County Public Infrastructure Department. The average daily traffic volumes presented in Standard Drawing No. 10.06-01, 02, and Appendix 2 Figure 1 are provided as general guidelines to define each street classification. Professional engineering experience and judgment should be used in application of the guidelines to a specific project.

It is advisable to consult with the appropriate agencies and review the most recent edition of the following publications to determine adequate thoroughfare requirements and special design features.

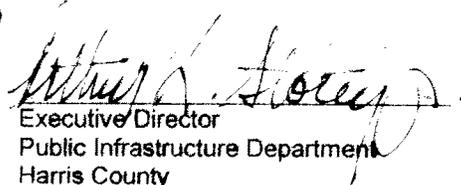
- Recommended Guidelines for Subdivision Streets, Institute of Transportation Engineers
- Guidelines for Urban Major Streets Design, Institute of Transportation Engineers
- A Policy on Geometric Design of Highways and Streets, American Associations of State Highway and Transportation Officials (AASHTO)
- Texas Manual on Uniform Traffic Control Devices (TMUTCD), Texas Department of Transportation

**THE GUIDELINES IN THIS APPENDIX ARE HEREBY APPROVED AS BASIC REQUIREMENTS FOR FUTURE STREET PLANNING AND DEVELOPMENT**

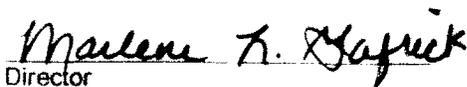
**JULY 2009**



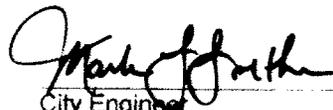
Director  
Department of Public Works & Engineering  
City of Houston



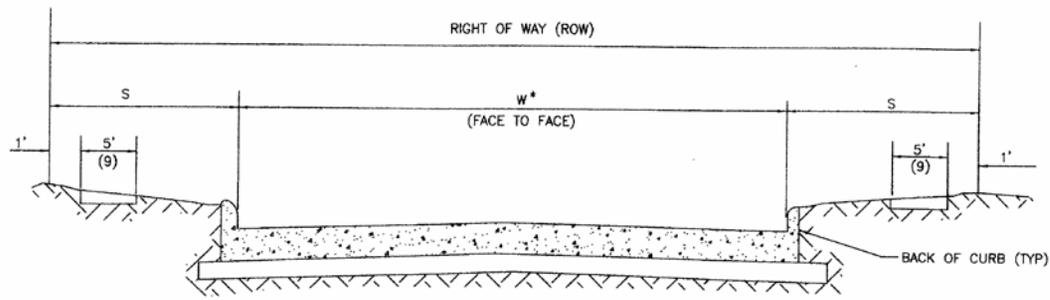
Executive Director  
Public Infrastructure Department  
Harris County



Director  
Department of Planning & Development  
City of Houston



City Engineer  
Department of Public Works & Engineering  
City of Houston



UNDIVIDED STREET DIMENSIONS (FEET)

	LOCAL STREET					ALL OTHER	
	SINGLE FAMILY RESIDENTIAL (SFR)		RESIDENTIAL MAIN			APT/ COMM	MAJOR
	STANDARD DENSITY LOT(2)	HIGH DENSITY LOT(3)	WITHOUT MEDIAN	WITH MEDIAN	(4)(6)	(5)(6)	
ADT (1)	250-350	350-750	≥1500	≥1500	500-5000	1500-5000	
ROW	50	60	55	60	60	70	
$W^*$	27	27	32	32	40	44	
S	11.5	16.5	11.5	14	10	13	

SEE DIMS. NO. 10.06-02

NOTES:

1. AVERAGE DAILY TRAFFIC. REFER TO GUIDELINES PRESENTED IN SECTION 10.06A.
2. STANDARD LOT: LOT WIDTHS 40 FEET OR GREATER.
3. HIGH DENSITY LOT: LOT WIDTHS LESS THAN 40 FEET.
4. APARTMENT/COMMERCIAL: ANY PROPERTY USE OTHER THAN SINGLE FAMILY, RESIDENTIAL.
5. MAJOR: ANY ROADWAY DESIGNATED AS A MAJOR COLLECTOR ON THE MAJOR THOROUGHFARE AND FREEWAY PLAN.
6. ABUTTING LAND USE: AS REQUIRED BY CHAPTER 42 OF THE CODE OF ORDINANCES.
7. WIDTH (W) DOES NOT INCLUDE WIDTH FOR BICYCLE LANES. REFER TO APPENDIX 2 FOR MINIMUM REQUIREMENTS. REQUIRES APPROVAL OF AGENCY ENGINEER.
8. REQUESTS FOR ALTERNATIVE STREET CROSS SECTION SHALL BE SUBMITTED TO AGENCY ENGINEER FOR REVIEW.
9. 5' MINIMUM WIDTH IS CITY OF HOUSTON STANDARD FOR NON-TRANSIT CORRIDOR STREETS. MINIMUM WIDTH FOR TRANSIT CORRIDOR STREETS IS 6'. FOR MINIMUM WIDTH IN ETJ CONTACT AGENCY ENGINEER.

NOT APPLICABLE IN EXTRA-TERRITORIAL JURISDICTION (ETJ) OF CITY OF HOUSTON.

$W^*$  WIDTH (W) INCLUDES ON STREET PARALLEL PARKING WHERE APPROVED BY AGENCY ENGINEER.

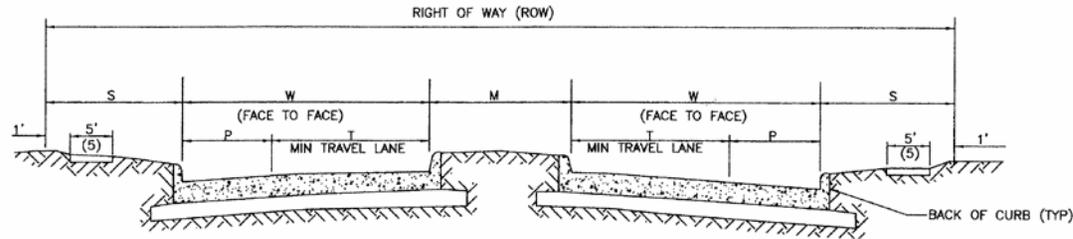
**CITY OF HOUSTON**  
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

UNDIVIDED STREET  
TYPICAL CROSS SECTION

(NOT TO SCALE)

APPROVED BY: <i>Mark G. ...</i> CITY ENGINEER	APPROVED BY: <i>Michael ...</i> DIRECTOR OF PUBLIC WORKS AND ENGINEERING
EFF DATE: JULY-01-2009	DWG NO: 10.06-01

PREVIOUS NO: CH 10 FIG 02



DIVIDED STREET DIMENSIONS (FEET)

	LOCAL STREET SINGLE FAMILY RESIDENTIAL		MAJOR STREET					SEE AGENCY ENGINEER
	RESIDENTIAL MAIN STD CENTER SW	RESIDENTIAL MAIN CENTER SW(3)	PRINCIPAL THOROUGHFARE, THOROUGHFARE, MAJOR COLLECTOR, COLLECTOR (4)					
ADT (1)	>1500	>1500	5000-50,000					
ROW (2)	70	80	80	90	100	100	>100	
W	20	20	24	24	24	33		
M	8	24	14	22	32	14		
S	11	8	9	10	10	10		
T	12	12	24	24	24	33		
P	8	8	0	0	0	0		

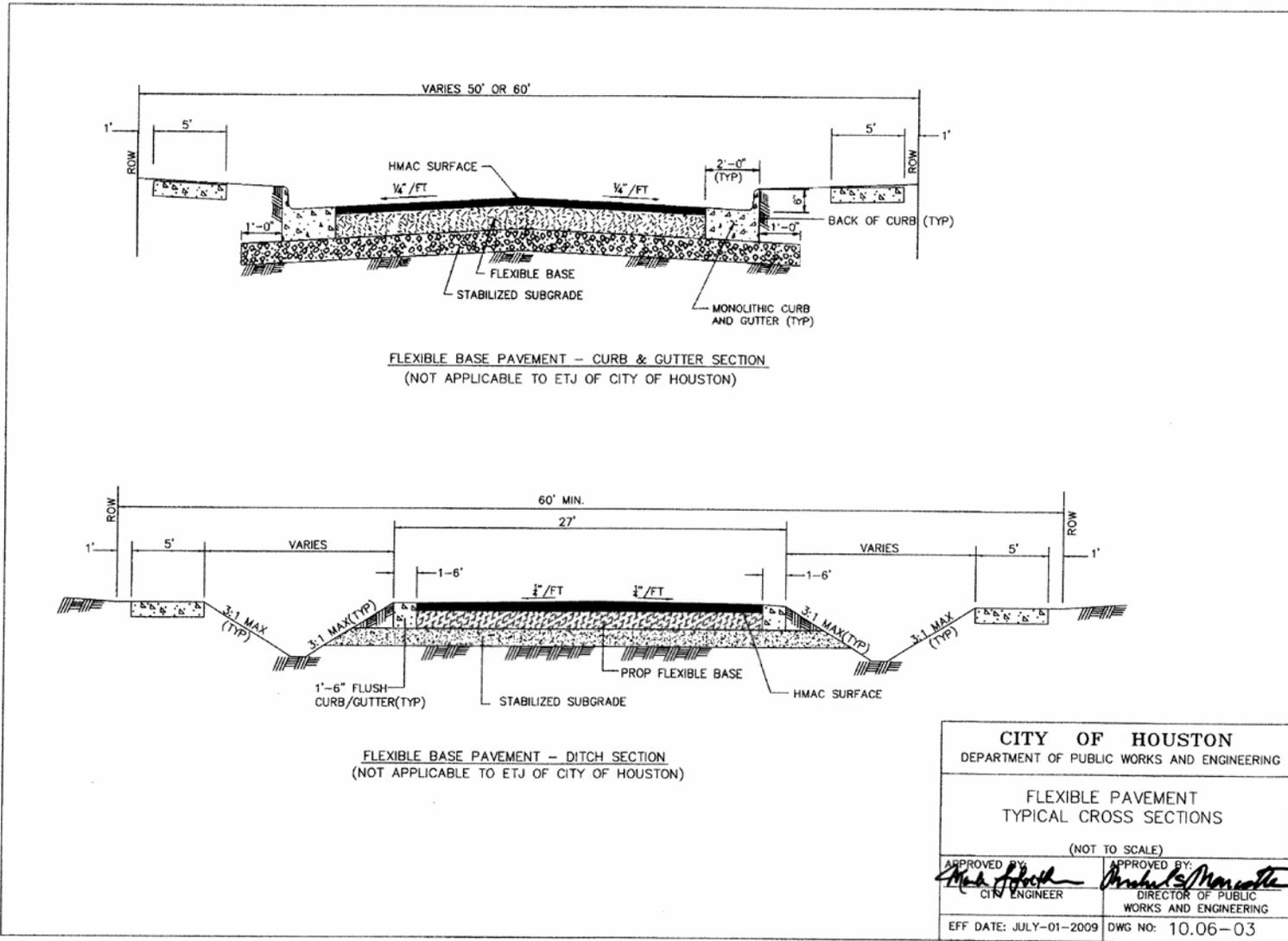
NOT APPLICABLE IN EXTRA-TERRITORIAL JURISDICTION (ETJ) OF CITY OF HOUSTON.

