

**City of Denton**

**Transportation Design Criteria Manual**



**July 26, 2013**



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Transportation Criteria Manual

## Overview

These rules and design criteria shall be known as the City of Denton Transportation Design Criteria Manual. The purpose of these criteria is to establish standard principles and practices for the design and construction of transportation infrastructure within the City of Denton, Texas and within its extraterritorial jurisdiction.

The standards, graphs, diagrams, charts procedures, and other information provided herein are intended to establish minimum standards. Responsibility for actual design remains with the design engineer. Users of this criteria manual should be knowledgeable and experienced in the theories and application of Transportation Engineering principles. In addition, these criteria are not intended to be a complete set of design criteria. The Federal Government, the State of Texas, North Central Texas Council of Governments Standard Specifications for Public Works Construction, the City of Denton Addendum to the NCTCOG Specifications, Denton County; the Denton County Transit Authority (DCTA), and/or any other City recognized authority shall be consulted for additional criteria, at the City's discretion, until at such time as the City issues its own policy, procedure, requirement, specification and/or standard.

These design criteria are not intended to be a complete set of design criteria and the Denton Development Code shall be consulted for additional criteria. The design criteria contained in this manual do not supersede the criteria contained in the Denton Development Code and any revisions to the Denton Development Code shall supersede the criteria in this manual.



# Section 1 – Street Design

## 1.1 Geometric Standards

### 1.1.1 Standard Cross Sections, Materials & Right of Way

Refer to City of Denton Standard Street Detail Sheets in Appendix A for Standard Cross Sections and Requirements

Refer to City of Denton Standard Street Detail Sheets in Appendix B for Downtown Implementation Plan Standard Cross Sections and Requirements

### 1.1.2 Cul De Sac Requirements

**Table 1-A, Cul De Sac Dimensions**

Land Use	Max Length
Single family/duplex lots	600 feet or no more than 29 lots
Multi Family uses	600 feet
Commercial/Retail uses	600 feet
Industrial uses	600 feet

- Cul De Sac length is measured from the centerline of the intersecting street to the cul de sac radius centerpoint.
- For offset Cul De Sac, the length is measured from the centerline of the intersecting street to the Cul De Sac radius center point, perpendicular to the intersecting street centerline.

**Table 1-B, Requirements for Temporary Turn-Arounds**

Land Use	Min. Outside Radius	Min. Thickness if Crushed Rock	Min Thickness if Asphalt
Residential	40 feet	6 inches	2 inches
Other	45 feet	10 inches	5 inches

- A 6-inch lime treated subgrade is required under temporary turn-arounds.

### 1.1.3 Intersection Geometry

**Table 1-C, Intersection Geometry**

Type	Intersection Angle (Degrees)	Right of Way Corner Clip	Curb Return Radius
Alley/Alley	90+/-15	5 feet	10 feet
Alley/Neighborhood	90+/-10	5 feet	10 feet
Alley/Collector	90+/-10	5 feet	20 feet
Flag Drive/Neighborhood	90+/-15	5 feet	10 feet
Flag Drive/Collector	90+/-10	5 feet	20 feet
Neighborhood/Neighborhood	90+/-10	10 feet	20 feet
Neighborhood/Collector	90+/-10	15 feet	20 feet
Neighborhood/Arterial	90+/-5	15 feet	30 feet
Collector/Collector	90+/-5	15 feet	30 feet
Collector/Arterial	90+/-5	20 feet	30 feet
Arterial/Arterial	90+/-5	30 feet	30 feet

- Fences must provide a 5-foot corner clip adjacent to driveways

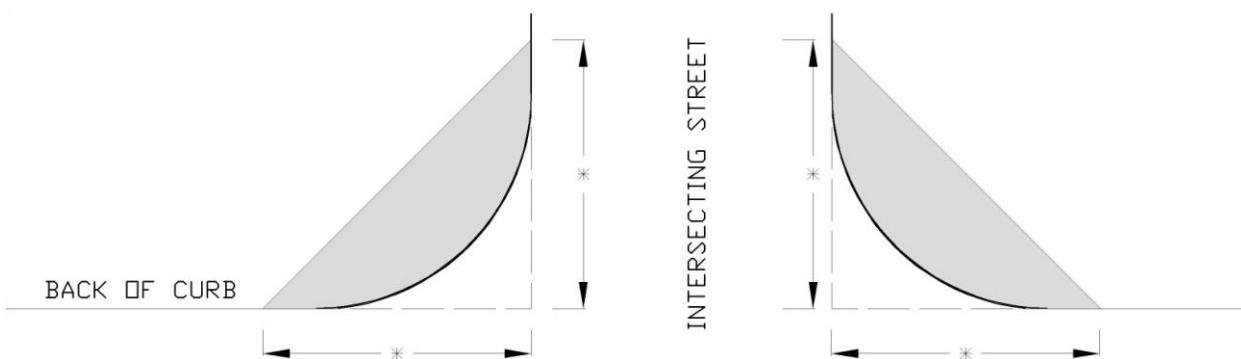


Figure 1-1, Vision Clearance Area

- Street designs are required to meet or exceed minimum AASHTO intersection sight distance requirements for all cases “a” through “f” as may apply.
- The vision clearance area must not contain any fences, foliage, or opaque objects between 2 and 8 feet tall (as measured from the nearest gutter elevation) other than public utility/signal poles.

#### 1.1.4 Minimum Intersection Spacing/Max Block Length

**Table 1-D, Min. Intersection Spacing**

	Alley	Flag Drive	Neighborhood	Collector	Arterial
Alley	100 feet	N/A	100 feet	100 feet	N/A
Flag drive	N/A	N/A	75 feet	75 feet	N/A
Neighborhood	100 feet	75 feet	*200 feet	*200 feet	400 feet
Collector	100 feet	75 feet	*200 feet	*200 feet	400 feet
Arterial	N/A	N/A	400 feet	400 feet	1200 feet

\* 100-foot minimum to the first intersection for entrances to subdivisions off of an arterial where lots back up to the arterial. This is measured between right of way lines.

**Table 1-E, Max Block Lengths**

Land Use	Max Block Length
Single family/duplex Residential, Multi Family, Commercial/Retail, Industrial	1200 feet

- Lot width is measured at the right of way line
- Block length is measured between right of way lines and on both sides of the street.
- Alley or Flag Drive intersections are not considered in block length calculations.
- Max Block Length does not apply to blocks that back up to developed properties where redevelopment is not expected in the near term, floodplains, railroads or freeways without frontage roads

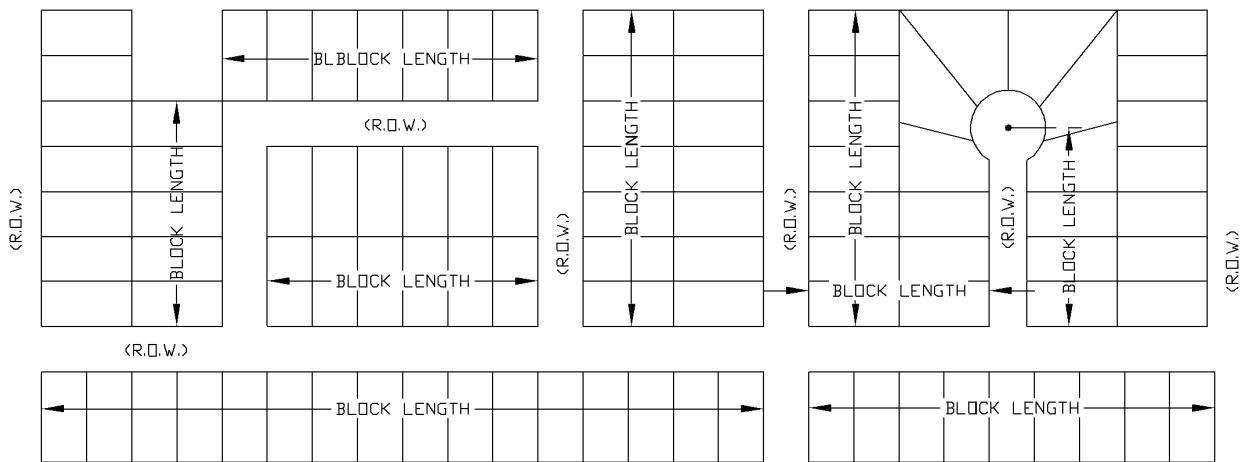


Figure 1-2, Block Length Measurements

### 1.1.5 Horizontal & Vertical Street Alignment

Table 1-F, Street Alignment

Design Feature	Alley	Flag Drive	Neighborhood Street	Collector	Secondary Arterial	Primary Arterial
Min. Design Speed (mph)	15	N/A	30	35	40	45
Min. Centerline Radius (ft) *	100	50	200	400	575	750
Horizontal Curve Separation	0	0	0	100	100	100
Min. Tangent at Intersection	0	0	0	100	100	100
Min. Grade (%)	0.5	0.5	0.5	0.5	0.5	0.5
*Max. Grade (%)	8	10	10	10% for residential, 7% for non-residential	7	7

\* Minimum centerline radius based on cross slope of minus two-percent (-2%).

- Maximum grade within 60 feet of an intersection measured from the intersecting curb is 2.0% or less
- Grade breaks without a vertical curve are permitted only when the algebraic difference between the two grades is 0.5 or less.
- For drainage purposes, 50 foot vertical curves are required when grades change from + to - or vice versa and the algebraic difference between the grades is between 1 and 1.2. Otherwise, the minimum vertical curve length is 100 feet.

- Street designs are required to meet minimum AASHTO vertical curve sight distance as well as stop sight distance requirements.
- Cross Street connections shall be ADA compliant for pedestrian crossings

### 1.1.6 Traffic Calming

- Traffic calming devices are permitted and required only on residential and collector streets
- Appropriate signage and pavement markings are to be provided along with all traffic calming devices and are not necessarily included in the figures below.
- Additional right of way may need to be dedicated in order to accomplish traffic calming.

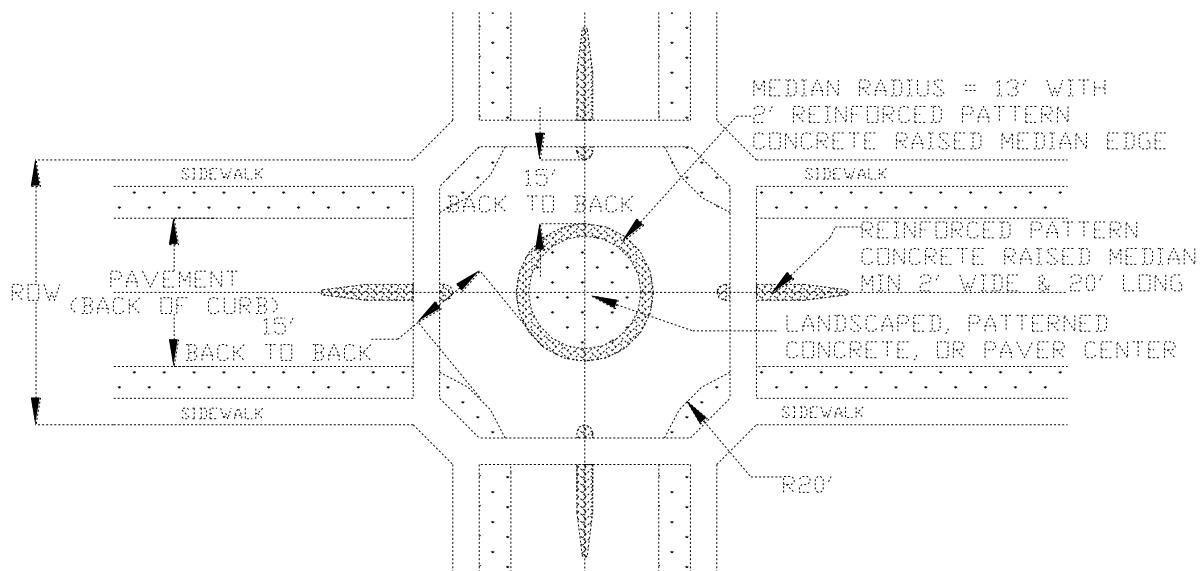


Figure 1-3, Traffic Circle

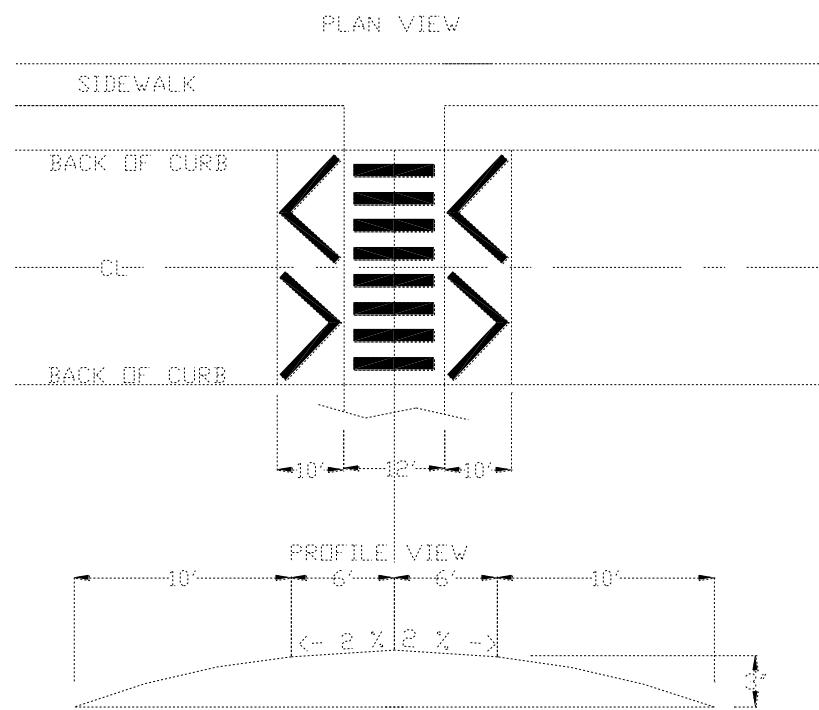


Figure 1-4, Raised Crosswalks

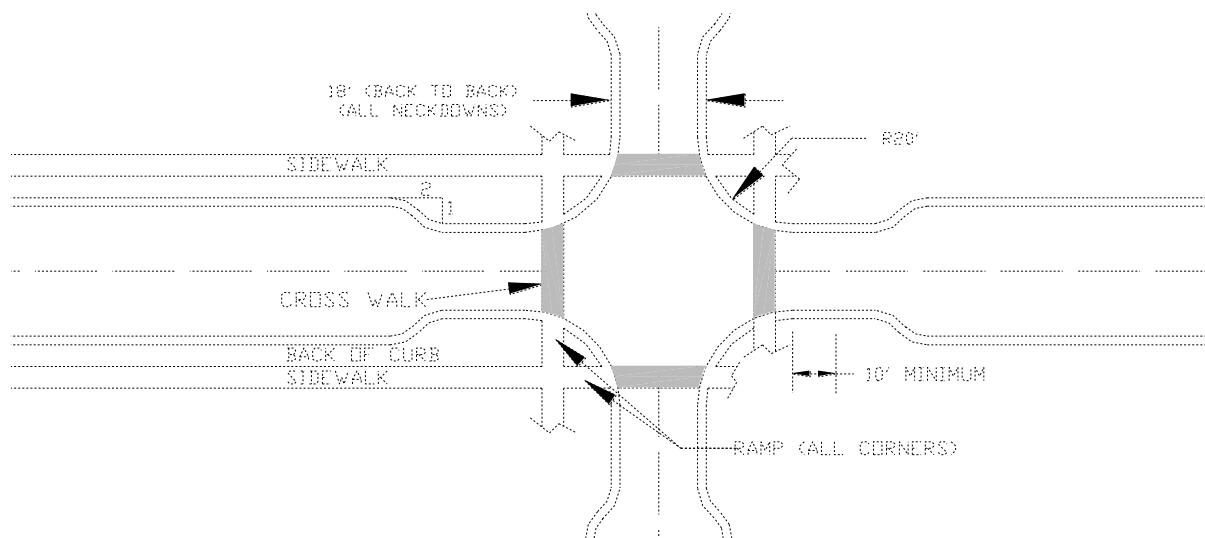


Figure 1-5, Neck Downs

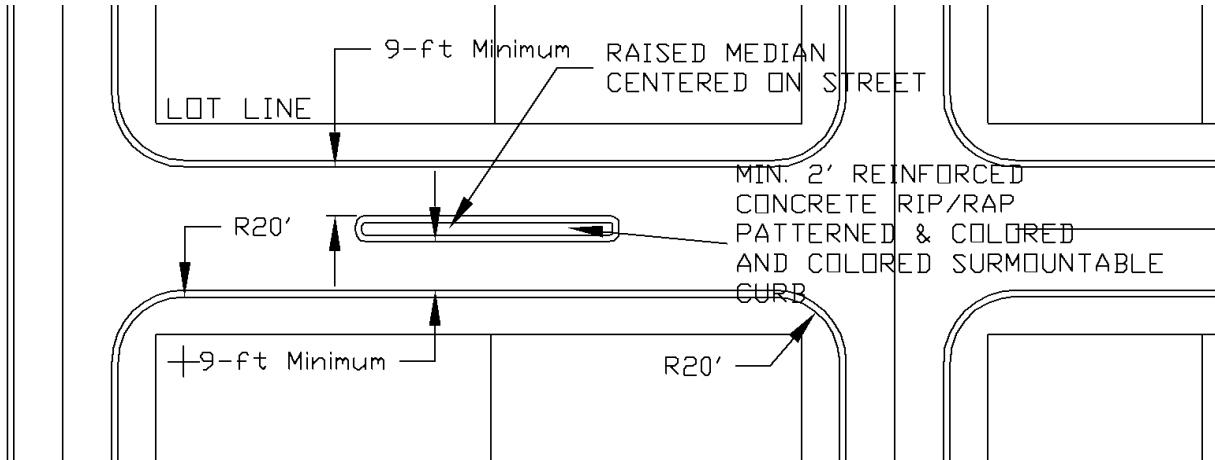


Figure 1-6, Mid Block Median

- Mid Block Medians shall be no longer than two lots.
- On street sections where driveways are permitted, the location and length of a mid block median shall be such that full driveway access is provided for at least one driveway on each lot.
- Transition back to normal street section at 1 foot of width to 5 feet of length.

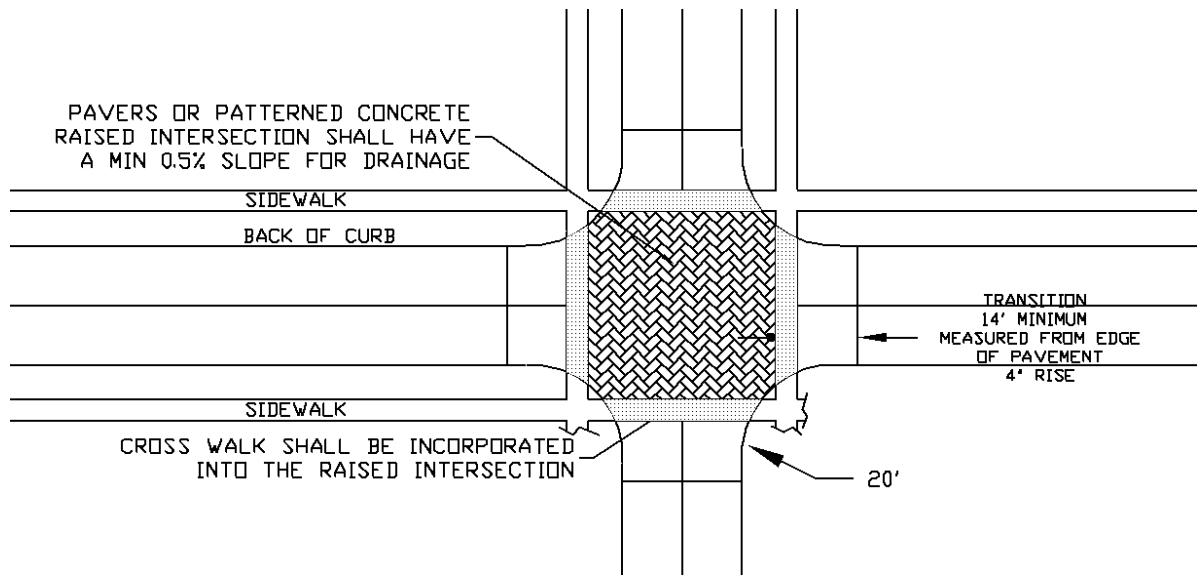


Figure 1-7, Raised Intersection Plan View

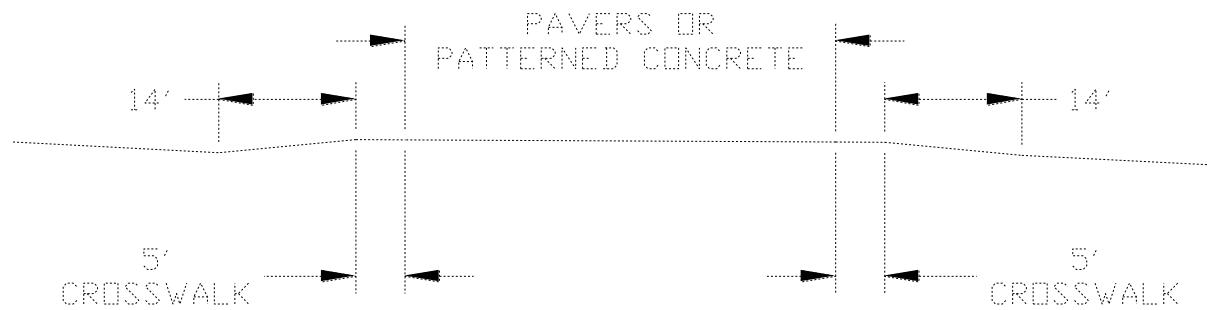


Figure 1-8, Raised Intersection Profile View

### 1.1.8 Medians, Median Openings & Turn Bays

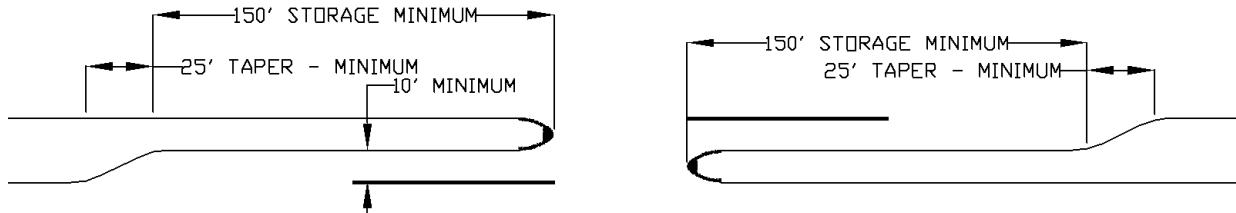


Figure 1-10, Left Turn Bay/Median Opening Geometry

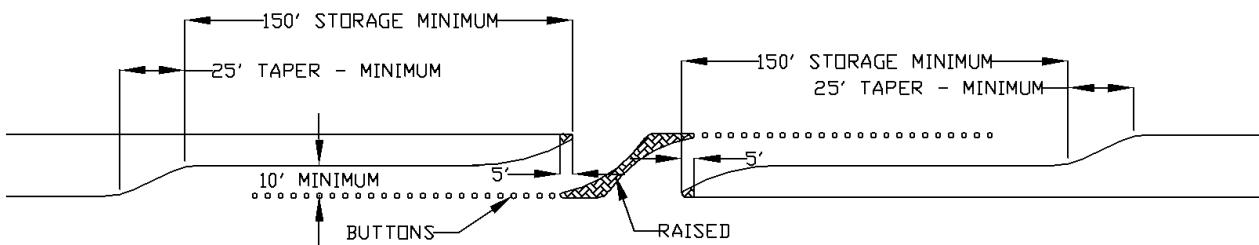


Figure 1-11, Enclosed Left Turn Bay Geometry

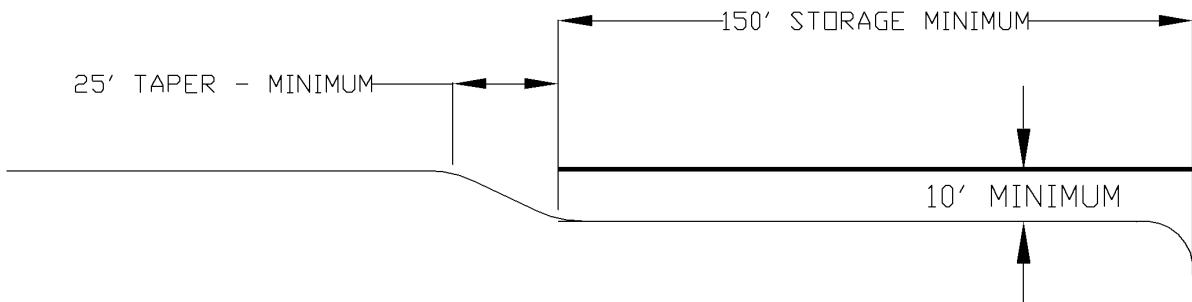


Figure 1-12, Right Turn Bay Geometry

For Figures 1-10, 1-11 and 1-12 the following apply:

- Please note that the above diagram represents the minimum requirements for left turn bay/median opening geometries.
- Longer storage lengths may be required based on a Traffic Impact Analysis.
- The pedestrian path shall be accounted for across the median with a leave out or ramp in accordance with the Texas Accessibility Standards.
- Cross slope of a median opening or turn bay shall not be more than 2% or less than 0.5%.
- On Texas Department of Transportation (TXDOT) roads, TXDOT standards will apply over City of Denton Standards

### 1.1.9 Perimeter Street Transitions

**Table 1-G, Pavement Transition Lengths**

Type of Street	Length of Transition Per offset distance (ratio)
Neighborhood	5
Collector	10
Secondary Arterial	15
Primary Arterial	20

## 1.2 Miscellaneous Standards

### 1.2.1 Traffic Impact Analysis (TIA)

#### Methodology

Prior to initiating work on a TIA document, the TIA document preparer shall schedule a TIA pre-document preparation meeting with City staff to discuss the City's expectations with regard to completing a TIA document for each specific project. It is the responsibility of the applicant to demonstrate that a TIA is not required.

Specific areas that will be discussed at this TIA pre-document preparation meeting as being necessary to the completion of a TIA document will include but may not be limited to the following items:

**Study Area.** Limits will, at a minimum, typically include: site access(es), adjacent/perimeter and internal public site roadway(s) (any such roadway may be further divided into study links), from collector type(s) through freeway type(s), adjacent intersection(s), from collector type(s) through freeway type(s), in any combination, and the first signalized intersection in every direction from the site. Depending on various factors (including, but not limited to, unbalanced distribution from the site, substantial site trip generation, traffic system infrastructure capacity restraints, site attraction/distribution anomalies relative to other distant properties, and the like) the study area can be increased, from the minimum, in any direction for any distance so as to include everything that this development may influence or that may influence this development.

**Data.** The location(s) and type(s) of all required and/or necessary data collection (which can include, but is not limited to: vehicle, bicycle, pedestrian, [including classifications of any of these three] sight distance, parking turnover and usage, queuing, etc.) that may be required to be analyzed/assessed in order to provide a TIA document that reflects a reasonable assessment of the impacts of the site will be determined. After the TIA pre-document preparation meeting the City will determine if it has any information that may be applicable to the project and will provide it to the TIA preparer.

**Trip Generation.** Trip generation for the site will be determined using trip rate(s) developed by ITE and summarized in its most recent publication of its Trip Generation Handbook. The regression equation provided by the ITE Trip Generation Handbook will be used to determine the trip rate(s) unless it isn't provided or as may be agreed upon by the City.

Because trip generation, distribution and background growth determination is not an exact science, the City's desire is that a TIA will error on the conservative side. As such the City may allow internal trip discounting. In addition, the City may allow pass-by trip reduction. The use of internal trip discounting and/or pass-by trips will be approved by the City at this TIA pre-document preparation meeting. If the City agrees with the TIA preparer that internal trip discounting and/or pass-by trip are allowed, the City will not accept more than 50% of any discount rate as provided for by a nationally recognized resource.

**Analysis Period.** The time period(s) to be analyzed may include: AM peak hour, PM peak hour, 24-hour period, or any combination of the three; weekday, Saturday, Sunday, or any combination of the three; for the adjacent roadway or the generator, or a combination of the two, as may apply.

**Build-out and phasing.** The projected build-out date and any site phasing will be discussed. Typically, the City will want to see the impact of each phase (in a cumulative manner) on the adjacent roadway system.

**Growth Rate/Existing TIA documents.** An annual growth rate (may be different for different phases) will be determined and provided by the City to apply to the existing traffic volumes. Existing TIA document(s) for other development(s), which can influence this development's study area, may be determined as needing to be included in this TIA document and appropriate copy(ies) will be provided by the City.

**Trip Distribution.** The TIA preparer will be prepared to provide an initial determination on this site's trip distribution to the traffic system for, if applicable, each phase of this development. The distribution numbers determined at the TIA pre-document preparation meeting are tentative and may change upon sound engineering

practices by the TIA preparer and/or the City. In either case, the TIA document shall detail the process of how the distribution percentages were decided.

**Traffic Impact.** The TIA preparer will conduct a capacity analysis (which may include but is not limited to: all roadways using LOS D and NCTCOG maximum volumes for the type of street classifications, driveway intersections with roadways, and roadway intersections with other roadways) that were identified in the study area limits. The analysis will address all applicable conditions (including, but not limited to: existing, proposed and the net change between them). The analysis tool shall produce results compatible with the methodology developed by the Transportation Research Board and its most current publication of the Highway Capacity Manual.

If the site is being constructed in a phased manner, the City may require that the analysis be conducted for each phase of development.

**Mitigation Measures.** Areas of significant impact on traffic flow and/or on the safety of traffic operations will be evaluated to ascertain transportation related improvements to mitigate the amount of impact produced by the proposed land development.

The TIA document should reflect the City's goal of maintaining quality of life issues, which includes, among many other items, reasonable traffic flow upon the traffic system within the City that, at a minimum, usually includes the assessment of peak periods that do not exceed a level of service "D". However, the TIA preparer should develop mitigation measures that offset the actual effects of the increased traffic created by the development (regardless of the current or expected level of service) including equitable participation in mitigation measures that may not be fully warranted by the development.

Additional meetings may be required and as may apply.

#### Report (TIA Document)

The TIA preparer will prepare a detailed TIA document to be submitted to and for review and approval by the City. The minimum review time by City staff, in all cases, will be 2 weeks from submittal of an acceptable report.

The TIA document shall be a self contained report, in that reference(s), resource(s) (including copies of each ITE Trip Generation land use category(ies) for each time period analyzed), data collection information, analysis (manual and/or computer) input/assumptions and output/results shall be included.

Specific topics (i.e. numbered 1-14, as may apply and as noted below)/subtopics (i.e. alphabetized A-??, as may apply for each subtopic and as noted below) are to be addressed in the TIA document report. Headings for each of the following topics and subtopics will be a part of the TIA document. If information that would be expected to be contained within a topic/subtopic is not applicable or should the information not be obtainable by the TIA preparer, the heading for that topic/subtopic will still be provided within the TIA document and with sufficient enough verbiage so as to explain why the information for the topic is not relevant to and/or obtainable for this TIA document. If the following information is not available to the TIA preparer by the time of the TIA document's submittal, the TIA preparer will assume the most conservative scenario possible and will use the most conservative data/estimation/analysis, as may apply. The topics/subtopics will be in order as provided herein. Topics/subtopics that will be included in the TIA document, but which may not be limited to, include the following:

Cover sheet with name of development and any other pertinent information.

**Index.** For this topic, provide an index of each topic (1-14) and subtopic (A-??) with appropriate page number(s).

**Introduction.** For this topic, provide a letter of introduction indicating the name of the project and any other pertinent information; company's name, qualifications and address; responsible Engineer's name, phone number, FAX number, e-mail address with professional engineering seal. Within the body of the letter, provide any and all pertinent information (including, but not limited to: people attending each meeting and what assumption(s) where agreed upon with the City).

**Executive Summary.** For this topic, provide a synopsis of the development as it exists and what is proposed as well as this document's findings, conclusions and mitigation recommendations.

**Study Area.** For this topic, include detailed information on: the property's surrounding this site (including but not limited to zoning, build-out (in relation to this site's build out: do buildings exist and if so what are their uses; are buildings being constructed, if so what is built, what is occupied, what are their uses and what is yet to be built; are building(s) to be built and if so when is expected construction to begin and build out; building(s) are not being constructed, etc.); major point(s) that may be a source of attraction(s)/destination(s) for this site, the City's infrastructure as it pertains to traffic, etc.

Key Map- Current. For this subtopic, provide relevant information and plan sketch(es) showing, at a minimum:

the boundaries of the study area,

the boundaries of the site, and

the identification of all applicable current traffic infrastructure including, but not limited to:

those roadway(s) identified to be studied are to be labeled with the City's designated name (and, if applicable, all state/federal designations). If they are label identified (i.e. 1-?? or A-??), such identification shall be referenced consistently throughout the TIA document when discussing it.

any other roadway(s), as may be necessary to show a complete picture of the roadway system, are to be labeled with the City's designated name (and, if applicable, all state/federal designations),

for each intersection(s) identified to be studied such that:

they are to be label identified (i.e. 1-?? or A- ??), and such identification shall be referenced consistently throughout the TIA document when discussing it,

their roadway names shall be listed, and

their applicable current traffic control device(s) indicated, if any.

Key Map- Build-out. For this subtopic, provide relevant information and plan sketch(es) showing, at a minimum:

the boundaries of the study area,

the boundaries of the site, and

the identification of all applicable proposed traffic infrastructure including, but not limited to:

those roadway(s) identified to be studied are to be labeled with the City's designated name (and, if applicable, all state/federal designations). If they are label identified (i.e. 1-?? or A-??), such identification shall be referenced consistently throughout the TIA document when discussing it.

any other roadway(s), as may be necessary to show a complete picture of the roadway system, are to be labeled with the City's designated name (and, if applicable, all state/federal designations),

for each intersection(s) identified to be studied such that:

they are to be label identified (i.e. 1-?? or A- ??), and such identification shall be referenced consistently throughout the TIA document when discussing it,

their roadway names shall be listed, and

their applicable current traffic control device(s) indicated, if any. (indicate if it is exiting and to remain or proposed).

**Major Attraction/Destination Point(s) Map.** For this subtopic, provide relevant information and a plan sketch that identifies point area(s) that may affect this site's distribution including, but not limited to:

schools.

employment centers (if this development has residential)

residential centers (if this development has commercial/industrial)  
service centers (hospital(s), regional and sub-regional mall(s), and the like)  
recreational centers  
others as may apply

**Perimeter Property Zoning Map.** For this subtopic, provide relevant information and a plan sketch that identifies the current zoning of all properties surrounding (including those across any perimeter roadway and corner to) this site.

**Other Maps.** For this subtopic, provide a heading for each with relevant information and a plan sketch for any item(s) that may be a result of a discussion with City staff and/or as the TIA preparer deems appropriate.

Note: Each of the above described maps are necessary if there are substantial differences and/or information required such that their individuality is necessary to help avoid confusion and/or misunderstanding. If this is not the case, then various maps may be combined. If combined, the various conditions/requirements for each map will be clearly identified/differentiated.

**Site.** For this topic, provide the necessary information that is relative to this site. If the following information is not available to the TIA preparer by the time of the TIA document's submittal, the TIA preparer will assume the most conservative scenario possible.

**Current Zoning.** For this subtopic, describe the current zoning type(s) and, if there is more than one zoning designation for the property, a plan sketch showing the limits of each.

Current Building(s). For this subtopic, describe the current building(s) in relation to:

size(s), and  
location(s)

as may be relevant to the current zoning type(s), in determining appropriate ITE trip generation rate(s), for each zoning type(s) and that are of any traffic related consequence relative to:

current use(s),  
current occupancy rate(s)/percent(s), and  
current trip generation,

for those structures (or parts thereof) that are currently occupied and in accordance with current count(s) and/or calculated trips,

if applicable, provide a table and/or a plan sketch for the above.

**Proposed Zoning.** For this subtopic, if different from the current zoning, describe the proposed zoning type(s) for the property.

proposed buildings size(s).

proposed building location(s) as are relevant to proposed zoning type(s), in determining appropriate ITE trip generation rate(s) for each type of zoning relative to:

the trip generation rates for those structures (or parts thereof) that are currently occupied and in accordance with the Trip Generation topic if applicable, provide a table and/or a plan sketch for the above.

**Proposed Phasing.** For this subtopic, for each phase, describe:

what building(s) will be constructed  
the year of expected completion

what standard/expected traffic related infrastructure (internal roadways, perimeter paving etc. but, excluding any recommendation[s] as a result of this study)

a build-out date.

if applicable, provide a table and/or a plan sketch for the above. Typically, the City will want to see the impact of each phase (in a cumulative manner) on the adjacent roadway system.

**Site Access.** For this subtopic, describe all (non-single family and non-two family residential zoned) site's accesses, current, if any; which will remain as is, which will be modified and if so how, and which will be closed. Also discuss left turn lane(s), right turn lane(s) or other current features that may affect the usage of the access.

proposed; describe widths, stacking space requirements and that provide, number of ingress lanes, number of egress lanes and, if more than one, what turning movements will be allowed, slopes, as it related to the area between the edge of roadway and the ROW as well as from the ROW to the end of the required stacking distance, curb radii, signing and makings, truck usage and anything else that may be relevant. Also, discuss left turn lane(s), right turn lane(s) or other features that may affect the usage of the access. In addition, discuss City regulation(s) regarding driveways and the relationship with the parking lot and the application to land development as are contained in the development code.

**On Site Circulation.** For this subtopic, describe and assess the ability of vehicles to access and depart from the various on site facilities such as:

loading area(s),

trash area(s),

drive-up window(s),

traffic calming devices,

block lengths,

other items as may relate to this development.

**Site Exhibit.** For this subtopic, a plan sketch for the site shall be included.

current conditions, and

proposed conditions

**Traffic Related Infrastructure.** For this topic, describe applicable roadways and their intersections within the study area and per the City's mobility plan, including, from collector type(s) through freeway type(s) or other roadways identified to be studied:

**Current Roadway(s).** For this subtopic, provide information about the roadway's cross-section(s), which may vary for different links of the same roadway, in which case different link's cross-sections (with their boundary limits) may need to be described;

description of each existing roadway(s),

classification type, per the City's mobility plan

width (edge to edge, curb face to curb face or a combination)

number of lanes and movement designation(s)

median(s), if any, and if so their maximum width,

shoulder(s), if any, and its width

speed limit(s),

if there is sidewalk or not,

if there are bike paths, and if so are they in the roadway (marked or unmarked) or separate from,

is there a bus route on it or not

other pertinent information as may be necessary to provide a comprehensive understanding of the roadway description of the type(s) of traffic control device(s) at each said roadway type(s) intersection,

Proposed Roadway(s). for this subtopic, for improvement(s) required of the development by ordinance and/or the City's mobility plan and/or as a result of a Capitol Improvement Project (CIP) by the City, county or state, provide information about the roadway's cross-section(s), which may vary for different links of the same roadway, in which case different link's cross-sections (with their boundary limits) may need to be described:

description of each roadway type(s) at the time of this development's build-out:

classification type, per the City's mobility plan

width (edge to edge, curb face to curb face or a combination)

number of lanes and movement designation(s)

median(s), if any, and if so their maximum width,

shoulder(s), if any, and it's width

speed limit(s)

if there is sidewalk or not,

if there are bike paths, and if so are they in the roadway (marked or unmarked) or separate from,

is there a bus route on it or not

other pertinent information as may be necessary to provide a comprehensive understanding of the roadway

Type(s) of traffic control device(s) at each roadway type(s) intersection:

Who will construct it,

When will it be constructed

Other pertinent information as may be required

**Site Trip Generation.** For this topic, provide sufficiently detailed information about trip generation including but not limited to:

General Trip Generation. For this subtopic, provide a general discussion of trip generation and how it is determined, calculated, applied to sites, etc.

Site's Trip Generation. For this subtopic, provide a discussion about the site's trip generation in relation to the general trip generation discussion. The information provided will include both inbound and outbound generated trips. Provide information for the site relative to (if phased, provide for each phase and a total for build out):

zoning code(s),

description of zoning code(s)

building types in unit types (square feet, pumps, housing units, apartment units, etc. as is most appropriate)

ITE trip generation land use code used

ITE trips generated for each time period required.

If applicable, provide this information in a table.

**Site Distribution.** For this topic, the information provided will include both inbound and outbound generated trips, provide information concerning the build out and, if applicable, each intermediate phase.

Distribution Discussion. For this subtopic, provide a

discussion about how the site's traffic distribution was determined.

Site's Traffic Distribution- Roadway. For this subtopic, provide a:

discussion about, and a

plan sketch showing, the roadway system with applicable directional distributions for each link of each roadway and for each time period identified to be analyzed.

Site's Traffic Distribution- Intersection. For this subtopic, provide a:

discussion about, and a

plan sketch showing the roadway's intersection(s) with applicable movement distributions for each direction and for each time period identified to be analyzed.

Site's Traffic Distribution- Driveway. For this subtopic, provide a:

discussion about, and a

plan sketch showing, the site's driveway(s) with applicable distributions for each direction and for each time period identified to be analyzed.

Other Conditions. Provide appropriate heading(s) and, for each of the condition(s) to be studied and, if applicable, appropriate:

“other” condition discussion,

“other” condition sketch(s) and/or

“other condition table(s) in a format similar to that as indicated above.

**Site Assignments.** For this topic, use what was determined earlier. Include:

Site's Generation and Distribution. For this subtopic, provide a

discussion of how the vehicle trip generation(s) and trip distribution determine the trips assigned to the traffic system for the build out and, if applicable, any intermediate phase(s).

Site's Roadway Link(s) Distribution Condition(s). For this subtopic, include:

Link(s)- provide a

discussion and

complete and comprehensive plan sketch showing

the roadway system with applicable directional distributions for each link of each roadway and for each time period identified to be analyzed.

Site's Intersection(s) Distribution Condition(s)- For this subtopic, include:

Intersection(s)- provide a

discussion and

complete and comprehensive plan sketch showing the roadway's intersection(s) with applicable movement distributions for each direction and for each time period identified to be analyzed.

Site's Driveway(s) Distribution Condition(s)- for this subtopic, include:

Site driveway(s)- provide a

discussion and

complete and comprehensive plan sketch showing the site's driveway(s) with applicable distributions for each direction and for each time period identified to be analyzed.

Other Distribution Condition(s). For this subtopic, provide appropriate heading(s) and, for each of the condition(s) to be studied, if applicable, appropriate:

“other” condition discussion

“other” condition sketch(s) and/or

“other” condition table(s) in a format similar to that as indicated above.