NOTES:

1. AVERAGE DAILY TRAFFIC. REFER TO GUIDELINES PRESENTED IN SECTION 10.06A.
2. ANY RIGHT-OF-WAY DIMENSIONS DIFFERENT FROM THOSE SHOWN SHALL REQUIRE SPECIAL GEOMETRIC DESIGN AS DETERMINED BY AGENCY ENGINEER.
3. SIDEWALK LOCATED IN CENTER MEDIAN ONLY (MIN. SW WIDTH-6')
4. REFER TO CITY MOBILITY PLAN (INFRASTRUCTURE DESIGN MANUAL, CHAPTER 10, APPENDIX 2) FOR OPTIONAL DESIGNS TO SERVE SPECIAL MOBILITY NEEDS, PEDESTRIAN NEEDS, BICYCLE LANES, OR OTHER REQUIREMENTS. APPROVAL BY CITY ENGINEER REQUIRED.
5. 5' MINIMUM WIDTH IS CITY OF HOUSTON STANDARD FOR NON-TRANSIT CORRIDOR STREETS. MINIMUM WIDTH FOR TRANSIT CORRIDOR STREETS IS 6'. FOR MINIMUM WIDTH IN ETJ CONTACT AGENCY ENGINEER.

CITY OF HOUSTON DEPARTMENT OF PUBLIC WORKS AND ENGINEERING	
DIVIDED STREET TYPICAL CROSS SECTION (NOT TO SCALE)	
APPROVED BY: <i>Mark A. Hock</i> CITY ENGINEER	APPROVED BY: <i>Michael S. Mancetta</i> DIRECTOR OF PUBLIC WORKS AND ENGINEERING
EFF DATE: JULY-01-2009	DWG NO: 10.06-02

PREVIOUS NO: CH 10 FIG 01



**NOTES:**

1. ALL RAMPS AND SIDEWALKS SHALL BE CONSTRUCTED IN ACCORDANCE WITH AGENCY STANDARD DETAILS, AMERICANS WITH DISABILITIES ACT (ADA) AND TEXAS DEPARTMENT OF LICENSING AND REGULATION (TDLR) REQUIREMENTS.
2. ALL PAVEMENT MARKINGS SHALL BE INSTALLED IN ACCORDANCE WITH AGENCY STANDARD DETAILS AND THE TEXAS MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES (TMUTCD).
3. CURB RADII SHALL BE DESIGNED TO ACCOMMODATE THE TYPE OF VEHICLES ANTICIPATED TO USE THE FACILITY, (I.E., BUSES, TRUCKS, ETC.) IN ACCORDANCE WITH AASHTO CRITERIA FOR TURNING VEHICLES.
4. WHERE ALTERNATIVE MINIMUM CURB RADIUS IS REQUIRED TO SERVE MOBILITY, PEDESTRIAN, OR OTHER SPECIAL NEEDS, SUBMIT DESIGN LAYOUT AND SUPPORTING CALCULATIONS TO AGENCY ENGINEER FOR REVIEW AND APPROVAL.
5. THE CORNER CUT AREA IS RESERVED FOR TRAFFIC SIGNAL EQUIPMENT AND SHALL BE KEPT FREE OF SIGNS, POLES, PRIVATE UTILITY CONTROL CABINETS AND ALL SURFACE ENCROACHMENTS WHICH COULD PREVENT THE FUTURE INSTALLATION OF SUCH EQUIPMENT WITHIN THE AREA.
6. WHERE A NEW ROADWAY OR DRIVEWAY IS CONNECTING TO AN EXISTING SIGNALIZED INTERSECTION, THE APPLICANT SHALL BE RESPONSIBLE FOR DESIGNING AND CONSTRUCTING THE NECESSARY MODIFICATIONS TO THE EXISTING SIGNAL SYSTEM AS REQUIRED BY AGENCY ENGINEER.

**TABLE 1. INTERSECTION CURB RADIUS REQUIREMENTS**

INTERSECTION TYPE	MINIMUM CURB RADIUS BY INTERSECTION ANGLE		
	90 DEG.	85-90 DEG.	80-85 DEG.
LOCAL - LOCAL	25 FT	30 FT	30 FT
COLLECTOR - LOCAL	25 FT	30 FT	30 FT
COLLECTOR - COLLECTOR	30 FT	30 FT	35 FT
THOROUGHFARE - COLLECTOR	30 FT	35 FT	35 FT
THOROUGHFARE - THOROUGHFARE	35 FT	35 FT	40 FT
PRINCIPAL THOROUGHFARE - THOROUGHFARE	35 FT	35 FT	40 FT
PRIN. THOROUGHFARE - PRIN. THOROUGHFARE	35 FT	35 FT	40 FT

**TABLE 2. ROW CUTBACK REQUIREMENTS**

CURB RADIUS	MINIMUM ROW CUTBACK "X"	ROW RADIUS R(1)
25 FT	15 FT X 15 FT	25 FT
30 FT	20 FT X 20 FT	30 FT
35 FT	25 FT X 25 FT	35 FT
40 FT	30 FT X 30 FT	40 FT
45 FT	35 FT X 35 FT	45 FT

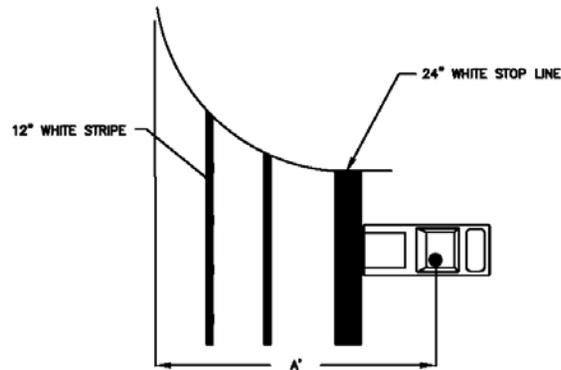
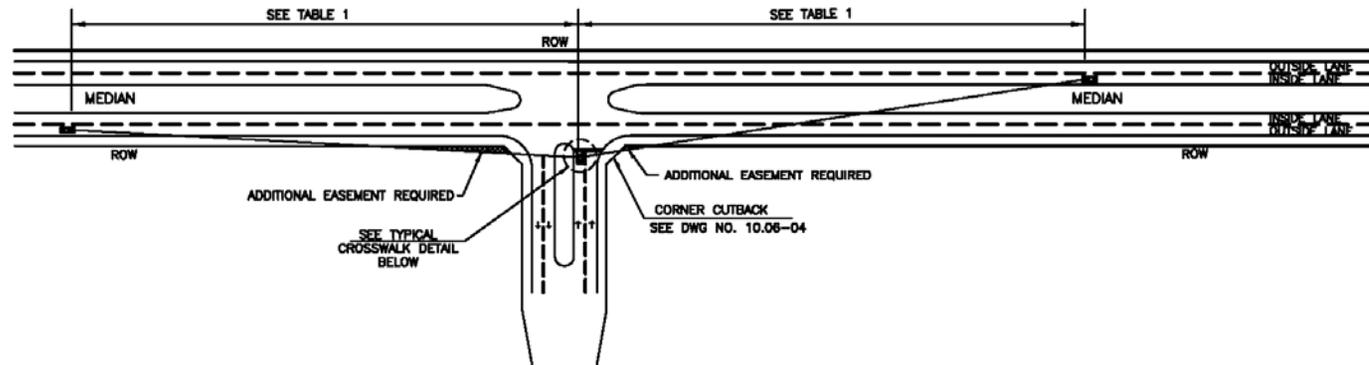
(\*) SKETCH SHOWS ACCEPTABLE PROPERTY CUTBACK DISTANCE X AS SUBSTITUTE FOR ROW RADIUS R.

**CITY OF HOUSTON**  
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

INTERSECTION GEOMETRY  
CURB RADIUS AND CORNER CUTBACK  
(NOT TO SCALE)

APPROVED BY: *Mark R. Smith* CITY ENGINEER  
APPROVED BY: *Michael S. Macosta* DIRECTOR OF PUBLIC WORKS AND ENGINEERING

EFF DATE: JULY-01-2009 DWG NO: 10.06-04



TYPICAL CROSSWALK AND STOP BAR PLACEMENT DETAIL

TABLE 1  
REQUIRED INTERSECTION SIGHT DISTANCE

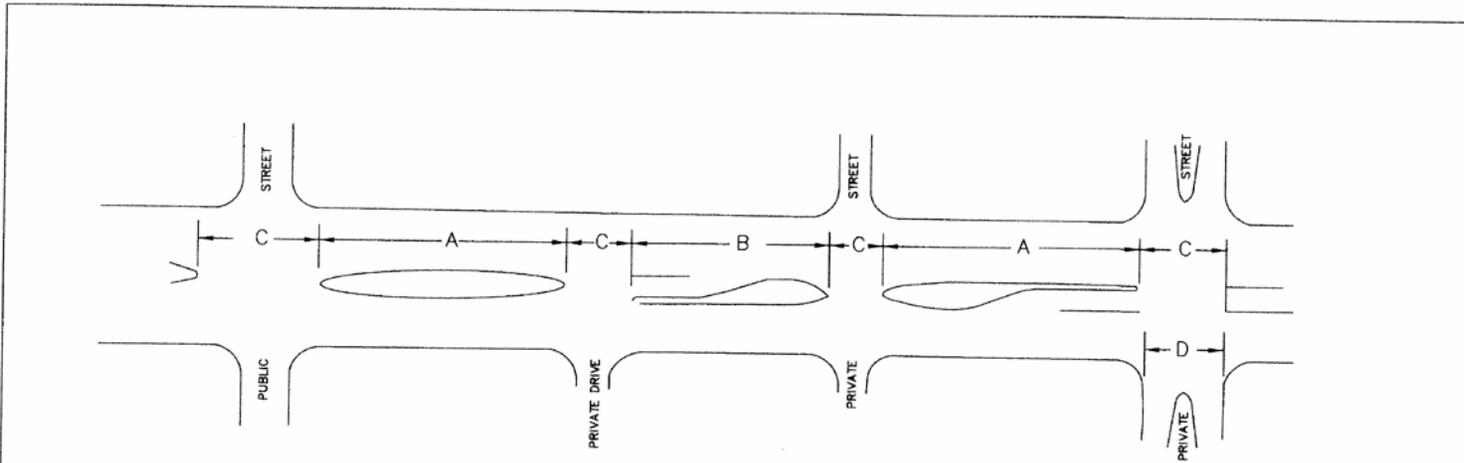
STREET CLASSIFICATION	SIGHT DISTANCE (*)	A
LOCAL STREET	390'	15'
ALL OTHER STREETS	500'	25'

(\*) BASED ON AASHTO INTERSECTION SIGHT DISTANCE CRITERIA.