**Current Conditions.** For this topic, provide information about the current condition(s) of the roadway(s) noted in topic #6 (by link if necessary to provide sufficient detail) in relation to traffic flow characteristics, intersection traffic flow characteristics, and any other item that may be of consequence to this site’s impact as it relates to this topic. Include

those applicable items as indicated in topic 12)

**Background Conditions.** For this topic, provide information about the expected condition(s) of the roadway(s), as may be projected from topic #6, for the traffic projection(s) of current traffic data (to the build out and, if any, intermediate phases) in relation to traffic flow characteristics, intersection traffic flow characteristics, and any other item that may be of consequence to this site’s impact as it relates to this topic. Include:

Background Projection(s). For this subtopic, provide a

Discussion about the projected percentage increase(s) of exiting traffic to determine the ultimate background traffic for the build-out of this development, as well as any intermediate phasing. Indicate the number of years the projection(s) is for and as may apply to any intermediate phasing and

those applicable items as indicated in topic 12)

**Total Background Plus Site Conditions.** For this topic, provide information about the expected condition(s) of the roadway(s), as may be projected from topic #6, for the total background plus site condition(s) of the roadway(s) (by link if necessary to provide sufficient detail) in relation to pavement condition assessment(s), traffic flow characteristics, intersection traffic flow characteristics, and any other item that may be of consequence to this site’s impact as it relates to this topic. Include:

Roadway Pavement Conditions. For topics 10) and 12), for this subtopic, provide a

Discussion about the assessment of the pavement type and condition of the roadway links identified and relative to its ability to withstand the volume and/or type(s) (especially trucks, buses and the like) of traffic using it.

Roadway Link’s Condition(s). For this subtopic, include:

Link flow characteristics- for topics 10), 11) and 12), provide a

Discussion (i.e. expected congestion conditions, delay conditions, and the like) about the traffic demand under this condition for each link of each roadway and for each time period identified to be analyzed.

Background link(s)> other development(s)- provide a

discussion and

complete and comprehensive relevant sketch(es) showing amplifiable trips for the appropriate traffic system for all other development(s) identified to be included in this study.

Background link(s)> existing count(s) projected- provide a

discussion and

complete and comprehensive plan sketch(es) showing the roadway system with background (existing projected) directional counts for each link of each roadway and for each time period identified to be analyzed.

Link trips- for topics 10), 11) and 12), provide a

discussion and

complete and comprehensive plan sketch showing the roadway system for each link of each roadway and for each time period identified to be analyzed as may apply and

Link LOSs- for topics 10), 11), and 12), provide a discussion and

complete and comprehensive table of LOSs for each link of each roadway and for each time period identified to be analyzed. If City's minimum LOS's for any link is exceeded, provide the same type of information and analysis for whatever mitigation is required to bring the link of the roadway into compliance.

Intersection Conditions. For this subtopic, include:

Intersection flow characteristics- for topics 10), 11) and 12), provide a

Discussion (i.e. expected congestion conditions, delay conditions, and the like) about each roadway's intersection and for each time period identified to be analyzed.

Background intersection(s)> other development(s)- provide a discussion and

complete and comprehensive relevant sketch(es) showing each roadway's intersection and for each time period identified to be analyzed for all other development(s) identified to be included in this study.

Background intersection(s)> existing count(s) projected- provide a discussion and

complete and comprehensive plan sketch(es) showing each roadway's intersection and for each time period identified to be analyzed with background (existing projected) directional counts for each link of each roadway and for each time period identified to be analyzed.

Intersection(s) trips- for topics 10), 11) and 12), provide a discussion and

complete and comprehensive plan sketch showing the roadway's intersection(s) for each direction and for each time period identified to be analyzed, as may apply.

Intersection LOSs- for topics 10), 11), and 12), provide a discussion and

complete and comprehensive table of LOSs for each roadway's intersection (by movement/direction and total) and for each time period identified to be analyzed for the type of traffic control device that would

exist at that time as well as any other traffic control device that would be required due to capacity problems

If the City's minimum LOS's for any intersection is exceeded, provide the same type of information and analysis for whatever mitigation is required to bring the roadway's intersection into compliance.

Site's Driveway(s) Condition(s)- For topics 10), 11), and 12), for this subtopic, include:

Site driveway(s)- provide a discussion and

complete and comprehensive plan sketch showing the site's driveway(s) and total background plus site's roadway trips for each direction and for each time period identified to be analyzed

If City's minimum LOS's is exceeded, provide the same type of information and analysis for whatever mitigation is required to bring the driveway into compliance.

Other Total Background Plus Site Condition(s). For topics 10), 11), and 12), for this subtopic, provide heads and a general description/condition and, if applicable, appropriate heading(s) and, for each of the condition(s) to be studied, if applicable, appropriate:

- “other” condition discussion
- “other” condition sketch(s) and/or
- “other” condition table(s) and in a format similar to that as indicated above.

If City’s minimum is exceeded, provide the same type of information and analysis for whatever mitigation is required to bring the item into compliance.

### **Pedestrian/Bicycle Component**

An assessment shall be provided of the ease of accessibility for:

- I. A development that contains residences (single family, duplex, townhome, condominium, apartment, mixed use with residential units or the like) is to provide pedestrian travel from all appropriate points within the site [origin(s)] to all appropriate uses [destination(s)] that may include, but is not limited to:
  - A. All schools within the development as well as within a 2 mile radius beyond any point within the development which children will be required to attend and for which any shuttle/bus service will not be provided indefinitely
  - B. All major employment centers within the development and/or within a 1 mile radius beyond any point within the development
  - C. All commercial sites within the development and/or within a 1 mile radius beyond any point within the development that does not repeat the same service/provide the same goods via the same reasonably direct route
  - D. All Transit stations/bus stops within the development and/or within a 1 mile radius beyond any point within the development.
  - E. All appropriate sports/recreation locations within the development and/or within a 1 mile radius beyond any point within the development
  - F. Any appropriate additional destination items, as may be determined by the City because of localized conditions, within a 1 mile radius beyond any point within the development.

The assessment shall consist of

- i. For pedestrians: a map (note: supplemental map(s) are required to be provided if there is a need for clarity/provide sufficient detail in order to provide the information needed for each of the following) identifying:
  - a. the development’s limits/boundaries and, if applicable, each said residential area of origin,
  - b. each said destination,
  - c. the most applicable and direct route(s) from each appropriate origin within the proposed site to each destination,
  - d. the limits/identification of the type (such as, but not limited to: sidewalk, pedestrian/bicycle facility, improved trail, improved pathway or the like) of pedestrian facility along each said route
  - e. the limits/identification of a pedestrian facility’s manner of surface construction material (concrete, asphalt, gravel/flexbase, compacted spoils [indicate spoil’s material] or the like) of each said pedestrian facility along each said route and the break point at which there is a change in surface type or clearly identifying where there is no such pedestrian facility
  - f. for each said route, the limits/identification of the general condition (rate as high – many issues; medium - moderate issues; or low – few to no issues, with the consideration of such items as: trip hazards; erosion hazards; or the like that could interfere and/or restrict travel for each as a part of this evaluation) of the pedestrian facility along each said route

- g. the location/identification of ADA ramps for each pedestrian facility along each said route and if it meets or does not meet current ADA requirements. If it does not meet current ADA requirements, indicate for each how does it not meet these requirements (is not directional, does not have domes, etc).
- h. the location/identification of the crossing of major thoroughfares (including but not limited to: arterials and high volume collector streets) for the pedestrian facility along each said route
- i. the location/identification of the crossing of complex intersections (width, geometrics, more than four legs, if signalized – are there pedestrian push-buttons/heads and crosswalk, etc) by the pedestrian along each said route
- j. the location/identification of challenging driveway types (such as large vehicle volumes and/or substantial truck usage) to pedestrians along each said route
- k. the location/identification of railroad/rail-transit crossings for each pedestrian facility along each said route
- l. the location/identification of items that restrict/inhibit the exiting and/or the installation of a future pedestrian facility along each identified pedestrian route (grade differences; bridge structure; landscaping; ROW; buildings, drainage, above ground utility features and/or other structures; and the like)
- m. Any additional items as may be determined by the City because of localized conditions

The assessment shall propose solutions to reduce or eliminate all adversarial conditions.

- ii. For bicyclists: a map (note: supplemental map(s) are required to be provided if there is a need for clarity/provide sufficient detail in order to provide the information needed for each of the following) identifying:
  - a. the development's limits/boundaries and, if applicable, each said residential area origin,
  - b. each said destination,
  - c. the most applicable and direct route(s) from each appropriate origin within the proposed site to each destination,
  - d. the limits/identification of the type (such as, but not limited to: sidewalk [if allowed], pedestrian/bicycle facility, improved trail, improved pathway, designated bike lane, designated share the road facility, sharrowsed street, wide outside lane or the like) of the bicycle facility along each said route
  - e. the limits/identification of the bicycle facility's manner of surface construction material (concrete, asphalt, gravel/flexbase, compacted spoils [indicate spoil's material] or the like) of each said pedestrian facility along each said route and the break point at which there is a change in surface type or clearly identifying where there is no such pedestrian facility
  - f. for each said route, the limits/identification of the general condition (rate as high – many issues; medium – moderate issues; or low – few to no issues, with the consideration of such items as: uneven surface; erosion hazards; or the like that could interfere and/or restrict travel for each as a part of this evaluation) of the bicycle facility along each said route
  - g. the location/identification of the crossing of major thoroughfares (including but not limited to: arterials and high volume collector streets) for the bicycle facility along each said route
  - h. the location/identification of the crossing of complex intersections (width, geometrics, more than four legs, if signalized – are there pedestrian push-buttons/heads and crosswalk, etc) by the bicyclist along each said route
  - i. the location/identification of challenging driveway types (such as large vehicle volumes and/or substantial truck usage) to the bicyclist along each said route
  - j. the location/identification of railroad/rail-transit crossings for each bicycle facility along each said route

- k. the location/identification of items that restrict/inhibit the exiting and/or the installation of a future bicycle facility along each identified pedestrian route (grade differences; bridge structure; landscaping; ROW; buildings, drainage, above ground utility features and/or other structures; and the like)

- l. Any additional items as may be determined by the City because of localized conditions

The assessment shall propose solutions to reduce or eliminate all adversarial conditions.

- II. A site that does not contain a residence (as defined above): to provide bicycle travel from all appropriate points on the site [origin(s)] to all appropriate destination points that includes, but are not limited to:

- A. All schools within the development as well as along school routes or within a 0.5 mile radius beyond any point of any non-residential structure within the development that could attract school children to it
- B. All applicable service related centers within the development and/or within a 1 mile radius beyond any point of any non-residential structure within the development that could attract non-motorized traffic to/from this development (examples: to/from the site from/to restaurants; grocery stores; etc)
- C. All residences within the development, as well as within a 1 mile radius beyond any point of any non-residential structure within the development that could attract non-motorized traffic to/from this development.
- D. All Transit stations/bus stops within the development and/or within a 1 mile radius beyond any point of any non-residential structure within the development,
- E. All appropriate sports/recreation locations within the development and/or within a 1 mile radius beyond any point of any non-residential structure within the development
- F. Any appropriate additional destination items, as may be determined by the City because of localized conditions, within a 1 mile radius beyond any point of any non-residential structure within the development.

The assessment shall consist of

- i. For pedestrians: a map (note: supplemental map(s) are required to be provided if there is a need for clarity/provide sufficient detail in order to provide the information needed for each of the following) identifying:
  - a. the development's limits/boundaries and, if applicable, each said non-residential area of origin,
  - b. each said destination,
  - c. the most applicable and direct route(s) from each appropriate origin within the proposed site to each destination,
  - d. the limits/identification of the type (such as, but not limited to: sidewalk, pedestrian/bicycle facility, improved trail, improved pathway or the like) of pedestrian facility along each said route
  - e. the limits/identification of a pedestrian facility's manner of surface construction material (concrete, asphalt, gravel/flexbase, compacted spoils [indicate spoil's material] or the like) of each said pedestrian facility along each said route and the break point at which there is a change in surface type or clearly identifying where there is no such pedestrian facility
  - f. for each said route, the limits/identification of the general condition (rate as high – many issues; medium - moderate issues; or low – few to no issues, with the consideration of such items as: trip hazards; erosion hazards; or the like that could interfere and/or restrict travel for each as a part of this evaluation) of the pedestrian facility along each said route
  - g. the location/identification of ADA ramps for each pedestrian facility along each said route and if it meets or does not meet current ADA requirements. If it does not meet current ADA requirements, indicate for each how does it not meet these requirements (is not directional, does not have domes, etc).

- h. the location/identification of the crossing of major thoroughfares (including but not limited to: arterials and high volume collector streets) for the pedestrian facility along each said route
- i. the location/identification of the crossing of complex intersections (width, geometrics, more than four legs, if signalized – are there pedestrian push-buttons/heads and crosswalk, etc) by the pedestrian along each said route
- j. the location/identification of challenging driveway types (such as large vehicle volumes and/or substantial truck usage) to pedestrians along each said route
- k. the location/identification of railroad/rail-transit crossings for each pedestrian facility along each said route
- l. the location/identification of items that restrict/inhibit the exiting and/or the installation of a future pedestrian facility along each identified pedestrian route (grade differences; bridge structure; landscaping; ROW; buildings, drainage, above ground utility features and/or other structures; and the like)
- m. Any additional items as may be determined by the City because of localized conditions

The assessment shall propose solutions to reduce or eliminate all adversarial conditions.

- ii. For bicyclists: a map (note: supplemental map(s) are required to be provided if there is a need for clarity/provide sufficient detail in order to provide the information needed for each of the following) identifying:
  - a. the development's limits/boundaries and, if applicable, each said residential area origin,
  - b. each said destination,
  - c. the most appropriate direct route(s) from each appropriate origin within the proposed site to each destination,
  - d. the limits/identification of the type (such as, but not limited to: sidewalk [if allowed], pedestrian/bicycle facility, improved trail, improved pathway, designated bike lane, designated share the road facility, a sharrowsed street, wide outside lane or the like) of the bicycle facility along each said route
  - e. the limits/identification of the bicycle facility's manner of surface construction material (concrete, asphalt, gravel/flexbase, compacted spoils [indicate spoil's material] or the like) of each said pedestrian facility along each said route and the break point at which there is a change in surface type or clearly identifying where there is no such pedestrian facility
  - f. for each said route, the limits/identification of the general condition (rate as high – many issues; medium - moderate issues; or low – few to no issues, with the consideration of such items as: uneven surface; erosion hazards; or the like that could interfere and/or restrict travel for each as a part of this evaluation) of the bicycle facility along each said route
  - g. the location/identification of the crossing of major thoroughfares (including but not limited to: arterials and high volume collector streets) for the bicycle facility along each said route
  - h. the location/identification of the crossing of complex intersections (width, geometrics, more than four legs, if signalized – are there pedestrian push-buttons/heads and crosswalk, etc) by the bicyclist along each said route
  - i. the location/identification of challenging driveway types (such as large vehicle volumes and/or substantial truck usage) to the bicyclist along each said route
  - j. the location/identification of railroad/rail-transit crossings for each bicycle facility along each said route
  - k. the location/identification of items that restrict/inhibit the exiting and/or the installation of a future bicycle facility along each identified pedestrian route (grade differences; bridge structure; landscaping; ROW; buildings, drainage, above ground utility features and/or other structures; and the like)

1. Any additional items as may be determined by the City because of localized conditions  
The assessment shall propose solutions to reduce or eliminate all adversarial conditions.

**Conclusions and Recommendation.** For this topic, provide a synopsis of this study, conclusions and any recommendations, including mitigation measure(s) required of this development and/or the need for public improvements. For the development, include those mitigation measures that are:

those required by ordinance (such as construction of internal roadway(s)/sidewalk(s), perimeter roadway(s)/sidewalk(s) and such).

the result of this site's increased generated traffic on the traffic system which, although will not result in an exceeding the minimum City standards (such as LOS), will be sufficient to require this development to participate in it's portion of the cost(s) for the expected improvement(s),

the result of exceeding minimum City standards (such as LOS),

At a minimum, exhibit(s) displaying all mitigation measures in a schematic format will be required. For unique concepts that are not easily described, detailed exhibits shall be prepared. If changes to an existing traffic control device, include, as may apply: warrant study(ies); timing calculation(s)/phasing; upgrades/additions) and the like. If a new traffic control device, include, as may apply: warrant study(ies); timing calculation(s)/ phasing; locations and the like. The TIA preparer shall also provide appropriate dimensions (including, but not limited to: storage/turning lanes). In addition the TIA preparer will also provide estimated construction costs for all mitigation measures required of this site's development.

**Appendices.** For this topic, all sheet(s) shall be numbered. Provide all reasonable and applicable:

**Data Collected.** Provide all information in a concise, easy to read and interpret manner that is relevant to all data collected.

**Analysis.** Provide all input and output sheets in a concise, easy to read and interpret manner of all calculation(s), warrant study(ies), review(s), assessment(s), and the like done either manually and/or by computer.

Background information to supplement any resource(s) and/or reference(s) used to supplement inferences/assumptions/basis for and the like (including copies of each ITE Trip Generation land use category(ies) for each time period analyzed).

### **Additional Applicant Responsibility**

The completion of a TIA report in accordance with the requirements described in this document does not relieve the applicant from the responsibility of insuring that the proposed land development meets all other applicable City regulations and ordinances.

In cases where the City plans to use a review consultant, the preparer will be required to submit a copy of the final report directly to the City's review consultant in addition to the City Engineer.

### **Review Comments**

In the event that a Traffic Impact Analysis (TIA) is considered incomplete by staff or the review consultant, the preparer will be notified of the information needed to complete the review in writing. The final review and comment(s) will be delayed accordingly.

Once the City's review of the TIA document is determined to be complete, the preparer will be notified in writing as to whether or not the City concurs with the results of the study and if the City does not concur, where the differences are.

## **1.2.4 Street Name Signs**

Street name signs, materials and installation are to conform to the City of Denton Standard Detail Sheets in Appendix A.

### **1.2.5 Pavement Markings**

Pavement markings, materials and installation are to conform to the City of Denton Standard Detail Sheets in Appendix A.

## **Section 2 – Pedestrian and Bicycle Facility Design**

### **2.1 Geometric Standards**

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#### **2.1.1 Alignment, Location, Materials & Sections**

Refer to City of Denton Standard Street Detail Sheets in Appendix A for Standard Cross Sections and Requirements within the right-of-way or public easements.

### **2.2 Amenities**

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#### **2.2.1 Bicycle Parking**

- All private/on-site bicycle parking facilities/devices shall be constructed as to be structurally equivalent to the City sidewalk requirements and shall provide for the opportunity for bicyclists to secure their bicycle from theft.

#### **2.2.2 Bridges and Drainage Crossings**

- Bridges and drainage crossings shall be at least as wide as the required width of the pavement plus the pedestrian and/or bicycle facility for the type of City facility being designed for, and meet Texas Accessibility Standards, which includes but is not limited to ramp, slope, and texture.

## Section 3 – Drive Approach Design

### 3.1 Geometric Standards

The following standards generally apply to all developments. However, there may be unique situations for which these standards may be impractical. In these situations, the City Engineer and/or his/her representative will work with the developer to develop a mutually agreeable solution. In the event that a mutually agreeable solution is not reached, the developer may apply to the Planning and Zoning Commission for consideration of the issue.

A “Driveway” is located entirely on private property. It is only for a single family or a duplex property. It connects a drive approach to a garage, “car” port, parking pad or the like.

A “Drive Aisle” is located entirely on private property. It is for every other condition other than for a single family or a duplex property. It connects a drive approach to an area(s) that is to be accessed on the site such as, but not limited to: parking space(s); loading dock(s); loading area(s) (marked or implied - for passengers and/or goods); porte cochere(s), and/or the like. It can also be a fire lane (in and of itself or in conjunction with other access use[s]). It can also be an access to an adjoin property (in and of itself or in conjunction with other access use[s]).

A “Drive Approach” is located in the ROW and connects a street (City, public or private) or highway (TxDOT) with a driveway or a drive aisle. Some features of the drive approach may extend into and be a part of the driveway or drive aisle.

#### 3.1.1 Width, Radius and Other Dimensions

**Table 3-A, Driveway Dimensions**

Use	Drive Approach Widths	Radius
Single Family and Duplex Residential *	Min. Width = 12 feet Max Width = 20 feet **	5 feet
Multi-Family Residential	Min. Width = 24 feet Max Width = 38 feet	10 to 20 feet
Commercial	Min. Width = 30 feet Max Width = 38 feet***	20 to 25 feet
Industrial	Min. Width = 30 feet Max Width = 38 feet***	20 to 25 feet

- Add 5 feet to maximum radius for significant truck traffic
- For shared drive approaches, no lot shall contain less than 9 feet of the drive approach and driveway or drive aisle (as may apply). Drive approach shall be centered on lot line such that maximum drive approach width equals 30-ft.
- Maximum drive approach width is a function of traffic volume. Refer to figures 3-1 through 3-5.
- \* For infill situations:
  - A one single family residential or a two-family residential lot accessing a collector may be permitted to have 1 full width or circular drive approach when alleys are not practical.
  - Adjacent two single family residential or two two-family residential lots accessing a collector may be permitted to have 1 shared full width or circular drive approach when alleys are not practical.
  - Contiguous three or more single family residential or three or more contiguous two-family residential lots accessing a collector will be required to enter the collector by an alley, flag drive, or residential street.
  - For one single-family residential or one two-family residential lot accessing an arterial, an on-site facility will be required to allow entrance into the arterial in a forward manner.
- \*\* For homes with a three or more car garage, where the garage door faces the street and the garage door is less than 40 feet from the back of curb, the maximum drive approach width is 30-ft.
- \*\*\* Drive approaches with a median installed in lieu of the double yellow marking may exceed the maximum drive approach width by the width of the median only. Drive approaches with significant truck traffic may install surmountable curb with textured and colored pavement in the parkway with a depth equal to or greater than the drive approach pavement requirement.

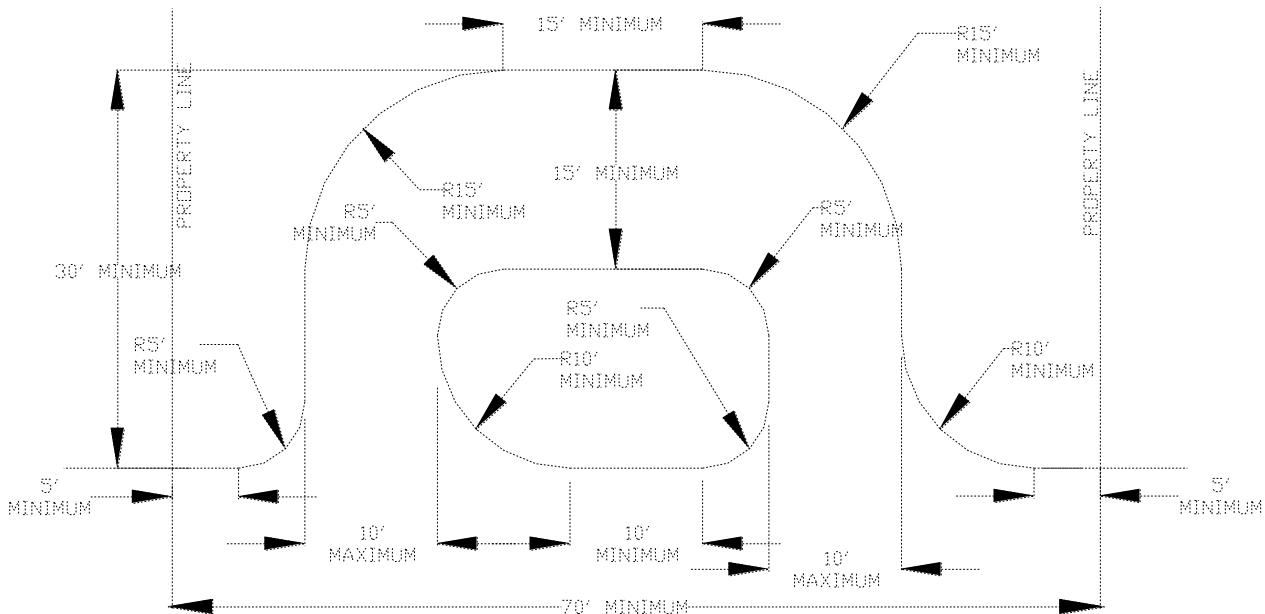


Figure 3-1, Residential Circular Drives

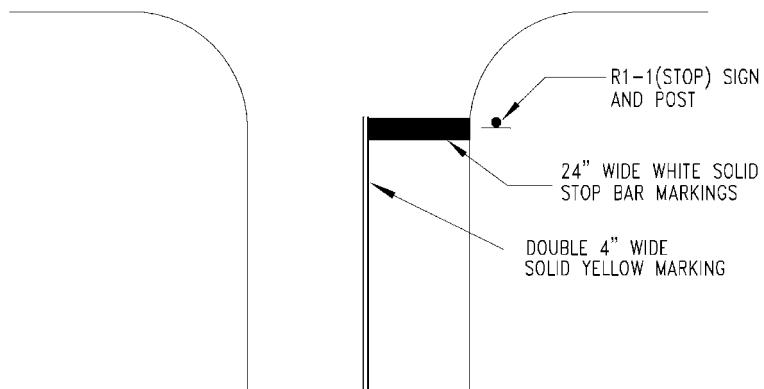


Figure 3-2, Single Lane Egress, Single Lane Ingress  
Commercial Drive Approach

- The stop bar and stop sign shall be on private property as well as upstream of any pedestrian facility crossing the drive approach and/or the drive aisle.
- The outbound (towards the street) lane shall be 10 feet wide until at such time as the width of the driveway is greater than 28 feet and then the inbound (onto the site) lane shall be a minimum of 18 feet wide.

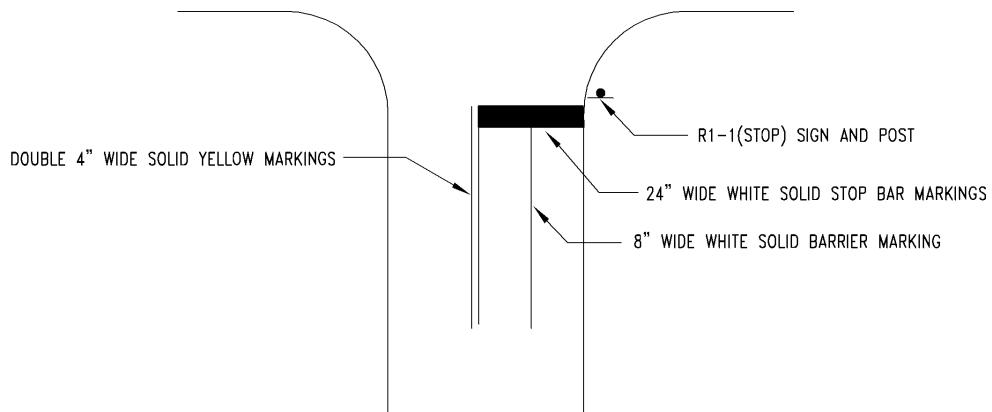


Figure 3-3, Dual Lane Egress, Single Lane Ingress  
Commercial Drive Approach

- The stop bar and stop sign shall be on private property as well as upstream of any pedestrian facility crossing the drive approach and/or the drive aisle.
- The two outbound (towards the street) lanes shall each be 10 feet wide until at such time as the width of the driveway is greater than 38 feet and then the inbound (onto the site) lane shall be a minimum of 18 feet wide.

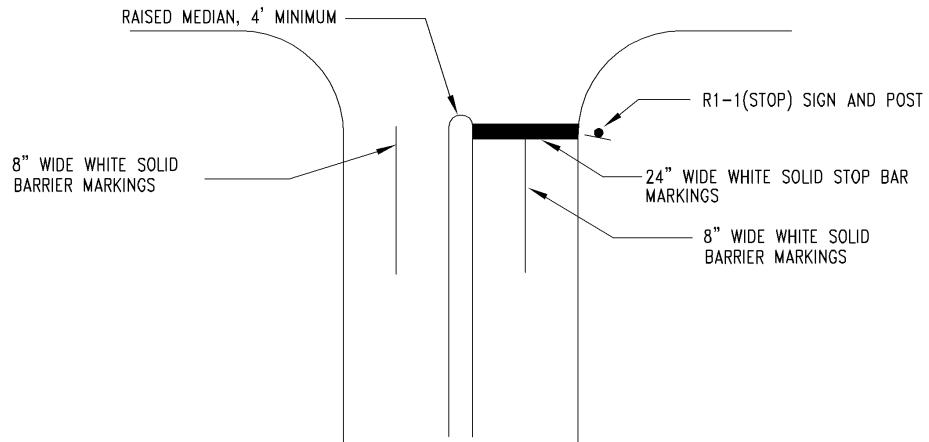


Figure 3-4, Multiple Lane Egress, Multiple Lane Ingress  
With Median Commercial Drive Approach

- The stop bar and stop sign shall be on private property as well as upstream of any pedestrian facility crossing the drive approach and/or the drive aisle.
- The two outbound (towards the street) lanes shall each be 10-12 feet wide the two inbound (onto the site) shall each be 10-12 feet wide.
- Median shall accommodate any pedestrian facility across the drive approach and/or drive aisle as projected from both sides thereof.
- Only allowed when dual left turn lanes into the site or opposing street/driveway has two or more lanes of which two are designated as being through lanes.

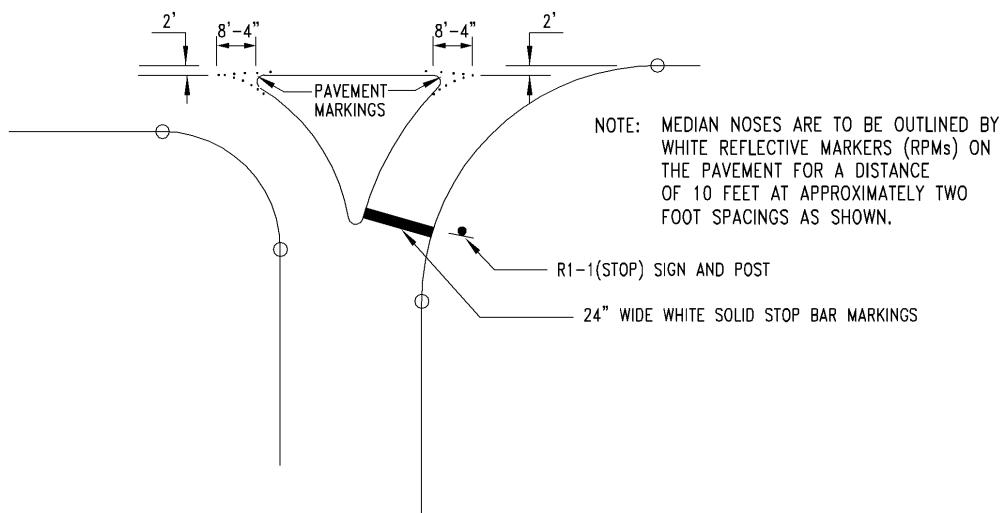


Figure 3-5, Right in /Right out Commercial Drive Approach

- The stop bar and stop sign shall be on private property as well as upstream of any pedestrian facility crossing the drive approach and/or the drive aisle.
- The minimum width of the drive approach/drive aisle prior to the island, as well as each lane (inbound and outbound) at the island and the applicable radii shall be determined by the engineer of record and based upon the type(s) of vehicles expected to use it as well as an auto-turn analysis provided to the City for review and approval.
- Median/island shall accommodate any pedestrian facility across the drive approach and/or drive aisle as projected from both sides thereof.
- For "one way in" or "one way out" driveways, the geometry shall be as shown in the figure above for the respective side.

### 3.1.2 Grades

- Cross-section of center of driveway will be required to ensure grade compliance.
- 1. Driveway Spacing (same side of the street)

**Table 3-B, Minimum Drive Approach Spacing**

Street Classification	Min. Drive Approach Spacing
Alley	10 feet
Flag Drive	10 feet
Neighborhood	10 feet if permitted
Collector	100 feet if permitted
Secondary Arterial	150 feet if permitted
Primary Arterial	200 feet if permitted

- Driveway spacing is measured between the closest edges of each drive approach not including the radius.

### 2. Corner Clearance

**Table 3-C, Minimum Corner Clearance**

Type of Intersection	Approaching the Intersection	Departing the Intersection
Alley/Alley	10 feet both streets	10 feet both streets
Alley/Neighborhood	20 feet on alley, 50 feet on Neighborhood if permitted	20 feet on alley, 50 feet on Neighborhood if permitted
Alley/Collector	20 feet on alley, 75 feet on collector if permitted	20 feet on alley, 100 feet on collector if permitted
Flag Drive/Neighborhood	20 feet on flag drive, 50 feet on neighborhood if permitted	20 feet on flag drive, 50 feet on neighborhood if permitted
Flag Drive/Collector	20 feet on flag drive, 75 feet on collector if permitted	20 feet on flag drive, 100 feet on collector if permitted
Neighborhood/Neighborhood	50 feet both streets	50 feet both streets
Neighborhood/Collector	50 feet neighborhood, 75 feet collector	50 feet neighborhood, 100 feet collector
Neighborhood/Arterial	50 feet neighborhood, 150 feet arterial if permitted	50 feet neighborhood, 200 feet arterial if permitted
Collector/Collector	75 feet both streets	100 feet both streets
Collector/Arterial	75 feet collector, 150 feet arterial if permitted	100 feet collector, 200 feet arterial if permitted
Arterial/Arterial	150 feet both streets if permitted	200 feet both streets if permitted

- Corner clearance is measured between the right of way line of the intersecting street and the nearest edge of the drive approach not including the drive approach radius.

### 3. Drive Approach Offset/Relation to Median Openings

- a. For collector streets, drive approaches that do not align across the street from each other must be offset by a minimum of 75 feet between nearest tangent edge to nearest tangent edge.
- b. For Arterial Streets without medians, drive approaches must align across the street from each other and be positioned as is reasonable and practical given property line location and time of development of the site. When this is not physically possible or practical, based on the opinion of the City Engineer, drive approaches that do not align must be offset across the street from each other by a minimum of 150 feet between nearest tangent edge to nearest tangent edge.
- c. For Arterial Streets with medians, drive approaches must align with existing or proposed median openings. Where this is not possible or practical as determined by the City Engineer, drive approaches must be placed as far away from the existing or proposed median opening as is reasonably possible.

## Section 4 – Parking Design

### 4.1 Geometric Standards

Please note that the figures below are typical space layout for public streets where parking is permitted and off-street parking, and do not include the requirements for handicap parking.

#### A. Parking Spaces

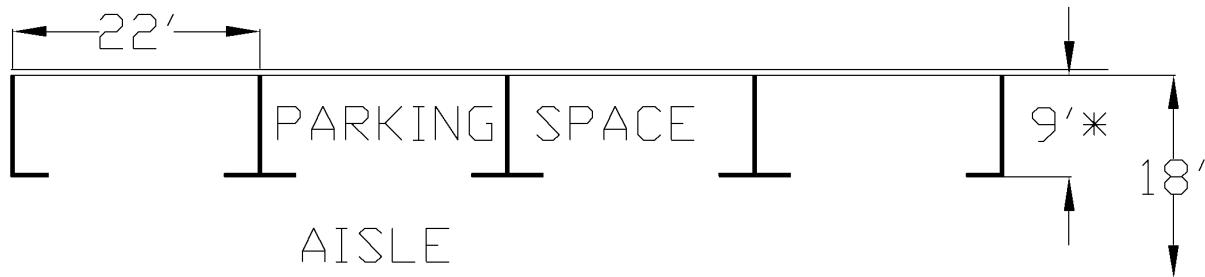


Figure 4-1, Parallel Parking

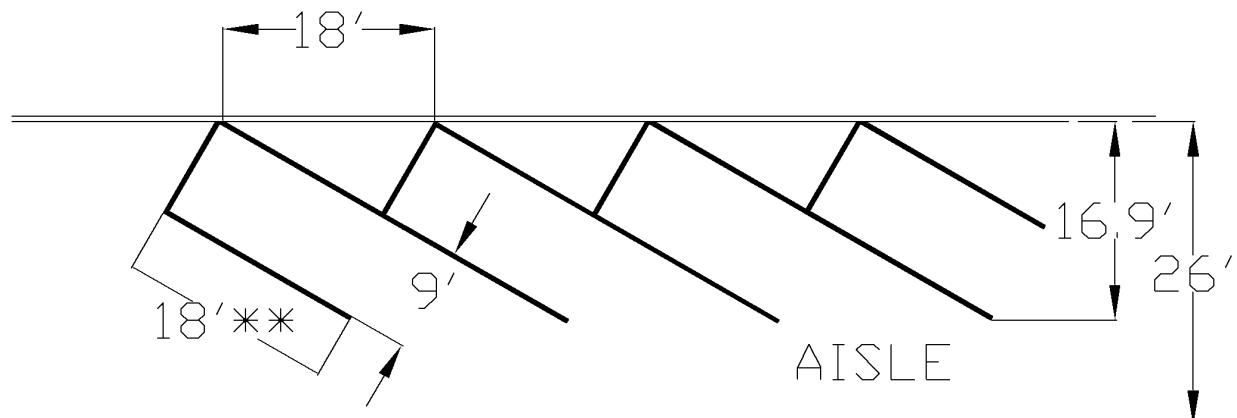


Figure 4-2, 30 Degree Angle

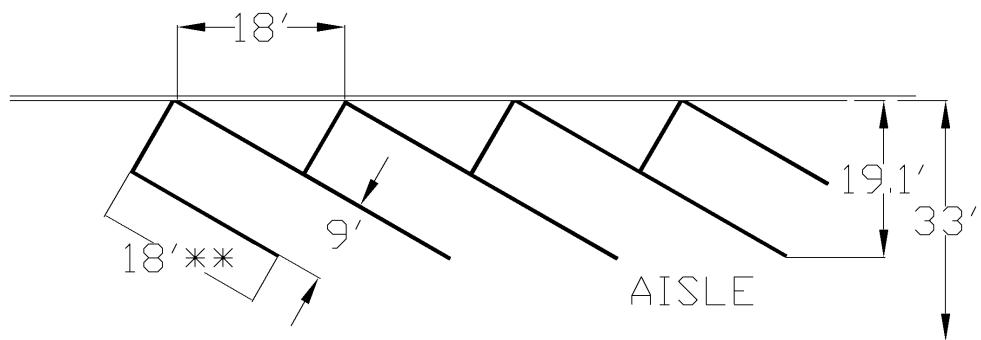


Figure 4-3, 45 Degree Angle

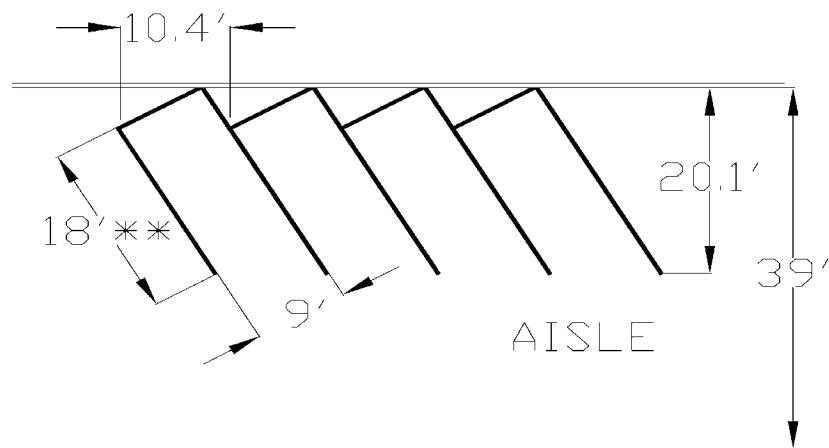


Figure 4-4, 60 Degree Angle

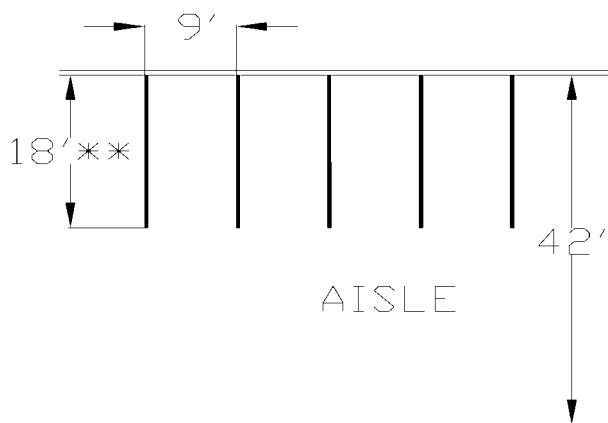


Figure 4-5, 90 Degree Angle

\* When permitted, the minimum parking space may be 8-ft in width for residential streets and residential collectors.

\*\* Wheelstops will be required to prevent vehicle overhang into adjacent property, right-of-way, structures, landscaping or sidewalk.

- Parking spaces may be reduced to 16.5-ft in length if overhang is allowed.
- All standard parking spaces shall be white in color.
- All handicap parking spaces shall be installed in accordance with the City of Denton standard detail in Appendix A.
- Dead-end parking areas that exceed fifteen (15) parking spaces on one side of the drive aisle will be required to provide a means to turn-around.
- A 5-ft minimum vehicular maneuvering area will be required beyond and for the last parking space at the end of a dead-end drive aisle.

#### B. Drive Aisles

- Two way drive aisles must be a minimum of 20 feet wide unless there are 90-degree parking spaces backing into them, in which case the minimum width is 24 feet.
- One way drive aisles must meet the minimum dimensions shown in figures 4-1 through 4-4 unless they also serve as a fire lane, in which case they must meet the minimum width required for fire lanes.
- Fire lane markings shall be as wide as the drive aisle.

#### C. Stacking

**Table 4-1, Minimum Stacking**

Number of Parking Spaces	Min. Stacking for Primary Drive Aisle	Minimum Stacking for Secondary Drive Aisle
0 to 100	20 feet	20 feet
101 to 250	40 feet	20 feet
251 to 500	60 feet	40 feet
501 to 1000	80 feet	60 feet
1001 and over	Queuing Analysis Required	Queuing Analysis Required

- All drive approaches that access an arterial shall be classified as a primary drive approach. If no drive approaches access an arterial, then the drive approach expected to receive the most traffic is considered to be the primary drive approach.
- Stacking distance is measured between the first parking space or drive aisle and the property line.
- Parking lots with 10 or less parking spaces may use a minimum stacking distance of 10 feet for drive approaches accessing a residential street or collector street.

#### D. Drive Through Facilities

The minimum number of queue spaces, including the vehicle at the service window, shall be provided for each drive-through facility as follows:

**Table 4-2, Storage Requirements for Drive Through Facilities**

Land Use Type	Minimum Queue Spaces
Bank Teller lane	Five
Automated teller machine	Three
Restaurant, drive-through	Five
Car Wash stall, automatic or full service	Five
Car wash stall, self service	Three
Oil change station	Four
Dry cleaning or laundry	Three
Photo lab	Four
General Retail	Four
Gasoline pump island	30-feet from each end of the pump island
Kiosk with food	Four
Kiosk without food	Three

- Queue space shall be a minimum 8-ft by 20-ft in dimension.
- The applicant may submit a documented industry or national standard in lieu of the above requirements.
- Drive through lanes are to be exclusive of circulation drive aisles and parking spaces, and be within the property lines of the facility being served.
- A by-pass lane of 9-ft in width shall be provided and may be part of a drive aisle.

#### E. Off-street Loading Areas

- All non-residential developments shall provide one minimum loading zone on-site sized for the type and number of vehicles expected to serve the development. The vehicle shall exit the site in a forward manner. This requirement does not apply to non-residential developments that only have quick deliveries (such as Fed Ex, UPS, or USPS). Developments within the Downtown Implementation Plan Boundary are exempt from this requirement.

## F. Materials and Pavement Sections

**Table 4-3, Minimum Pavement Standards<sup>1</sup>**

Impervious Surface			Pervious Surface		
	Concrete	Asphalt	Solid Pavers	Open Pavers	Gravel
<b>Parking Spaces</b>	5 inches on scarified and compacted base	5 inches on 6 inch lime or cement treated base	3 1/8 inch pavers on scarified and compacted base	See Additional Requirements below	N/A
<b>Light Duty Drive Aisle (for residential uses only)</b>	6 inches on scarified and compacted base	6 inches on 6 inch lime or cement treated base	3 1/8 inch pavers 6 inch lime or cement treated base	See Additional Requirements below	N/A
<b>Heavy Duty Drive Aisle</b>	6 inches on 6 inch lime or cement treated base	7 inches on 6 inch lime or cement treated base	3 1/8 inch pavers on 4 inches of asphalt over 6 inch lime or cement treated base	N/A	N/A
<b>Vehicle and Equipment Storage/Staging Areas for rental, retail, wholesale or industrial purposes</b>					8-inch Grade 1 or Grade 2 Flexible Base over 6-inch lime or cement treated base

**Additional Requirements**

- Parking spaces in excess of those required must be constructed of open pavers such as Grasscrete™, Turfstone™, porous asphalt, porous concrete, or approved equal. Engineer of record shall provide structural needs for the type of traffic use for the type of material used, and that there is proper drainage. If markings cannot be installed then another means will be required to delineate each parking space. Maximum allowable slope for open pavers shall be 0.5% in all directions.
- Use of leveling sand under concrete pavement is discouraged. A maximum of 2 inches of leveling sand may be used under concrete pavement in addition to minimum required base prep.
- Concrete pavement is to be reinforced with #3 bars on 24 inch centers, 6"X6" #6 welded wire fabric or an approved paving fiber. Chairs will be used to support reinforcement.
- Gravel Parking:

<sup>1</sup> This table only provides specific design requirements for these pavement types, where allowed. Please see applicable portions of the Denton Development Code including, but not limited to those restrictions on where these surfaces are allowed.

- a) **Material.** Gravel Material shall be required to be constructed in accordance with the North Central Texas Council of Government (NCTCOG) Standard Specifications. Grade 2 Flexible Gravel Base Material will be permitted only for equipment storage areas.
- b) **Dust Control.** For dust control, all gravel pavement will be required to apply a dust control emulsion on an as-required basis to satisfy the Section 17-101(b) of the City of Denton Property Maintenance Code. Emulsion used may be DustLess, Z-110, or an equivalent product approved by the City Engineer.
- c) **ROW Screening/Buffer Requirements.** Screening at the Right-of-Way and buffer requirements shall be in accordance with the standards of Subchapter 35.13 of the City of Denton Development Code.
- d) **Environmental Mitigation.** Gravel parking areas will be required to construct sedimentation basins for sediment and hydrocarbon control. Sedimentation basins will be designed in accordance with the Integrated Stormwater Management Program (iSWM) Section 4.

## Section 5 – Transit Facility Design

- Any development proposing to construct a bus stop (bus turnout and/or shelter) shall be designed in accordance with the Denton County Transit Authority standards.
- Bus stops shall be located on the departing side of a street intersection.

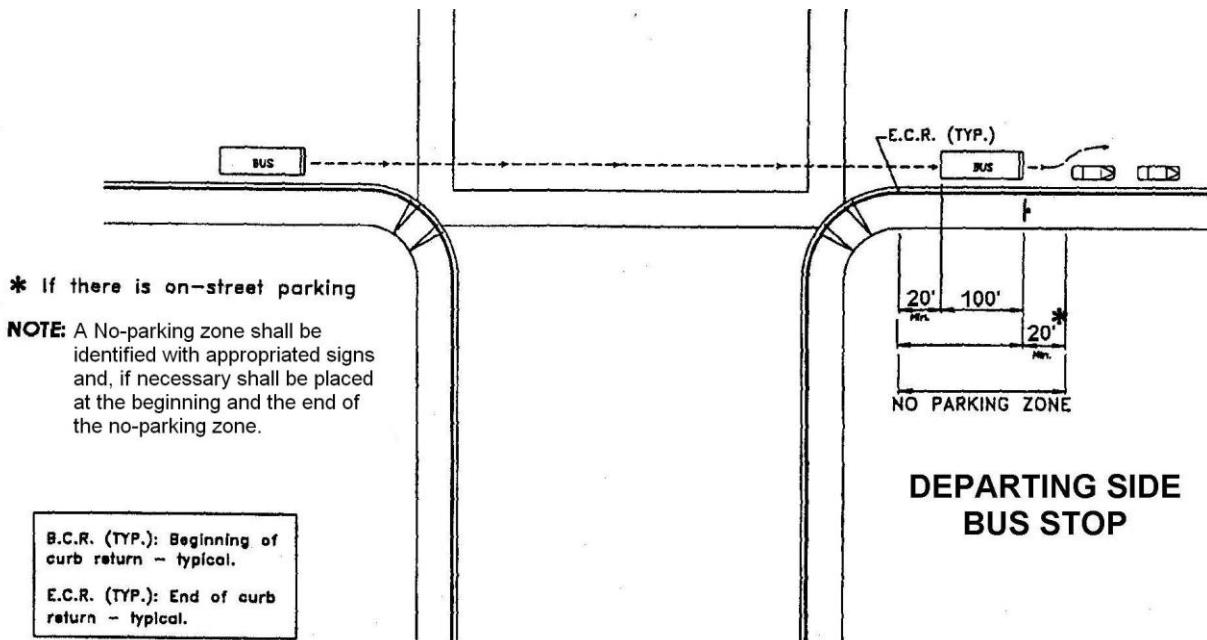
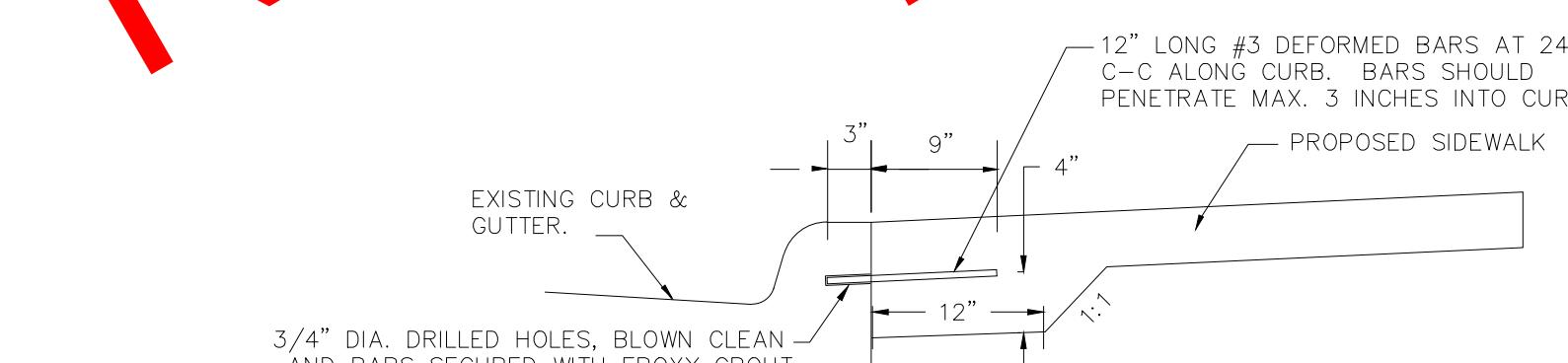
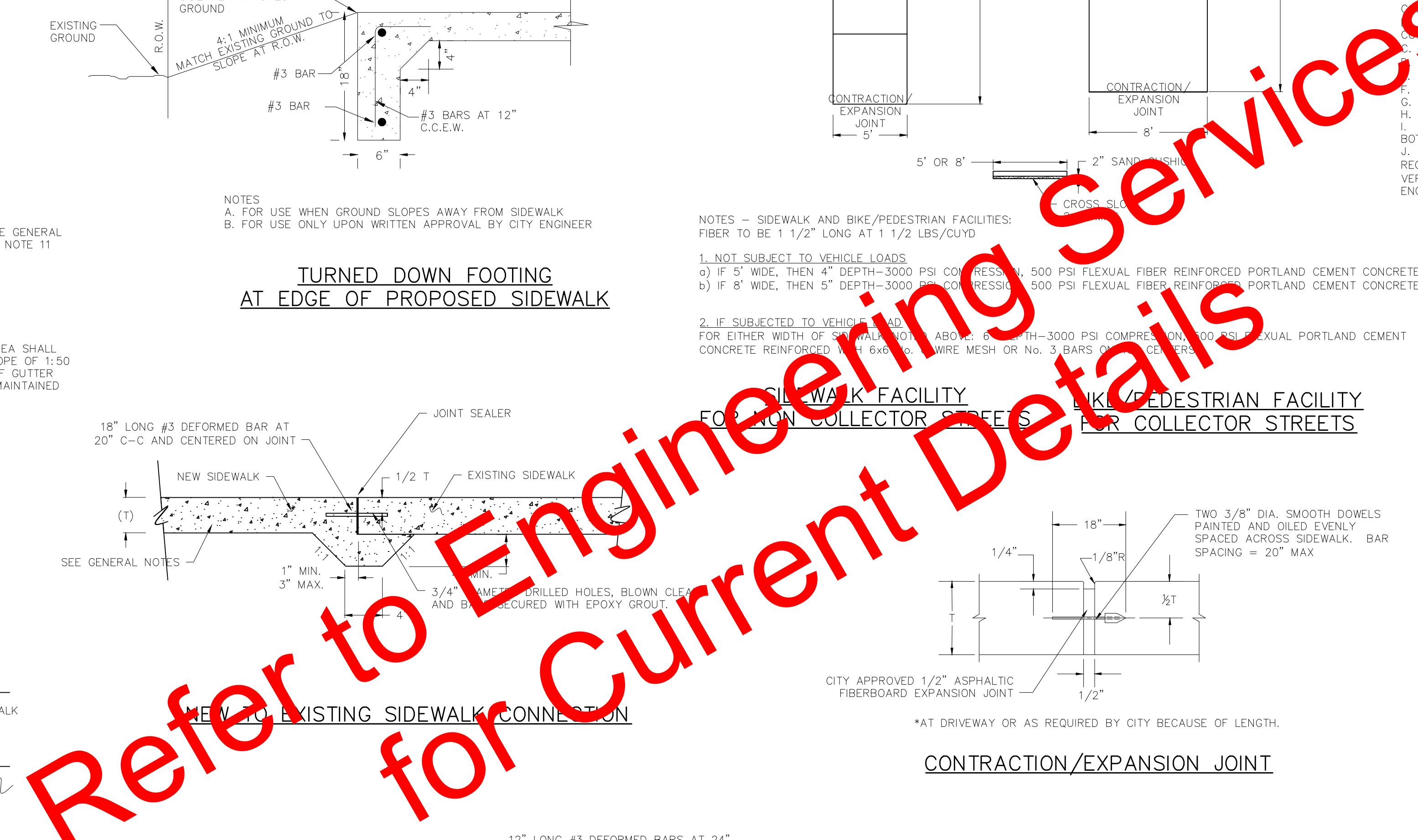
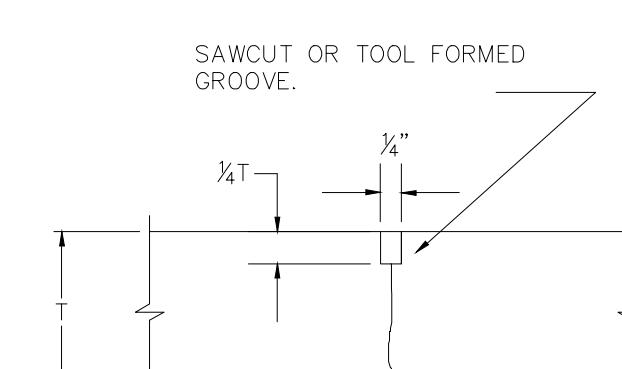


Figure 5-1, Standard Bus Stop Location

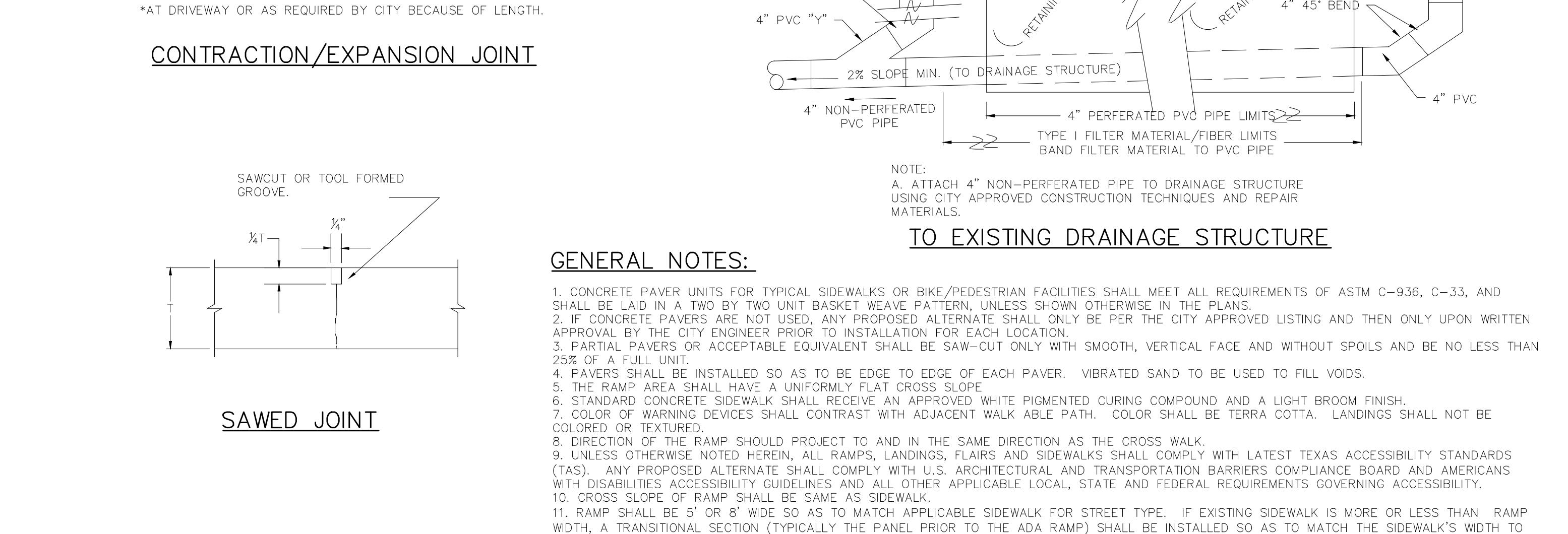
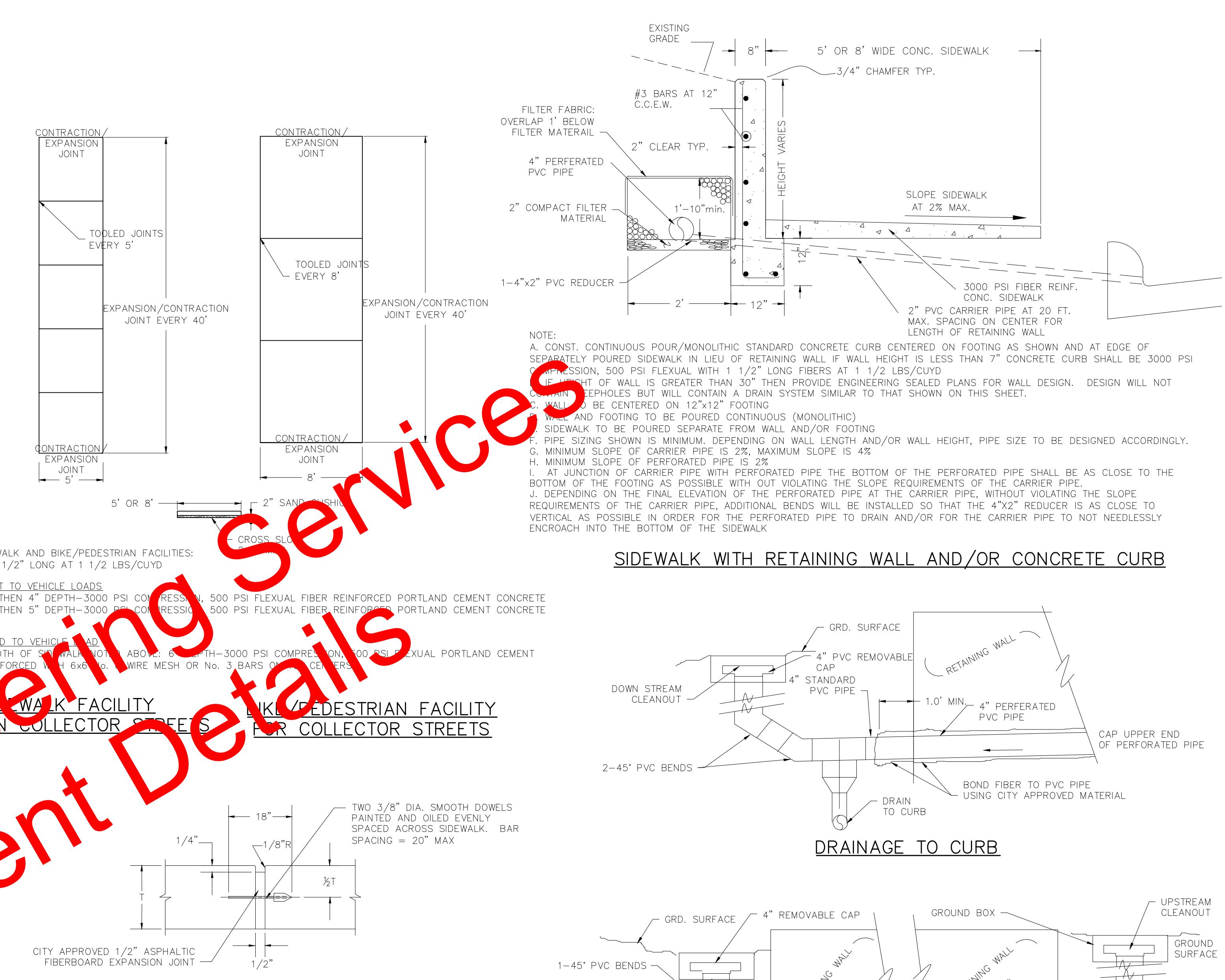
## Appendices – City Standard Details & Sections



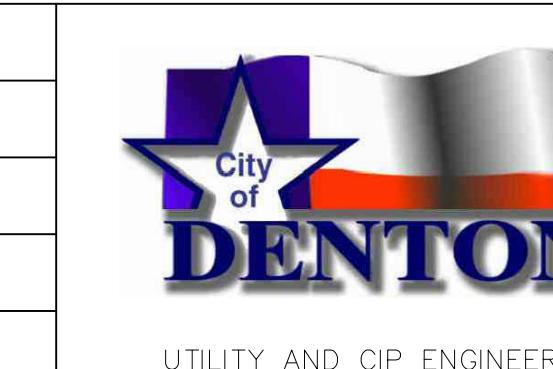
SIDWALK ALONG EXISTING BACK OF CURB



SAWED JOINT



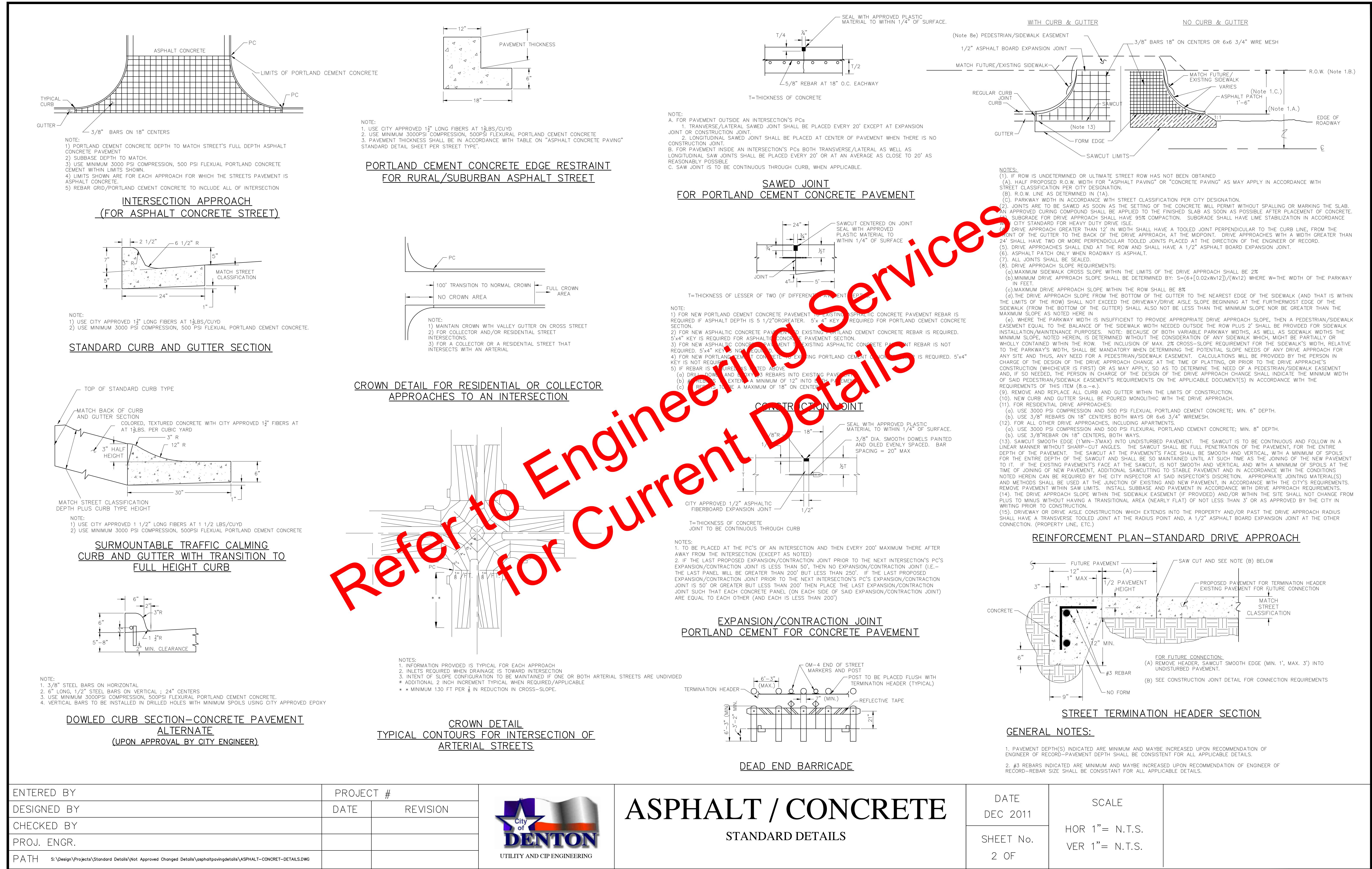
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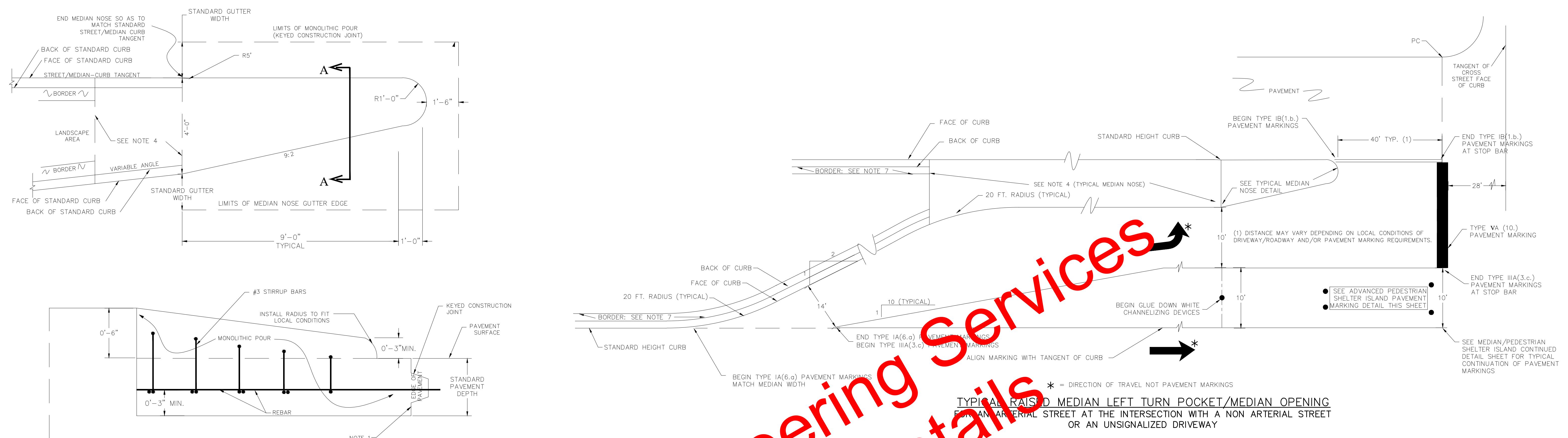


## SIDEWALK DETAILS

STANDARD DETAILS

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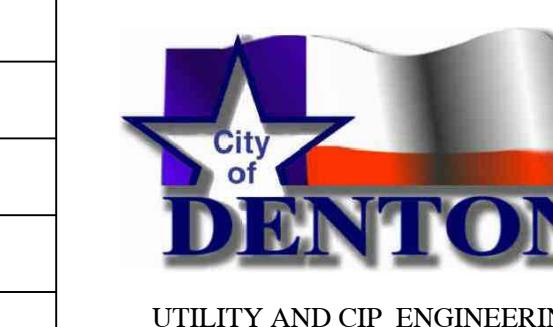
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for Current Details

**NOTES:**

APPLICABLE TO ALL ASPHALT/CONCRETE MEDIAN/PEDESTRIAN SHELTER ISLAND STANDARD DETAIL SHEETS

- WHEN MATCHING EXISTING PAVEMENT WITH NEW MEDIAN NOSE
  - WHEN MEDIAN NOSE IS POURED FIRST AND THEN ADJACENT PAVEMENT:
    - REBAR WITHIN MONOLITHIC POUR AREA SHALL EXTEND A MINIMUM OF 18 IN. BEYOND LIMITS OF MONOLITHIC POUR.
    - WHEN ADJACENT PAVEMENT IS POURED FIRST AND THEN NOSE, MEDIAN NOSE SHALL EXTEND A MINIMUM OF 18 INCHES INTO MONOLITHIC POUR.
    - REBAR THAT IS WITHIN ADJACENT PAVEMENT SHALL EXTEND A MINIMUM OF 18 INCHES INTO MONOLITHIC POUR.
    - WHEN ATTACHING TO EXISTING CONCRETE, DRILL  $\frac{1}{4}$  IN. DIAMETER HOLES, A MINIMUM OF 18 INCHES INTO EXISTING CONCRETE, BLOW HOLES CLEAN AND SECURE REBAR OF SAME SIZE AS REQUIRED FOR PAVEMENT WITH EPOXY GROUT.
  - MATCHING ASPHALT: REBAR TO EXTEND TO FACE OF PAVEMENT
  - CONCRETE FOR MONOLITHIC POUR OF MEDIAN NOSE TO BE OF SAME REQUIREMENTS AS PAVEMENT REQUIREMENTS.
  - REINFORCEMENT BARS FOR THE MEDIAN NOSE SHALL THOSE FOR PAVEMENT FOR SIZE AND SEPARATION UNLESS OTHERWISE NOTED HEREIN.
  - PATTERED CONCRETE RIP-RAP IS REQUIRED FOR THE PORTION OF THE MEDIAN LESS THAN OR EQUAL TO 8 FT. WIDE. BACK OF CURB TO BACK OF CURB EXCLUDING MEDIAN NOSE, IT SHALL BE COLORED TERRA COTTA, MINIMUM DEPTH SHALL BE 6 INCHES WITH #3 REBAR ON 18IN. CENTERS. CONCRETE PATTERN SHALL BE APPROVED BY CITY PRIOR TO INSTALLATION.
  - FOR THE MEDIAN NOSE STIRRUP BARS SHALL MATCH THOSE IN PAVEMENT FOR SIZE AND SEPARATION.
  - FOR THE MEDIAN NOSE STIRRUP BARS SHALL EXTEND WITHIN 1 FT. OF LIMITS OF MONOLITHIC POUR.
  - FOR THE MEDIAN BORDER SHALL BE 10 IN. MIN. IN WIDTH PATTERNED CONCRETE RIP-RAP, COLORED TERRA COTTA, MINIMUM 4 IN. DEPTH WITH PAVEMENT MARKINGS OR DOWNSTREAM OF INTERSECTION.
  - IMMEDIATELY DOWNSTREAM OF THE INTERSECTION, THE LANE CONFIGURATION WILL BE: INSIDE VEHICLE LANE=13 FEET WIDE; MIDDLE VEHICLE LANE=11 FEET WIDE (FOR A 6-LANE DIVIDED ARTERIAL); OUTSIDE LANE-FOR A PORTLAND CEMENT CONCRETE PAVEMENT STREET WITH INTEGRAL CURB AND GUTTER=11 FEET WIDE VEHICLE LANE WITH BALANCE BEING A MARKED URBAN SHOULDER OR FOR A ASPHALTIC CONCRETE PAVEMENT STREET WITH SEPARATE PORTLAND CEMENT CONCRETE PAVEMENT CURB AND GUTTER=THE BALANCE OF THE WIDTH OF PAVEMENT BEING THE VEHICLE LANE WITH NO MARKED URBAN SHOULDER. THE VEHICLE LANES SHALL BE DEFINED BY THE INSTALLATION OF A TYPE II(A.3.A) PAVEMENT MARKING. THE URBAN SHOULDER(WHEN INSTALLED) SHALL BE A TYPE IA(2.A) PAVEMENT MARKING. SAID LANE CONFIGURATION/PAVEMENT MARKINGS SHALL CONTINUE, AS NOTED TO (AND THEN BE SUSPENDED AT) THE UPSTREAM EDGE OF THE TYPE VA(1.4) PEDESTRIAN CROSSWALK PAVEMENT MARKING. SAID TYPE IA(2.A) PAVEMENT MARKINGS SHALL THEN CONTINUE AS NOTED, BEING 10 FEET DOWNSTREAM OF THE UPSTREAM EDGE OF THE TYPE VA(1.4) PEDESTRIAN CROSSWALK PAVEMENT MARKING AND IMMEDIATELY BEGIN A TAPE OF 40:1 FOR 80 FEET SUCH THAT THE: INSIDE LANE=11 FEET; MIDDLE VEHICLE LANE=11 FEET WIDE; OUTSIDE VEHICLE LANE=11 FEET WIDE, WITH THE BALANCE BEING A MARKED URBAN SHOULDER. THIS CONFIGURATION WILL CONTINUE FOR 40 FEET AT WHICH TIME THE NOTED VEHICLE TYPE IA(3.A) PAVEMENT MARKING SHALL END AND TYPE IA(5.A) PAVEMENT MARKINGS SHALL BEGIN.
  - OR USE TYPE IA(6.6) PAVEMENT MARKINGS TO CONNECT UPSTREAM WITH DOWN STREAM LANE LINES. THE NUMBER OF THIS TYPE OF PAVEMENT MARKING SHOULD BE USED SPARINGLY SO AS TO NOT COMPLICATE THE VISUAL EFFECTS IN THE INTERSECTION.
  - USE A COMBINATION OF "A" AND "B" ABOVE.
  - OTHER CONFIGURATIONS AS APPROVED, IN WRITING, BY THE CITY
  - GLUE DOWN WHITE CHANNELIZING DEVICES ARE TO BE A MINIMUM OF 2 1/4 IN. IN DIAMETER, A MINIMUM OF 30 IN. IN HEIGHT AND HAVE A MINIMUM OF 2 WHITE REFLECTORIZED BANDS, NEAR THE TOP TO BE APPROVED BY CITY, WRITING PERTAINING TO THE APPROPRIATE PAVEMENT MARKING.
  - PAVEMENT MARKING TYPE AND (CODE): REFERENCE M&S 004 AND 005 SERIES.
  - THE CENTER OF EACH APPLICABLE ADA RAMP IS TO ALIGN WITH THE CENTER OF THE APPLICABLE PEDESTRIAN REFUGE'S GAP BETWEEN TWO ISLANDS. HOWEVER, THERE CAN BE SPECIFIC INSTANCES WHERE THERE IS AN ISSUE THAT DOES NOT ALLOW THE ADA RAMPS TO ALIGNMENT IN THIS MANNER. IF SUCH IS THE CASE, THE ADA RAMPS WILL BE PLACED AS CLOSE TO THE DESIRED ALIGNMENT INDICATED AND THEN THE LONGITUDINAL LENGTH OF THE PEDESTRIAN REFUGE ISLAND NUMBER 1 LENGTHENED OR SHORTENED SO THAT THE CENTER OF THE PEDESTRIAN REFUGE'S GAP BETWEEN THE TWO ISLANDS IS CENTERED ON EACH OF THE APPLICABLE ADA RAMPS. ALLOTER DIMENSIONS PROVIDED IN THE DETAILS SHALL BE ADJUSTED ACCORDINGLY, SO AS TO MEET THE INTENT OF THE ORIGINAL REQUIREMENTS.

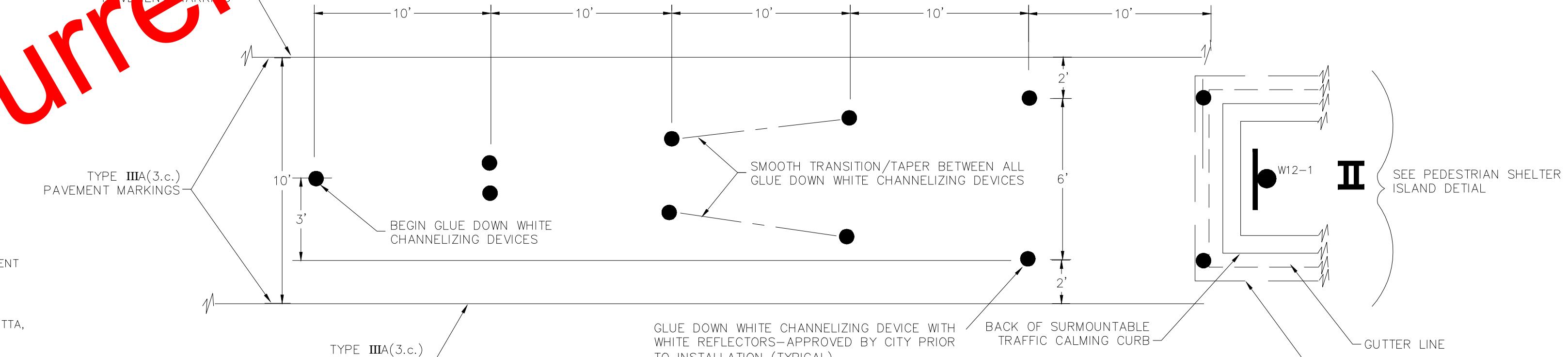
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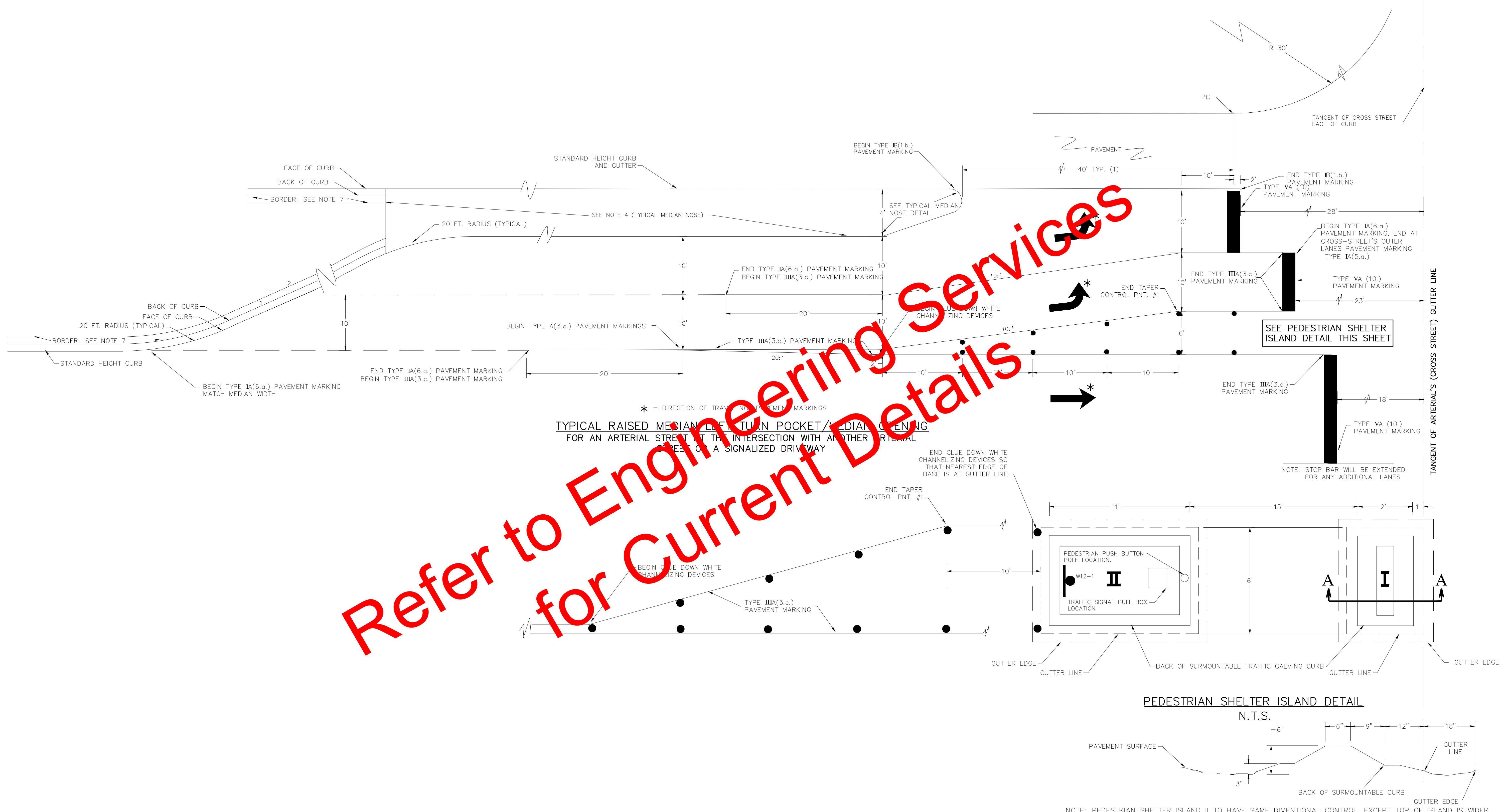


## ASPHALT / CONCRETE MEDIAN/PEDESTRIAN SHELTER ISLAND STANDARD DETAILS

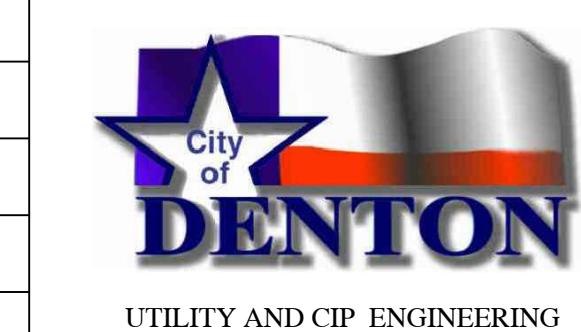
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ADVANCED PEDESTRIAN SHELTER ISLAND PAVEMENT MARKING DETAIL  
FOR AN ARTERIAL STREET AT THE INTERSECTION WITH A NON ARTERIAL STREET OR AN  
UNSIGNALIZED DRIVEWAY





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**ASPHALT / CONCRETE**  
MEDIAN/PEDESTRIAN SHELTER ISLAND CONTINUED  
STANDARD DETAILS

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**Asphaltic Cement Concrete (Flexible) Pavement Section Requirements for Public Streets**

<b>Asphaltic Cement Concrete (Flexible) Pavement Section</b>				
<b>Pavement Section</b>	<b>Design Value</b>			
	<b>Arterial</b>	<b>Non-Residential Collector</b>	<b>Residential St. Collector</b>	<b>All Residential's</b>
<b>Pavement Depth (inches)</b>	<b>12</b>	<b>11</b>	<b>9</b>	<b>8</b>
<b>Stabilized Subgrade Depth (inches)</b>	<b>12</b>	<b>12</b>	<b>12</b>	<b>12</b>
<b>Subgrade Treatment</b>	Per NCTCOG	Per NCTCOG	Per NCTCOG	Per NCTCOG

**Portland Cement Concrete (Rigid) Pavement Section Requirements for Public Streets**

<b>Portland Cement Concrete (Rigid) Pavement Section</b>				
<b>Pavement Section</b>	<b>Design Value</b>			
	<b>Arterial</b>	<b>Non-Residential Collector</b>	<b>Residential St. Collector</b>	<b>All Residential's</b>
<b>Pavement Depth (inches)</b>	<b>11</b>	<b>10</b>	<b>8</b>	<b>7</b>
<b>Stabilized Subgrade Depth (inches)</b>	<b>12</b>	<b>12</b>	<b>8</b>	<b>8</b>
<b>Subgrade Treatment</b>	Per NCTCOG	Per NCTCOG	Per NCTCOG	Per NCTCOG

\*Reference Pavement Design Guidelines and Typical Pavement Sections by Michael P. Batuna P.E. of CTL/Thompson Texas LLC for the City of Denton, dated May 6, 2010.

Note: Depths provided are minimum City requirements. Engineer on record may be required to provide additional analysis depending on local soil and moisture conditions as well as higher than expected traffic volumes and/or truck mix.

# SIGNS, SIGN-POSTS, PAVEMENT MARKINGS, THEIR APPURTENANCES AND ANCILLARY ARTICLES

## GENERAL NOTES:

1. Agency— as used herein and for the purposes of these notes shall be: that entity that has maintenance control of said item(s). It should be noted that in some instances, City maintained item(s) can be within TxDOT ROW (such as, but not limited to: stop signs and/or street name blades installed for a City street that intersects a TxDOT highway) or visa-versa.

2. City— as used herein and for the purposes of these notes shall be: the City of Denton, Texas.

3. Comply/compliant/compliance— as used herein and for the purposes of these notes shall be an item(s) which:

- 3.1. meets (or can exceed upon approval) the principles of the agency and
- 3.2. is new. For the "REMOVAL AND REINSTALLATION OF ITEM(S)" note herein, the existing item(s) can be other than new, but the intent of the criteria for an item(s) that is not acceptable should be used by the agency as a basis for a reasonable determination of compliance and
- 3.3. is correctly utilized by the contractor and
- 3.4. is properly located at the assigned place by the contractor and
- 3.5. is completed in the required time by the contractor, as provided for in a set of sealed project design plan(s) that is agreed upon by the agency and/or as directed by the agency. The priority of compliance of an item(s) in which there may be a conflict shall be the following and in order of:
- 3.6. the agency, but if none, then
- 3.7. as provided by another authoritative entity, as agreed upon by the agency, but if none, then
- 3.8. as provided by the manufacturer, as agreed upon by the agency, but if none, then
- 3.9. as provided by a set of sealed project design plan(s) that is agreed upon by the agency and/or the engineer of record.

4. Contractor— as used herein and for the purposes of these notes shall include the: primary contractor and/or sub-contractor(s) and/or representative(s) and/or agent(s) thereof and/or person(s) acting on the behalf thereof.