NOTES:

1. INTERSECTION SIGHT DISTANCES ARE BASED ON AMERICAN ASSOCIATION OF STATE HIGHWAY AND TRANSPORTATION OFFICIALS (AASHTO) CRITERIA FOR INTERSECTION SIGHT DISTANCE.
2. IF ROADWAY BEING CROSSED OR TURNED ONTO HAS A MEDIAN THAT IS 25 FEET OR GREATER, SIGHT DISTANCE TO THE RIGHT MAY BE MEASURED FROM THE POINT AT WHICH A VEHICLE CAN SAFELY STOP WITHIN THE MEDIAN OPENING.

<b>CITY OF HOUSTON</b> DEPARTMENT OF PUBLIC WORKS AND ENGINEERING	
INTERSECTION GEOMETRY SIGHT DISTANCE TRIANGLE	
(NOT TO SCALE)	
APPROVED BY:	APPROVED BY:
CITY ENGINEER	DIRECTOR OF PUBLIC WORKS AND ENGINEERING
EFF DATE: JULY-01-2012	DWG NO: 10.06-05



TYPICAL MEDIAN OPENING C

MEDIAN INTERRUPTION FOR	(1)		
	NO LTB	1 LTB	2 LTB
PRIVATE DRIVE	45'	52.5'	60'
UNDIVIDED STREET <40 44'	45' 50'	52.5' (2) 55' (2)	60' 60'
DIVIDED STREET ALL	D+22'	D+22'	D+22'

NOTE:

- (1) LTB—LEFT TURN BAY.
- (2) DISTANCE FROM CENTERLINE OF OPENING TO MEDIAN NOSE WITH LEFT TURN LANE IS 30' FOR RIGHT ANGLE INTERSECTIONS. FOR INTERSECTIONS OTHER THAN 90°, APPLY DESIGN VEHICLE TURNING TEMPLATE TO DETERMINE DIMENSION TO MEDIAN NOSE CUT OFF.

MINIMUM MEDIAN LENGTH A, B

IF DIVIDED STREET IS:	INTERSECTING STREET CLASSIFICATION			
	MAJOR STREET/ THOROUGHFARE (A)	COLLECTOR STREET (A)	LOCAL STREET (A)	PRIVATE STREET OR DRIVEWAY (B)
PRINCIPAL THOROUGHFARE/ THOROUGHFARE	500'	500'	350'	300'
COLLECTOR STREET	350'	300'	250'	250'
LOCAL STREET	250'	250'	250'	250'

CITY OF HOUSTON  
DEPARTMENT OF PUBLIC WORKS AND ENGINEERING

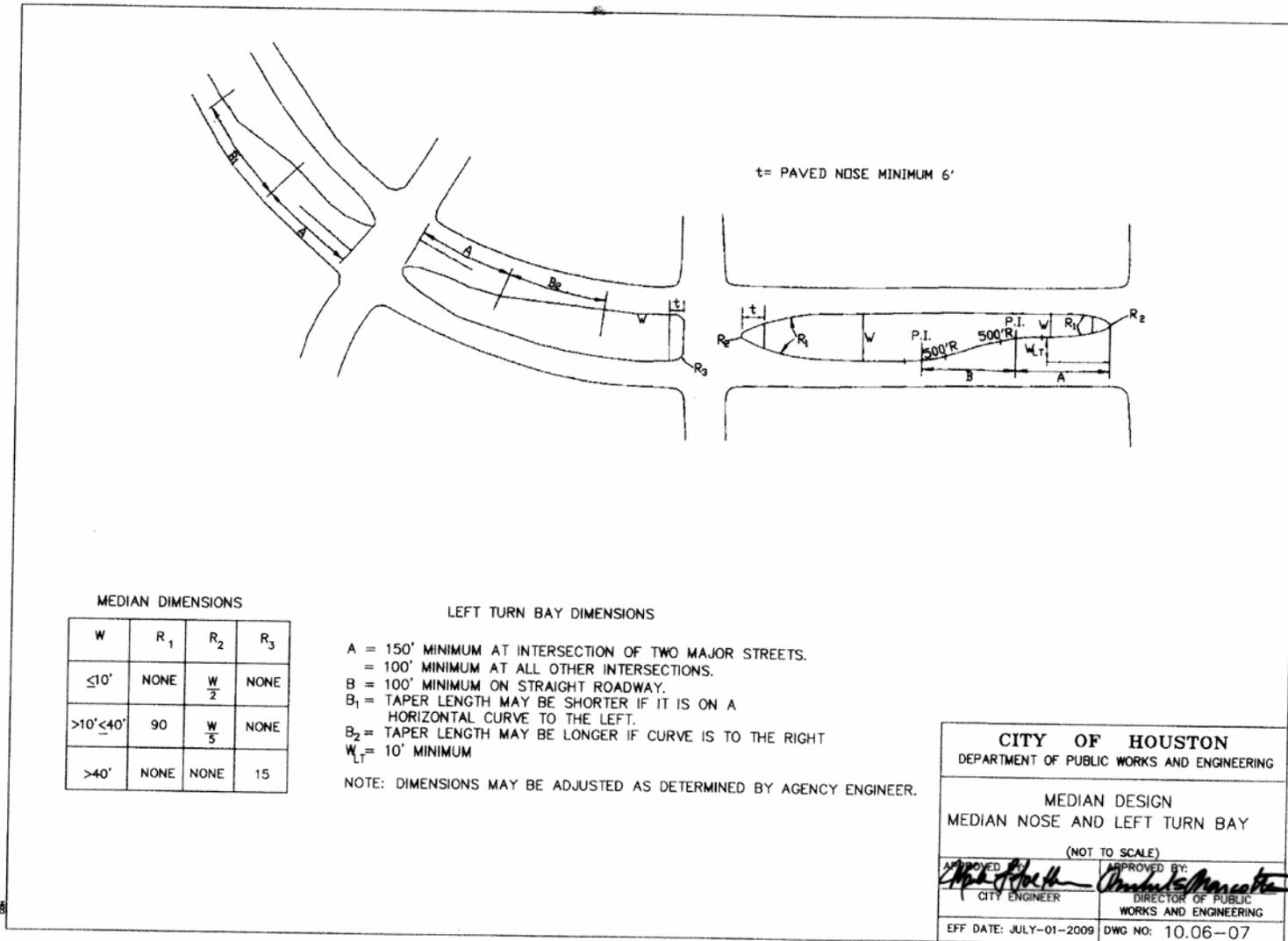
MEDIAN DESIGN  
MEDIAN LENGTH AND OPENING

(NOT TO SCALE)

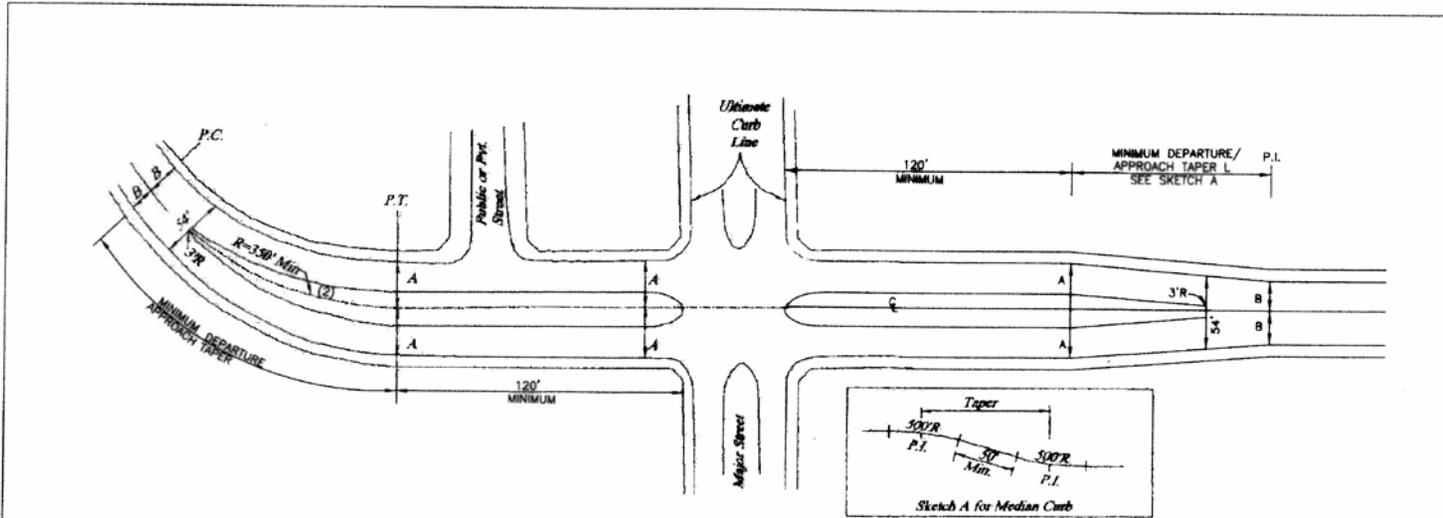
APPROVED BY: *Paul Powell* CITY ENGINEER  
APPROVED BY: *Michael Maricote* DIRECTOR OF PUBLIC WORKS AND ENGINEERING