5. Inspect/inspected/inspection— as used herein and for the purposes of these notes shall be: a review and determination as to whether an item(s) is compliant or not acceptable as the result of an action by the contractor, in part or in whole. An inspection may be done for an item(s) during the time from the start date of construction until the expiration of the warranty period of bond coverage for workmanship and materials and that is:

- 5.0. not provided for in a set of sealed project design plan(s) that is agreed upon by the agency
- 5.0.1. but is within the limits of construction and/or is within 600 feet of any point thereof.
- 5.1. utilized by the contractor as provided for in a set of sealed project design plan(s) that is agreed upon by the agency and/or as directed by the agency.

6. Item(s)— as used herein and for the purposes of these notes shall apply to: any sign and/or sign-post and/or pavement marking and/or associated appurtenance(s) and/or ancillary item(s), in part or in whole, as it relates to the context used and as is necessary for the compliant acceptance thereof.

7. May— as used herein and for the purposes of these notes shall be: a decision by the agency to act or not to act at any time. Said decision can change at any time, for any cause, and at the agency's discretion.

8. New— as used herein and for the purposes of these notes shall be: an item(s) without prior usage and/or has not been rejected, for any cause, by any entity.

9. Not acceptable— as used herein and for the purposes of these notes shall be an item(s) that: does not comply/is not compliant/is not in compliance with, in part or in whole. A determination of an item(s) being not acceptable can include, but is not limited to the result of:

- 9.0. any vandalism (including, but not limited to any: marring, defacement, disfigurement and the like);
- 9.1. natural wear;
- 9.2. any damage;
- 9.3. a blemish;
- 9.4. a defect;
- 9.5. a different type of: shape and/or size than the principles;
- 9.6. a different type of: wording and/or font size and/or font type than the principles;
- 9.7. improper manufacturing;
- 9.8. inadequate reflectivity;
- 9.9. a different type of reflective sheeting than the principles; and/or
- 9.10. any other, as may be applied by the agency.
- 9.11. improper installation
- 9.12. a different color than the principles

An item(s) rejected by any entity for any cause is deemed not acceptable to the agency.

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An item(s) that is not acceptable shall not be utilized by the contractor at any location within the agency's jurisdiction unless the cause of said item(s) being not acceptable is fully disclosed and provided in writing (by the contractor) and deemed compliant, in writing, for utilization under specific circumstances.

If an item(s) is not approved for utilization, the contractor shall take possession of said item(s) and said item(s) shall be rendered unusable for the intended purpose by the contractor, under the supervision of the agency and properly disposed of by the contractor in such a manner as to be acceptable to all Federal, State and City principles as may pertain to the disposal of such item(s).

If an item(s) is deemed not acceptable, the contractor shall replace it with a compliant item(s). The inspection of any such item(s) may continue as many times as necessary until at such time as the contractor causes said item(s) to be compliant.

10. Principles— as used herein and for the purposes of these notes shall include, but not be limited to current: practices; policies; procedures; specifications; and/or standards of the agency and/or as directed by the agency.

11. Utilize/utilized/utilization— as used herein and for the purposes of these notes shall be: the installation, reinstallation, replacement, modification and/or removal, in part or in whole, as it relates to the described context of the required action and as is necessary for the proper utilization and compliant acceptance thereof. Unless specifically noted otherwise, any reference to any utilization of an item(s) by the contractor shall be at the contractor's expense. Any item(s) utilized by the contractor shall be compliant.

12. As used herein and for the purposes of these notes and unless specifically noted herein, any reference to an inspection and/or approval and/or noticing and/or a time requirement and/or quality assurance and/or a determination (including, but not limited to the terms: deem/deemed) and/or acceptance is implicit to be the result and/or cause and/or requirement of the agency or an agent thereof and at the agency's or said agent's discretion.

13. The contractor shall contact 1-800 DIGTESS prior to any sign-pole utilization, as directed by the agency.

14. Item(s) utilized by the contractor and maintained by the City shall comply with the City's principles and may be inspected.

As provided for in a set of sealed project design plan(s) that is agreed upon by the agency and/or as directed by the agency, the contractor may enter into an agreement with the City, for the City to:

- a. manufacture or have manufactured, in part or in whole, and utilize sign(s) and applicable appurtenance(s), for a fee and/or
- b. manufacture or have manufactured, in part or in whole, for a fee, and provide sign(s) and applicable appurtenance(s) to the contractor for utilization and/or
- c. utilize, in part or in whole, for a fee, after receiving and inspecting, compliant only contractor supplied sign(s) and applicable appurtenances and/or
- d. receive, in part or in whole, and inspect contractor supplied sign(s) and applicable appurtenances and return said item(s) to the contractor to utilize compliant only item(s) and/or
- e. provide, in part or in whole, and utilize accordingly sign-post(s) and applicable appurtenance(s), for a fee and/or
- f. provide, in part or in whole, sign-post(s) and applicable appurtenance(s), for a fee to the contractor for utilization and/or
- g. utilize, in part or in whole, for a fee, after receiving and inspection, compliant only contractor supplied sign-post(s) and applicable appurtenances and/or
- h. receive, in part or in whole, and inspect contractor supplied sign-post(s) and applicable appurtenances and return said item(s) to the contractor to utilize compliant only item(s) and/or
- i. provide, in part or in whole, and utilize accordingly pavement marking(s) and applicable appurtenance(s), for a fee and/or
- j. provide, in part or in whole, pavement marking(s) and applicable appurtenance(s), for a fee to the contractor for utilization and/or
- k. utilize, in part or in whole, for a fee, after receiving and inspection, compliant only contractor supplied pavement marking(s) and applicable appurtenances and/or
- l. receive, in part or in whole, and inspect contractor supplied pavement marking(s) and applicable appurtenances and return said item(s) to the contractor to utilize compliant only item(s).

Said agreement(s) shall be negotiated with the City and confirmed in writing prior to the applicable preconstruction meeting. Time deadlines will be established in the agreement for any fee(s) and/or item(s) to be provided to the City by the contractor such that the completion of any task required of the City can be finished in advance of and be a part of any field inspection's "punch list" and/or acceptance associated with the completion of the project's construction. The City is not responsible for any delays as a result of any time deadlines not achieved by the contractor per the agreement and/or the result of an item(s) being deemed not acceptable.

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15. Item(s) utilized by the contractor and maintained by TxDOT shall comply with TxDOT's principles and may be inspected accordingly. Said item(s) will be obtained from a source other than the City and utilized by the contractor accordingly.

16. Item(s) utilized by the contractor and not maintained by the City or TxDOT (typically for private property) shall comply with existing principles of and in the following priority:

- 16.0. the City;
- 16.1. as provided by another authoritative entity, as agreed upon by the City;
- 16.2. as provided by the manufacturer, as agreed upon by the City and/or;
- 16.3. as provided for in a set of sealed project design plan(s) that is agreed upon by the agency and/or as directed by the agency.

Said item(s) will be obtained from a source other than the City, utilized by the contractor and may be inspected by the City.

17. The location of each item(s) to be utilized by the contractor shall be temporarily marked by the contractor and may be inspected prior to the contractor's utilization.

18. Pavement markings utilized by the contractor for a City street shall be as provided for in Section 3B-15 of the Texas Manual on Uniform Traffic Control Devices for Streets and Highways (or the most current replacement or its intent) and applicable TxDOT standard details (or the most current replacement or its intent), except for part #2, where spacing shall be "N".

18.0. RPMs utilized by the contractor for a City street shall be of the two way type (yellow/yellow or clear/red, as may apply) unless specifically directed otherwise.

18.1. Non-raised pavement markings utilized by the contractor for a City street shall be thermoplastic, a minimum of 90 mils (0.090 inches) unless specifically directed otherwise.

19. Street sign(s) (other than street name blades) utilized by the contractor shall comply with the principles.

Signs will be mounted such that the bottom edge of the lowest sign on a sign-post is at least 7feet but not greater than 7.5feet above the immediate top of curb elevation or the sidewalk or the average surrounding ground, whichever elevation is greater unless specifically directed by the City.

For the City, sign sheeting shall be:

- 19.0. Type III (high intensity or applicable approved equivalent) with graffiti overlay for any mounted sign for which the bottom edge of said sign is less than 10ft above the immediate average surrounding ground and
- 19.1. Type IV (prismatic or applicable approved equivalent) with graffiti overlay for a sign in which the bottom edge of said sign is 10 ft or greater above the immediate average surrounding ground.

20. Street name blade(s) utilized by the contractor shall comply with the principles.

Street name blades shall contain both the applicable street name and block number on both sides.

Mounting shall be such that the bottom of the lowest street name blade, on the sign-post, is at least 10feet but not greater than 12feet above the immediate average surrounding ground, unless specifically directed by the City.

Sign sheeting shall be Type II minimum (super engineering grade or applicable approved equivalent).

When a street is a single access point:

- 20.0. with an ending (either permanently or temporarily, as a result of a cul-de-sac, hammer head, a future extension with barricade, a looped single named street or the like) such that no other differently named street(s) intersects said street between the access point and the termination of said street, the developer shall provide a City modified street name blade with a black on yellow portion with the words "DEAD END" at the nearest applicable intersection,
- 20.1. that provides a way to differently named street(s), the developer shall provide a City modified street name blade with a black on yellow portion with the words "NO OUTLET" at the nearest applicable intersection,

or as directed by the agency.

21. Sign-post(s), see appropriate City standard detail(s).

22. REMOVAL AND REINSTALLATION OF ITEM(S): for any item(s) to be removed and then reinstalled by the contractor,

22.0. the contractor shall:

- 22.0.0. remove said item(s) from its location, by a city acceptable method when appropriate,
- 22.0.1. transport and store said item(s) at a protected location,
- 22.0.2. clean said item(s) in a reasonable manner, satisfactory to the agency, just prior to reinstallation and

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22.0.3. transport and reinstall said item(s) at the proper location, when appropriate such that each noted action required of the contractor shall be done in a manner so as to cause the least damage to the item(s) as is reasonably possible. Once reinstalled, said item(s) may be inspected or

22.1. the contractor, at his/her discretion and in lieu of reinstalling said item(s), can properly dispose of said removed item(s) and replace said item(s) with a compliant item(s). When installed, said item(s) may be inspected.

23. REMOVAL AND NONREINSTALLATION OF ITEM(S): for any item(s) to be removed by the contractor and not reinstalled, said item(s) shall be deemed not acceptable at the time of removal by the contractor and returned to the city if directed to do so by the city.

24. TEMPORARY ITEM(S) REQUIRED AS A RESULT OF REMOVAL: For any item(s) that is removed by the contractor and it is deemed necessary for the safety and well being of the public during construction, the contractor shall provide a temporary, compliant item(s) of the same type (or alternate acceptable to the agency), in a manner, time and location acceptable to the agency, until at such time as the agency determines said item(s) is no longer necessary, whereupon the contractor shall remove said item(s).

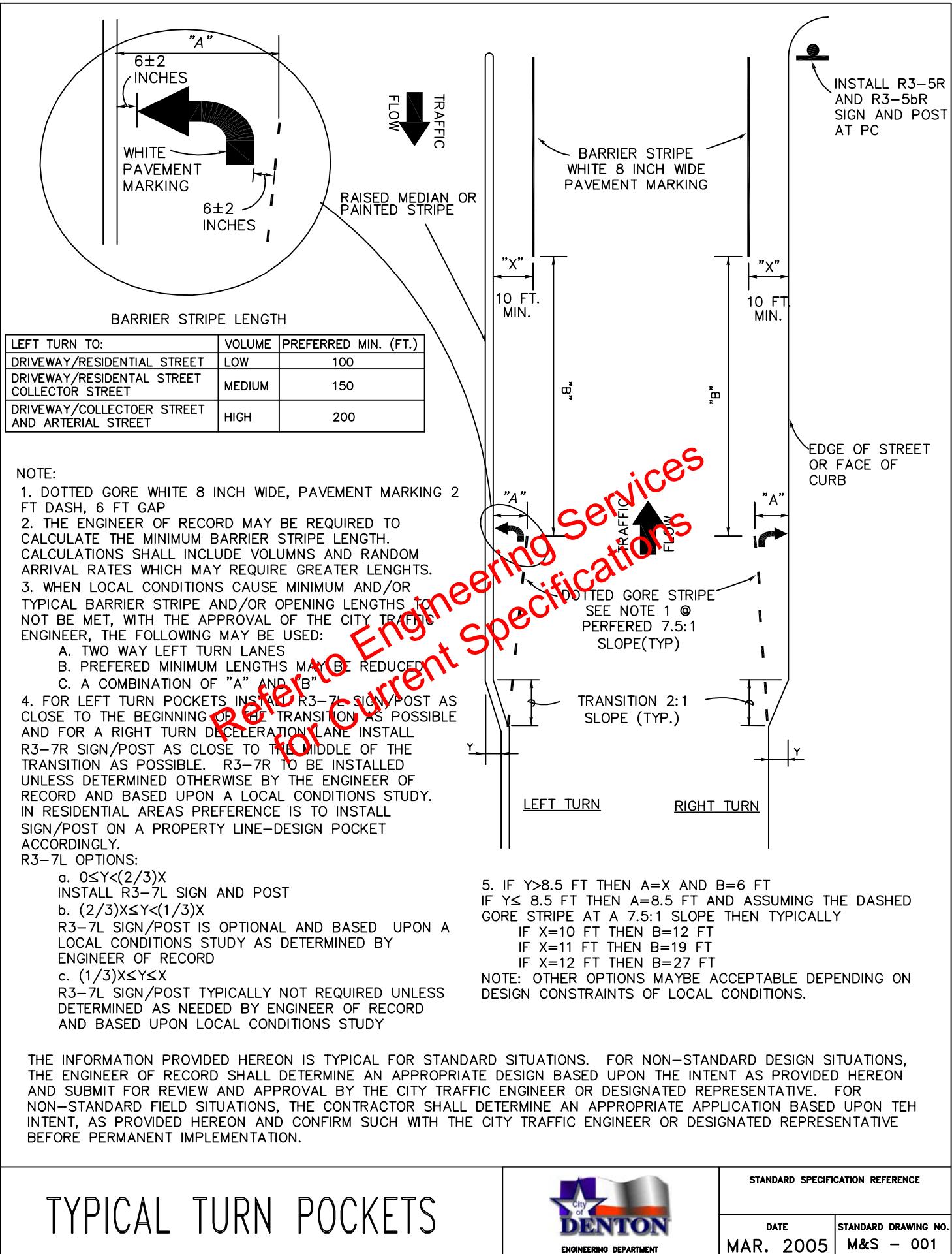
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## **GENERAL**

This and all associated documents required of the Contractor to correctly perform the work necessary to properly complete the job shall be within easy access, at all times, of the Contractor's on-site supervisor of the marking(s) crew. If said document(s) are not within easy access of said on-site supervisor, the City can, at its discretion, halt any and all associated work.

1) The Contractor's on-site supervisor of the markings crew(s) performing any work must be able to:

a) understand:

- i) written English and diagram(s)/schematic(s)/drawing(s) and the like, in part or in whole, sufficient to fully understand any City and/or TxDOT written policies, procedures, specifications, standards and/or the like that are presented to him/her for the correct completion of the work to be performed and
- ii) conversational and technical (as it relates to pavement markings) English sufficient to take instruction(s) from City staff so as to complete the work to be performed, as directed, and without supervision or additional written or spoken guidance by the City or

b) provide a translator with the above noted capabilities, at no cost to the City. If said supervisor/translator is not provided, no marking work shall be performed until said person is on the job's site. Any work done while said person is not on the job's site can be considered being non-compliant and thus, not acceptable to the City. If said work (in part or in whole) is rejected by the City as a result of said non-compliance, in any manner, the required pavement marking(s)/marker(s) will be removed by and at the Contractor's expense (by a method acceptable to the City), and properly reinstalled by and at the Contractor's expense, in accordance with the City's requirement(s).

Guides shall be established to mark the location of the pavement markings in the location as shown on the construction plans or as directed by the City. The location shall be verified before the pavement marking(s)/marker(s) is placed. The guides shall not leave a permanent indication on the road surface.

Pavement marking(s)/marker(s) shall be placed in accordance with the construction plans or as directed by the City. Said pavement marking(s)/marker(s) shall be in alignment when placed and not deviate by more than two (2) inches. Any pavement marking(s)/marker(s) placed and deemed unsatisfactory by the Engineer shall be removed by an acceptable method to the City and properly reinstalled by and at the Contractor's expense, in accordance with the City's requirement(s).

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For City directed work, application of pavement markings shall be done on an as needed basis per project. The City shall notify the Contractor of each project required to be completed, in any order and at any time throughout the length of the contract. Each said project shall be completed by the Contractor in its entirety within the time limit(s) as noted on the applicable quantity sheet(s) and as contained within the bid document(s) for and accepted by the City as submitted by the Contractor or, if there is no such condition contained within the bid documents, as agreed upon, in writing by the City and the Contractor prior to any installation, with allowance(s) for inclement weather, as noticed by the City in writing to the Contractor. The Contractor shall make arrangements and meet with appropriate City staff prior to beginning each project to determine the scope and quantities required of said project. The Contractor shall come to the meeting, prepared with estimates of all pavement markings required of each project to be discussed. Estimated quantities greater than 10% of the difference between the City and Contractor for each type of pavement marking shall be resolved by a meeting in the field with a representative of the City and the Contractor and field verifying those items for which there are noted differences. The City has the prerogative to change quantities after the meeting and prior to acceptance of the project, as provided in writing by the City. Said quantity changes by the City shall be done by Contractor only upon written authorization from the City. The Contractor shall be required to complete said written changes prior to final written acceptance by the City.

### **Traffic Control**

Traffic control shall be the responsibility of the Contractor. Traffic control shall comply with North Texas Council of Governments "Standard Specifications for Public Work Construction" latest edition Item 8.1 "Barriers and Warnings and/or Detour Signs" inclusive or current replacement.

### **Elimination of Existing Pavement Marking(s)/Marker(s)**

In areas where the pavement marking(s)/marker(s) are to be removed, the Contractor shall use one of the methods as outlined in item 677 of the TxDOT Standard Specifications for the Construction and Maintenance of Highways, Streets and Bridges and approved by the City.

The Contractor will be responsible for proper disposal of all the material as a result of the removal process.

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Pavement markings removed by the Contractor shall be replaced by the Contractor with temporary pavement markings and/or traffic control devices, as directed by the City, when the installation of the permanent pavement marking(s) replacement will not be installed within 4 hours of said removal. If the Contractor does not comply within the 4 hour requirement, the City has the prerogative to occupy the site and cause the site to be adequate for use by the public. The Contractor shall be charged by the City for the cost of all staff time, materials, machinery, traffic control devices and incidentals required of the City.

An existing adhesive installed pavement marking shall be removed in its entirety prior to any application of a Type I or Type II pavement marking in its place.

### **Protection of Pavement Marking(s)/Marker(s)**

Newly installed shall be protected from traffic until fully cured.

Existing to remain within the project's limits, plus those within a radius of 300 feet of the project's limits shall not be damaged as a result of the work performed by the Contractor.

Any existing to remain or newly installed that is damaged because of a lack of protection (as determined by the City at the time of the acceptance inspection of the work performed) shall be properly removed (by a method acceptable to the City) and replaced by the Contractor in accordance with the City's direction and at no expense to the City and prior to acceptance by the City of the work performed by the Contractor.

The method of protection shall not constitute a hazard to the traveling public.

### **Equipment Use**

All equipment used for pavement marking/marker installation and removal shall be specifically designed for that purpose by a company experienced in the design and manufacture of such equipment.

### **Coordination with City Engineer**

The City Engineer and/or his appointed representative will identify for the Contractor the roadways upon which the work will be performed and serve as a liaison between the City and the Contractor.

Pavement marking(s)/marker(s) of the type specified shall be applied at the location(s) as determined by the Engineer and/or his appointed representative and shall be in accordance with the current Manual on Uniform Traffic Control Devices.

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## Surface Preparation

The surface to which the pavement marking/marker material is to be applied shall be completely dry and free of dirt, oil, grease, debris and other foreign objects necessary for the application to and/or adherence of the pavement marking/marker to the pavement's surface. The Contractor shall be responsible for the proper preparation of the pavement surface accordingly. Any pavement marking/marker failure as a result of improper pavement surface preparation shall be replaced by the Contractor at the Contractor's expense upon removal of all of the pavement marking(s)/marker(s), by the Contractor and at the Contractor's expense, associated with the failure and upon the proper preparation of the surface prior to and the reapplication of the pavement marking/marker, for acceptance of the work by the City.

## Warranty

All pavement marking(s), glass beads, pavement marker(s), appurtenance(s), ancillary item(s) and/or any material(s) used in conjunction with them for whatever purpose(s), as well as any material(s) used for the application of and/or the attachment of these items to each other and/or the pavement's surface (including but not limited to: sealer(s) and epoxy adhesive(s)) shall be warrantied by the Contractor as noted on the applicable quantity sheet(s) and as contained within the bid document(s) for and accepted by the City as submitted by the Contractor; or, if there is no such condition contained within the bid documents, for a total of 30 days after acceptance of the work by the City. The warranty shall apply to these items as a result of improper: pavement surface preparation; method(s) of application; material(s) used; or the like, in which the item has; is; or is beginning to separate from the pavement surface or between two or more components of an item that has; is; or is beginning to separate from each other. The City shall determine the extent of the impropriety of the each said item and the Contractor shall, for said extent remove the existing item (and any component thereof); prepare the surface; and install the item (being new) in the appropriate location and under the condition(s) as set forth in this document. The warranty period for any such item so installed shall begin anew upon acceptance by the City and such requirement(s) shall continue until at such time as the warranty period has been successfully completed. The City reserves the right to withhold up to 50% of the cost(s) of the Contractor's billings of any item installed until at such time as the warranty period has been successfully completed.

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## **I PAVEMENT MARKING(S)**

General: This item shall govern the installation of pavement marking(s) of the types, colors, shapes, sizes, thickness and widths as shown.

### **Materials**

Materials used shall be classified in accordance with TxDOT Standard Specifications for Construction and Maintenance of Highway, Streets and Bridges item 666:

Type I Materials.

Type I are thermoplastic materials that require heating to elevate the temperatures for applications. Type I materials shall conform to TxDOT Departmental Materials Specifications D-9-8220 or its current replacement. Each container of Type I material shall be clearly marked to indicate the color, mass, type of material, manufacturer's name and the lot/batch number.

Type II Materials.

Type II materials are paint-type that are applied at ambient or slightly elevated temperatures. Type II materials shall conform to TxDOT Departmental Materials Specifications D-9-8200, YPT-10 and/or WPT-10 and D-9-8290 or its current replacement.

### **General Construction**

Pavement surface preparation shall be done in accordance with Item 678 of the TxDOT Standard Specifications for Construction and Maintenance of Highways, Streets, and Bridges or its current replacement.

Shall essentially have a uniform cross-section. The density and quality shall be uniform throughout the thickness. The application shall have no more than five percent, by area, of holes or voids and shall be free of blisters.

Each edge of each pavement marking shall be well defined and without any splatter, spill-over, splash, spray or the like adjacent to the pavement marking's edge.

In place or on the roadway, shall be reflectorized both internally and externally.

Glass beads shall be applied to the material at a uniform rate sufficient to achieve uniform and distinctive retroreflective characteristics when observed. Glass beads shall be a minimum of Type I gradation, in accordance with TxDOT specification DMS 8290

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## Application of Type I

Application of a pavement sealer shall be required for a location that does not have exiting marking(s) on all Portland cement concrete surfaces and any asphalt surface that is 3 years or older. The pavement sealer may be a Type II pavement marking, an acrylic sealer or an epoxy sealer. The manufacturer's directions for application of acrylic or an epoxy sealer shall be followed. If the thermoplastic manufacturer does not recommend that a sealer be used, then the Contractor will not be required to furnish one.

Shall be applied within temperature limits of the product as well as ambient air and roadway's surface as recommended by the material's manufacturer. The Contractor shall provide all such relevant information to the City before any application of the item to the roadway. If the product's manufacturer does not provide such information, then the pavement's surface temperature shall be above 50 F/ 10 C. Pavement temperature shall be measured in accordance with Test Method Tex-829-B or its current replacement.

When applied by spray and operation ceases for five minutes or more, the spray head shall be flushed by spraying the material into a pan or similar container until that which is being sprayed is at the proper temperature for application.

Shall be a minimum thickness of 0.090 inches (2.3 millimeters) when measured in accordance with Test Method Tex-854-B or its current replacement. The maximum thickness shall be 0.180 inches (4.5 millimeters).

Shall be of uniform thickness throughout the length and width.

In excess of 0.090 inches shall be paid as 0.090 inches.

Pre-formed shall be applied in the manner recommended by the manufacturer. The Contractor shall provide all such relevant information to the City before any application of the item to the roadway.

Shall not be placed in inclement weather.

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## **Application of Type II**

Shall be applied within temperature limits of the product, ambient air and roadway's surface as recommended by the material's manufacturer. The Contractor shall provide all such relevant information to the City before any application of the item to the roadway. If the product's manufacturer does not provide such information, then the pavement's surface temperature shall be above 50 F/ 10 C. If applicable, pavement temperature shall be measured in accordance with the current TxDOT requirement.

The application rate shall be: between 15 and 20 gallons per mile of solid four inch wide line or its equivalent ratio for line widths greater and/or not solid except that, for new surface treatment projects the application rate shall be between 25 and 30 gallons per mile of solid four inch line and between 40 and 50 gallons per mile for solid eight inch line or its equivalent ratio for lines other than four and eight inches wide and/or not solid.

For new surface treatment projects, shall be applied in two applications for each approximately one-half the application rate. The first application shall not contain glass beads. The interval between the first and second application shall be a minimum of one hour or until dry, whichever is greater.

Shall not be placed in inclement weather.

## **Methods of Measurement and for Payment**

For City Contracts:

A double solid line shall be measured as one line and shall be calculated based upon two (2) times the measurement. This work shall be measured by the linear footage of the longitudinal or lateral (whichever is not the width specified) distance, on the surface of the pavement marking, for the width specified. Payment shall be based upon the amount calculated.

A single line (including: edgeline, barrier line, bike lane, diagonal marking, stop bar and standard parking stall line) shall be measured as one line and shall be calculated based upon one (1) times the measurement. This work shall be measured by the linear footage of the longitudinal or lateral (whichever is not the width specified) distance, on the surface of the pavement marking, for the width specified. Payment shall be based upon the amount calculated.

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A broken, dotted or lane drop line shall be measured as one line, including gaps between line segments. This work shall be measured by the linear footage of the longitudinal or lateral (whichever is not the width specified) distance, on the surface of the pavement marking, for the width specified.

1. A broken line shall be calculated based upon the line segment to gap ratio of 0.25 (of each length as provided herein) times the measurement.
2. Dotted line shall be calculated based upon the line segment to gap ratio of 0.25 (of each length as provided herein) times the measurement.
3. Lane drop line shall be calculated based upon the line segment to gap ratio of 0.25 (of each length as provided herein) times the measurement.

Payment shall be based upon the amount calculated for each.

A two-way left turn pocket shall be measured as one line along one of the solid pavement markings. The total for the entire marking shall be equal to 2.50 times said measurement (of each length as provided herein). Said 2.5 multiplier is determined by the combination of that solid line measurement plus the accompanying broken line's segment to gap ratio of 0.25 times said solid line's measurement, thus equaling 1.25 for each said line combination. Then the 1.25 line combination shall be multiplied by 2 for to obtain the 2.5 multiplier for the two combination lines that equal a two-way left turn pocket. This work shall be measured by the linear footage of the longitudinal or lateral (whichever is not the width specified) distance, on the surface of the pavement marking, for the width specified. Payment shall be based upon the amount calculated.

A yield line shall be measured per triangle type pavement marking and calculated based upon the total number of the measurement. Payment shall be based upon the amount calculated.

A word shall be measured per letter per category and shall be calculated based upon the total number of letters measured for each category. Word pavement markings shall be divided into two categories:

1. Large- those words required of a vehicle lane.
2. Small- those words required of a bicycle lane.

Payment shall be based upon the amount calculated for each letter for each category.

A symbol shall be measured per symbol per category and shall be calculated based upon the total number of symbols measured for each category. Symbols shall be divided into three categories:

1. Large- item(s) shall include: rail-road crossing marking, entire and complete in accordance with MUTCD requirements.
2. Medium- item(s) shall include: right arrow(s), left arrow(s) and through arrow(s) (note: any combination [any two or all three] of right, left and/or through arrows shall be measured as two (2) markings); wrong way arrow(s); and lane transition arrow(s).
3. Small- item(s) shall include: each symbol type as it relates to a bicycle path.

Payment shall be based upon the amount calculated for each symbol for each category.

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## TYPICAL INTERSECTION MARKINGS



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A cross-walk shall be measured per each pavement marking and shall be calculated based upon one (1) times the measurement. This work shall be measured by the linear footage of the longitudinal or lateral (whichever is not the width specified) distance, on the surface of the pavement marking, for the width specified. Payment shall be based upon the amount calculated.

A standard parking stall shall be measured, calculated and payment shall be in accordance with and as a single line.

An ADA compliant parking stall shall be measured per item per category and shall be calculated based upon the total number of items measured for each category. ADA compliant parking stalls shall be divided into three categories

1. Standard: A standard accessible handicap parking stall and access aisle shall be measured as one item for the pavement marking(s) required and is to include those necessary for both a standard width access aisle (5ft), and the associated single parking stall (including, but not limited to: the single line and the symbol) per the City's standard detail.
2. Van: A van accessible handicap parking stall and access aisle shall be measured as one item for the pavement marking(s) required and is to include those necessary for both a van width access aisle (8ft), and the associated single parking stall (including, but not limited to: the single line and the symbol) per the City's standard detail.
3. Stall: Any parking stall not associated with an access aisle shall be measured as one item for the pavement marking(s) required and is to include those necessary for the associated single parking stall (including, but not limited to: the single line and the symbol) per the City's standard detail.

Payment shall be based upon the amount calculated for each item for each category.

A speed hump shall be measured, calculated and payment shall be in accordance with and as single line for each pavement marking (typical total of four markings) installed per speed hump.

The requirements for any pavement marking not provided herein will be established by the City prior to beginning of the work to be performed by the Contractor.

Any repair work ordered by the Engineer shall not be measured.

Any work done by a Contractor not under contract by the City, will account for the work done in accordance with the requirement(s) of the entity under which the contract for work to be performed was issued.

*Refer to Engineering Specifications*

**TYPICAL INTERSECTION MARKINGS**



STANDARD SPECIFICATION REFERENCE

**M&S 0041**

DATE  
**MAY 2009**

STANDARD DRAWING NO.

## Methods of Construction

- A. Longitudinal lines placed on tangent roadways segments shall be straight and true unless noted otherwise by the City.
- B. Longitudinal lines placed on curves shall be continuous smoothly curved lines consistent with roadway alignment unless noted otherwise by the City.
- C. Lateral lines shall be straight and true in accordance with City requirements unless noted otherwise by the City
- D. Symbol and word pavement markings shall be centered in the lane and without overlap (except for each of the various arrows when used in combination) or conflict with any other or as directed by the City
- E. Vehicle tracking as a result of vehicle movement through a non dried marking shall be repaired (including, but not limited to: the replacement of the damaged pavement marking(s) and the removal of all tracked pavement marking(s)) by the Contractor to the satisfaction of the City and at the Contractors expense.

## Pavement Marking(s) Description

The following applies to the City's M&S series schematics. The numbers provided in the pavement markings description are in direct relation to the number(s) provided on schematics. Any conflicts will be resolved by the City with appropriate verbal direction and/or in writing prior to application.

The M&S series schematics are an attempt to show various types of pavement marking(s)/marker(s) and their relation to and in combination with each other and are not an endorsement of acceptable geometric design(s). In addition, because each location's circumstance(s) is different, the Engineer of Record shall apply the information provided by the City to any design with proper engineering consideration and understanding of the specific needs necessary for the local.

The identification code for the typical subsets of a particular line pavement marking, where such type of marking(s) has multiple applications (width and/or color) is indicated by:

### **TYPE**

**I** = 4 inches wide,

**II** = 6 inches wide

**III** = 8 inches wide,

**IV** = 12 inches wide

**V** = 24 inches wide,

**A** = white,

**B** = yellow

**C** = blue

A 4, 6, 8, and 12 inch wide line shall be applied as one single width. A 24 inch wide line may be applied with two 12 inch wide lines, provided the final width of the pavement marking is a true 24 inches wide.

Refer to Engineering Services  
for Current Specifications

**TYPICAL INTERSECTION MARKINGS**



STANDARD SPECIFICATION REFERENCE

**M&S 004J**

DATE  
**MAY 2009**

STANDARD DRAWING NO.

1. **Double**
  - a. **TYPE IA** – Two parallel lines with a 4 inch parallel space between; each line is 4 inches in width; each line is solid; each line is white – typical use: separates traffic in the same direction on a multilane roadway where conditions are such that a vehicle in either lane is not allowed to change to the other lane.
  - b. **TYPE IB** – Two parallel lines with a 4 inch parallel space between; each line is 4 inches in width; each line is solid; each line is yellow – typical use: separates opposing direction traffic on a multilane roadway or where there is a horizontal and/or vertical curve that restricts passing sight distance. Note: see Broken line, Type 1B for alternate type.
2. **Edgeline**
  - a. **TYPE IA** - One line; 4 inches in width; solid; white – typical use on right edge of a roadway without curb/gutter (in direction of travel) or to define an urban shoulder.
  - b. **TYPE IB** - One line; 4 inches in width; solid; yellow – typical use on the left side of a one-way street to transition from an on street no parking area to an on street parking area ( or visa versa) or adjacent to a median of a two-way street that is without the curb/gutter.
3. **Barrier Line**
  - a. **TYPE IA**- One line; 4 inches in width; solid; white – typical use; extension of a broken line immediately upstream of a stop or yield condition or where the changing of a lane is discouraged. Minimum of 120 feet lengths in excess of 120 feet shall be in 40 foot increments.
  - b. **TYPE IIA**- One line; 6 inches in width; solid; white – typical use; Bike Lane
  - c. **TYPE IIIA** - One line; 8 inches in width; solid; white - typical use; left or right turn pockets or where the changing of a lane is highly discouraged.
4. **Reserved for future use.**
5. **Broken line (can also be called a Skip line)**
  - a. **TYPE IA** – One line; 4 inches in width; line segment pavement marking - 10 feet in length with a gap - 30 feet in length; white – typical use; separation of through traffic lanes traveling in the same direction.
  - b. **TYPE IB** – (Alternate type centerline) One line; 4 inches in width; line segment pavement marking - 10 feet in length with a gap - 30 feet in length; yellow – typical use; separation of traffic traveling in the opposite direction on a two-lane roadway where there is no horizontal and/or vertical curve that restricts passing sight distance.
6. **Dotted Line**
  - a. **TYPE IA** - One line, 4 inches in width; line segment pavement marking - 2 feet in length, white - typical use; transition through an intersection for traffic traveling in the same direction (the intersection being defined as being within the tangents of the applicable outer most defined [through the use of an edgeline or curb line] edge of the outer most through lane):
    - i. outside the limits of the intersection the gap shall be 6 feet in length,
    - ii. within the intersection, the marking shall be placed on the lane line, on the center of the travel lane and on the limit(s) of the intersection with the gap

Refer to Engineering Services  
for Current Specifications

- b. **TYPE IB** - One line, 4 inches in width; line segment pavement marking - 2 feet in length, yellow - typical use; transition through an intersection for traffic traveling in the opposite direction (the intersection being defined as being within the tangents of the applicable outer most defined [through the use of an edgeline or curb line] edge of the outer most through lane):
  - i. outside the limits of the intersection the gap shall be 6 feet in length,
  - ii. within the intersection, the marking shall be placed on the lane line, on the center of the travel lane and on the limit(s) of the intersection with the gap being variable.
- c. **TYPE IIA**— One line, 6 inches in width; line segment pavement marking - 2 feet in length and a gap - 6 feet in length, white – typical use; for a bike lane, defines the vehicle/bike conflict/transitional area up stream of an intersection, minimum of 24ft.
- d. **TYPE IIIA**— One line, 8 inches in width; line segment pavement marking - 2 feet in length and a gap - 6 feet in length, white – typical use; prior to the beginning of a left turn or right turn pocket, typical within limits of the transition.

7. **Diagonal Marking**

- a. **TYPE VA** - one line, 24 inches in width, solid; white, if more than one is used, then 20 foot spacing, on center between each, minimum length is 5 feet, generally 45degrees to direction of travel - typical use:
  - i. to better define the edge of the roadway or a location along the edge of the roadway where vehicle travel is restricted from using and therefore, the line is linear/straight or in a painted median that separates vehicles traveling in the same direction and therefore is "V" shaped
  - ii. better define a painted median that separates vehicles traveling in the opposite direction
- b. **TYPE VB** - one line, 24 inches in width, solid; yellow, if more than one is used, then 20 foot spacing, on center, between each, minimum length is 5 feet , generally 45degrees to direction of travel - typical use; to better define the edge of the roadway or a location along the edge of the roadway where vehicle travel is restricted from using and therefore, the line is linear/straight or in a painted median that separation of opposing traffic separation of traffic traveling in the opposite direction

8. **Two-Way Left Turn Pocket, TYPE IB** - 2 sets of 4 inch yellow lines with a 4inch parallel space between; one set shall consist of two lines: the first being a single continuous solid line on the outside and the second being a broken line (see item #5) on the inside. Each set shall be separated (defining the lane's width) as determined by the City Engineer.

9. **Lane Drop, TYPE IIIA** – One line, 8 inches in width; 3 foot line segment pavement marking and a 9 foot gap, white – typical use; prior to a barrier line for a through lane that turns into a mandatory left or right turn lane/pocket. Minimum of 120 feet, lengths in excess of 120 feet shall be in 40 foot increments

10. **Stop Bar, TYPE VA** – One line; 24 inches in width, solid, white; length to be from the curb-line/edge of pavement to the marked centerline/nearest edge of the median of

Refer to Engineering Services  
for Current Specifications

11. **Yield Line** – Solid, white, alternating marking with 12 inch spacing, as measured along the top of the marking; the marking is in the shape of a triangle with it being 12 inches wide, as measured along the top edge of the marking and 18 inches deep, as measured at a 90 degree angle and away from the top edge. See pedestrian crosswalk for further information

12. **Word** – White, a letter or any combination thereof used to convey a message and typically is used to supplement a sign, per TxDOT standards and as directed and approved by the City.

13. **Symbol** – Typically white, a diagrammatic representation of a word, typically designates a desired direction of travel, per TxDOT standards and as directed and approved by the City.

14. **Pedestrian Crosswalk, TYPE VA** – Multiple line segments and gaps; each line segment pavement marking is 24 inches in width, minimum 6 feet in length; solid; white.

- One line segment on the lane line (for an outside lane greater than 12 feet in width, place marking 12 feet from the adjacent vehicle's lane marking, install any additional line segment(s) beyond the 12 feet as directed by engineering design plans or the City),
- one line segment on the centerline of a vehicle travel lane
- one line segment at:
  - the gutter-line/edge of pavement if on a tangent or
  - the projection of the gutter line/edge of pavement's tangent if within the curve of an intersection of two streets.

The gap's width is variable, but at no time shall be less than 2 feet.

At a median, patterns of line segments and gaps will be installed so as to meet the line segment and gap requirements so noted.

Crosswalk shall be installed so as to fully include projection of applicable ADA ramps/pedestrian way.

The pedestrian crosswalk marking shall be aligned and parallel with the direction of travel of the vehicle.

Where not controlled by a stop bar at an intersection, a yield line will be installed upstream of the pedestrian crosswalk, unless otherwise directed by the City.

- Standard Parking Stall, TYPE IA** – One line; 4 inches in width; solid; white
- ADA parking stall** – Shall meet the Americans with Disabilities requirements in accordance with City schematic M&S 100 or current replacement
- Speed Hump, TYPE IIIA** – Shall meet the requirements of the 2003 revised MUTCD Section 3B-26 and Figure 3B29, Option C or its current replacement.
- Misc.** – Other pavement markings than those noted above may be required to be installed by the City. Specific criteria will be verbally provided by the City at the time of installation or design plans indicating the criteria will be provided prior to installation.

## **II PAVEMENT MARKER(S)**

Pavement markers shall be of the following classes and types as specified in TxDOT Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges Item 672.2:

### **Classes**

Class A – Jiggle Bar Tiles: shall include types: I-A, I-C, II-A-A, W and Y

Class B – Raised Pavement Markers (RPMs): shall include types: I-A, I-C, I-R, II-A-A, II-C-R and II-B-B.

Class C and D – Traffic Buttons: shall include types I-A, I-C, I-R, II-A-A, and II-C-R, W and Y.

Class E shall include types: I-A, I-C, I-R, II-A-A, and II-C-R. The body color descriptions do not apply to class E pavement markers.

### **Types**

Reflectorized:

Type I-A. Shall contain one (1) face that reflects amber light. The body, other than the reflective face, shall be yellow.

Type I-C. Shall contain one (1) face that reflects white light. The body, other than the reflective face, shall be white.

Type I-R. Shall contain one (1) face that reflects red light. The body, other than the reflective face, shall be white.

Type II-A/A. Shall contain two (2) reflective faces oriented 180 degrees to each other, each of which shall reflect amber light. The body, other than the reflective faces, shall be yellow.

Type II-C/R. Shall contain two (2) reflective faces oriented 180 degrees to each other, one (1) of which shall reflect white light and one (1) of which shall reflect red light. The body, other than the reflective faces, shall be white.

Type II-B/B. Shall contain two (2) reflective faces oriented 180 degrees to each other, each of which shall reflect blue light. The body, other than the reflective faces, shall be blue. This item shall be placed in the center of the adjacent through lane closest to the fire hydrant and in the direction the fire hydrant is facing, with one reflective face of the RPM facing in the direction of travel.

*Refer to Engineering Services  
for Current Specifications*

**TYPICAL INTERSECTION MARKINGS**



STANDARD SPECIFICATION REFERENCE

**M&S 004N**

DATE  
**MAY 2009**

STANDARD DRAWING NO.

None Reflectorized traffic buttons shall be of the following types:

Type W. Type W shall have a white body and no reflective faces.

Type Y. Type Y shall have a yellow body and no reflective faces.

Unless specified in the construction plans or the special contract definitions of these specifications, use with same-directional lines shall be Type II-C-R, use with opposing-directional lines shall be Type II A-A.

If non reflectorized traffic buttons are specified (as approved in writing by the City), lane lines shall be type W and centerlines shall be Type Y.

### **Appearance Requirements**

The outer surface of the pavement marker shall be smooth except for the molding or stamping of the manufacturer's unique model imprint. All corners and edges exposed to traffic shall be rounded. The interface between the reflective face(s) and the body of the marker shall be solid.

The bottom surface of the pavement marker shall have a minimum roughness comparable to that of fine sandpaper, but shall not be of such roughness or grooved such that air will be entrapped when pressed into the adhesive.

### **Epoxy Adhesive**

Shall meet the minimum requirements of TxDOT Standard Specifications for Construction and Maintenance of Highways, Streets and Bridges Item 575 and TxDOT Departmental Material Specification D-9-6100 or the current replacement. Epoxy shall be machine mixed.

Those that are acceptable are as follows:

Types I and I-M: Rapid setting for use when a very fast set is required or if markers must be placed when pavement temperature is below 50F/10C.

Types II, II-M and II-MA: Medium setting.

Types III and III-M: Standard setting

Types IV and IV-M: Slow setting for use when setting time is not a consideration.

Those designated as Types I and IV are intended for hot mixing and application.

Refer to Engineering Services  
for Current Specifications

## **TYPICAL INTERSECTION MARKINGS**



STANDARD SPECIFICATION REFERENCE  
M&S 0040

DATE  
MAY 2009

STANDARD DRAWING NO.

On projects where the adhesive is to be handled by automatic metering, mixing and application equipment, Types I-M through IV-M which are designated specifically for machine application, shall be used. Type II-MA adhesive is designated for placement of all-weather markers. For all types, the resin component shall be pigmented white and the hardener component black.

The type of adhesive to be used for placing ceramic or plastic markers on a specific project shall be based upon the setting time required under the prevailing weather and traffic conditions and approved by the Engineer.

Prior to use, each component shall be stirred to re-disperse any settling or separation of the fillers and liquid portions until a uniform color and appearance obtained. No addition of solvents shall be allowed unless indicated by the manufacturer or approved by the Engineer.

### **Bituminous Adhesive**

Shall meet the minimum requirements of TxDOT Departmental Material Specification D-9-6130 or its current replacement.

The adhesive shall be suitable for bonding ceramic and plastic markers to and applicable when road surface and pavement marker temperatures are in the approximate range of 4 to 71 C (40 to 160 F). The composition of the adhesive must be such that its properties will not deteriorate when heated to and applied at temperatures up to 218 C(425 F) using either air or oil-jacketed melters.

### **Construction**

Pavement surface preparation shall be done in accordance with Item 678 of the TxDOT Standard Specifications for Construction and Maintenance of highways, Streets, and Bridges or its current replacement.

Each class shall come from the same manufacturer.

The Contractor shall use bituminous adhesive for Class A, B, C, and D on a bituminous type surface.

The Contractor shall use epoxy adhesive for Class A, B, C, and D on a Portland concrete cement surface.

The Contractor shall only use epoxy adhesive for Class E, for both bituminous or Portland concrete cement surfaces.

*Refer to Engineering Services  
for Current Specifications*

**TYPICAL INTERSECTION MARKINGS**



STANDARD SPECIFICATION REFERENCE

**M&S 004P**

DATE  
**MAY 2009**

STANDARD DRAWING NO.

The epoxy shall be applied in sufficient quantity such that 100% of the bonding area of the raised pavement marker shall be in contact with the adhesive and such that the pavement marker is seated on a continuous layer of adhesive and not in contact with the pavement surface, except for Class E.

Adhesive shall be applied in accordance with manufacturer's specifications except where different in these specifications.

Where bituminous adhesive is required, the pavement and pavement marker shall be at least 40 F/5 C. The bituminous adhesive shall not be heated above 400 F/205 C. The bituminous adhesive shall be agitated intermittently to ensure even heat distribution.

Shall be placed immediately after adhesive is applied and shall be firmly bonded to the pavement. The surfaces, especially the reflective surfaces, shall be free of adhesive.

### **Methods of Measurement and for Payment**

For City Contracts:

Measurement and payment shall be per unit class/type, as may apply, installed.

The requirements for any pavement marker not provided herein will be established by the City prior to finalization of the work to be performed by the Contractor.

Any repair work ordered by the Engineer shall not be measured.

Any work done by a Contractor not under contract by the City, will account for the work done in accordance with the requirement(s) of the entity under which the contract for work to be performed was issued.

### **Raised Pavement Marker(s) (RPMs) Description**

Unless approved otherwise by the City in writing, only Type II shall be used.

The following applies to the City's M&S 004 series schematics. The numbers provided herein are in direct relation to the number(s) provided in the Pavement Markings Description section of this document. Any conflicts will be resolved by the City with appropriate verbal direction and/or written notes prior to application.

Refer to Engineering Services  
for Current Specifications

**TYPICAL INTERSECTION MARKINGS**



STANDARD SPECIFICATION REFERENCE  
**M&S 004Q**

DATE <b>MAY 2009</b>	STANDARD DRAWING NO.
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The following RPMs shall be installed in association with the associated pavement marking:

1. **Double**

- a. **TYPE IA** – C/R RPM shall be installed in a repeating set of 3, set of 2 and set of 2 RPMs pattern with 40 foot spacing between each set for the entire length of pavement marking. The 3-RPM set shall be located such that all said 3 RPMs are located laterally on center and across from each other and such that one RPM is on the outside edge of each of the 2 pavement markings (total: 2 of the 3) and the third shall be centered between said 2 pavement markings. The 2-RPM set shall be located such that all said 2 RPMs are located laterally on center and cross from each other and such that one RPM is on the outside edge of each of the 2 pavement markings. The clear portion shall face oncoming traffic.
- b. **TYPE IB** - A/A RPM shall be installed in the same repeating set of 3, set of 2 and set of 2 RPMs pattern as for the Double Type IA noted immediately above.

2. **Edgeline**

- a. **TYPE IA** – Unless directed by the City, no RPM installed with the associated pavement marking.
- b. **TYPE IB** - Unless directed by the City, no RPM installed with the associated pavement marking.

3. **Barrier Line** –

- a. **TYPE IA** – C/R RPM, 10 feet on center for the entire length of the pavement marking. Starting with the most inside through lane (#1 lane, through lane closest to the centerline of the roadway). Located on the outside edge of said through lanes pavement marking
- b. **TYPE IIA** - Unless directed by the City, no RPM installed with the associated pavement marking
- c. **TYPE IIIA** – C/R, 10 feet on center for the entire length of the pavement marking. Located on the inside edge of said lane's pavement marking.

4. **Reserved for future use.**

5. **Broken line (may also be called a Skip line)**

- a. **TYPE IA** – C/R RPM shall be installed such that it is centered on the gap between each line for the entire length of the pavement marking.
- b. **TYPE IB** – A/A RPM shall be installed such that it is centered on the gap between each line for the entire length of the pavement marking.

6. **Dotted Line**

- a. **TYPE IA** - Unless directed by the City, no RPM installed with the associated pavement marking.
- b. **TYPE IIA** – Unless directed by the City, no RPM installed with the associated pavement marking.

7. **Diagonal Markings**

- a. **TYPE IIIA** – one C/R RPM shall be installed immediately upstream of the intersection of the Edgeline Type 1A and the diagonal Type 3A pavement markings.

Refer to Engineering Services  
for Current Specifications

b. **TYPE IIIB** - one A/A RPM shall be installed immediately upstream of the intersection of the Edgeline Type IB and the diagonal Type 3B pavement markings.

8. **Two-Way Left Turn Pocket**

- for the broken line: A/A RPM shall be installed such that it is centered on the gap between each line.
- For the solid line: Unless directed by the City, no RPM(s) installed with the associated pavement marking.

9. **Lane Drop, TYPE IIIA** – Unless directed by the City, no RPM installed with the associated pavement marking.

10. **Stop Bar, TYPE VA** – Unless directed by the City, no RPM installed with the associated pavement marking.

11. **Yield Line** – Unless directed by the City, no RPM installed with the associated pavement marking.

12. **Word** – Unless directed by the City, no RPM installed with the associated pavement marking.

13. **Symbol** – Unless directed by the City, no RPM installed with the associated pavement marking.

14. **Pedestrian Crosswalk, TYPE VA** – Unless directed by the City, no RPM installed with the associated pavement marking.

15. **ADA parking stall, TYPE IA** – Unless directed by the City, no RPM installed with the associated pavement marking.

16. **Speed Hump** – Unless directed by the City, no RPM installed with the associated pavement marking.

17. **Misc.** – Other pavement markers than those noted above may be required to be installed by the City. Specific criteria will be verbally provided by the City at the time of installation or design plans indicating the criteria will be provided prior to installation.

Refer to Engineering Services  
for Current Specifications

**General Comments:**

- 1) The following M&S 005 series schematics apply to the City's M&S 004 series schematic. The numbers provided in the pavement markings description of the M&S 004 series schematics are in direct relation to the number ( s ) provided on these schematics. Any conflict will be resolved by the City with appropriate verbal direction and/or written notes prior to application.
- 2) The M&S 005 series schematics are an attempt to show various types of pavement markings/markers and their relation to and in combination with each other and not an endorsement of acceptable geometric design ( s ) . In addition, because each location's circumstances ( s ) is different, the Engineer of Record shall apply the information provided herein to any design with proper engineering consideration and understanding of specific needs necessary for the local situation.

Refer to Engineering Services  
for Current Specifications

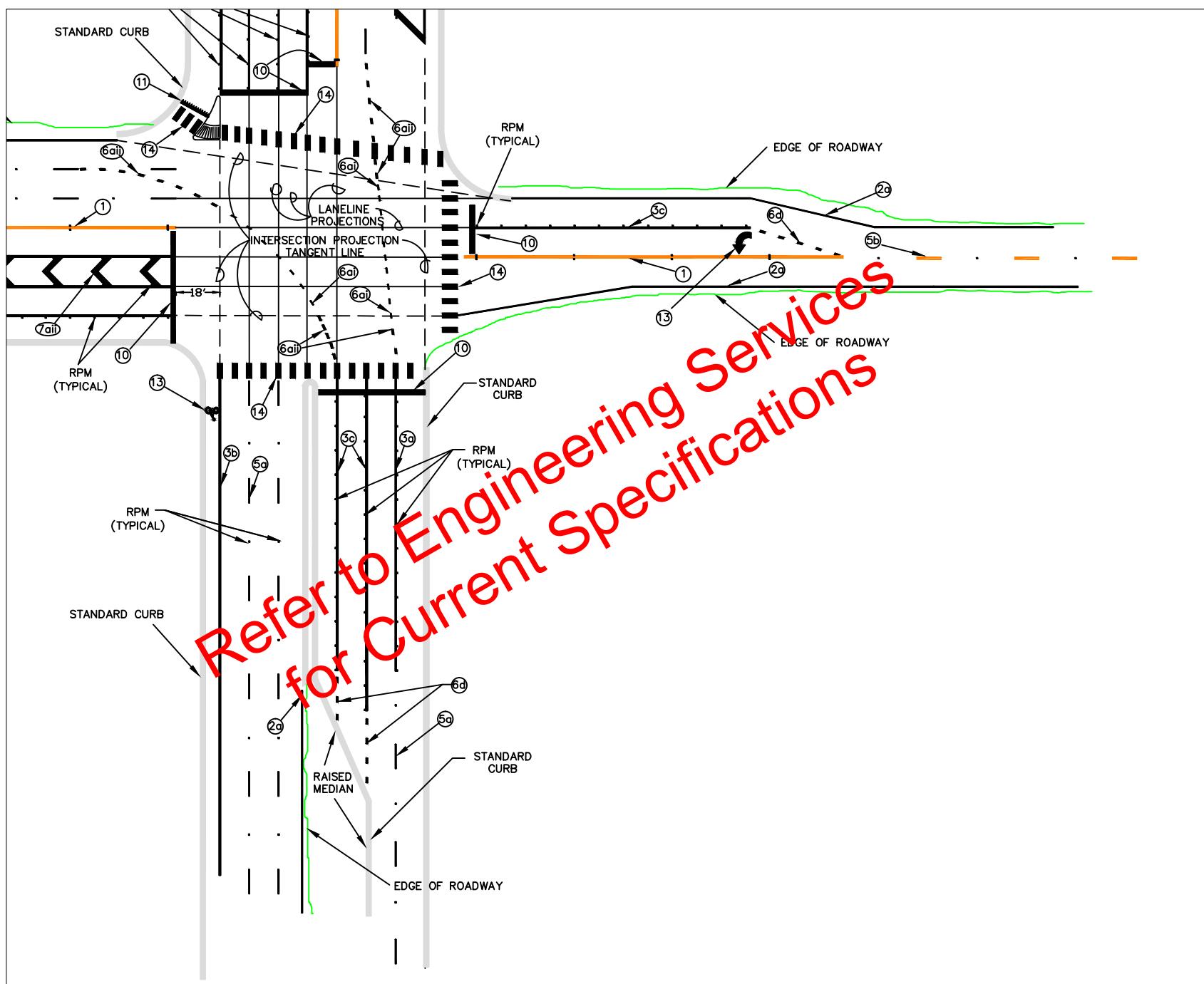
**TYPICAL INTERSECTION MARKINGS**



STANDARD SPECIFICATION REFERENCE  
**M&S 005A**

DATE <b>AUG 2011</b>	STANDARD DRAWING NO.
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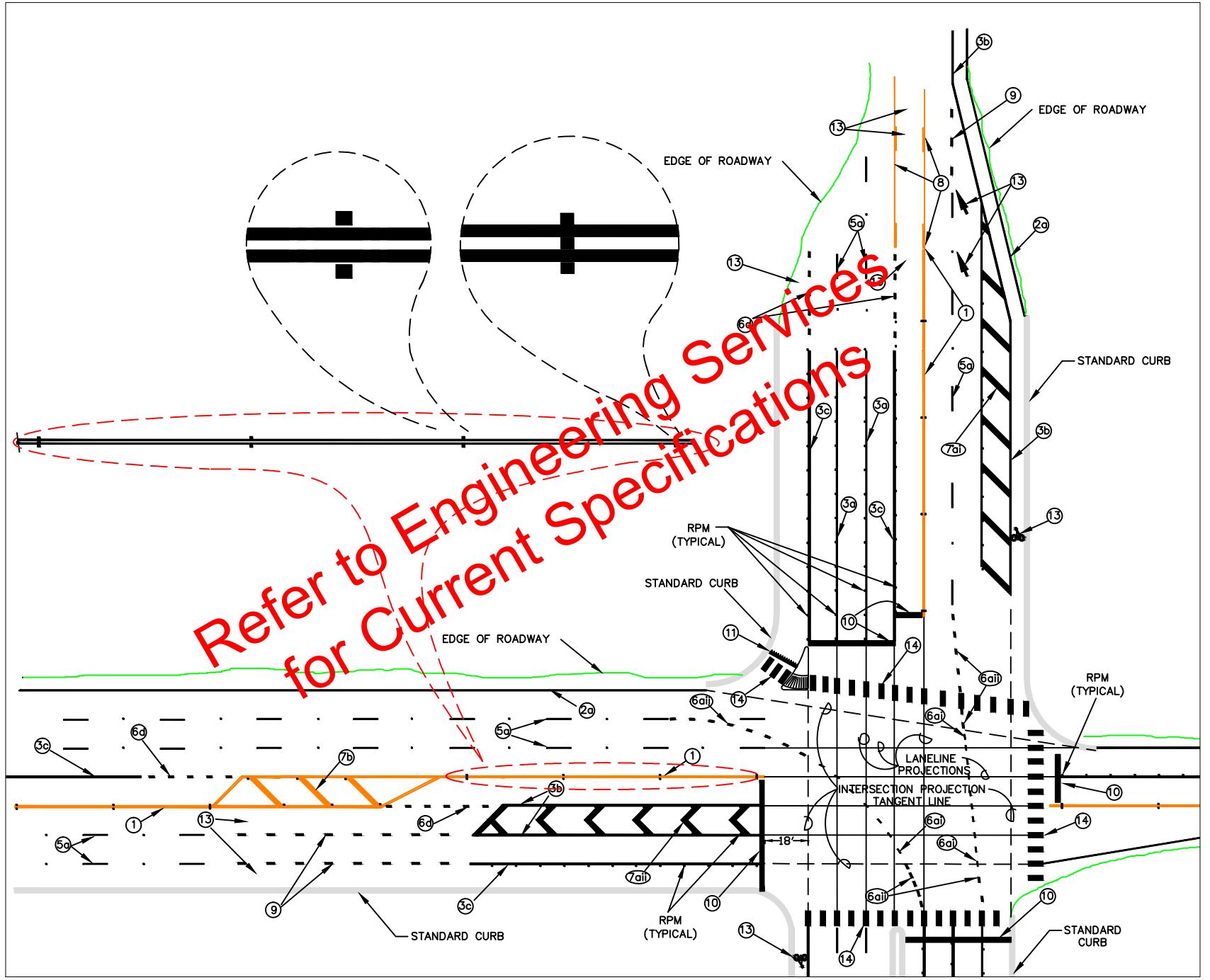
## TYPICAL INTERSECTION MARKINGS

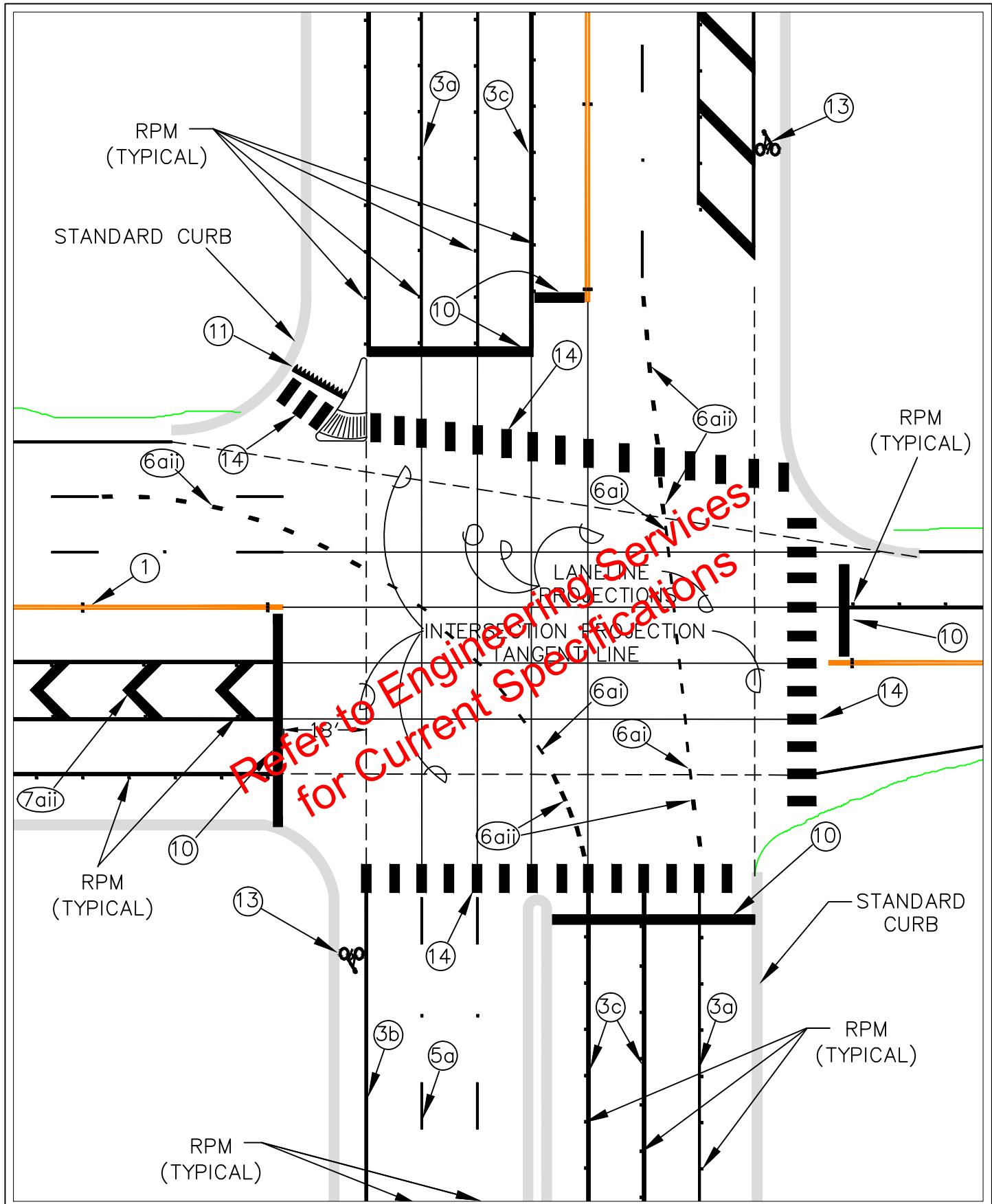


STANDARD SPECIFICATION REFERENCE	
AUG. 2011	M&S 005B
DATE	STANDARD DRAWING NO.

## TYPICAL INTERSECTION MARKINGS

STANDARD SPECIFICATION REFERENCE	M&S 005C
DATE	AUG. 2011
STANDARD DRAWING NO.	





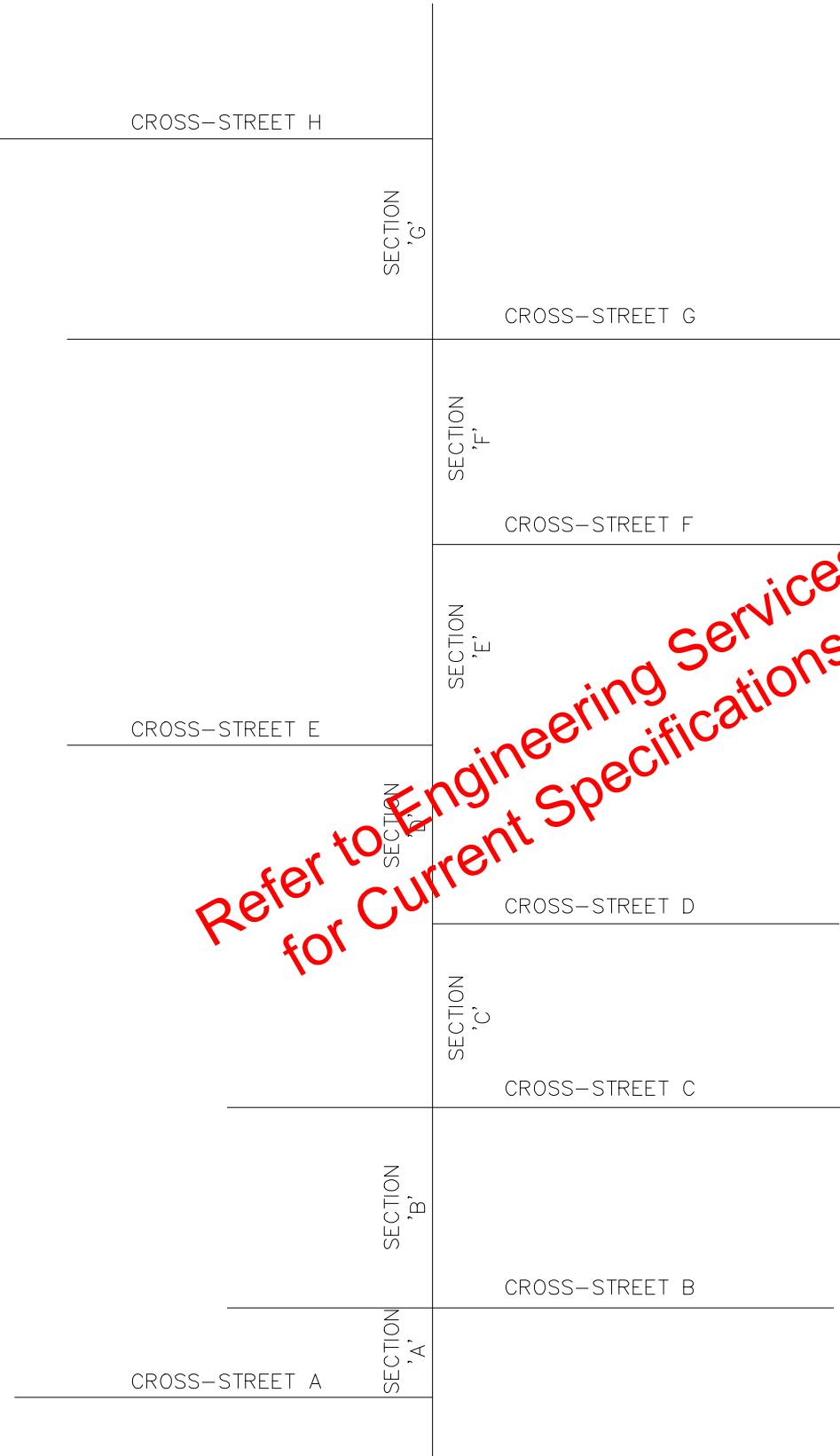
TYPICAL INTERSECTION MARKINGS

STANDARD SPECIFICATION REFERENCE

M&S 005D

DATE  
AUG. 2011

STANDARD DRAWING NO.



NOTE:

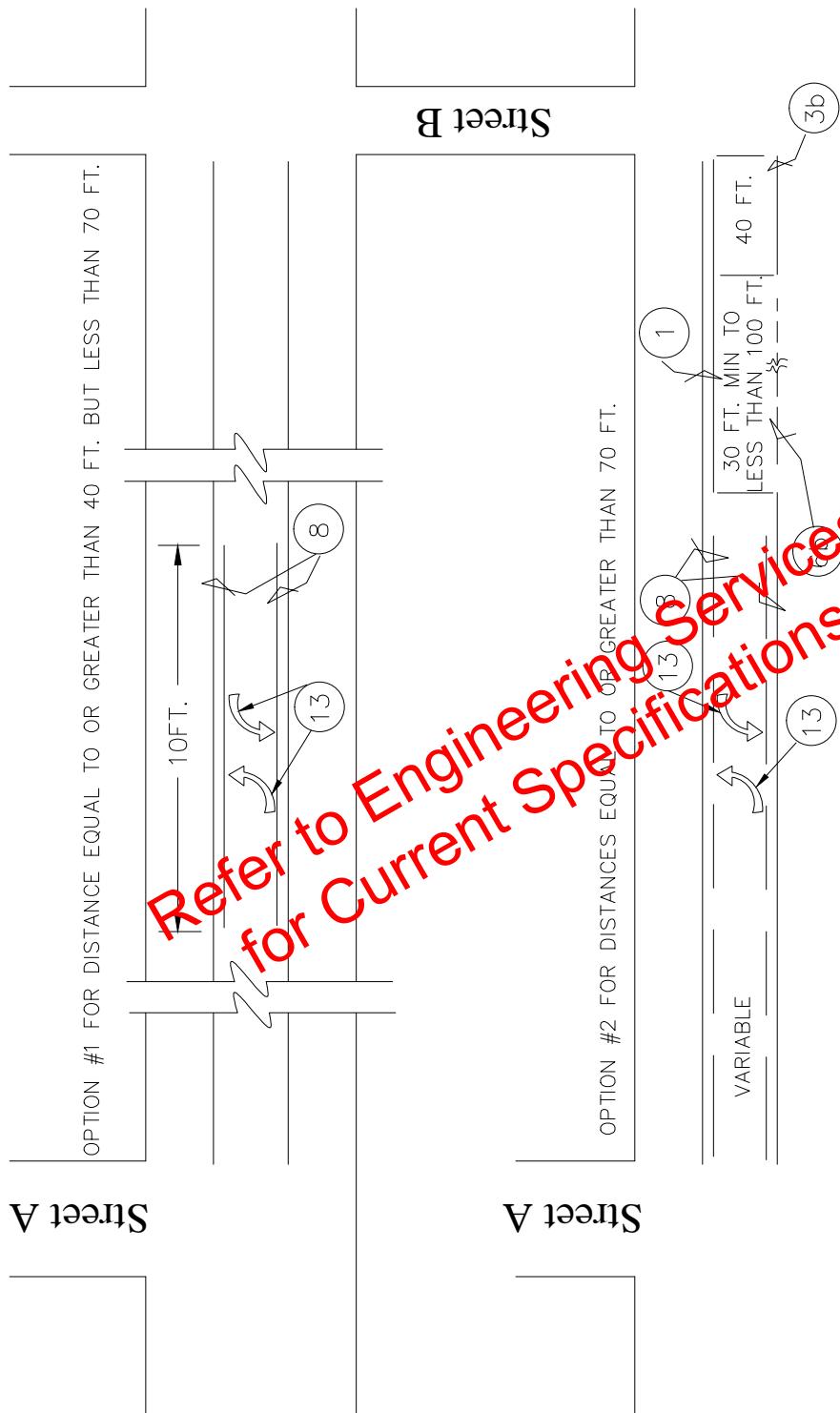
- 1) SEE SECTION DETAIL FOR MARKINGS
- 2) DISTANCES FOR EACH SECTION DETAIL ARE MEASURED FROM PC OF CROSS STREET OR MINIMUM OF 18 FT. FROM TANGENT OF CROSS-STREETS CURB/EDGE OF PAVEMENT.
- 3) FOR EACH SECTION DETAIL, DISTANCES LESS THAN 40 FT, CONSULT CITY ENGINEER
- 4) DRIVEWAY LOCATION CAN VARY THROUGHOUT EACH SECTION. MARKINGS DO NOT BREAK FOR DRIVEWAYS UNLESS SIGNALIZED OR AS DIRECTED BY CITY ENGINEER.
- 5) THE FOLLOWING M&S 006 SERIES SCHEMATICS APPLY TO THE CITY'S M&S 004 SERIES SCHEMATIC. THE NUMBERS PROVIDED IN THE PAVEMENT MARKINGS DESCRIPTION OF THE M&S 004 SERIES SCHEMATICS ARE IN DIRECT RELATION TO THE NUMBER(S) PROVIDED ON THESE SCHEMATICS. ANY CONFLICT WILL BE RESOLVED BY THE CITY WITH APPROPRIATE VERBAL DIRECTION AND/OR WRITTEN NOTES PRIOR TO APPLICATION.

CONTINUOUS LEFT TURN LANE  
SECTION TYPES



DATE: JAN. 2011      STANDARD DRAWING NO: M&S 006

## SECTION 'A' DETAIL



CONTINUOUS LEFT TURN LANE  
SECTION TYPES

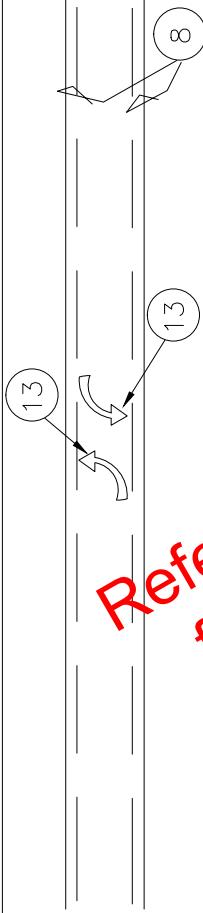


DATE: JAN. 2011      STANDARD DRAWING NO.: M&S 006A

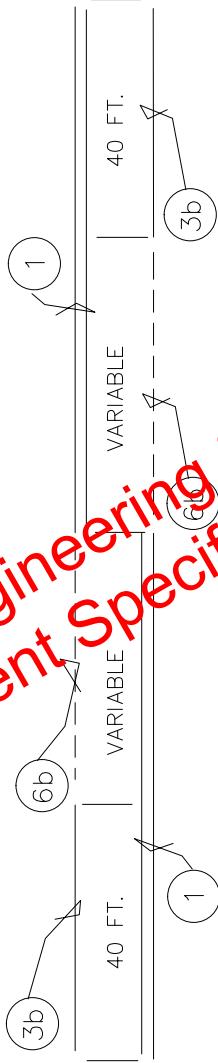
SEE GENERAL NOTES M&S 006

## SECTION 'B' DETAIL

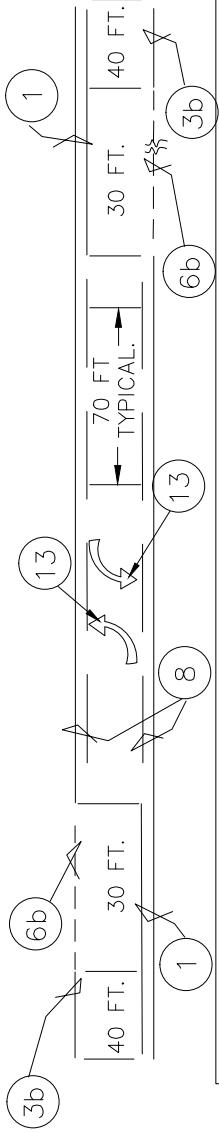
OPTION #3 FOR DISTANCE EQUAL TO OR GREATER THAN 40 FT. BUT LESS THAN 140 FT.



OPTION #4 FOR DISTANCE EQUAL TO OR GREATER THAN 140 FT. BUT LESS THAN 210 FT.



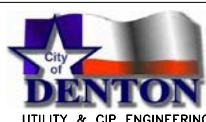
OPTION #5 FOR DISTANCE EQUAL TO OR GREATER THAN 210 FT.



SEE GENERAL NOTES M&S 006

Street B

CONTINUOUS LEFT TURN LANE  
SECTION TYPES



DATE  
JAN. 2011

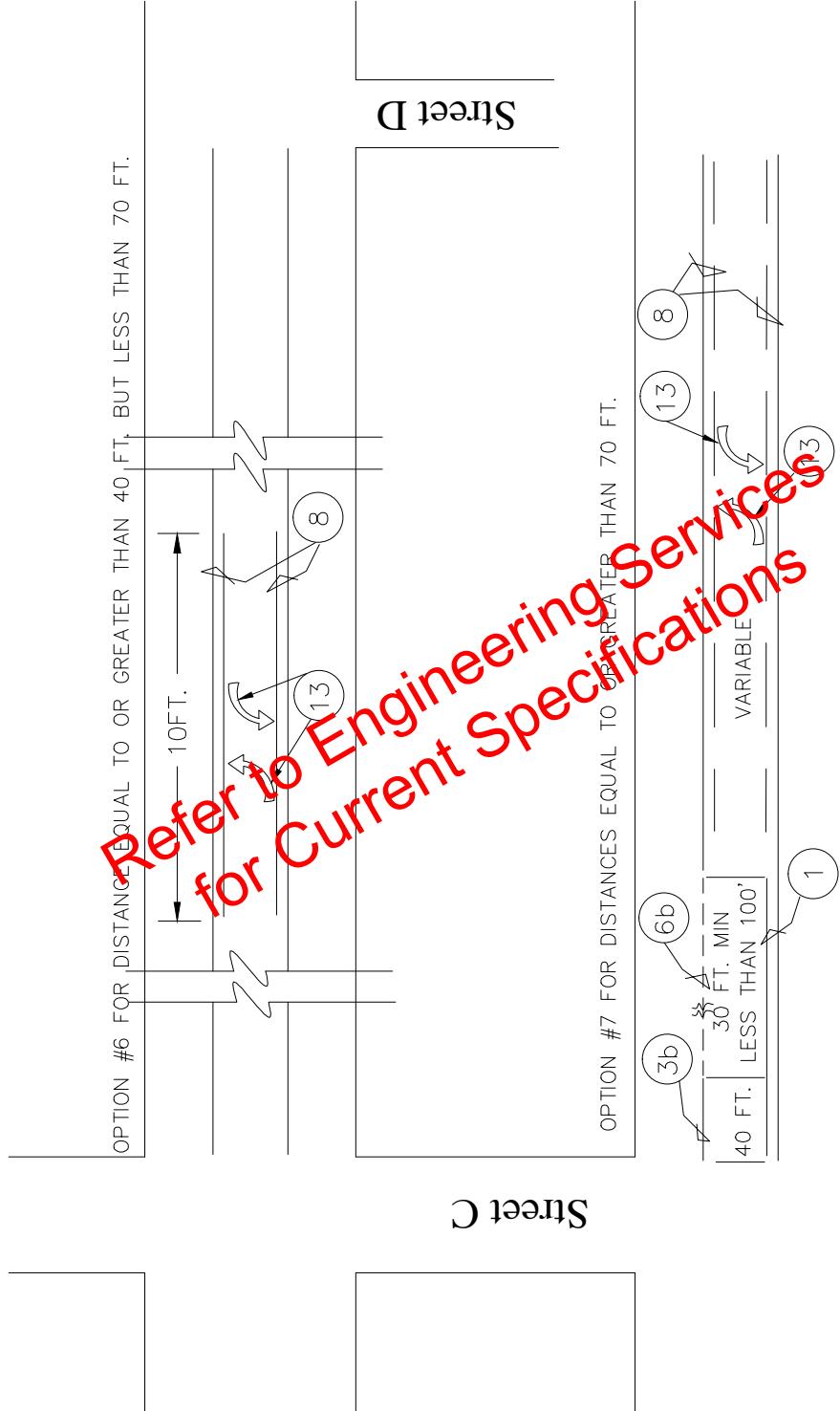
STANDARD DRAWING NO.  
M&S 006B

Street C

Street C

Refer to Engineering Services  
for Current Specifications

## SECTION 'C' DETAIL



SEE GENERAL NOTES M&S 006

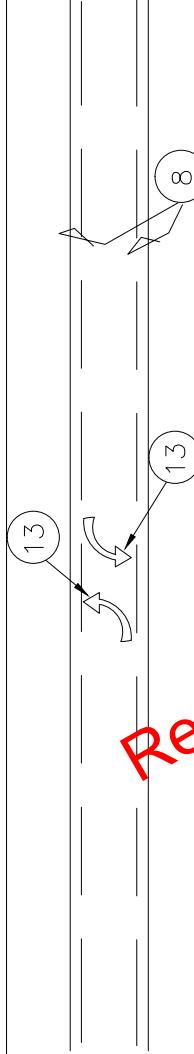
CONTINUOUS LEFT TURN LANE  
SECTION TYPES



DATE: JAN. 2011      STANDARD DRAWING NO.: M&S 006C

## SECTION 'D' DETAIL

OPTION #8 FOR DISTANCE EQUAL TO OR GREATER THAN 40 FT. BUT LESS THAN 140 FT.



Street E

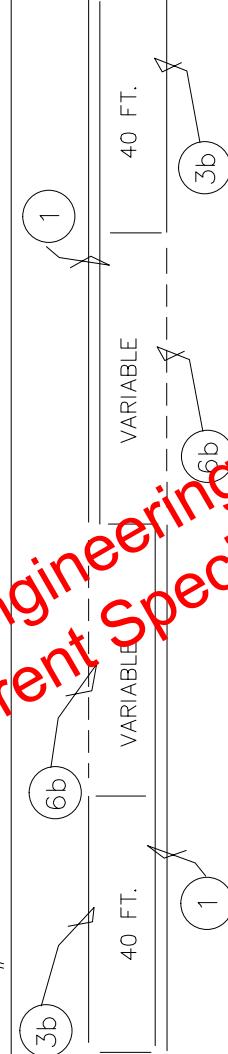
Street D

CONTINUOUS LEFT TURN LANE  
SECTION TYPES

Street E

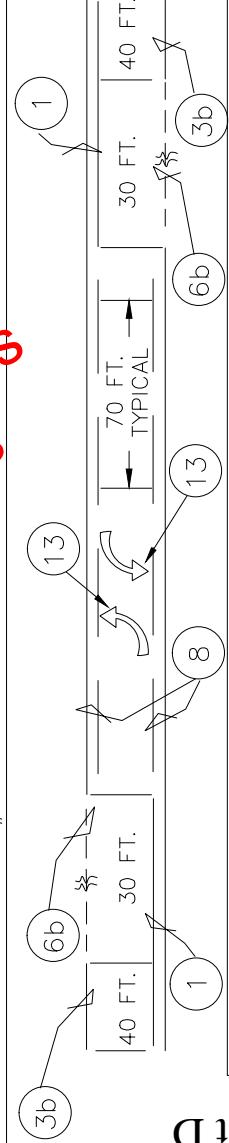
Street D

OPTION #9 FOR DISTANCE EQUAL TO OR GREATER THAN 140 FT. BUT LESS THAN 210 FT.



Street E

OPTION #10 FOR DISTANCE EQUAL TO OR GREATER THAN 210 FT.



Street D

SEE GENERAL NOTES M&S 006

*Refer to Engineering Services  
for Current Specifications*

## SECTION 'E' DETAIL

## CONTINUOUS LEFT TURN LANE SECTION TYPES



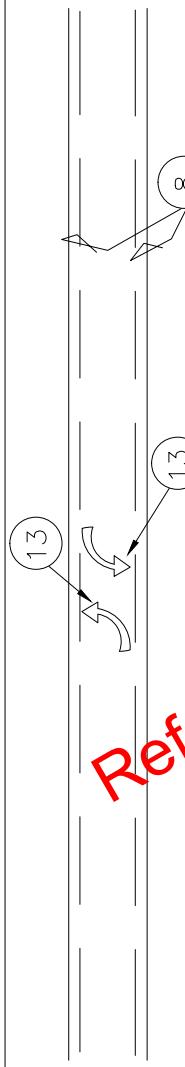
DATE	STANDARD DRAWING NO.
JAN. 2011	M&S 006E

A technical diagram of a concrete pier. The pier is shown in cross-section, revealing its hollow interior. Three vertical bars of rebar are embedded within the concrete. Two of these bars are labeled with the number '3' inside circles. A red, diagonally oriented text overlay reads 'Refer to Engineering Services for Current Specifications'. The background of the diagram is white, and the text is in a large, bold, red sans-serif font.

SEE GENERAL NOTES M&S 006

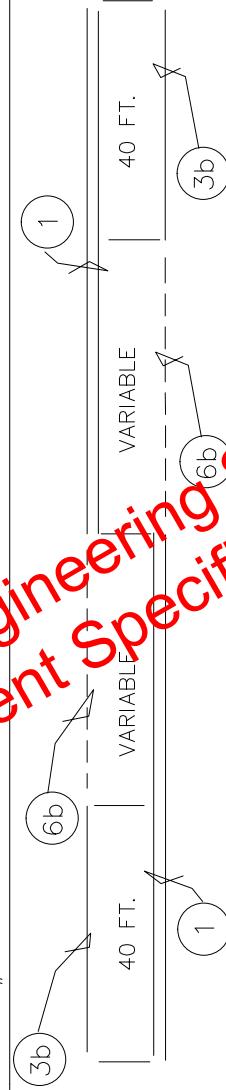
## SECTION 'F' DETAIL

OPTION #12 FOR DISTANCE EQUAL TO OR GREATER THAN 40 FT. BUT LESS THAN 140 FT.



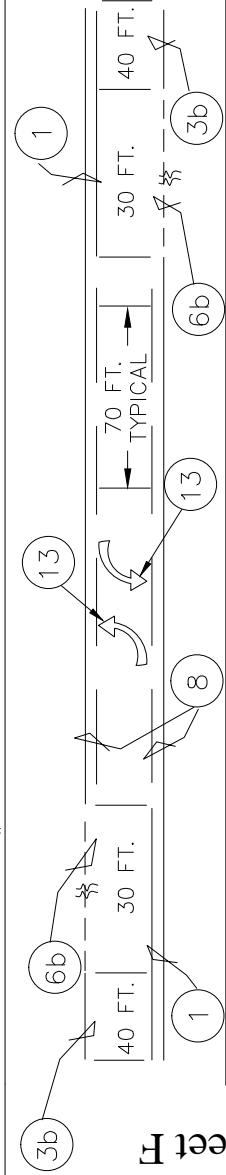
Street F

OPTION #13 FOR DISTANCE EQUAL TO OR GREATER THAN 140 FT. BUT LESS THAN 210 FT.



Street F

OPTION #14 FOR DISTANCE EQUAL TO OR GREATER THAN 210 FT.