EFF DATE: JULY-01-2009 DWG NO: 10.06-06

PREVIOUS NO: CH 10 FIG 3



PREVIOUS NO: CH 10 FIG 4



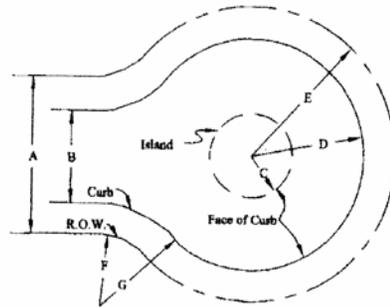
ROADWAY CROSS SECTION (FEET)		TAPER $L = \frac{WS^2}{80}$ (FEET)(1)
A + A	B + B	
80	40	400
80	27	540
70	40	300
70	27	440
60	40	200
60	27	340

NOTES:

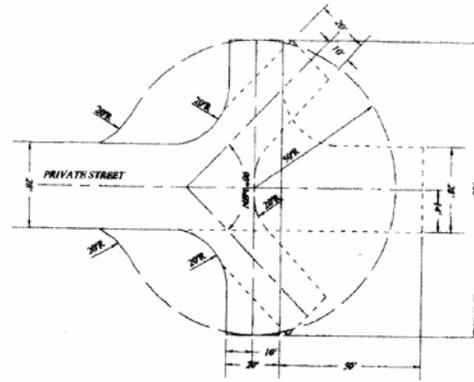
- 1) APPROACH AND DEPARTURE TAPER REQUIREMENT:  
 $L = \frac{WS^2}{80}$  WHERE L = LENGTH IN FEET  
 S = SPEED IN M.P.H.  
 W = LATERAL OFFSET IN FEET  
 S = 35 M.P.H. MINIMUM DESIGN SPEED FOR SUBDIVISION STREETS  
 W = A-B
- 2) 350' MINIMUM CENTERLINE RADIUS FOR HORIZONTAL CURVE WITH APPROACH OR DEPARTURE TAPERS.
- 3) REFER TO STANDARD DRAWING NO. 10.06-06 FOR MEDIAN LENGTHS AND MEDIAN OPENING.

<b>CITY OF HOUSTON</b> DEPARTMENT OF PUBLIC WORKS AND ENGINEERING	
MEDIAN DESIGN ROADWAY TAPERS FOR MEDIAN DESIGN (LOCAL STREETS) (NOT TO SCALE)	
DESIGNED BY: <i>Mark Abbott</i> CITY ENGINEER	APPROVED BY: <i>John L. Marotta</i> DIRECTOR OF PUBLIC WORKS AND ENGINEERING
EFF DATE: JULY-01-2009	DWG NO: 10.06-08

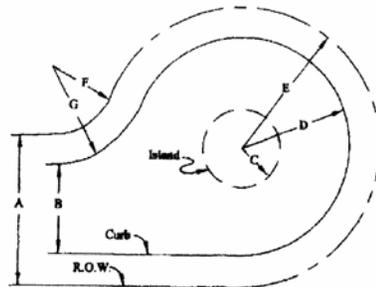
PREVIOUS NO: CH 10 FIG 7



SYMMETRICAL CUL-DE-SAC



TYPE 2 PERMANENT ACCESS EASEMENT (PAE)

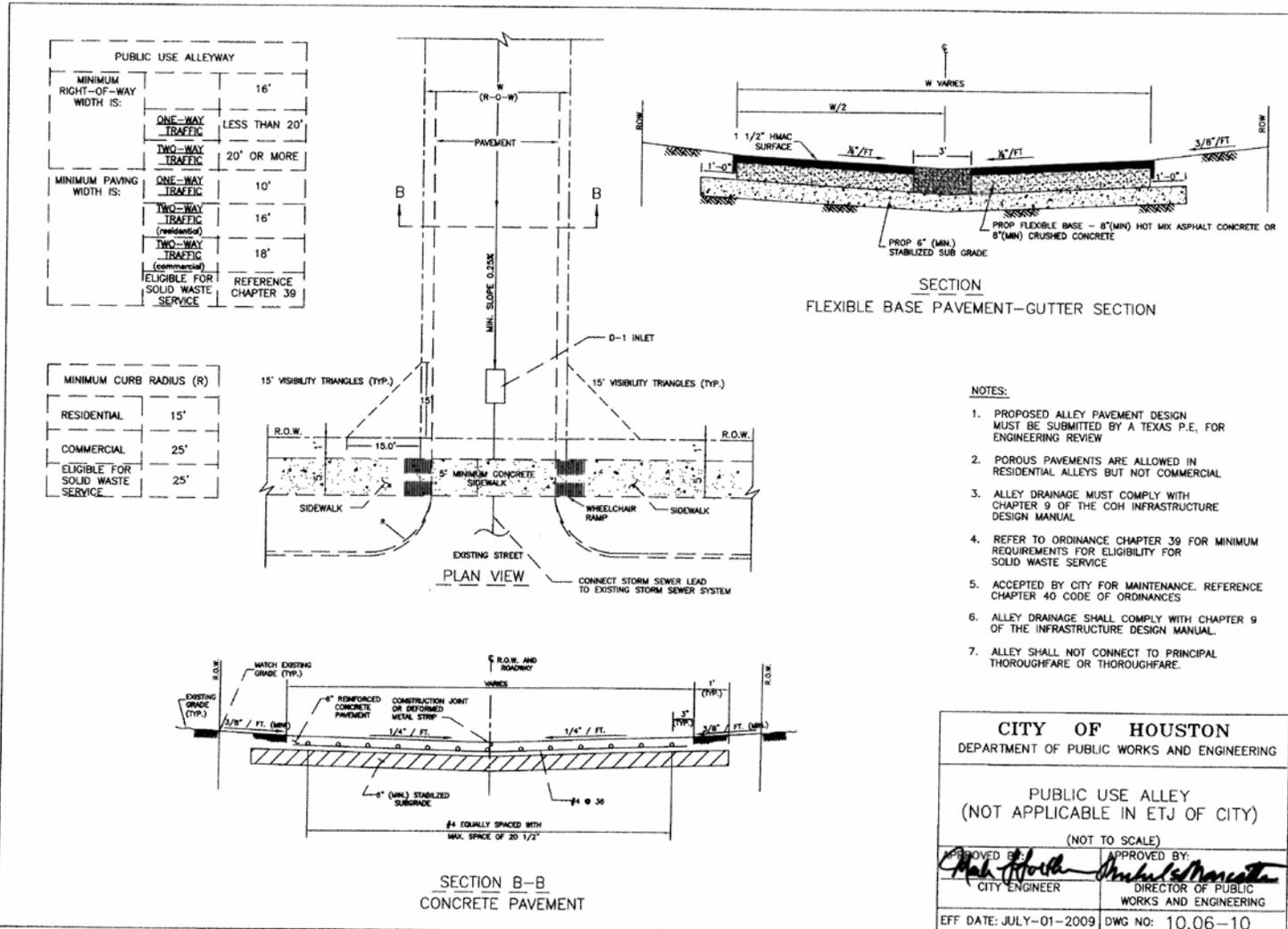


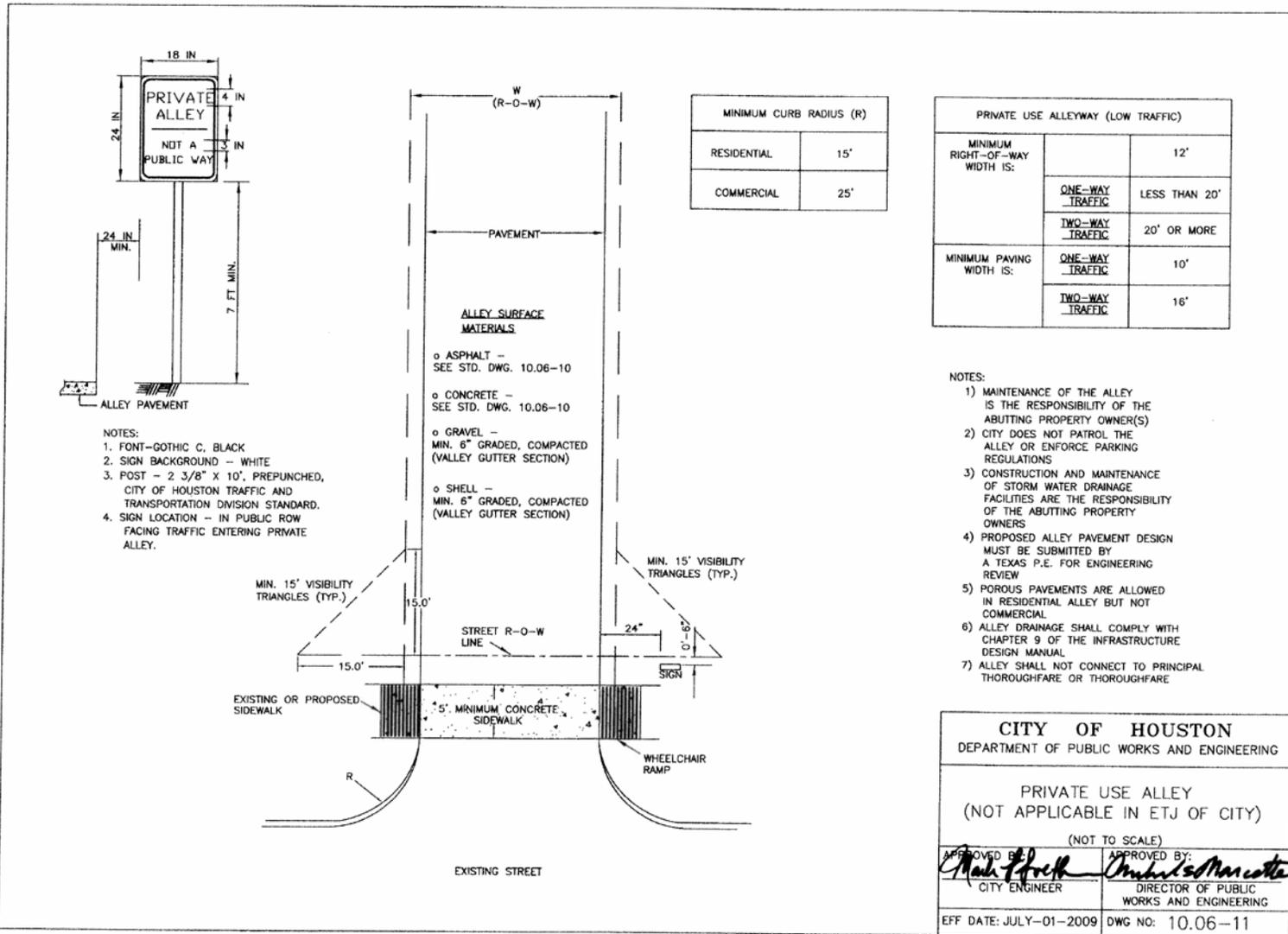
OFFSET CUL-DE-SAC

CUL-DE-SAC		
ABUTTING LAND USE		
	SINGLE FAMILY	ALL OTHER
A	ALL WIDTHS	60'
B	ALL WIDTHS	40'
C (MIN)	0	0
C (MAX)	20'	15'
D	42'	50'
E	50'	60'
F	25'	25'
G	35'	35'