SEE GENERAL NOTES M&S 006

CONTINUOUS LEFT TURN LANE  
SECTION TYPES



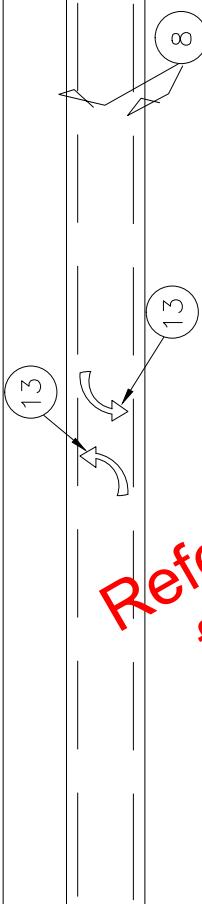
DATE  
JAN. 2011

STANDARD DRAWING NO.  
M&S 006F

*Refer to Engineering Services  
for Current Specifications*

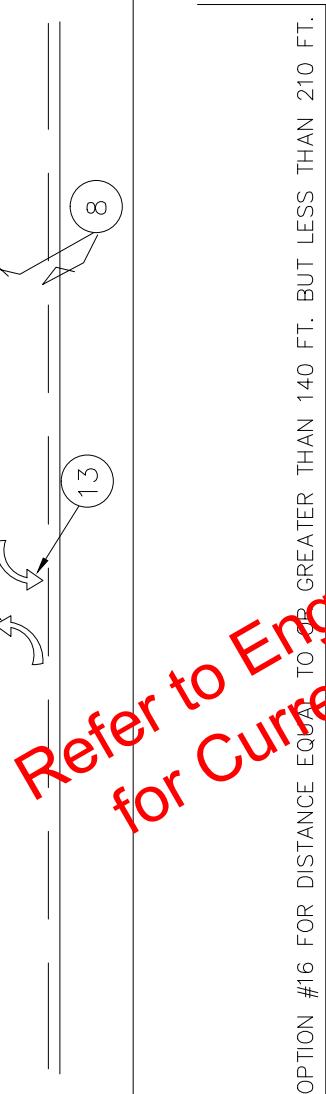
## SECTION 'G' DETAIL

OPTION #15 FOR DISTANCE EQUAL TO OR GREATER THAN 40 FT. BUT LESS THAN 140 FT.



Street G

OPTION #16 FOR DISTANCE EQUAL TO OR GREATER THAN 140 FT. BUT LESS THAN 210 FT.



Refer to Engineering Services  
for Current Specifications

OPTION #17 FOR DISTANCE EQUAL TO OR GREATER THAN 210 FT.



Street G

CONTINUOUS LEFT TURN LANE  
SECTION TYPES



DATE  
JAN. 2011

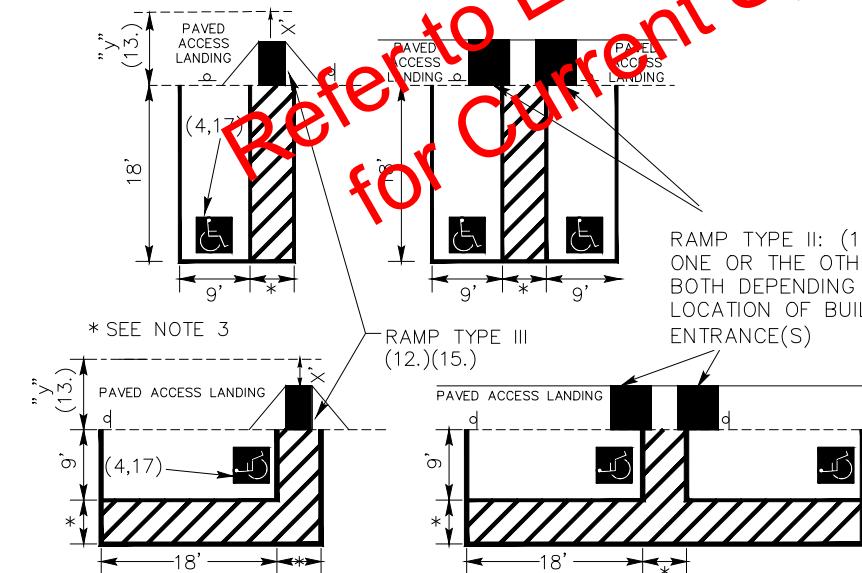
STANDARD DRAWING NO.  
M&S 006G

SEE GENERAL NOTES M&S 006

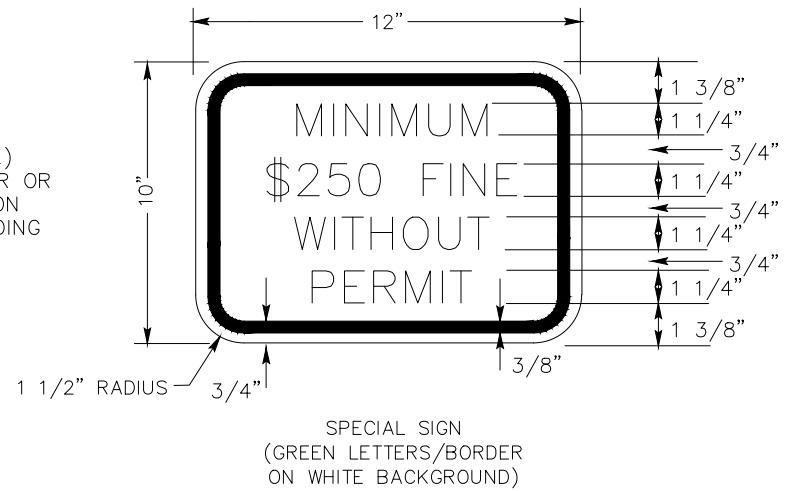
# DISABLED PARKING REQUIREMENTS OFF STREET PARKING



STANDARD SPECIFICATION REFERENCE  
DATE: JUNE, 2005  
STANDARD DRAWING NO. M&S - 100



NOTE:  
 1. ALL STRIPING FOR DISABLED PARKING SHALL BE BLUE AND 4 INCHES IN WIDTH.  
 2. CROXHATCH STRIPING FOR ACCESS AISLE SHALL BE ON 48 INCH CENTERS, AND AT 45 DEGREES TO THE LONG AXIS AS ILLUSTRATED.  
 3. STANDARD ACCESS AISLES SHALL BE A MINIMUM OF 5 FEET, VAN ACCESSIBLE ACCESS AISLES SHALL BE A MINIMUM OF 8 FEET.  
 4. EACH STALL SHALL BE IDENTIFIED WITH AN APPROPRIATELY SIZED WHITE SYMBOL OF ACCESSIBILITY CENTERED WITHIN A BLUE BOX BACKGROUND. THE BLUE BOX SHALL BE NO MORE THAN ONE FOOT FROM THE REAR OF THE STALL, AS ILLUSTRATED.  
 5. ALL STRIPING DIMENSIONS PROVIDED ARE MINIMUM AND SHALL BE MEASURED ON CENTER(S).  
 6. EVERY PARKING STALL SHALL BE IDENTIFIED BY A SIGN ASSEMBLY AS ILLUSTRATED.  
 7. THE SIGNS SHALL BE CLEARLY VISIBLE AT ALL TIMES, LOCATED AS CLOSE TO EACH STALL AS POSSIBLE, AND SHALL NOT BLOCK ANY DISABLED ACCESS ROUTE OR VEHICLE OVERHANG, AND IN NO CASE SHALL BE GREATER THAN 8 FEET FROM THE RESPECTIVE STALL, AND SHALL BE PERMANENTLY FIXED TO A PERMANENT STRUCTURE. NOTE THE POST SHOWN IS NOT REQUIRED IF SIGNS ARE ATTACHED TO THE FACE OF A BUILDING.  
 8. THE SIGN SHALL BE AT THE HEAD OF THE STALL (AS IS REASONABLY POSSIBLE) SO AS TO IDENTIFY EACH STALL. THE LOCATION OF THE SIGN SHALL BE APPROVED BY THE CITY.  
 9. THE SIGN SHALL FACE PERPENDICULAR TO THE LONG AXIS OF THE STALL.  
 10. THE SIGN HEIGHT REQUIREMENTS ARE AS ILLUSTRATED.  
 11. ANGLE PARKING (I.E. 0 < X < 90) SHALL MEET THE INTENT OF THESE REQUIREMENTS/STANDARDS.  
 12. IF THE ROOF FLARE IS LESS THAN 12:1 THEN A LANDING PAD "X", MINIMUM OF 5 FEET DEEP, SHALL BE PROVIDED. IF THE FLARE IS 12:1 OR GREATER, THEN NO LANDING PAD IS REQUIRED.  
 13. SIDEWALK WIDTH "Y" SHALL BE A MINIMUM OF 4 FEET UNOBSTRUCTED. ADDITIONAL WIDTH IS REQUIRED FOR SIGN POST LOCATION AND OR VEHICLE OVERHANG.  
 14. RAMP WIDTH SHALL BE A MINIMUM OF 5 FT.  
 15. EITHER CITY STANDARDS TYPE II OR TYPE III RAMPS ARE ACCEPTABLE. APPLY AS APPROPRIATE.  
 16. SEE STANDARD PLANS TEXAS DEPARTMENT OF TRANSPORTATION, TRAFFIC OPERATIONS DIVISION, PAVEMENT MARKINGS AND SIGNING FOR ACCESSIBLE PARKING CPM(AP)-98 FOR HANDICAPPED PARKING SIGN" FOR SIGN MANUFACTURING STANDARDS.  
 17. SEE STANDARD PLANS TEXAS DEPARTMENT OF TRANSPORTATION, TRAFFIC OPERATIONS DIVISION, PAVEMENT MARKINGS AND SIGNING FOR ACCESSIBLE PARKING CPM(AP)-98 FOR PAVEMENT MARKINGS STANDARDS ("WITH BACKGROUND" IS THE ONLY DETAIL THAT IS ACCEPTABLE) WILL BE USED.



*Refer to Engineering Services  
for Current Specifications*

## SIGN POST DETAIL

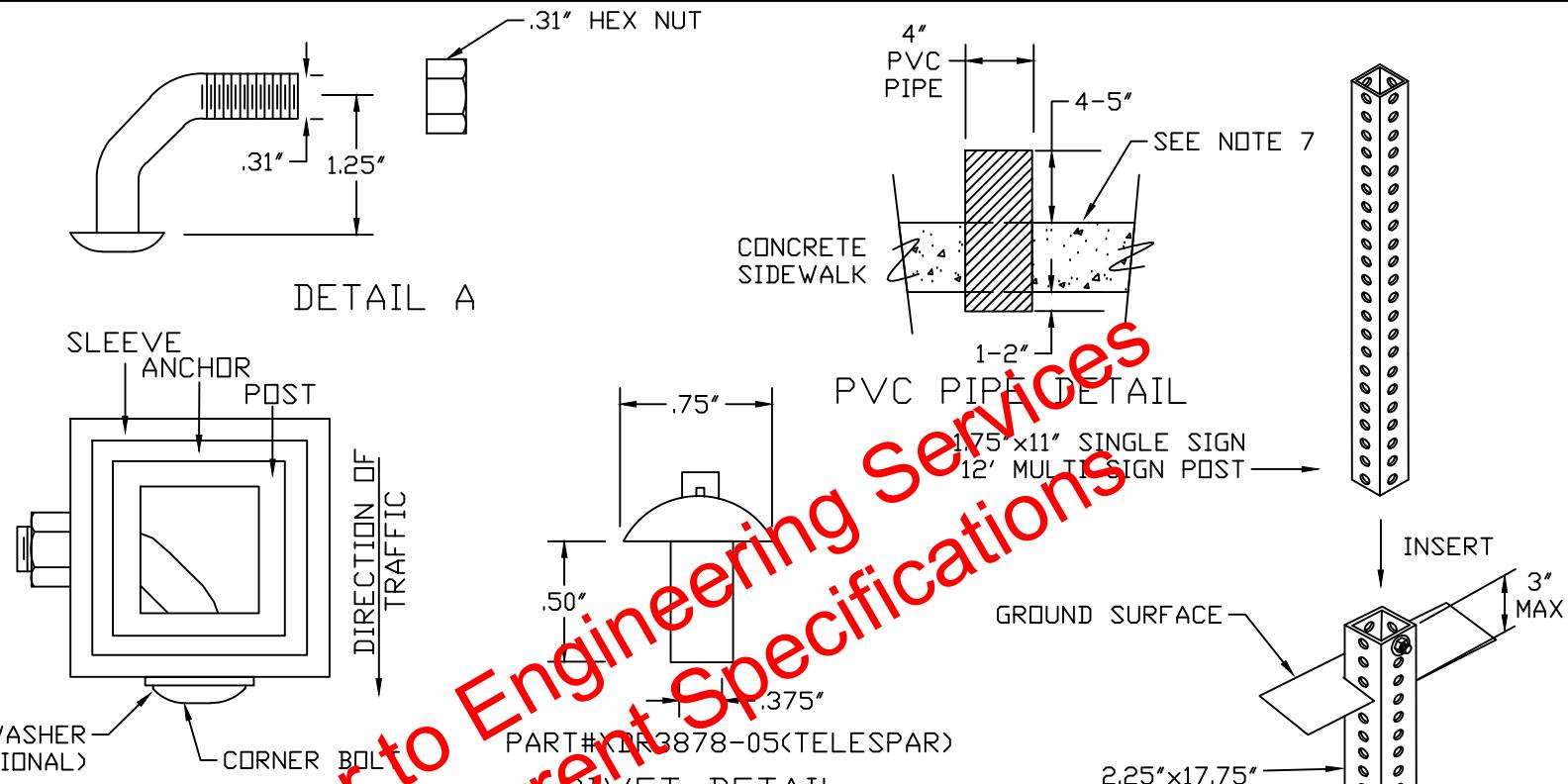


UTILITY & CIP ENGINEERING

STANDARD SPECIFICATION REFERENCE	DATE	JAN, 2009
M&S 200		

### NOTES:

- 1) ALL COMPONENTS SHALL BE SQUARE POST, PERFORATED ON ALL FOUR SIDES.
- 2) ATTACH POST TO ANCHORING SYSTEM BY USING ANGLE BOLT.(DETAIL A)
- 3) ATTACH SIGNS TO POST WITH .375 IN. DIA. DRIVE RIVETS(RIVET DETAIL).
- 4) LOCATES MUST BE CALLED IN PRIOR TO INSTALLATION OF POST ANCHOR.
- 5) CONCRETE SHALL NOT BE USED IN CONJUNCTION WITH THE INSTALLATION OF THE POST ANCHOR.
- 6) POST ANCHOR SHALL BE INSTALLED IN NATURAL GROUND USING A MECHANICAL METHOD PRESCRIBED BY THE MANUFACTURER. GROUND SHALL BE STABILIZED WITHIN A MINIMUM RADIUS OF 3 FEET OF THE POST ANCHOR AND IN SUCH A MANNER AS TO MAINTAIN THE POST'S INTEGRITY WITH THE REQUIRED SIGNAGE DURING HIGH WINDS AND/OR AS A RESULT OF VANDALISM/MISCHIEF.
- 7) WHEN SIGN POST IS TO BE SET IN NEW CONCRETE INSTALL A 4" PVC DIA. PIPE. AFTER PVC PIPE IS INSTALLED COVER PIPE HOLE SUFFICIENTLY TO PREVENT DEBRIS FROM ENTERING PIPE. ONCE SIGN POST IS READY TO BE INSTALLED CUT PVC PIPE FLUSH WITH CONCRETE SURFACE AND FILL PVC PIPE WITH CLEAN SAND AFTER POST IS INSTALLED.





*Refer to Engineering Services  
for Current Specifications*

- 1) A PRIVATE ROADWAY SHALL BE IDENTIFIED WITH PRIVATE BLADES THAT ARE MANUFACTURED IN ACCORDANCE WITH THE INFORMATION AS PROVIDED HERE ON.
- 2) THE PRIVATE BLADE IS TO BE SUBSTANTIALLY DIFFERENT THAN A CITY BLADE IN AT LEAST COLORATION (PREFERENCE IS BLACK LETTERS ON WHITE BACKGROUND) BUT CAN ALSO INCLUDE A DIFFERENT FONT TYPE.
- 3) ALL PRIVATE BLADES SHALL BE MANUFACTURED WITH EITHER BLADE EXTENSION AS SHOWN.
- 4) THE PRIVATE BLADE'S LETTER HEIGHT, SPACING AND OTHER APPLICABLE FORMATING IS TO CORRESPOND TO THAT AS PROVIDED ON CITY SCHEMATIC MS-003a, UNLESS APPROVED OTHERWISE BY THE CITY PRIOR TO MANUFACTURING.
- 5) IF BLACK LETTERS WITH WHITE BACKGROUND IS USED, WHITE BACKGROUND SHALL BE REFLECTIVE. IF ANY OTHER COMBINATION OF COLORS IS USED THAT DOES NOT CONTAIN BLACK, BOTH THE LETTERS AND THE BACKGROUND SHALL BE REFLECTIVE.
- 6) PRIVATE BLADE DESIGN SHALL BE APPROVED BY CITY PRIOR TO BEING MANUFACTURED.
- 7) ALL PRIVATE BLADES SHALL BE MAINTAINED BY OTHER THAN CITY.

	STREET BLADES FOR POST MOUNTING ON PRIVATE STREETS	APPROVED BY  CITY ENGINEER <span style="float: right;">FRANK G. PAYNE P.E.</span>	SCALE <u>None</u> ADOPTED _____	STANDARD PLAN No.  <b>MS 003b</b>
	CITY OF DENTON, TEXAS	CITY TRAFFIC ENGINEER <span style="float: right;">BERNARD J. VOKOUN P.E.</span>	REVISED _____ SUPERSEDES _____	

1ST BLADE MOUNT-ON POST



PART # 12U-90X

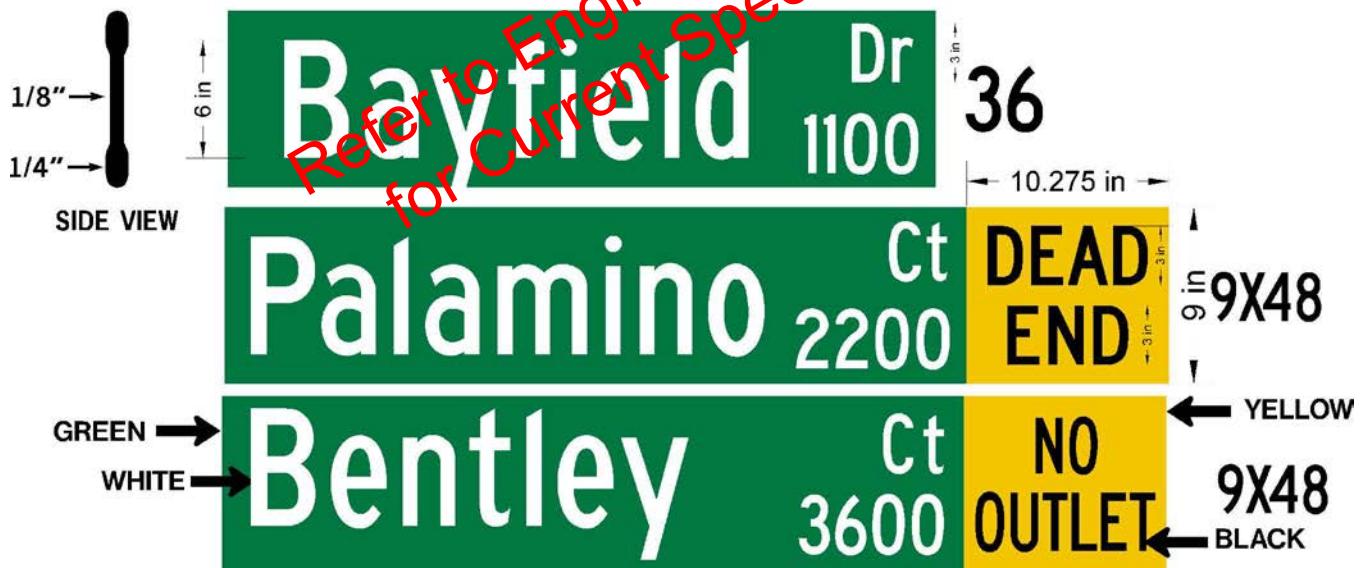
- 1) 1ST BLADE MOUNT AND 2ND BLADE MOUNT SHALL BE BY DYN A ENGINEERING LTD (AS SHOWN) OR CITY APPROVED EQUIVALENT
- 2) 1ST BLADE MOUNT TO BE PLACED A MINIMUM OF 10 FT. AND A MAXIMUM OF 12 FT. ABOVE AVERAGE IMMEDIATE SURROUNDING GROUND UNLESS OTHERWISE DIRECTED BY CITY.

**9" Extruded Sign Blades**  
**High Intensity grade vinyl**  
**Highway Gothic "C" (Font)**  
**Typical upper/lower case lettering**  
**Background Green with White Letters**  
**Sizes Used 24,30,36,42,48**

2ND BLADE MOUNT  
CROSS BRACKET  
MOUNTED ON 1ST BLADE



PART # 12-CX-21

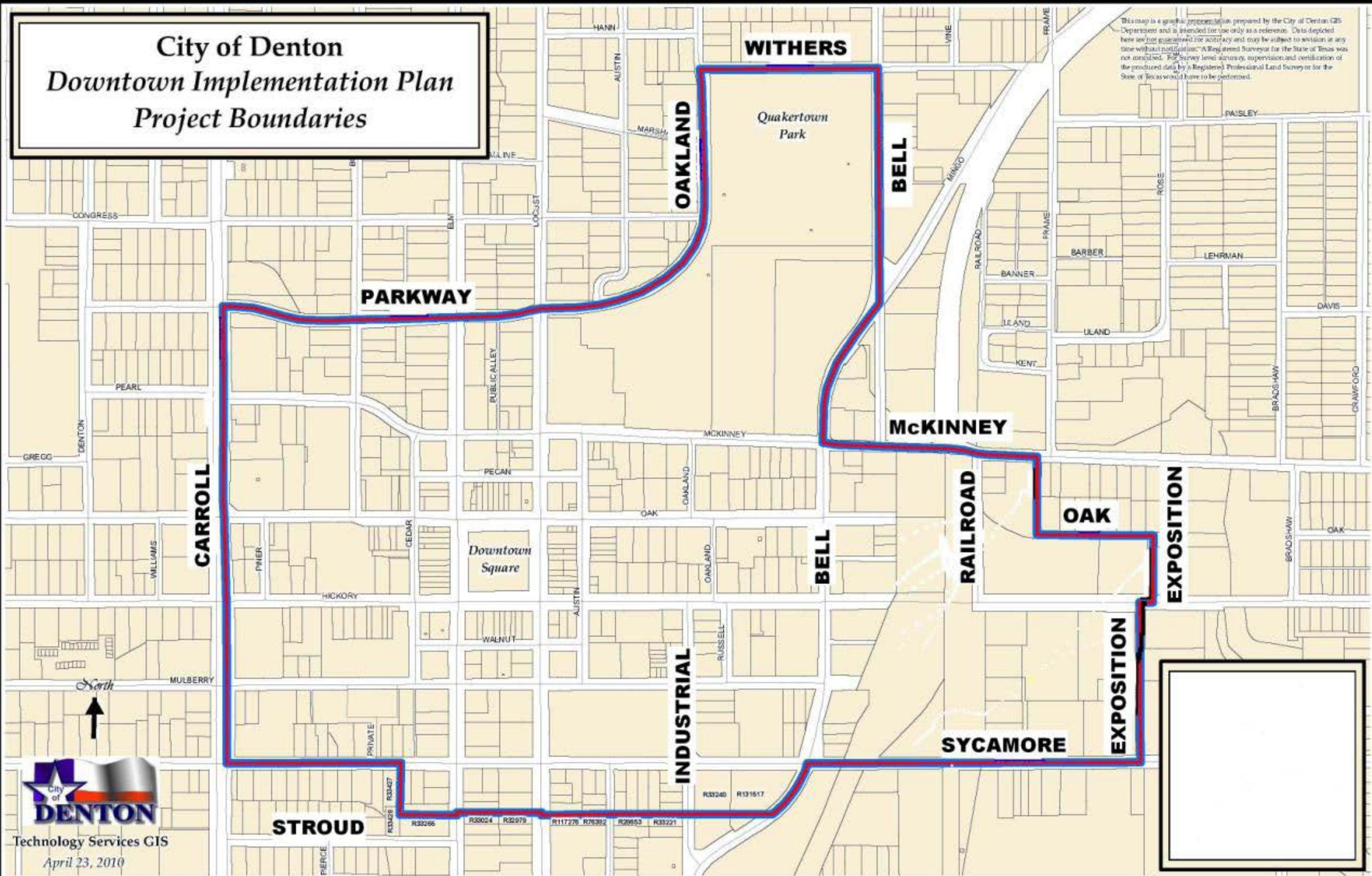


- I) THE DEAD END BLADE EXTENSION IS USED WHEN ONLY ONE STREET (BY NAME) IS SERVED BEYOND THE SIGN
- II) THE NO OUTLET BLADE EXTENSION IS USED WHEN MULTIPLE STREETS (BY NAME) ARE SERVED BEYOND THE SIGN
- III) BLADE EXTENSIONS WILL BE CONTAINED WITHIN AND A PART OF ONLY THOSE BLADE SIZES NOTED HERE IN.

\*REFERENCE SEE MS-002 FOR SIGN POLE REQUIREMENTS

	STREET BLADES FOR POST MOUNTING ON PUBLIC STREETS	APPROVED BY	SCALE <u>NONE</u>	STANDARD PLAN No.
	CITY OF DENTON, TEXAS	CITY ENGINEER <u>FRANK G. PAYNE P.E.</u> CITY TRAFFIC ENGINEER <u>BERNARD J. VOKOUN P.E.</u>	ADOPTED _____ REVISED _____ SUPERSEDES _____	MS 003a

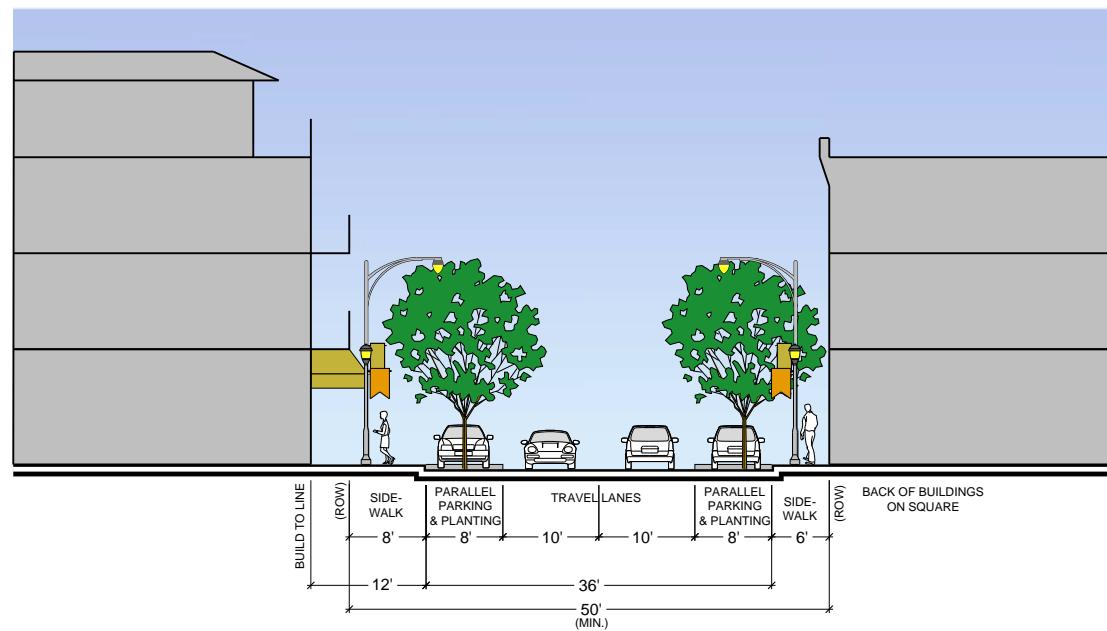
# City of Denton Downtown Implementation Plan Project Boundaries



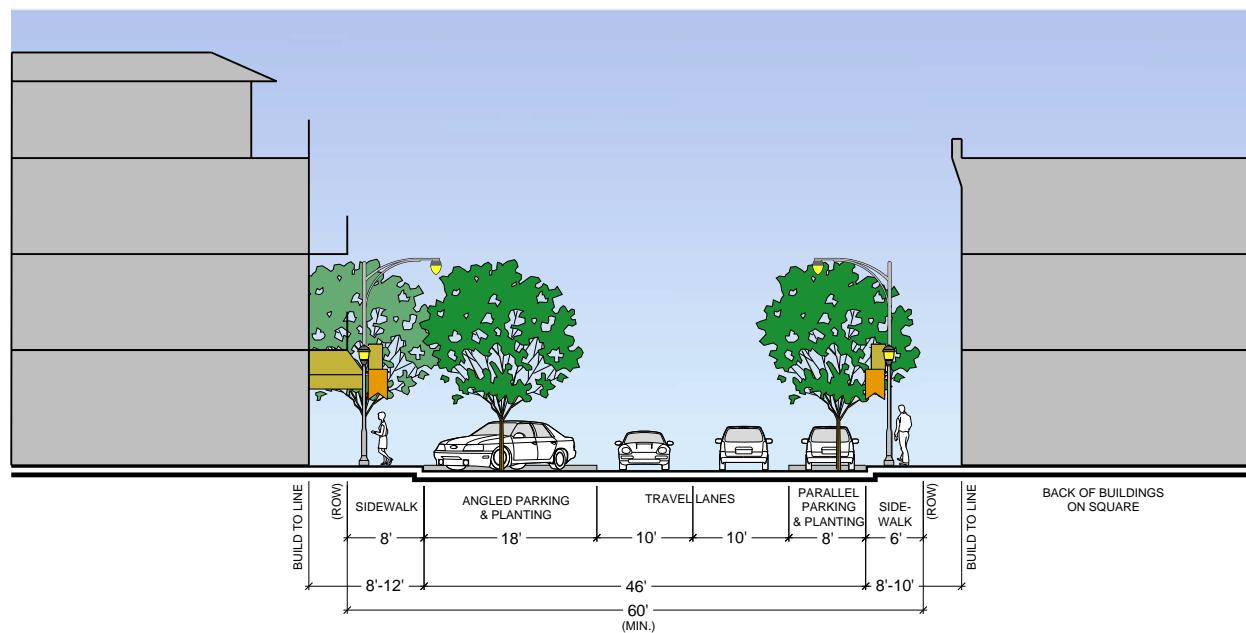
Technology Services GIS

April 23, 2010

**FIGURE 2**  
**AUSTIN STREET 1**  
**PECAN TO MCKINNEY, OAK TO PECAN**



**FIGURE 2**  
**AUSTIN STREET 2**  
**MULBERRY TO HICKORY, HICKORY TO OAK**



**FIGURE 2**  
**BELL AVENUE 1**  
**SYCAMORE TO MCKINNEY**

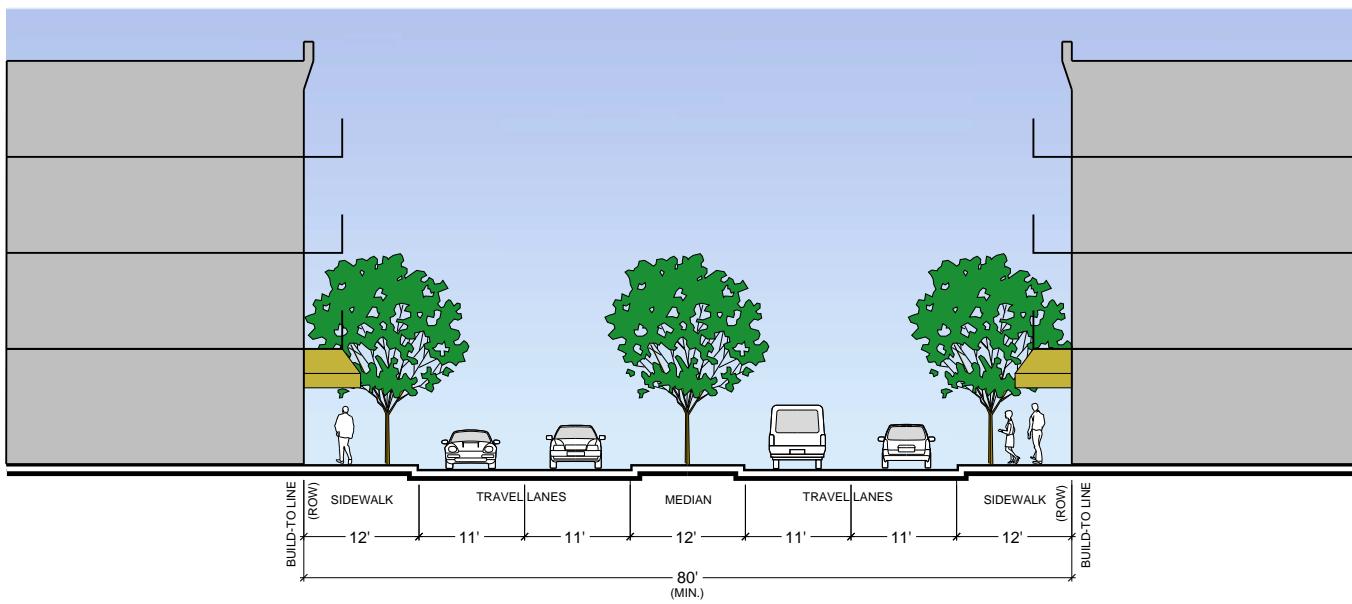
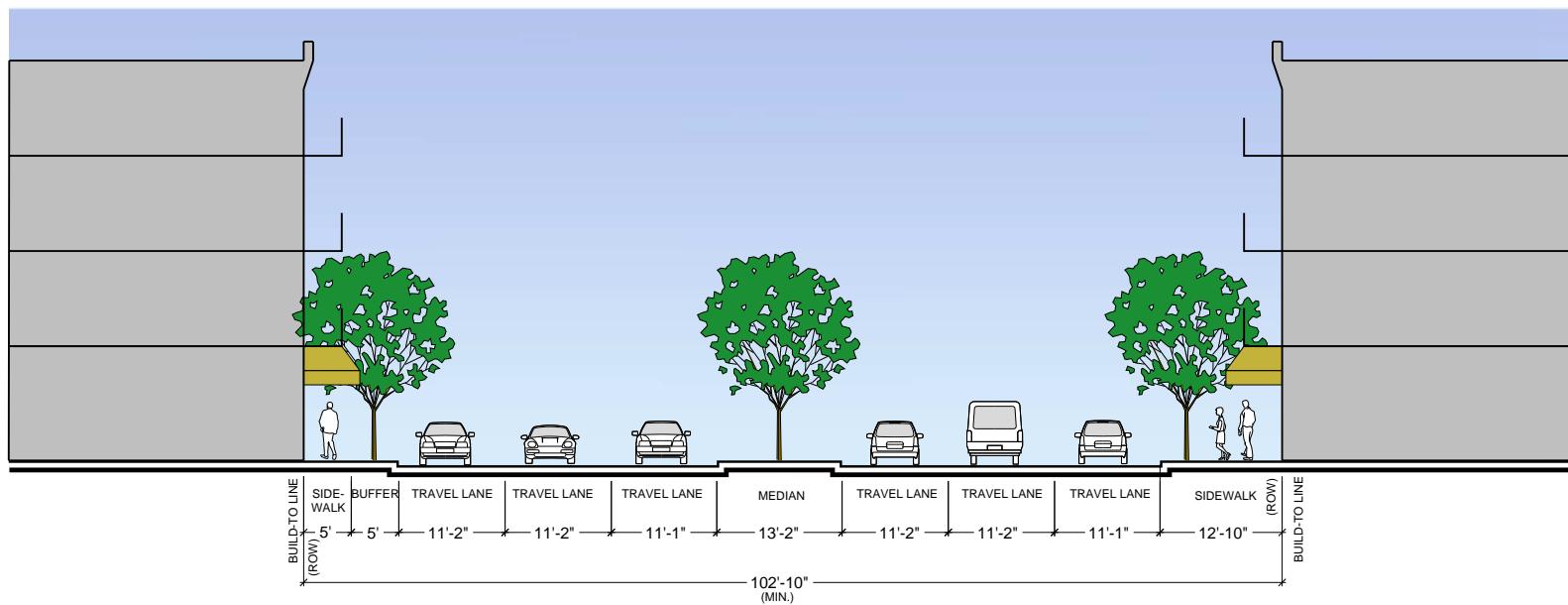
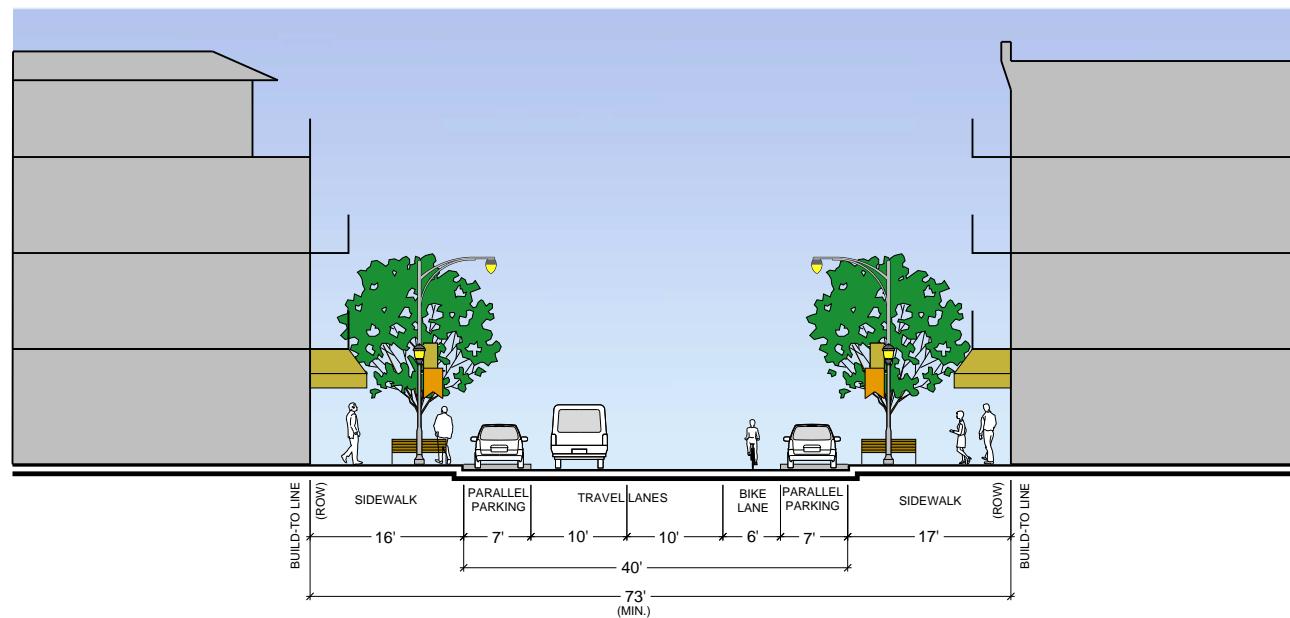


FIGURE 2  
CARROLL STREET 1  
SYCAMORE TO MCKINNEY



**FIGURE 2**  
**ELM STREET 1 - (VIEW TO SOUTH)**  
**PARKWAY TO MCKINNEY, WALNUT TO SYCAMORE**



**FIGURE 2**  
**ELM STREET 2 - (VIEW TO SOUTH)**  
**HICKORY TO WALNUT**

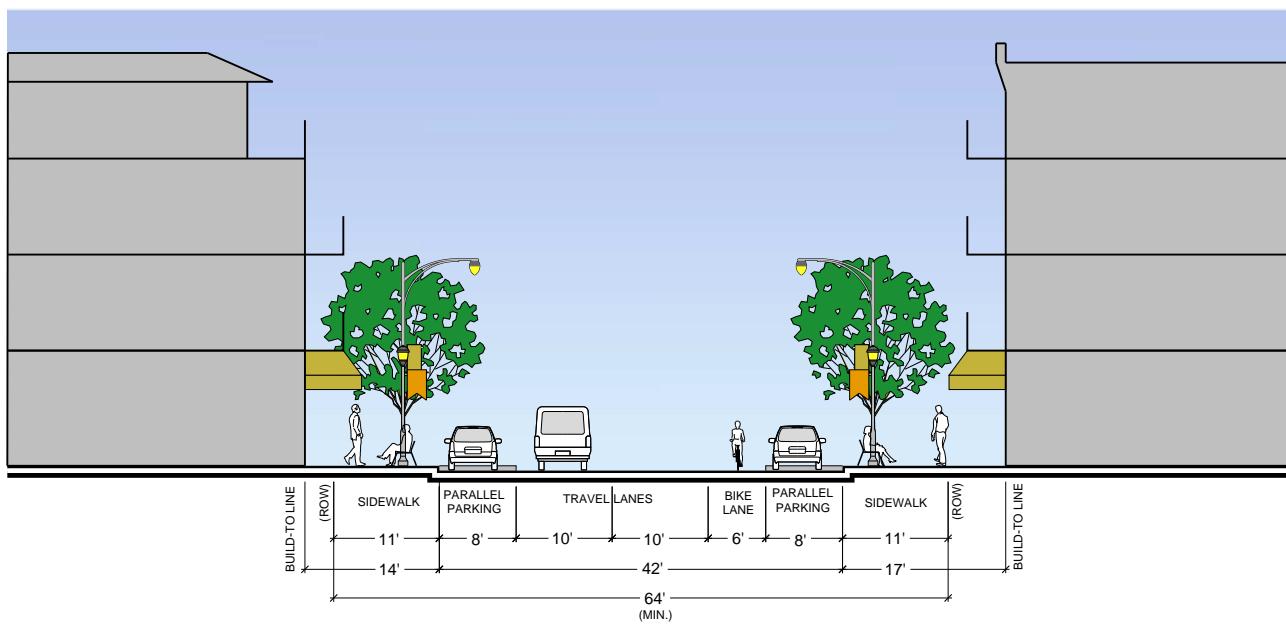
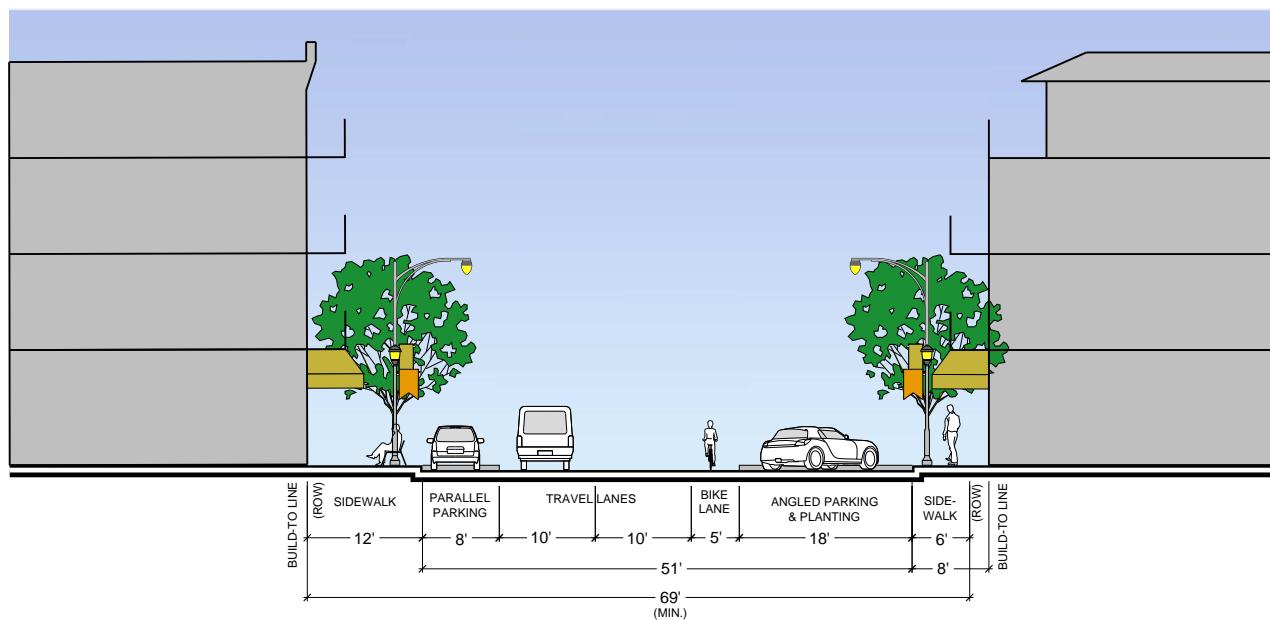
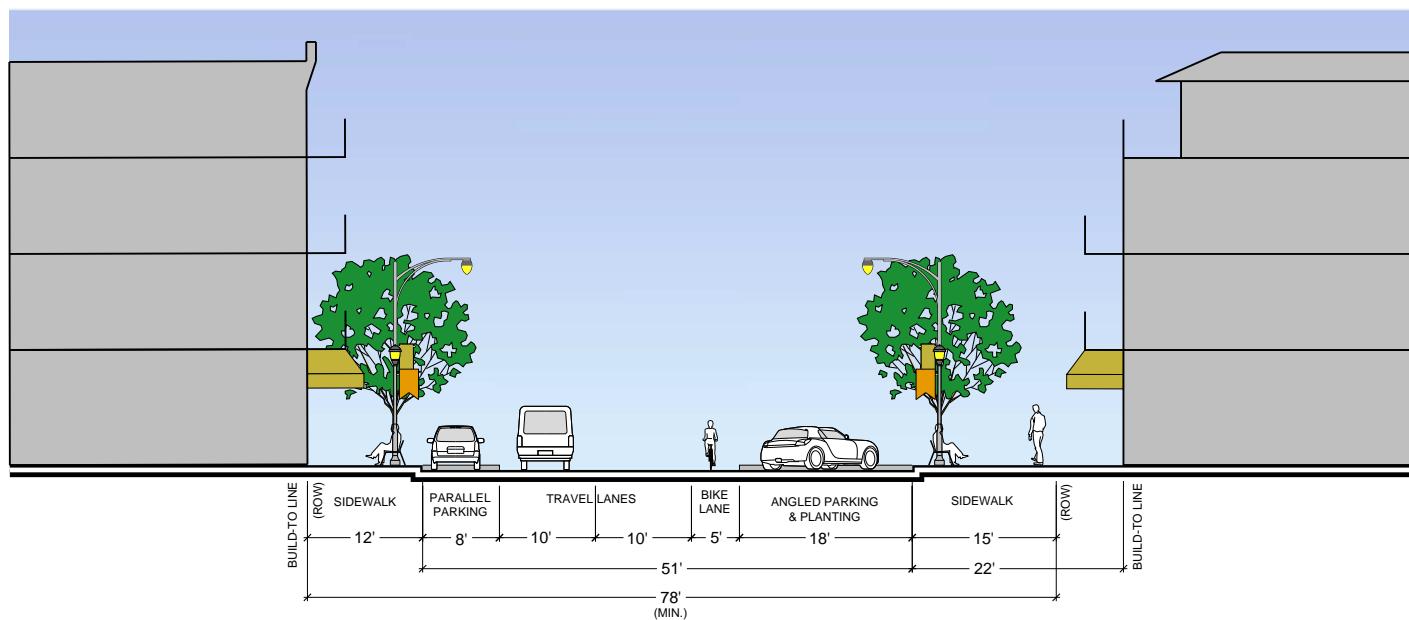


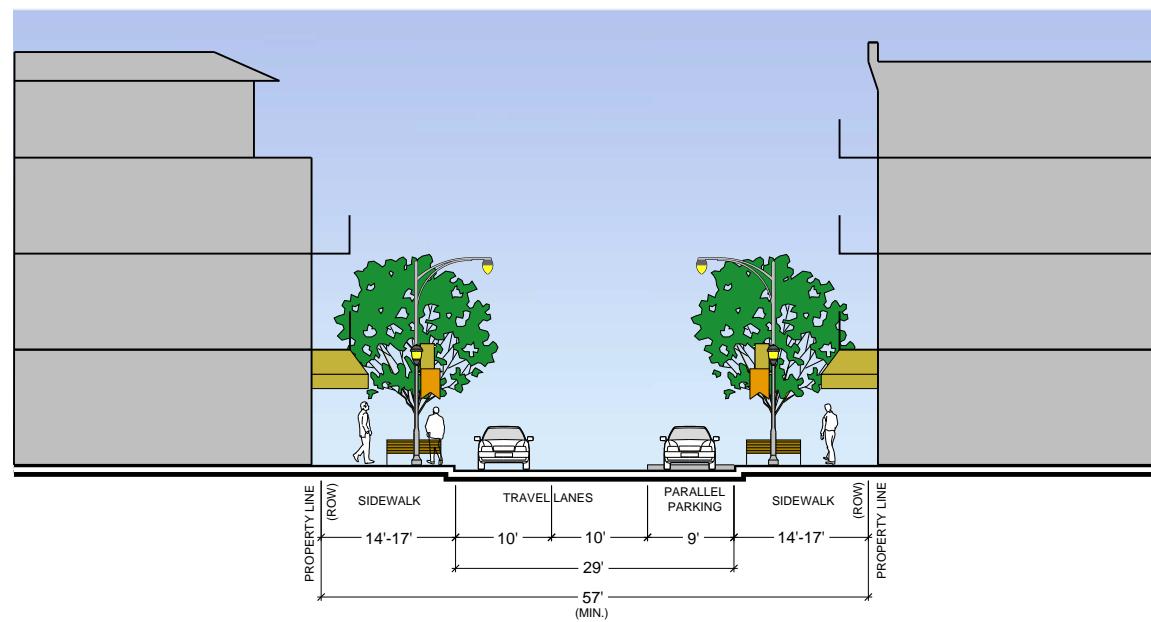
FIGURE 2  
ELM STREET 3 - (VIEW TO SOUTH)  
PECAN TO OAK



**FIGURE 2**  
**ELM STREET 4 - (VIEW TO SOUTH)**  
**MCKINNEY TO PECAN**



**FIGURE 2**  
**HICKORY STREET 1**  
CARROLL TO CEDAR (EXCEPT JUST WEST OF CEDAR)



**FIGURE 2**  
**HICKORY STREET 2**  
AUSTIN TO INDUSTRIAL, INDUSTRIAL TO BELL

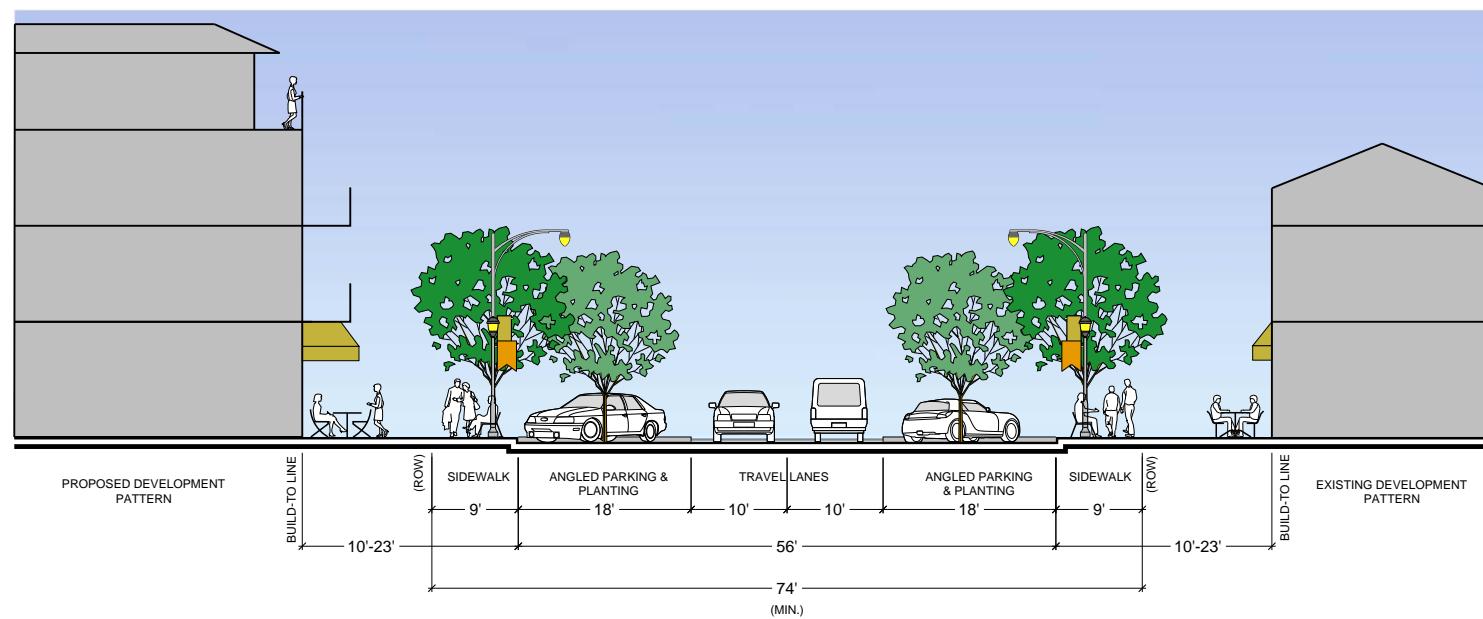
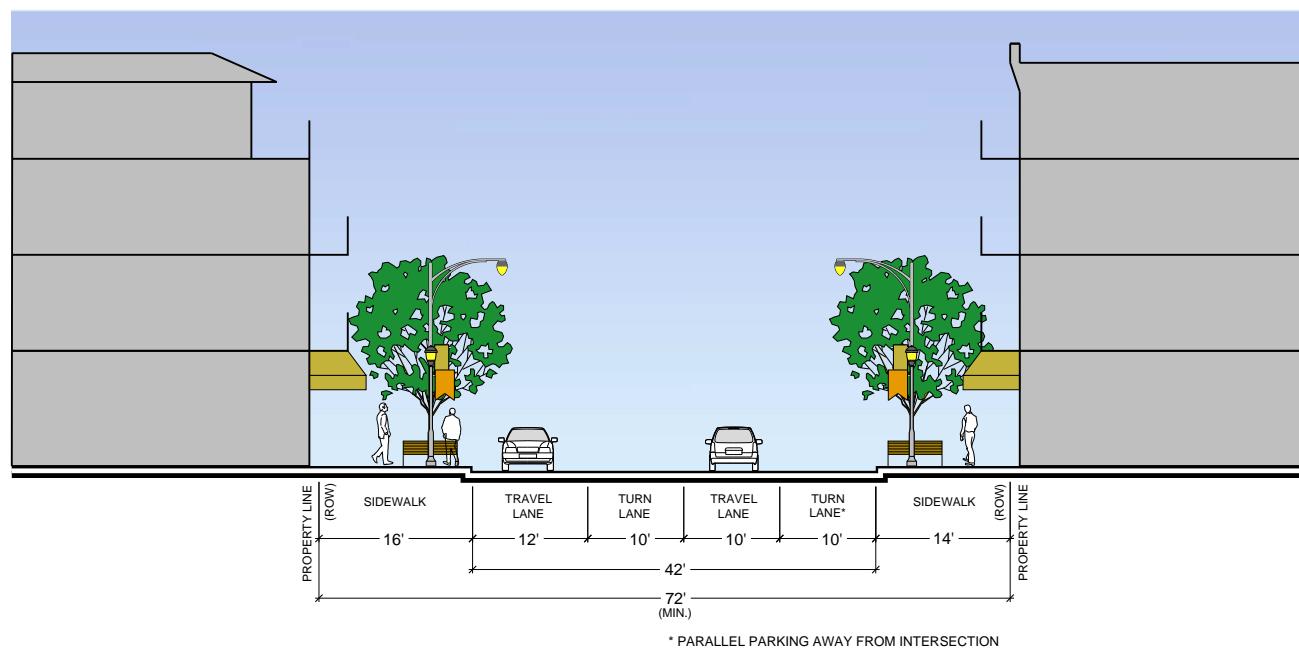


FIGURE 2  
HICKORY STREET 3  
BELL TO WEST OF RAILROAD TRACKS



**FIGURE 2**  
**HICKORY STREET 4**  
**CEDAR TO ELM, CARROLL TO CEDAR (JUST WEST OF CEDAR)**

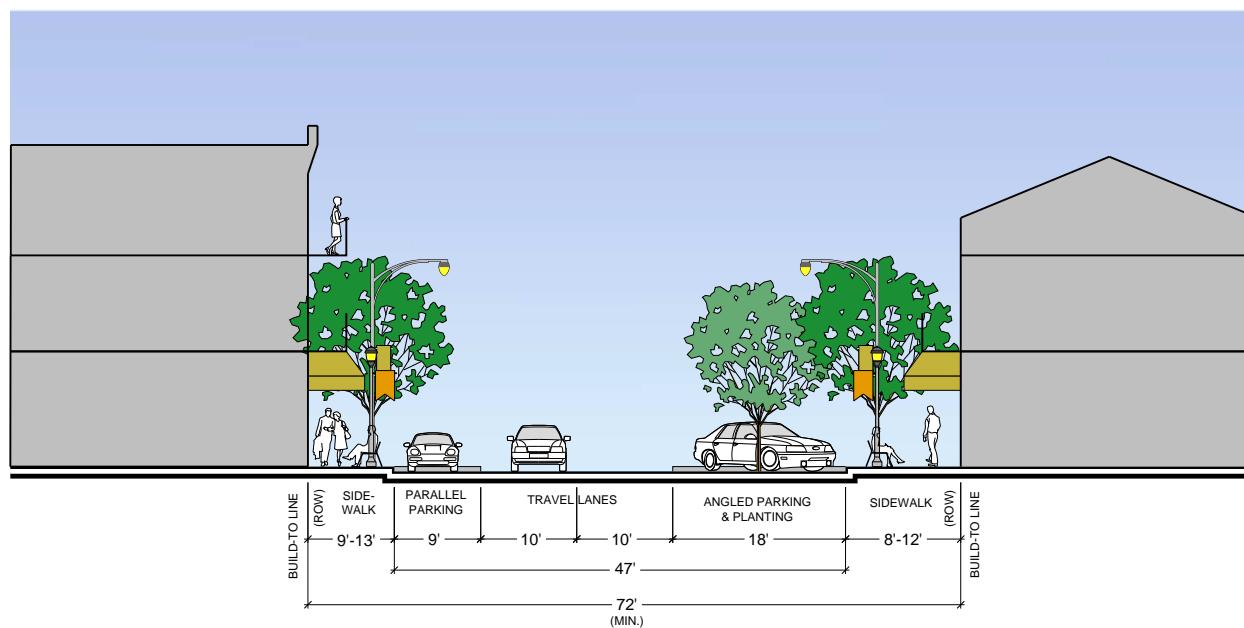
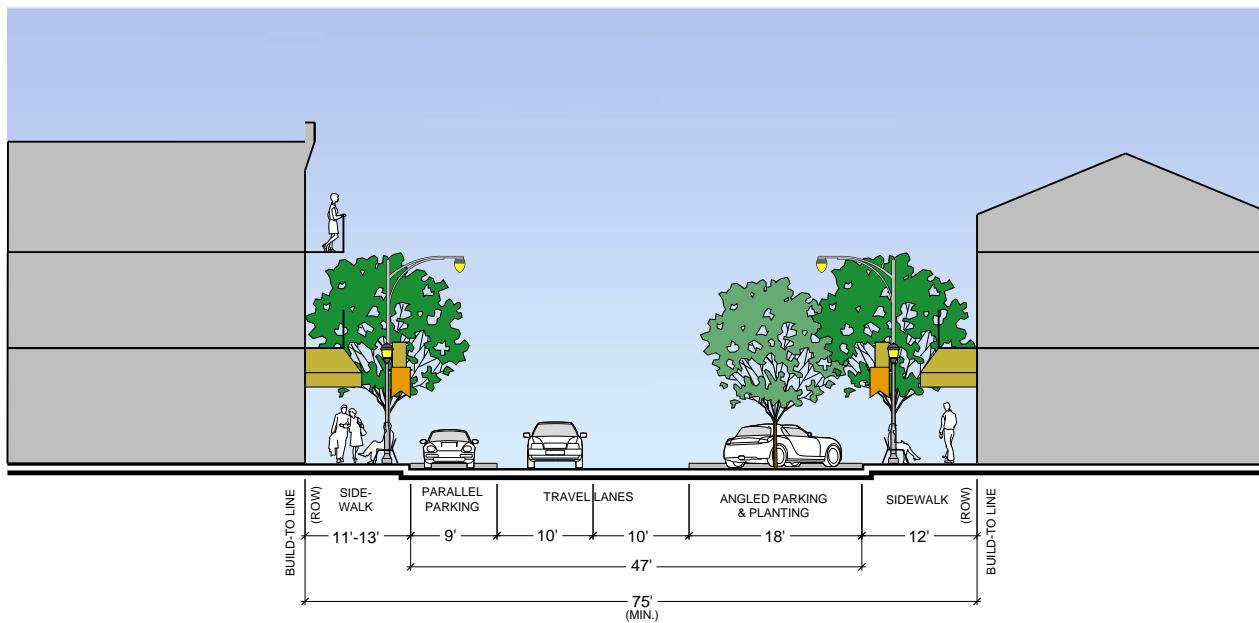
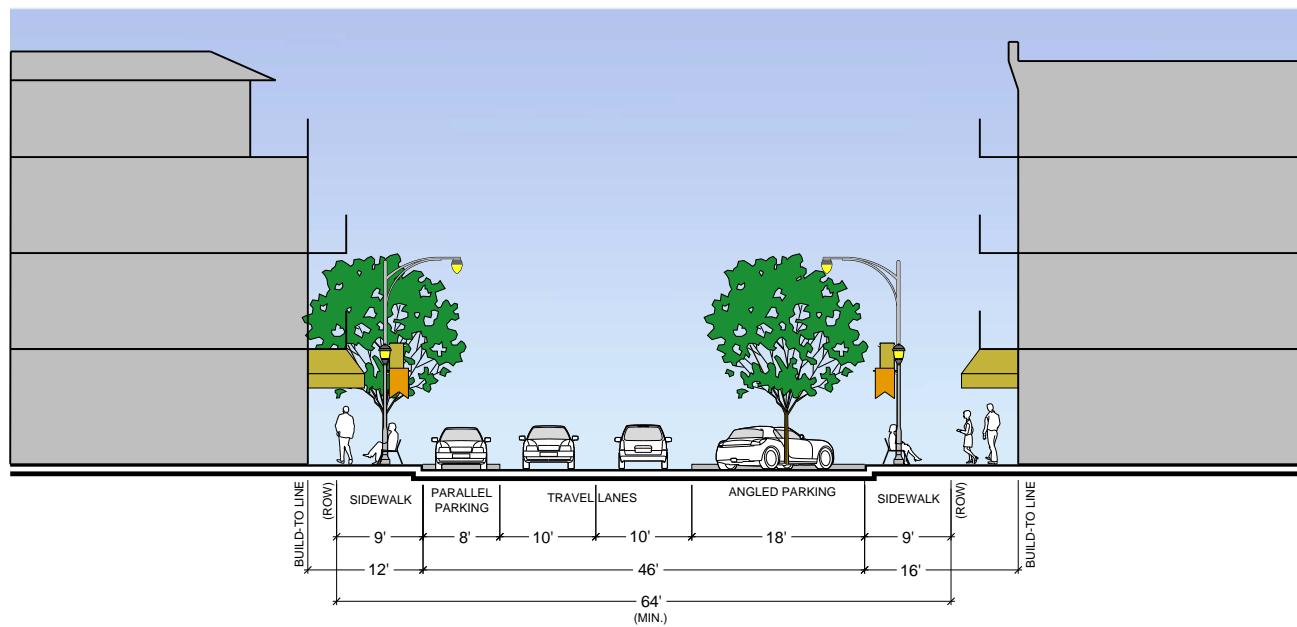


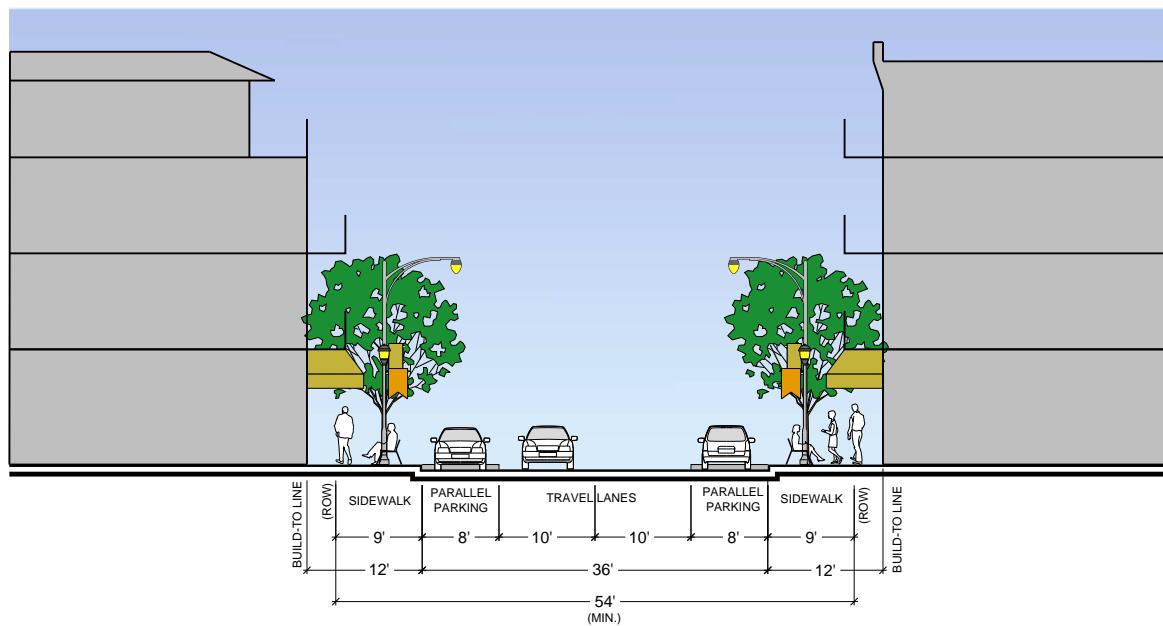
FIGURE 2  
HICKORY STREET 5 - (VIEW TO EAST)  
LOCUST TO AUSTIN



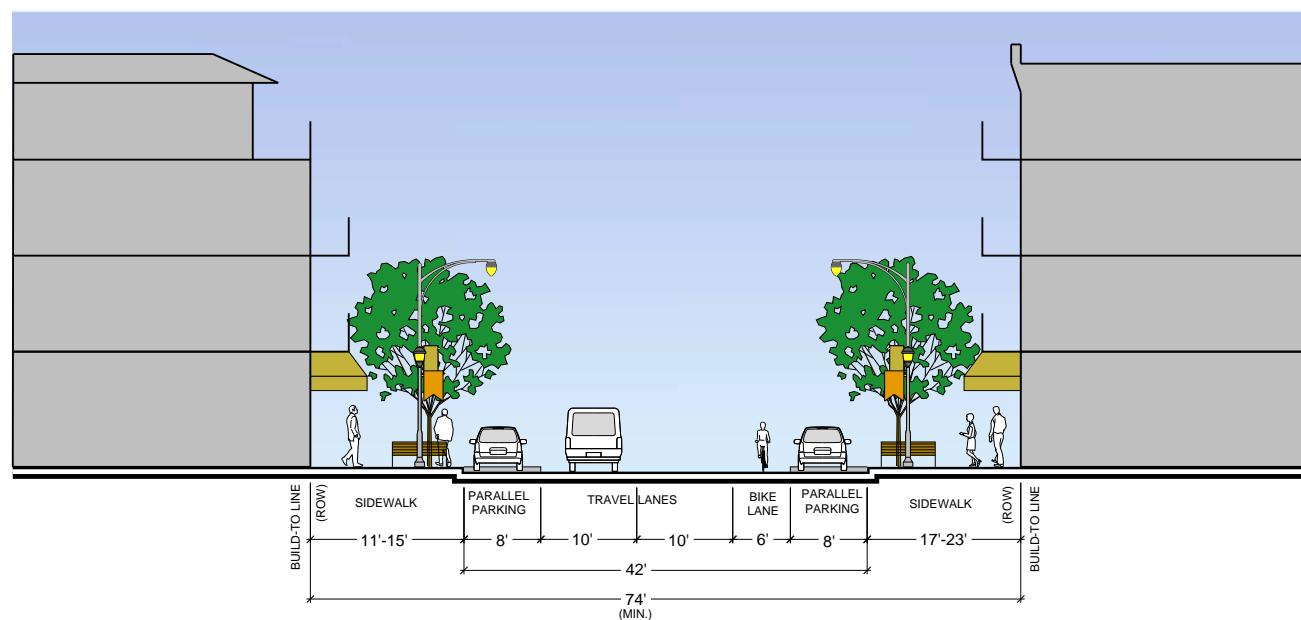
**FIGURE 2**  
**INDUSTRIAL STREET 1**  
**MULBERRY TO HICKORY**



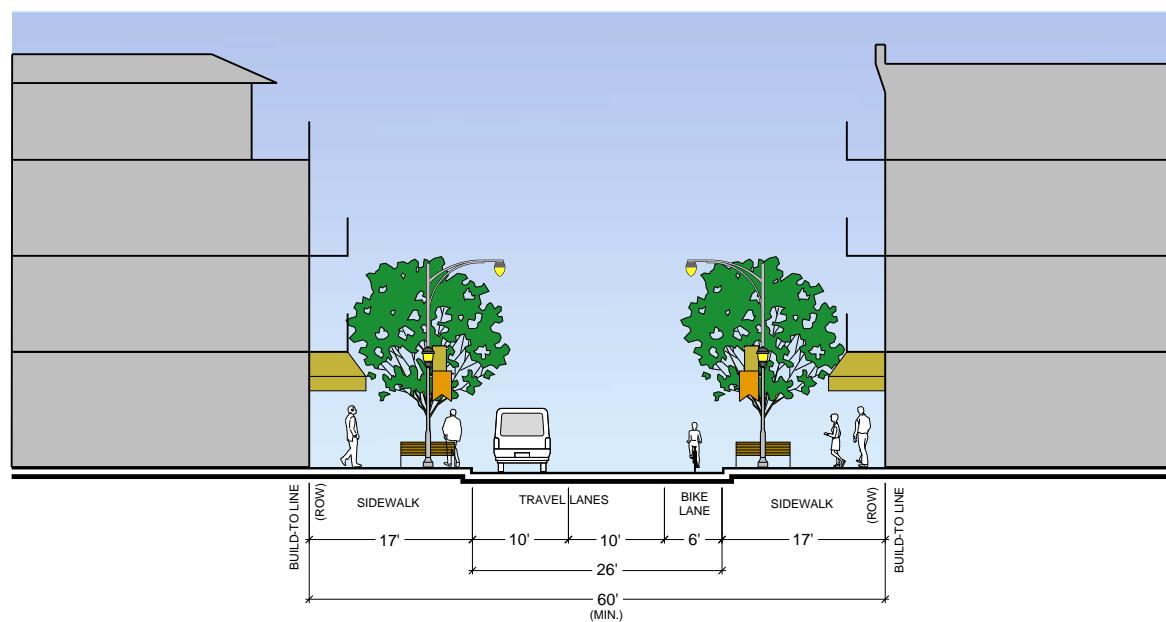
**FIGURE 2**  
**INDUSTRIAL STREET 2**  
**SYCAMORE TO MULBERRY**



**FIGURE 2**  
**LOCUST STREET 1 - (VIEW TO NORTH)**  
**SYCAMORE TO WALNUT, PECAN TO MCKINNEY**



**FIGURE 2**  
**LOCUST STREET 2 - (VIEW TO NORTH)**  
**MCKINNEY TO PARKWAY**



**FIGURE 2**  
**LOCUST STREET 3**  
**WALNUT TO HICKORY, OAK TO PECAN**

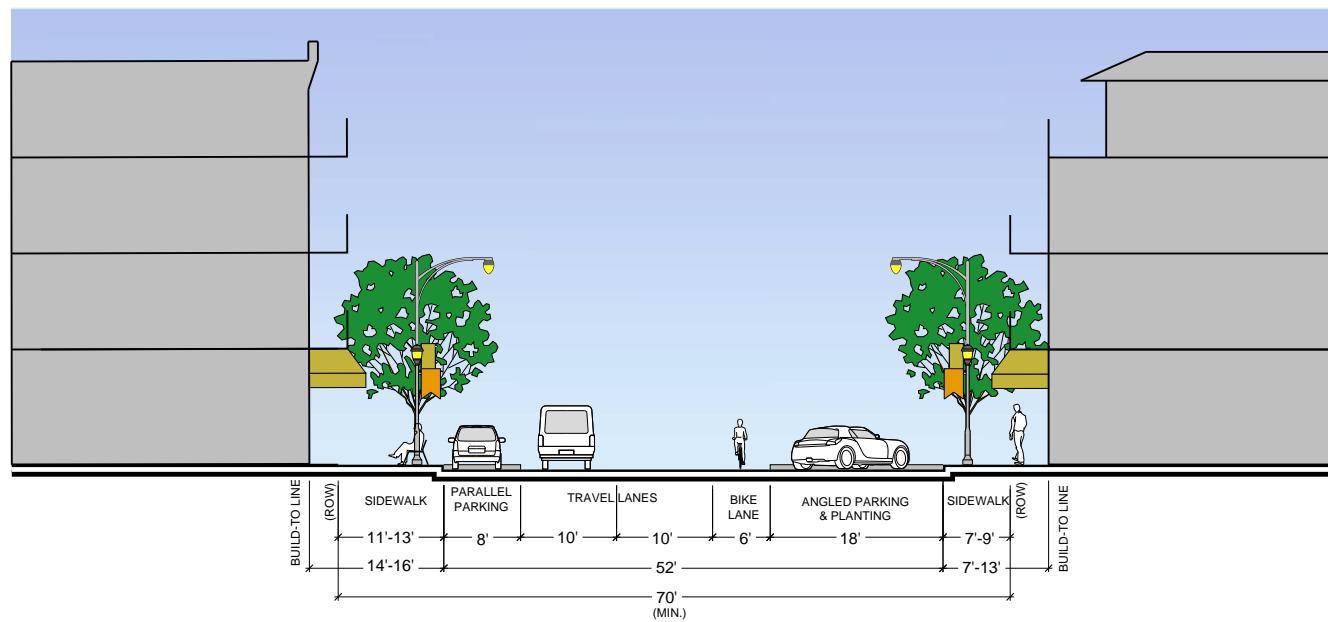


FIGURE 2  
MULBERRY STREET 1  
AUSTIN TO INDUSTRIAL (BEYOND CHURCH BUILDING), INDUSTRIAL TO BELL

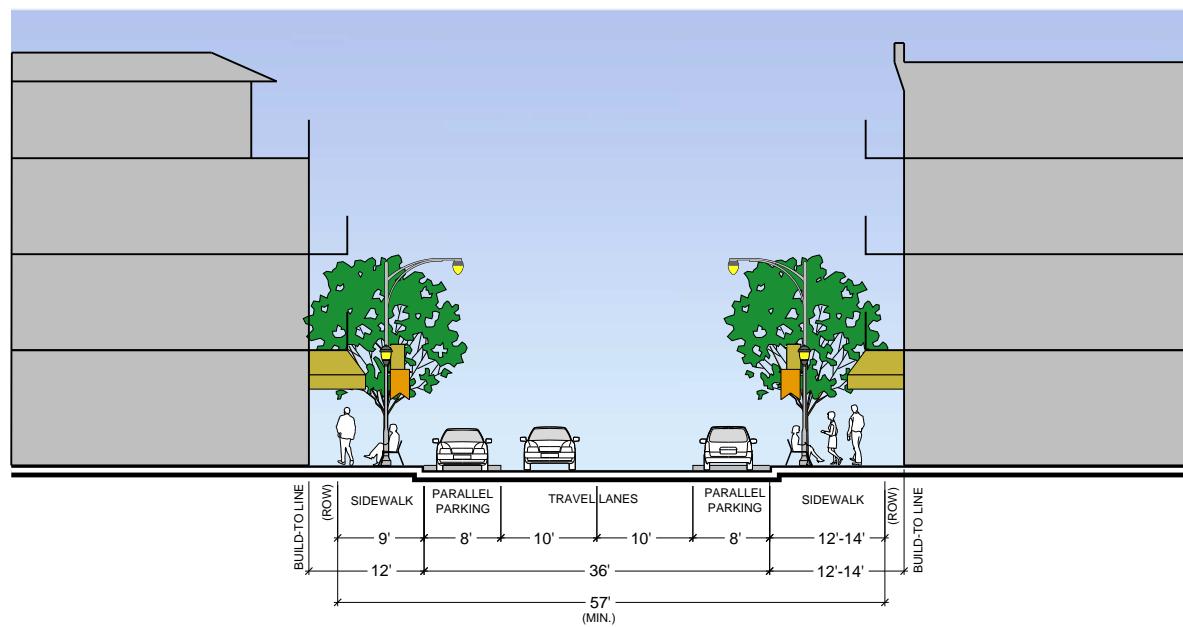
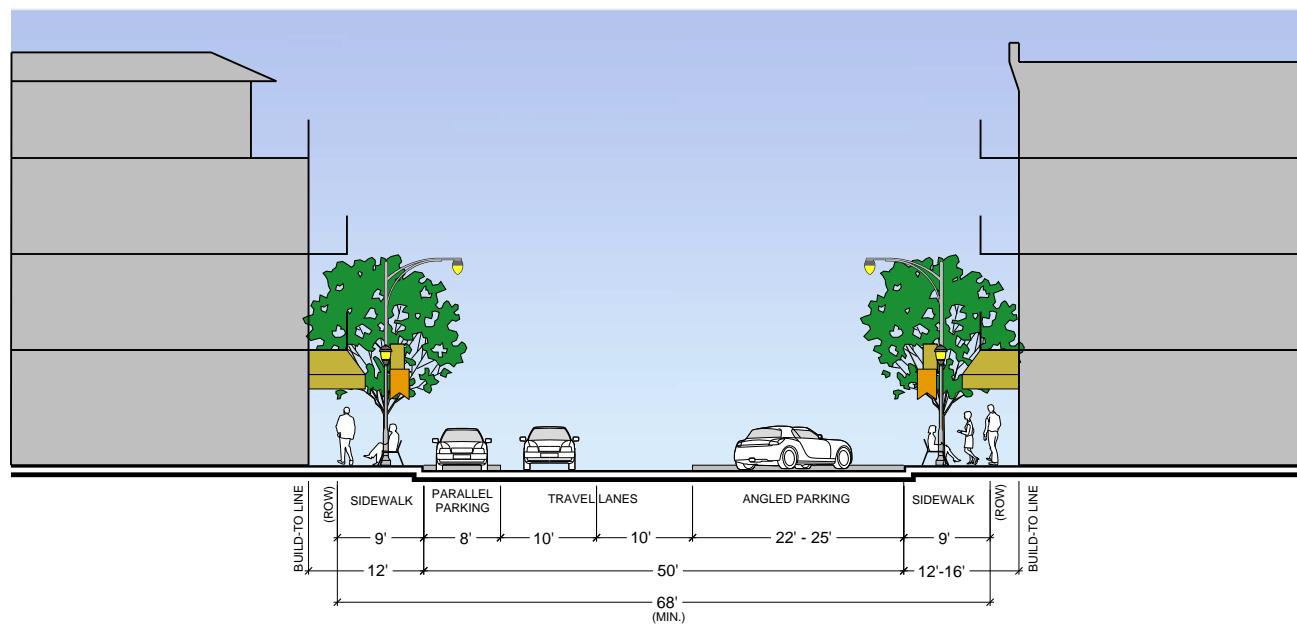
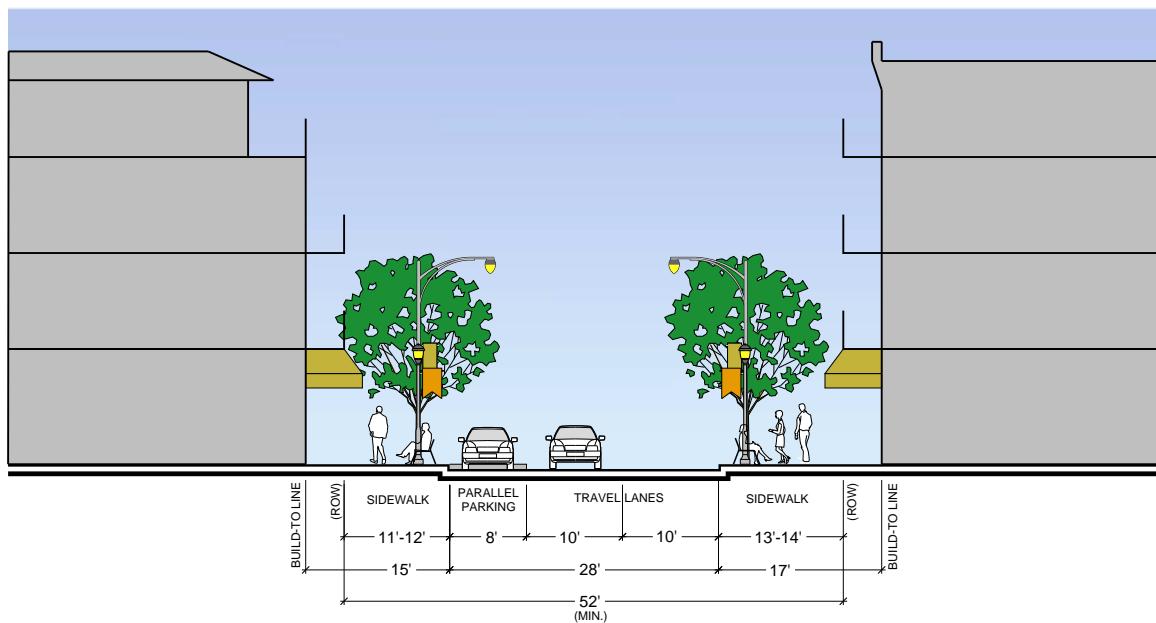


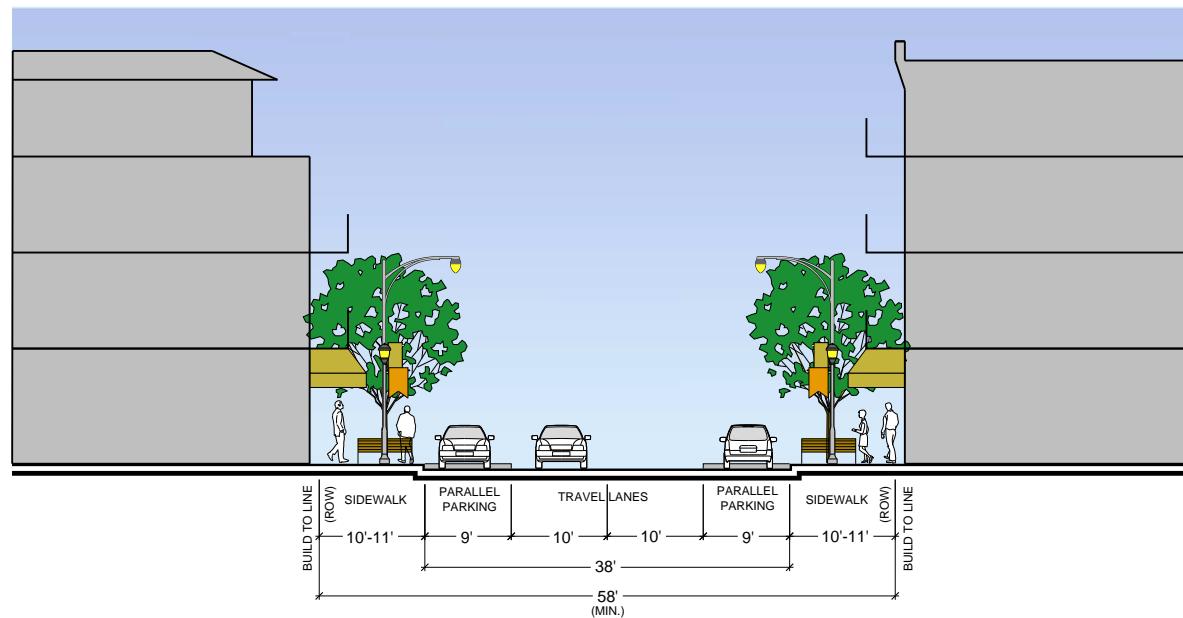
FIGURE 2  
MULBERRY STREET 2  
LOCUST TO EAST OF AUSTIN (AT CHURCH BUILDING)



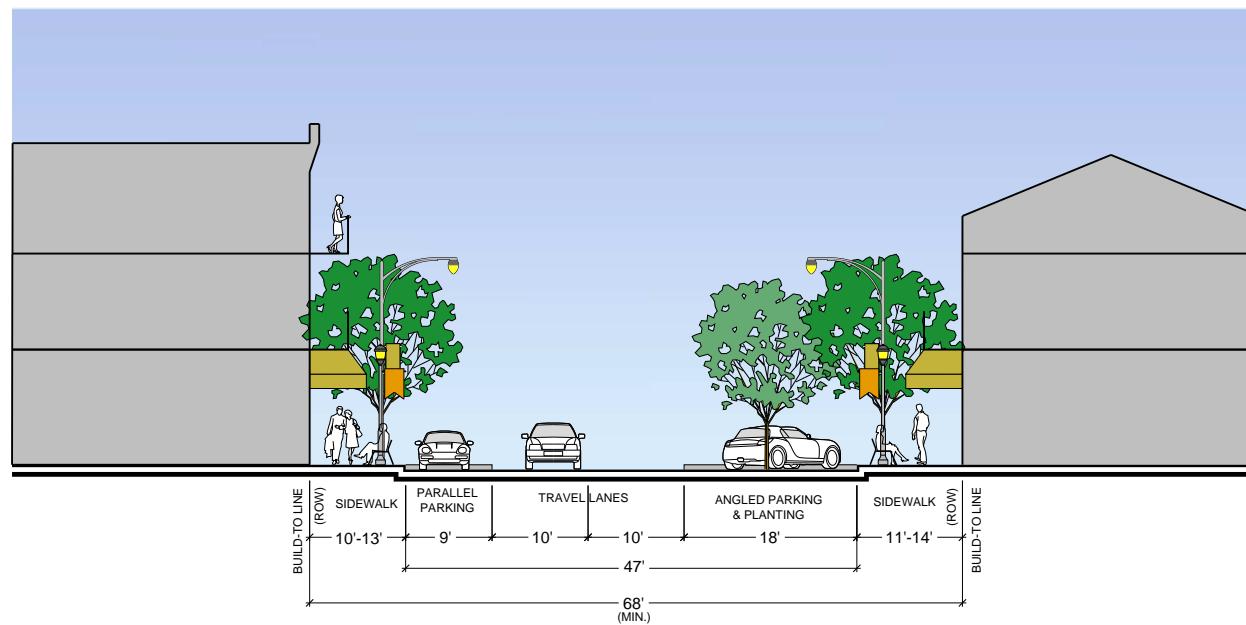
**FIGURE 2**  
**MULBERRY STREET 3**  
**CARROLL TO CEDAR, CEDAR TO ELM, ELM TO LOCUST**