<b>CITY OF HOUSTON</b> DEPARTMENT OF PUBLIC WORKS AND ENGINEERING	
STREET TERMINATION CUL-DE-SAC AND TYPE 2 PAE	
(NOT TO SCALE)	
APPROVED BY: <i>Chad Smith</i> CITY ENGINEER	APPROVED BY: <i>Michael Mancetta</i> DIRECTOR OF PUBLIC WORKS AND ENGINEERING
EFF DATE: JULY-01-2009	DWG NO: 10.06-09

PREVIOUS NO: CH 10 FIG 6





# APPENDIX 2

## CHAPTER 10

Appendix 2 presents a “Street Design Menu” with examples of optional roadway corridor sections that are a result of the 2009 City of Houston Mobility Planning Study. Figure 1 is provided to cross reference the street classifications in the Major Thoroughfare and Freeway Plan to the corridor sections within the City Mobility Plan. These corridor sections can be utilized for development of roadway systems within the City limit of Houston. These roadway sections are not applicable in the ETJ of the City. The tables identify the right-of-way requirements and element dimensions associated with each corridor section.

Each roadway corridor section is permissible under the Infrastructure Design Manual but requires the specific approval of the City Engineer prior to construction. While full right-of-way dedication may not be required under Chapter 42 of the City of Houston Code of Ordinances, it is expected that developer’s utilizing these alternative sections will make available the necessary public right-of-way dimensions at no cost to the City of Houston.

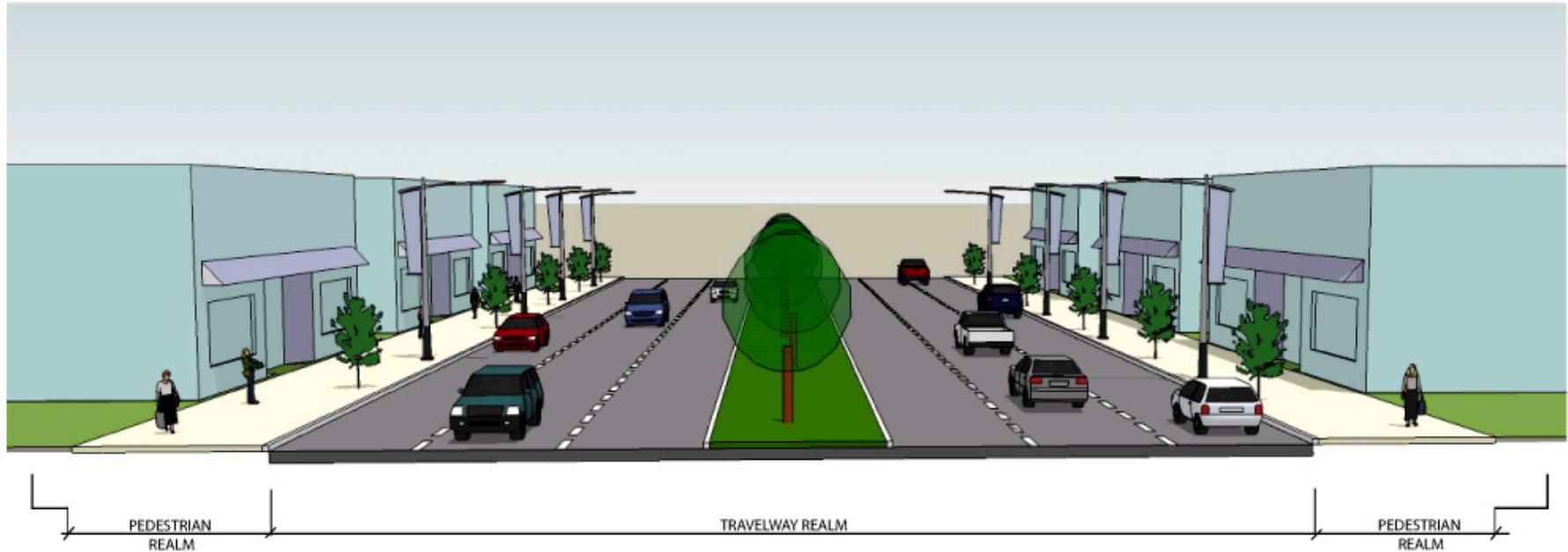
### **NOTES**

1. Sidewalk dimensions shown are options. Minimum sidewalk dimension for Transit Street designations is six (6) feet and five (5) feet for all others.
2. TW – Tree Wells will be considered for use in lieu of a green space dimension where shown in Tables.

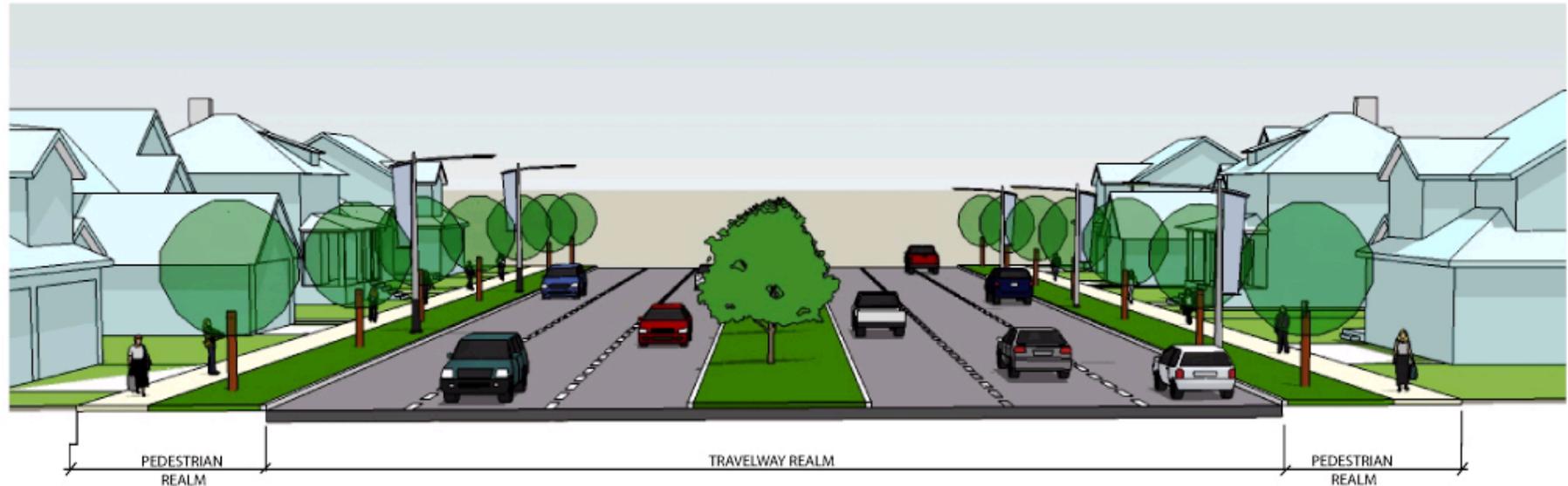
CITY MOBILITY PLAN (CMP)					MAJOR THOROUGHFARE AND FREEWAY PLAN (MTFP)				
MULTI MODAL CLASSIFICATION					EXISTING CLASSIFICATION				
Proposed ROW	Number of Lanes	Avg Daily Traffic Vol (vpd)	Design Speed (mph)	PRINCIPAL THOROUGHFARE	THOROUGHFARE	MAJOR COLLECTOR	COLLECTOR	LOCAL STREET	
				>5 miles >30,000 vpd <b>Design Speed 45 mph</b> Ex ROW: 60' - 400'	>3 miles >20,000 vpd <b>Design Speed 45 mph</b> Ex ROW: 50' - 210'	1 - 2 miles >5,000 vpd <b>Design Speed 45 mph</b> Ex ROW: 50' - 150'	1 - 2 miles >5,000 vpd <b>Design Speed 45 mph</b> Ex ROW: 50' - 150'	<1 mile <5,000 vpd <b>Design Speed 35 mph</b> Min 50'	
<b>BOULEVARD</b>									
Urban	100'-140'	4-8	15,000-50,000	<b>45</b>					
Suburban	100'-120'	2-6	500-50,000	<b>45</b>					
Transit	120'	4-6	1,500-30,000	<b>45</b>					
Industrial	100'-120'	4-6	15,000-50,000	<b>45</b>					
<b>AVENUE</b>									
Urban	80'-100'	2-4	1,500-30,000	<b>45</b>					
Suburban	80'-100'	2-4	1,000-20,000	<b>45</b>					
Transit	100'	2	1,500-15,000	<b>45</b>					
Industrial	80'-100'	3-5	5,000-35,000	<b>45</b>					
<b>COUPLET</b>									
<b>STREET</b>									
Urban	60'	2	1,000-10,000	<b>35</b>					
Suburban	60'	2	500-5,000	<b>35</b>					
<b>LOCAL STREET</b>									
Residential Main	60'-70'	2	≥1,500	<b>35</b>					
Residential High Density	55'-60'	2	350-750	<b>35</b>					
Residential Std Density	50'-65'	1+	250-350	<b>35</b>					

 Indicates Shared Classification

Figure 1

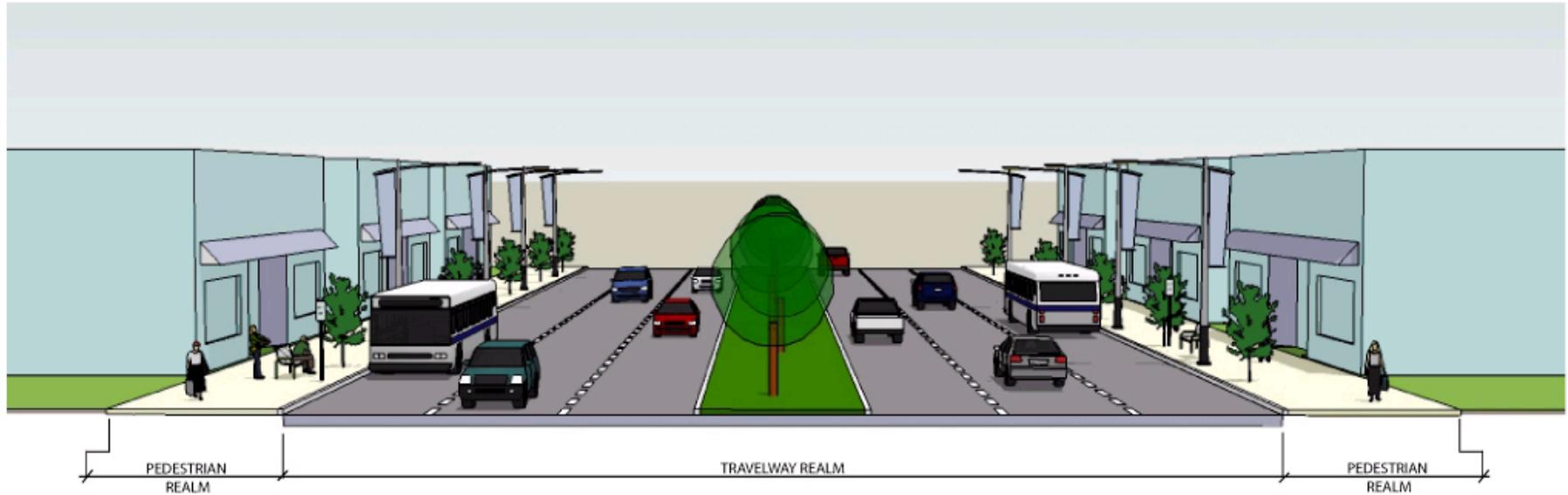


URBAN BOULEVARD DESIGNATION							
Minimum R.O.W. (feet)	PEDESTRIAN REALM		TRAVELWAY REALM				ADT (vpd)
	Sidewalk (feet)	Tree Well or Swale	On-Street Parking (feet)	Bike Lane (feet)	Median Width (feet)	Lane Widths (feet)	
100	16 x 2 = 32	TW	N/A	N/A	20	4 x 12 = 48	15,000-30,000
	18 x 2 = 36	TW	N/A	N/A	16	4 x 12 = 48	
	12 x 2 = 24	TW	N/A	6 x 2 = 12	16	4 x 12 = 48	
120	16 x 2 = 32	TW	N/A	N/A	16	6 x 12 = 72	15,000-40,000
	12 x 2 = 24	TW	N/A	N/A	24	6 x 12 = 72	
	10 x 2 = 20	TW	N/A	6 x 2 = 12	16	6 x 12 = 72	
140	10 x 2 = 20	TW	N/A	N/A	24	8 x 12 = 96	20,000-50,000

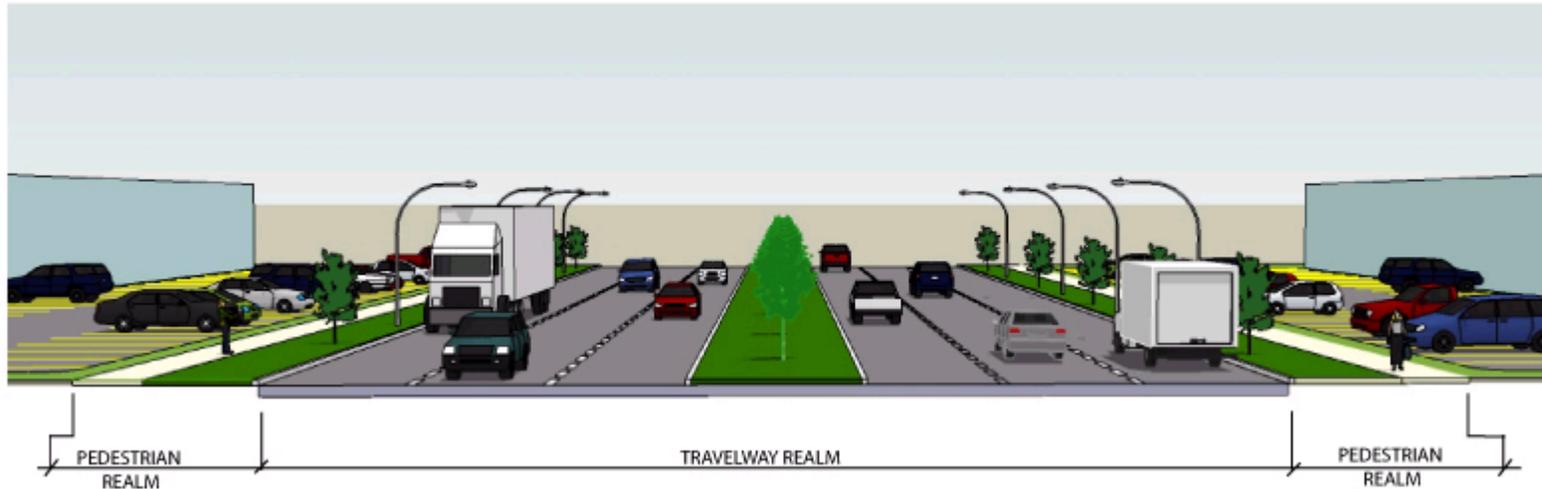


SUBURBAN BOULEVARD DESIGNATION							
Minimum R.O.W. (feet)	PEDESTRIAN REALM		TRAVELWAY REALM				ADT (vpd)
	Sidewalk (feet)	Tree Landscape or Swale (feet)	On-Street Parking (feet)	Bike Lane (feet)	Median Width (feet)	Lane Widths (feet)	
100	10 x 2 = 20	14 x 2 = 28	8 X 2 = 16	N/A	12	2 x 12 = 24	500-5,000
	5 x 2 = 10	10 x 2 = 20	N/A	N/A	20	4 x 12 = 48	20,000-35,000
	16 x 2 = 32	8 x 2 = 16	N/A	N/A	20	4 x 12 = 48	
120	10* x 2 = 20	8 x 2 = 16	N/A	5 x 2 = 10	18	4 x 12 = 48	1,500-15,000
	5 x 2 = 10	10 x 2 = 20	N/A	N/A	16	6 x 12 = 72	20,000-50,000
	14 x 2 = 28	6 x 2 = 12	N/A	N/A	20	6 x 12 = 72	

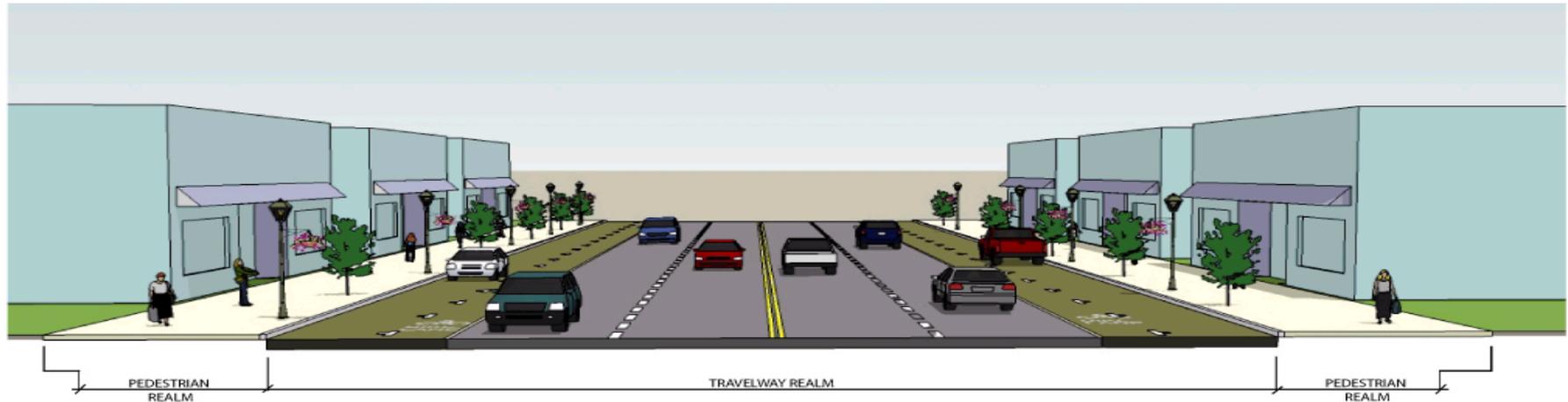
\* Multi-Use Path along Center of Median, No abutting sidewalks



TRANSIT BOULEVARD DESIGNATION							
Minimum R.O.W. (feet)	PEDESTRIAN REALM		TRAVELWAY REALM				ADT (vpd)
	Sidewalk (feet)	Tree Well or Swale (feet)	On-Street Parking (feet)	Bike Lane (feet)	Median Width (feet)	Lane Widths (feet)	
110	17 x 2 = 34	TW	N/A	N/A	28	4 x 12 = 48	15,000--30,000
120	16 x 2 = 32	TW	N/A	6 x 2 = 12			
120	15 x 2 = 30	TW	N/A	N/A	16	4 x 12, + 2 x 13 = 74	15,000-30,000
125	15.5 x 2 = 31	TW	N/A	N/A	20		