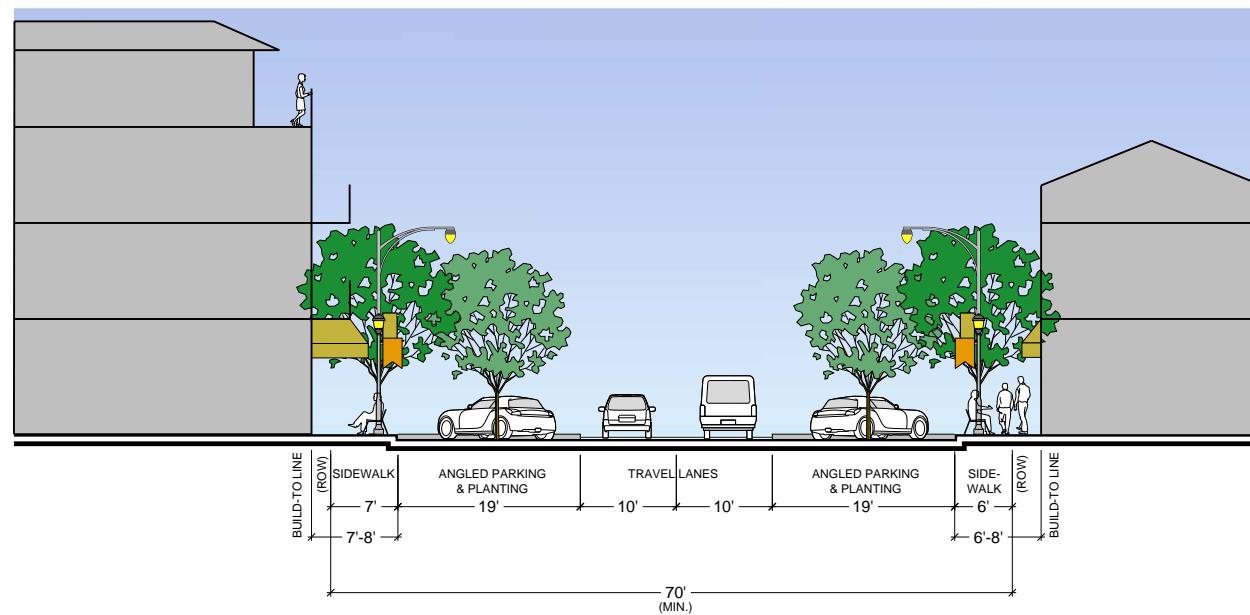
**FIGURE 2**  
**OAK STREET 1**  
**CARROLL TO BOLIVAR**



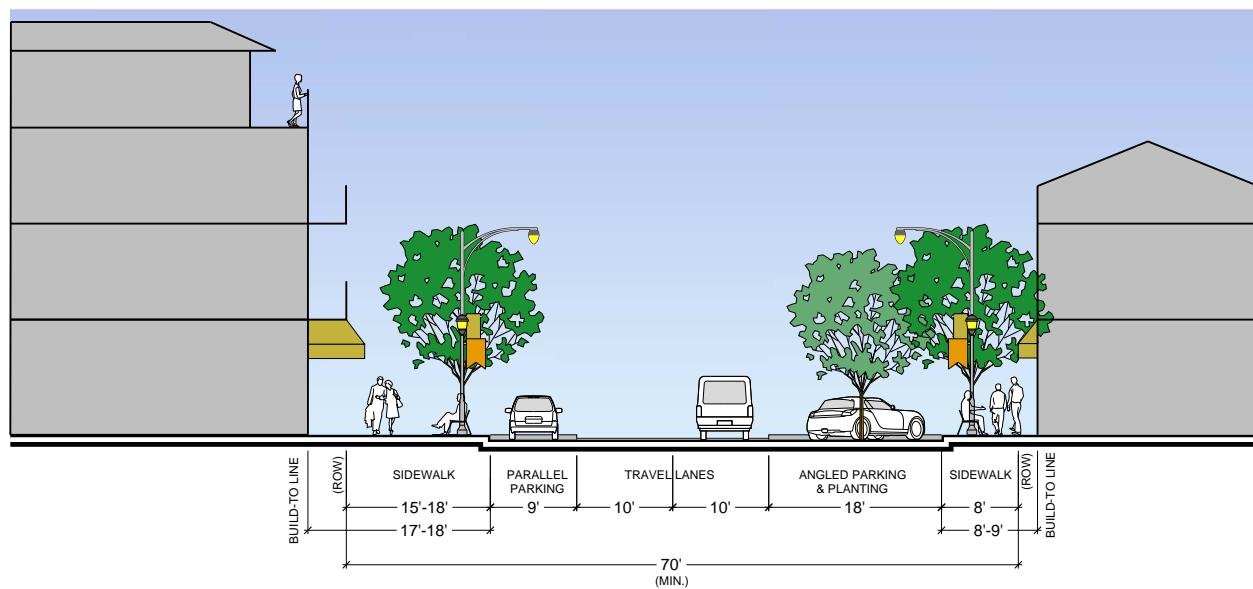
**FIGURE 2**  
**OAK STREET 2**  
AUSTIN TO OAKLAND, OAKLAND TO BELL



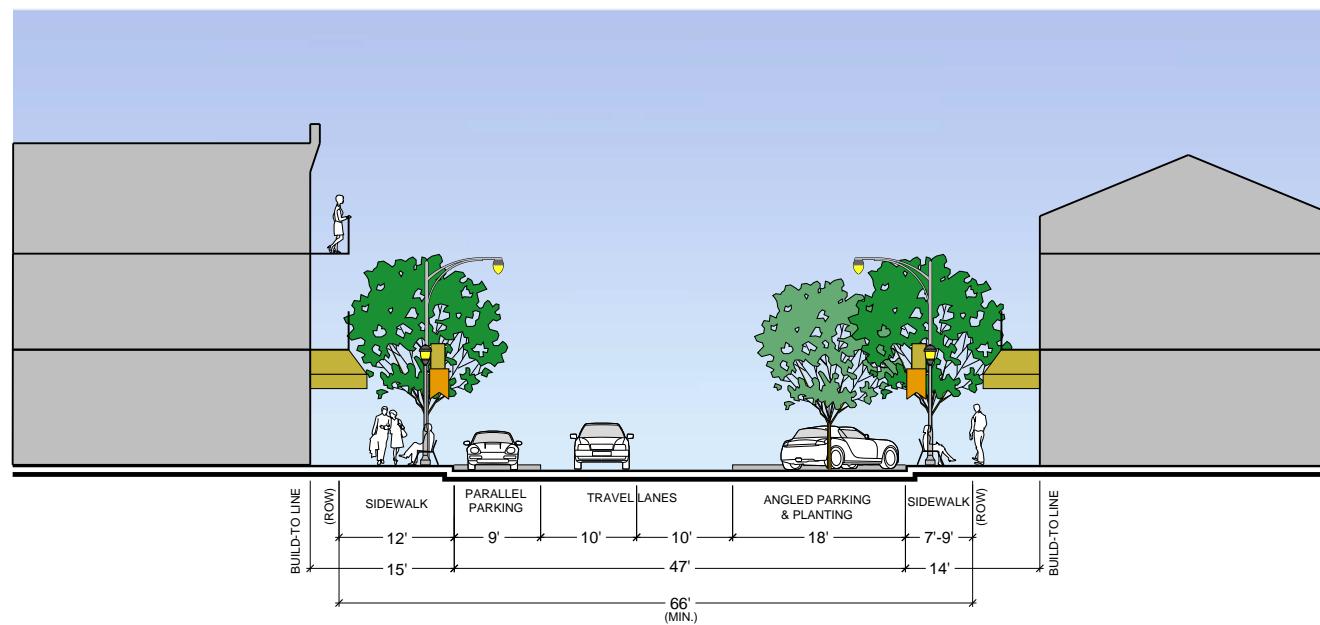
**FIGURE 2**  
**OAK STREET 3 (VIEW TO WEST)**  
**CEDAR TO ELM (ONE WAY)**



**FIGURE 2**  
**OAK STREET 4 (VIEW TO WEST)**  
**BOLIVAR TO CEDAR (ONE WAY)**



**FIGURE 2**  
**OAK STREET 5**  
**LOCUST TO AUSTIN**



**FIGURE 2**  
**PECAN STREET 1**  
**ELM TO LOCUST, LOCUST TO AUSTIN**

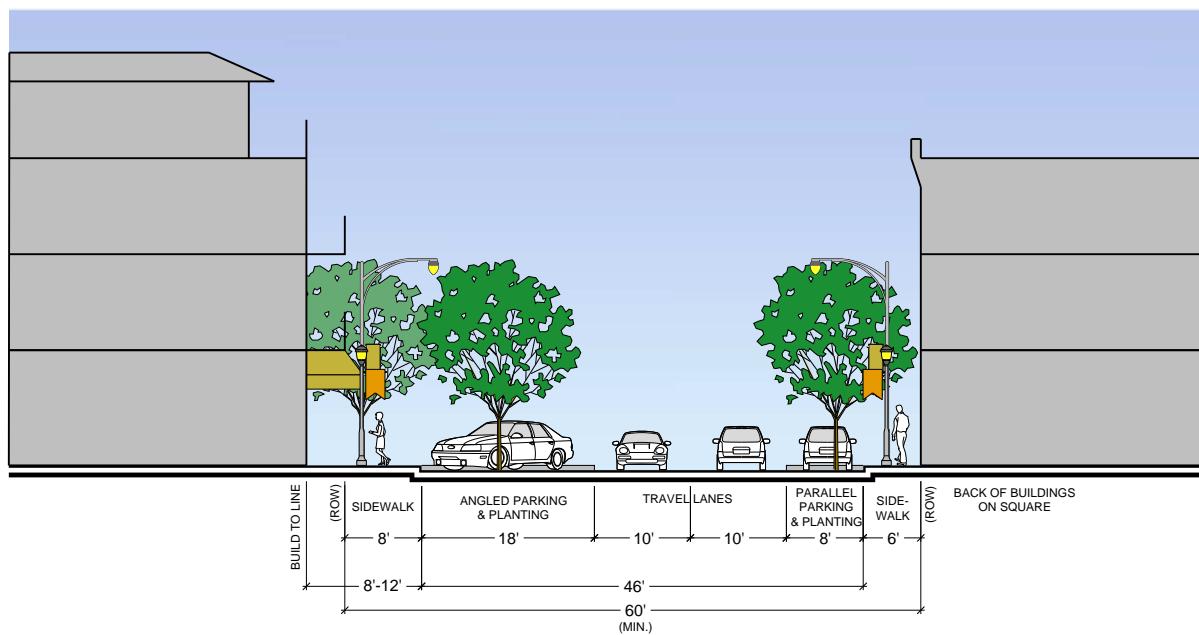
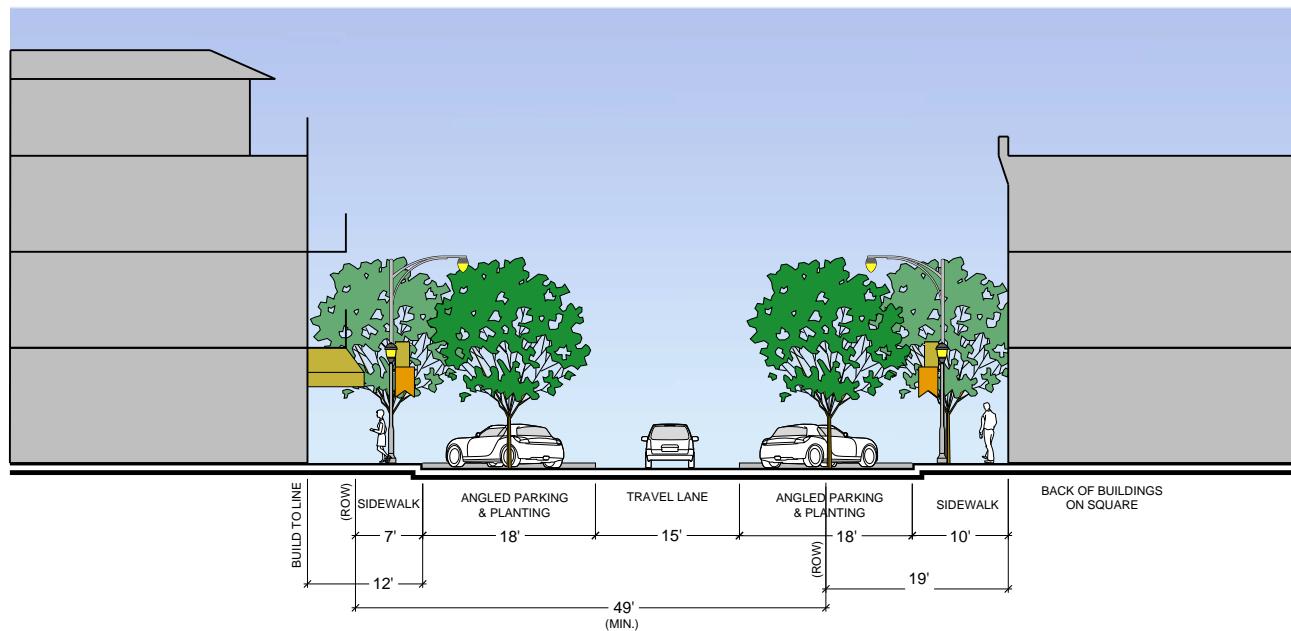


FIGURE 2  
PECAN STREET 2  
CEDAR TO ELM,



**FIGURE 2**  
**SYCAMORE STREET 1**  
**LOCUST TO INDUSTRIAL, CARROLL TO ELM AT WEST OF ELM**

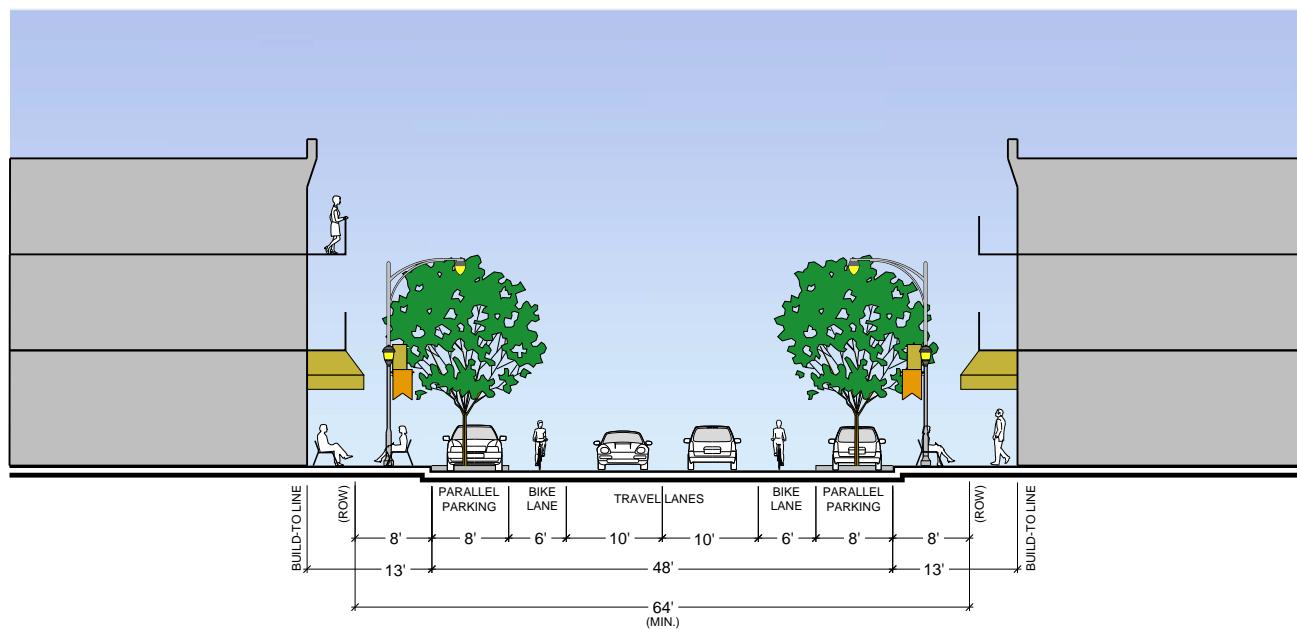


FIGURE 2  
SYCAMORE STREET 2  
ELM TO LOCUST

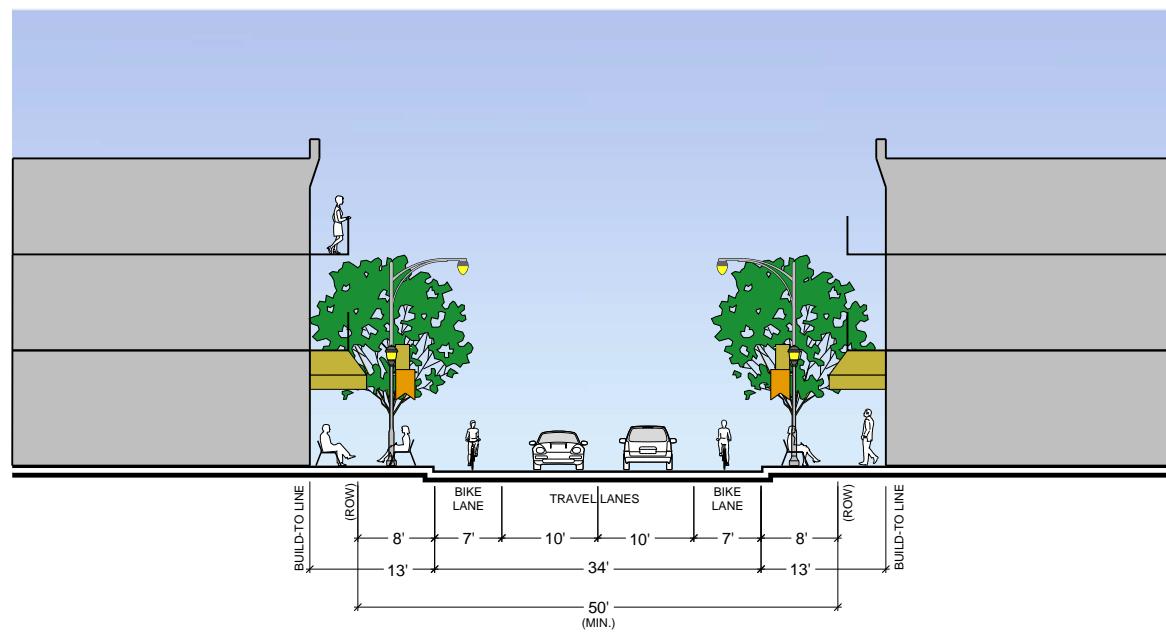
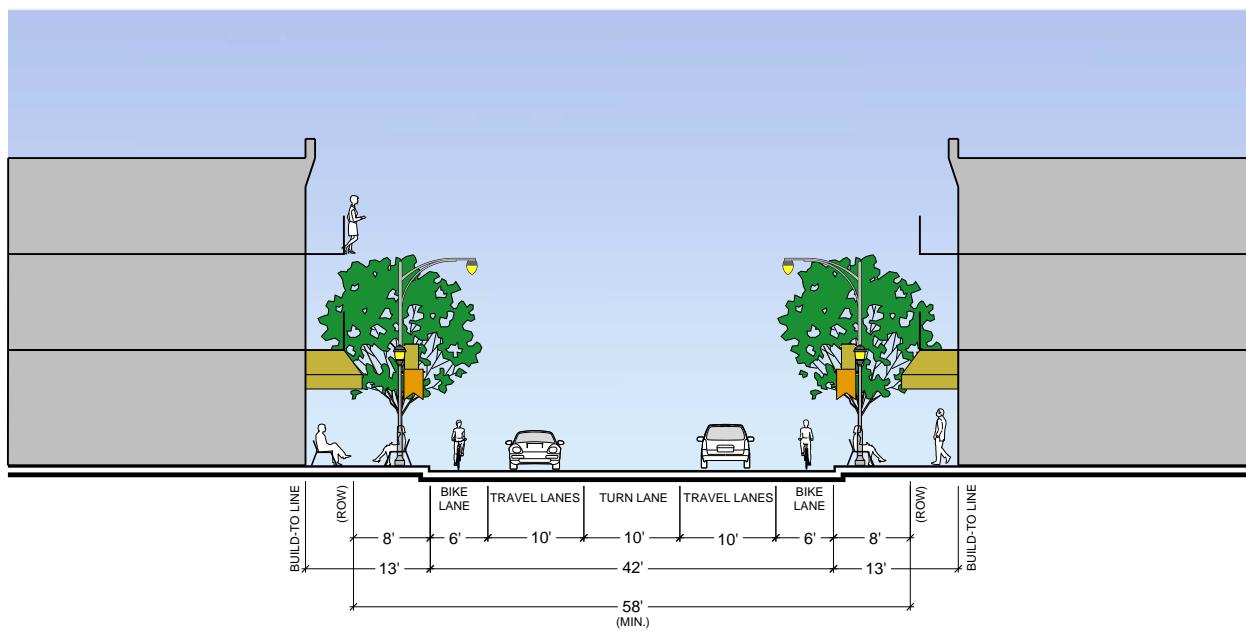
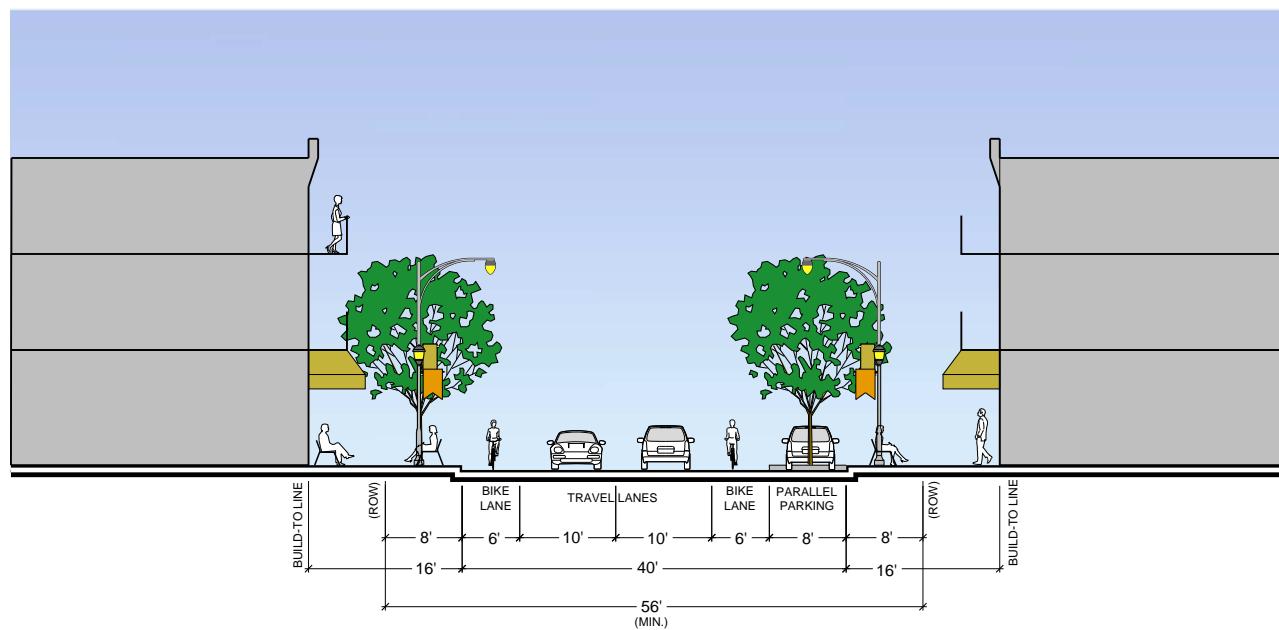


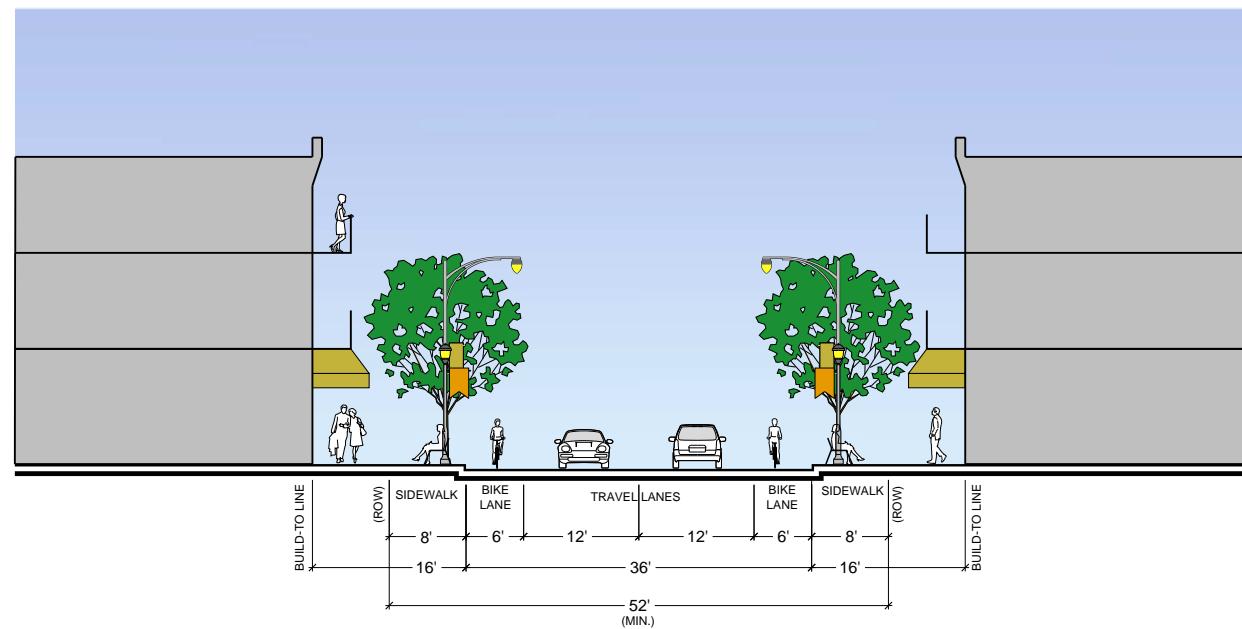
FIGURE 2  
SYCAMORE STREET 3  
CARROLL TO ELM AT EAST OF CARROLL



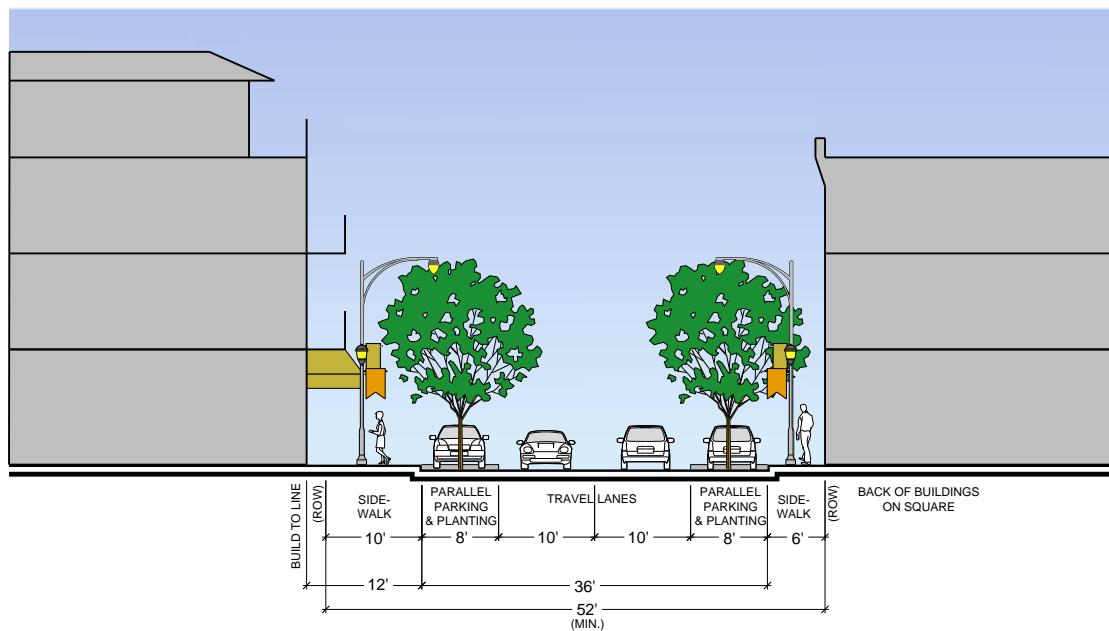
**FIGURE 2**  
**SYCAMORE STREET 4**  
**INDUSTRIAL TO BELL**



**FIGURE 2**  
**SYCAMORE STREET 5 - (VIEW TO WEST)**  
**BELL TO DCTA STATION**



**FIGURE 2**  
**WALNUT STREET 1**  
**ELM TO LOCUST**



**FIGURE 2**  
**WALNUT STREET 2 - (VIEW TO WEST)**  
**LOCUST TO AUSTIN**

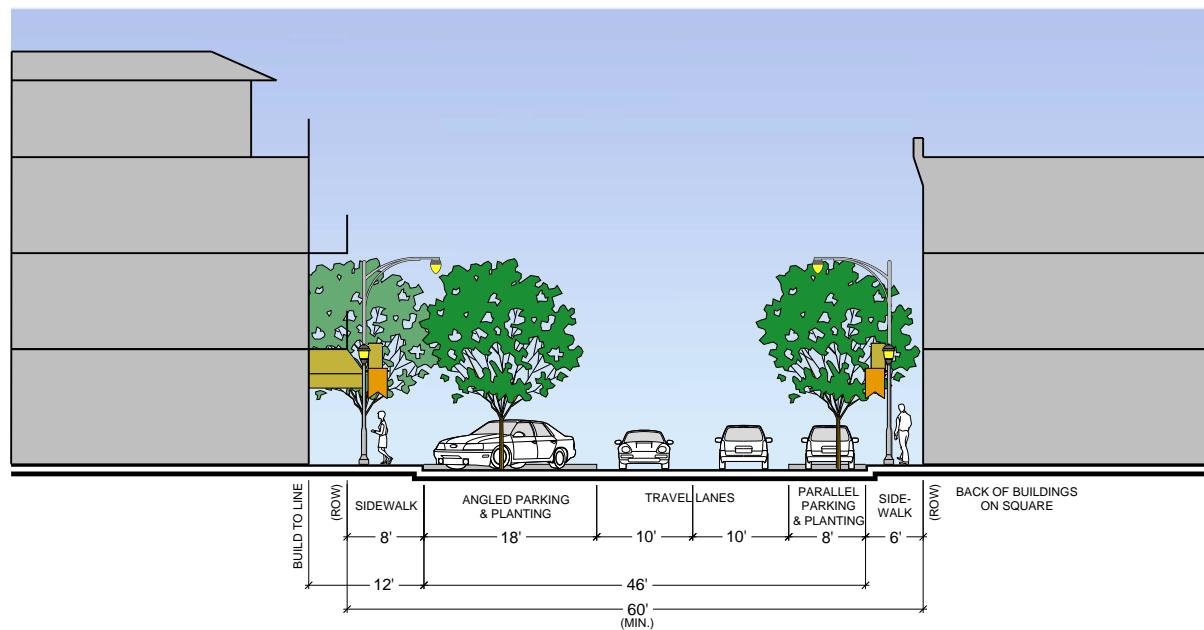
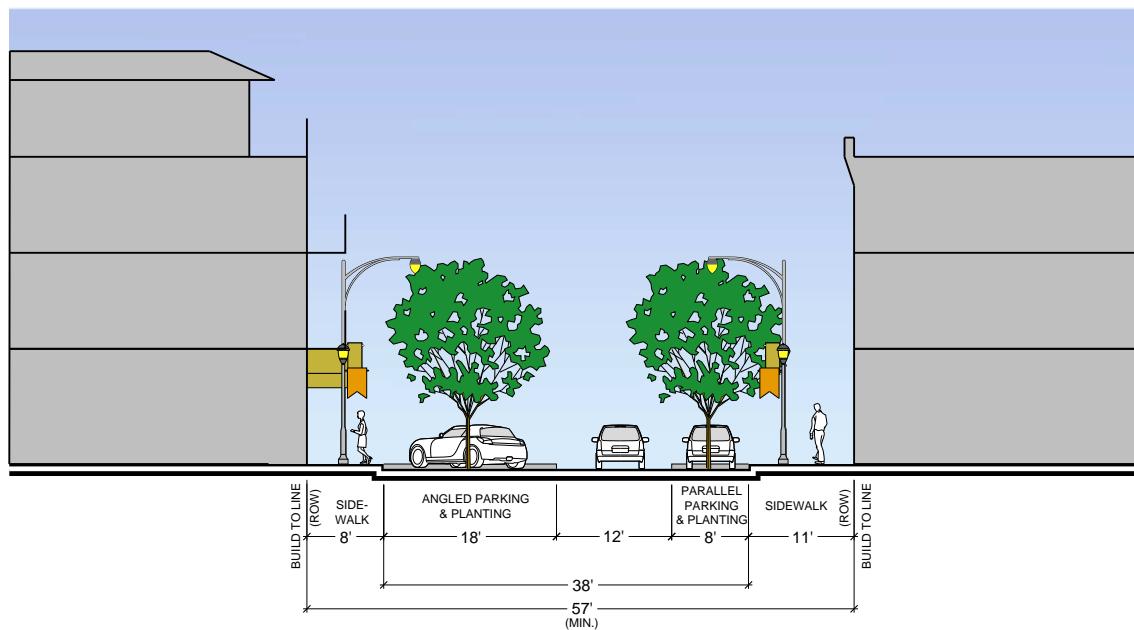
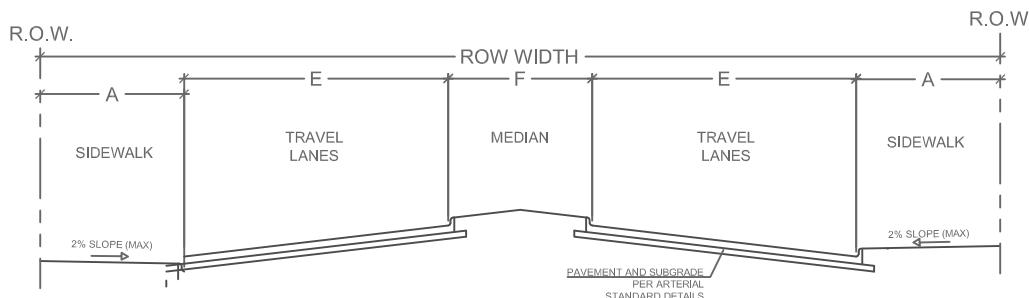


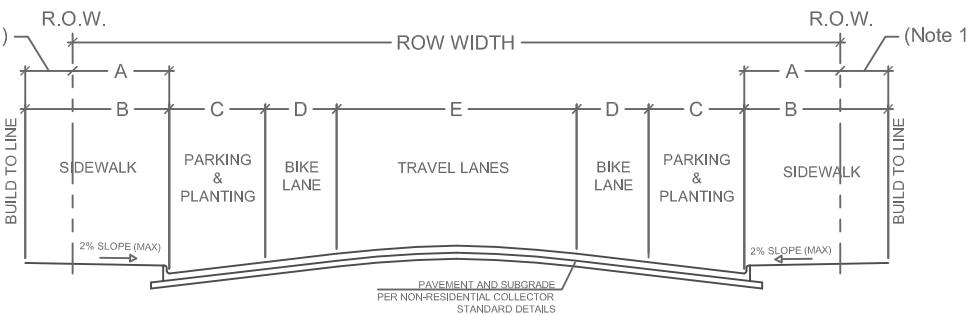
FIGURE 2  
WALNUT STREET 3 - (VIEW TO EAST)  
CEDAR TO ELM



## DOWNTOWN DIVIDED STREET SECTION



## DOWNTOWN UNDIVIDED STREET SECTION



STREET NAME	FROM	TO	A (SIDEWALK WITHIN ROW)				B (SIDEWALK)				C (PARKING & PLANTING)				D (BIKE LANE)				E (TRAVEL LANES)		F (MEDIAN) IF DIVIDED	ROW (min)	
			North	South	East	West	North	South	East	West	North	South	East	West	North	South	East	West	Width	# LANES			
AUSTIN	McKINNEY	PECAN	-	-	8'	6'	-	-	12'	6'	-	-	8'	8'	-	-	-	-	20'	2	-	50'	
	PECAN	OAK	-	-	8'	6'	-	-	8'-12'	8'-10'	-	-	18'	8'	-	-	-	-	20'	2	-	60'	
	OAK	HICKORY	-	-	8'	6'	-	-	8'-12'	8'-10'	-	-	18'	8'	-	-	-	-	20'	2	-	60'	
	HICKORY	MULBERRY	-	-	8'	6'	-	-	8'-12'	8'-10'	-	-	18'	8'	-	-	-	-	20'	2	-	60'	
	BELL	McKINNEY	SYCAMORE	-	-	12'	12'	-	-	12'	12'	-	-	-	-	-	-	-	22'	2	12'	80'	
ELM	BOLIVAR	McKINNEY	OAK	-	-	9'	8'	-	-	9'	8'	-	-	-	-	-	-	-	27'	2	-	50'	
	CARROLL	McKINNEY	SYCAMORE	-	-	12'	10'	-	-	12'	12'	-	-	-	-	-	-	-	33'	3	13'	102'	
	PARKWAY	McKINNEY	-	-	16'	17'	-	-	16'	17'	-	-	7'	7'	-	-	-	-	6'	20'	2	-	73'
	McKINNEY	PECAN	-	-	12'	15'	-	-	12'	22'	-	-	8'	18'	-	-	-	-	5'	20'	2	-	78'
	PECAN	OAK	-	-	12'	6'	-	-	12'	8'	-	-	8'	18'	-	-	-	-	5'	20'	2	-	69'
EXPOSITION	OAK	HICKORY	-	-	EXISTING	EXISTING	-	-	EXISTING	EXISTING	-	-	EXISTING	EXISTING	-	-	-	-	EXISTING	EXISTING	-	EXISTING	-
	HICKORY	WALNUT	-	-	11'	11'	-	-	14'	17'	-	-	8'	8'	-	-	-	-	6'	20'	2	-	64'
	WALNUT	SYCAMORE	-	-	16'	17'	-	-	16'	17'	-	-	7'	7'	-	-	-	-	6'	20'	2	-	73'
	HICKORY	SYCAMORE	-	-	14'	10'	-	-	14'	10'	-	-	-	-	-	-	-	-	27'	2	-	45'	
	CARROLL	JUST WEST OF CEDAR	14'	14'	-	-	14'-17'	14'-17'	-	-	9'	-	-	-	-	-	-	-	20'	2	-	57'	
HICKORY	JUST WEST OF CEDAR	CEDAR	9'	8'	-	-	9'-13'	8'-12'	-	-	9'	18'	-	-	-	-	-	-	20'	2	-	72'	
	CEDAR	ELM	9'	8'	-	-	9'-13'	8'-12'	-	-	9'	18'	-	-	-	-	-	-	20'	2	-	72'	
	ELM	LOCUST	EXISTING	EXISTING	-	-	EXISTING	EXISTING	-	-	EXISTING	EXISTING	-	-	-	-	-	-	EXISTING	EXISTING	-	EXISTING	-
	LOCUST	AUSTIN	11'	12'	-	-	11'-13'	12'	-	-	9'	18'	-	-	-	-	-	-	20'	2	-	75'	
	AUSTIN	INDUSTRIAL	9'	9'	-	-	10'-23'	10'-23'	-	-	18'	18'	-	-	-	-	-	-	20'	2	-	74'	
INDUSTRIAL	INDUSTRIAL	BELL	9'	9'	-	-	10'-23'	10'-23'	-	-	18'	18'	-	-	-	-	-	-	20'	2	-	74'	
	BELL	RAILROAD AVE	14'	16'	-	-	14'	16'	-	-	18'	18'	-	-	-	-	-	-	24'-42'	NOTE 2	-	72'	
	RAILROAD AVE	EXPOSITION	23'	15'	-	-	23'	15'	-	-	9'	9'	-	-	-	-	-	-	24'	2	-	80'	
	HICKORY	MULBERRY	-	-	9'	9'	-	-	16'	12'	-	-	18'	8'	-	-	-	-	20'	2	-	64'	
	MULBERRY	SYCAMORE	-	-	9'	9'	-	-	12'	12'	-	-	8'	8'	-	-	-	-	20'	2	-	54'	
LOCUST	PARKWAY	McKINNEY	-	-	17'	17'	-	-	17'	17'	-	-	8'	8'	-	-	-	-	6'	20'	2	-	60'
	McKINNEY	PECAN	-	-	17'	11'	-	-	17'-23'	11'-15'	-	-	8'	8'	-	-	-	-	6'	20'	2	-	74'
	PECAN	OAK	-	-	7'	14'	-	-	7'-13'	14'-16'	-	-	18'	8'	-	-	-	-	6'	20'	2	-	70'
	OAK	HICKORY	-	-	EXISTING	EXISTING	-	-	EXISTING	EXISTING	-	-	EXISTING	EXISTING	-	-	-	-	EXISTING	EXISTING	-	EXISTING	-
	HICKORY	WALNUT	-	-	7'	14'	-	-	7'-13'	14'-16'	-	-	18'	8'	-	-	-	-	6'	20'	2	-	70'
McKINNEY	CARROLL	BOLIVAR	8'	8'	-	-	8'	8'	-	-	17'-23'	11'-15'	-	-	8'	8'	-	-	15'	1	12'	60'	
	BOLIVAR	LOCUST	8'	8'	-	-	8'	8'	-	-	8'	8'	-	-	8'	8'	-	-	44'	4	-	48'-60'	
	LOCUST	AUSTIN	8'	8'	-	-	8'	8'	-	-	8'	8'	-	-	8'	8'	-	-	55'	5	-	70'	
	AUSTIN	BELL	8'	8'	-	-	8'	8'	-	-	8'	8'	-	-	8'	8'	-	-	22'	2	12'	62'	
	CARROLL	CEDAR	8'	8'	-	-	10'	10'	-	-	8'	8'	-	-	8'	8'	-	-	20'	2	-	52'	
MULBERRY	CEDAR	ELM	13'	11'	-	-	17'	15'	-	-	8'	8'	-	-	8'	8'	-	-	20'	2	-	52'	
	ELM	LOCUST	13'	11'	-	-	17'	15'	-	-	8'	8'	-	-	8'	8'	-	-	20'	2	-	52'	
	LOCUST	EAST OF AUSTIN (AT CHURCH BLDG)	9'	9'	-	-	12'	12'-16'	-	-	8'	22'-25'	-	-	8'	8'	-	-	20'	2	-	68'	
	EAST OF AUSTIN (AT CHURCH BLDG)	INDUSTRIAL	9'	12'	-	-	12'	12'-14'	-	-	8'	8'	-	-	8'	8'	-	-	20'	2	-	57'	
	INDUSTRIAL	BELL	9'	12'	-	-	12'	12'-14'	-	-	8'	8'	-	-	8'	8'	-	-	20'	2	-	57'	
OAK	CARROLL	BOLIVAR	10'	10'	-	-	10'-11'	10'-11'	-	-	9'	9'	-	-	9'	9'	-	-	20'	2	-	58'	
	BOLIVAR	CEDAR	8'	17'	-	-	8'-9'	17'-18'	-	-	18'	9'	-	-	18'	9'	-	-	20'	2	-	70'	
	CEDAR	ELM	6'	7'	-	-	6'-8'	7'-8'	-	-	19'	19'	-	-	19'	19'	-	-	20'	2	-	70'	
	ELM	LOCUST	EXISTING	EXISTING	-	-	EXIST																