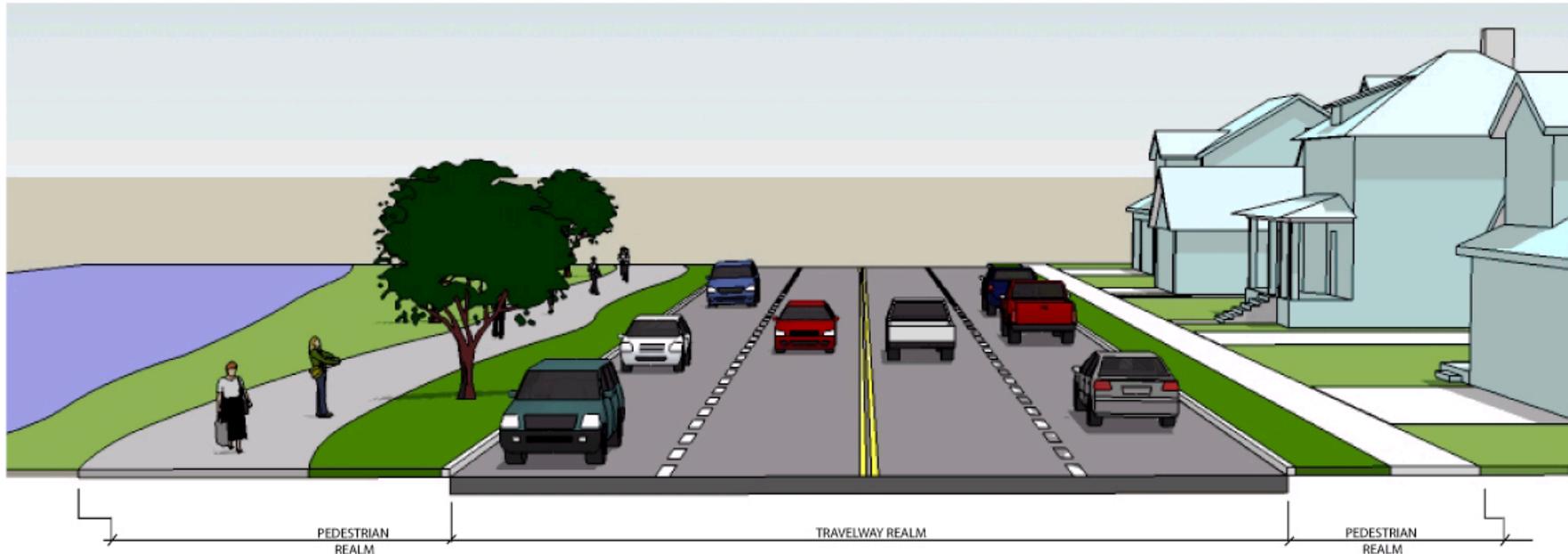
INDUSTRIAL BOULEVARD DESIGNATION							
Minimum R.O.W. (feet)	PEDESTRIAN REALM		TRAVELWAY REALM				ADT (vpd)
	Sidewalk (feet)	Tree Landscape or Swale (feet)	On-Street Parking (feet)	Bike Lane (feet)	Median Width (feet)	Lane Widths (feet)	
120	5 x 2 = 10	10 x 2 = 20	N/A	N/A	16	4 x 12, + 2 x 13 = 74	20,000--50,000
100	5 x 2 = 10	10 x 2 = 20	N/A	N/A	20	2 x 12, + 2 x 13 = 50	15,000--40,000



URBAN AVENUE DESIGNATION

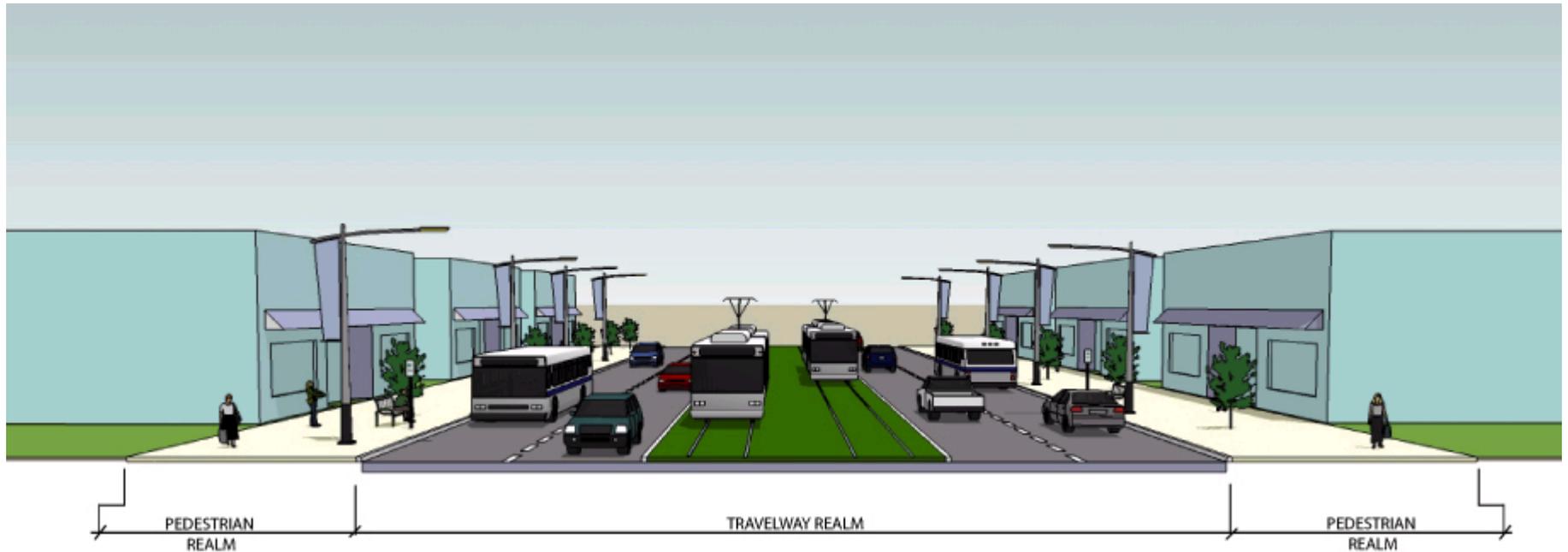
Minimum R.O.W. (feet)	PEDESTRIAN REALM		TRAVELWAY REALM				ADT (vpd)
	Sidewalk (feet)	Tree Well or Swale (feet)	On-Street Parking (feet)	Bike Lane (feet)	Median Width (feet)	Lane Widths (feet)	
80	20 x 2 = 40	TW	8 x 2 = 16	N/A	N/A	2 x 12 = 24	1,500-15,000
	10 x 2 = 20	TW	18 x 2 = 36 *	N/A	N/A		
	15 x 2 = 30	TW	8 x 2 = 16	5 x 2 = 10	N/A		
	10 x 2 = 20	TW	18 x 2 = 36 *	N/A	N/A[AM1]		
	22 x 2 = 44	TW	N/A	6 x 2 = 12	N/A	2 x 12 + 1 x 14 (CLTL*)* = 38	5,000-20,000
	21 x 2 = 42	TW	N/A	N/A	N/A		
	13 x 2 = 26	TW	8 x 2 = 16	N/A	N/A		
	8 x 2 = 16	TW	8 x 2 = 16	5 x 2 = 10	N/A		
	15 x 2 = 30	TW	N/A	6 x 2 = 12	N/A		
	16 x 2 = 32	TW	N/A	N/A	N/A		
80	8 x 2 = 16	TW	8 x 2 = 16	N/A	N/A	4 x 12 = 48	10,000-30,000
	10 x 2 = 20	TW	N/A	6 x 2 = 12	N/A		
	100	13 x 2 = 26	TW	8 x 2 = 16	5 x 2 = 10	N/A	
100	20 x 2 = 40	TW	N/A	6 x 2 = 12	N/A	4 x 12 = 48	

\* Angle Parking

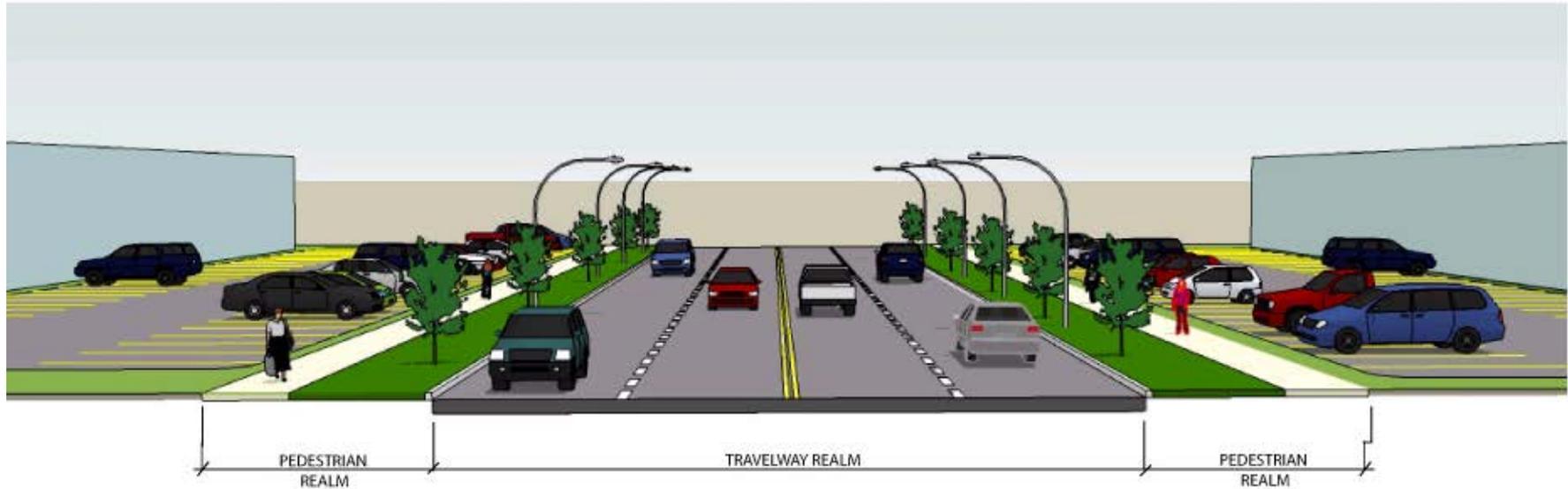


SUBURBAN AVENUE DESIGNATION

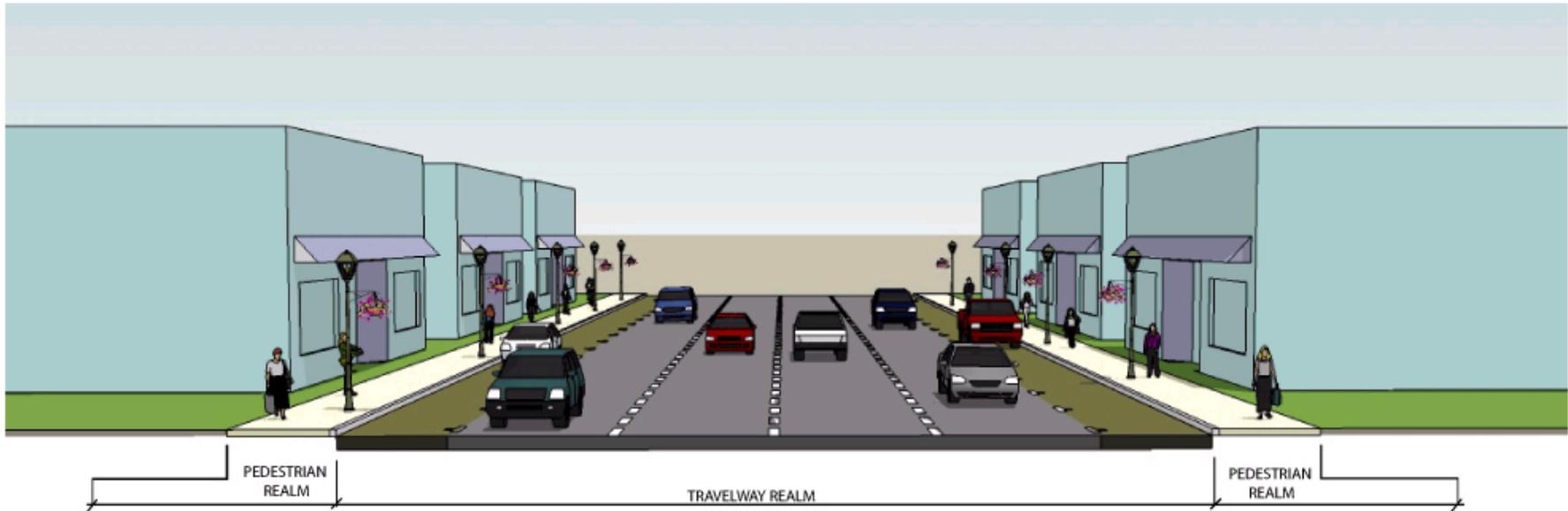
Minimum R.O.W. (feet)	PEDESTRIAN REALM		TRAVELWAY REALM				ADT (vpd)
	Sidewalk (feet)	Landscape Tree or Swale (feet)	On-Street Parking (feet)	Bike Lane (feet)	Median Width (feet)	Lane Widths (feet)	
80	10 x 2 = 20	10 x 2 = 20	8 x 2 = 16	N/A	N/A	2 x 12 = 24	1,000-10,000
	8 x 2 = 16	7 x 2 = 14	8 x 2 = 16	5 x 2 = 10	N/A		
	12 x 2 = 24	10 x 2 = 20	N/A	6 x 2 = 12	N/A		
	10 x 2 = 20	6 x 2 = 12	N/A	N/A	N/A	4 x 12 = 48	
	18 x 2 = 36	8 x 2 = 16	N/A	N/A	N/A		
	5 x 2 = 10	4 x 2 = 8	N/A	6 x 2 = 12	N/A		
100	5 x 2 = 10	12 x 2 = 24	8 x 2 = 16	N/A	N/A	4 x 12 = 48	5,000-20,000
	5 x 2 = 10	14 x 2 = 28	N/A	6 x 2 = 12	N/A		



TRANSIT AVENUE DESIGNATION							
Minimum R.O.W. (feet)	PEDESTRIAN REALM		TRAVELWAY REALM				ADT (vpd)
	Sidewalk (feet)	Tree Well or Swale (feet)	On-Street Parking (feet)	Bike Lane (feet)	Median Width (feet)	Lane Widths (feet)	
100	18 x 2 = 36	TW	N/A	6 x 2 = 12	28	2 x 12 = 24	1,500-15,000
100	16 x 2 = 32	TW	8 x 2 = 16	N/A			



INDUSTRIAL AVENUE DESIGNATION							
Minimum R.O.W. (feet)	PEDESTRIAN REALM		TRAVELWAY REALM				ADT (vpd)
	Sidewalk (feet)	Tree Landscape or Swale (feet)	On-Street Parking (feet)	Bike Lane (feet)	Median Width (feet)	Lane Widths (feet)	
80	5 x 2 = 10	10 x 2 = 20	N/A	N/A	N/A	2 x 12, + 2 x 13 = 50	10,000-25,000
	5 x 2 = 10	10 x 2 = 20	N/A	N/A	N/A	2 x 13, + 1 x 14 = 50	5,000-15,000
90	5 x 2 = 10	15 x 2 = 30	N/A	N/A	N/A	2 x 13 + 1 x 14 = 50	5,000-15,000
100	5 x 2 = 10	12 x 2 = 24	N/A	N/A	N/A	4 x 13 +, 1 x 14 = 66	10,000-35,000

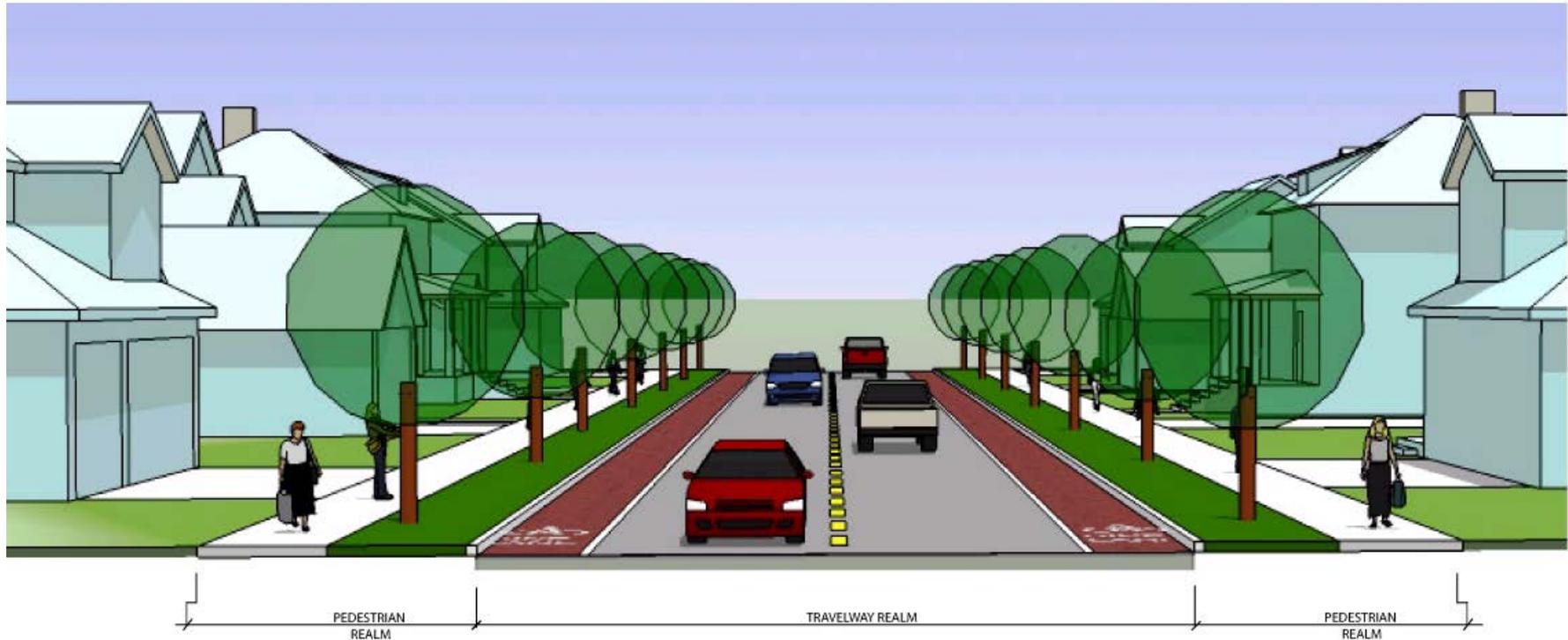


COUplet DESIGNATION

Street Type	Minimum R.O.W. (feet)	PEDESTRIAN REALM		TRAVELWAY REALM			Lane Widths (feet)	ADT (vpd)
		Sidewalk (feet)	Tree Well or Swale (feet)	On-Street Parking (feet)	Bike Lane (feet)	Median Width (feet)		
2 Lane Couplet	60	20 x 2 = 40	TW	8 x 2 = 16	N/A	N/A	2 x 12 = 24	1,000-10,000
	18	20 x 2 = 40	TW	N/A	N/A	N/A		
3 Lane Couple	80	14 x 2 = 28	TW	8 x 2 = 16	N/A	N/A	3 x 12 = 36	1,500-15,000
		22 x 2 = 44	TW	N/A	N/A	N/A		
4 Lane Couplet	80	8 x 2 = 16	TW	8 x 2 = 16	N/A	N/A	4 x 12 = 48	5,000-20,000
		16 x 2 = 32	TW	N/A	N/A	N/A		
5 Lane Couplet	80	10 x 2 = 20	TW	N/A	N/A	N/A	5 x 12 = 60	10,000-25,000
	100	12 x 2 = 24	TW	8 x 2 = 16	N/A	N/A		



URBAN STREET DESIGNATION						
Minimum R.O.W. (feet)	PEDESTRIAN REALM		TRAVELWAY REALM			ADT (vpd)
	Sidewalk (feet)	Tree Well or Swale (feet)	On-Street Parking (feet)	Bike Lane (feet)	Lane Widths (feet)	
60	18 x 2 = 36	TW	N/A	N/A	2 x 12 = 24	1,000 – 10,000
	10 x 2 = 20	TW	8 x 2 = 16	N/A		
	12 x 2 = 24	TW	N/A	N/A		
	12 x 2 = 24	TW	N/A	6 x 2 = 12 <sub>[AM2]</sub>		



SUBURBAN STREET DESIGNATION						
Minimum R.O.W. (feet)	PEDESTRIAN REALM		TRAVELWAY REALM			ADT (vpd)
	Sidewalk (feet)	Landscape Tree or Swale (feet)	On-Street Parking (feet)	Bike Lane (feet)	Lane Widths (feet)	
60	5 x 2 = 10	13 x 2 = 26	N/A	N/A	2 x 12 = 24	500 – 5,000
	5 x 2 = 10	5 x 2 = 10	8 x 2 = 16	N/A		
	5 x 2 = 10	7 x 2 = 14	N/A	6 x 2 = 12		
	5 x 2 = 10	10 x 2 = 20	N/A	N/A	2 x 12 + 6' (Median) = 30	