Fort Bend County
Engineering Department

Engineering Design Manual

March 2022 Edition

PREFACE

Presented herein are the design guidelines for Design Consultants and Program Managers that have contracts for the management and design of roads and bridges for the Fort Bend County Mobility Bond Program. These roads will be collectors and major thoroughfares. Therefore, this manual does not address the design of local roads and bridges within subdivisions.

The design process will be a collaborative effort between the Design Consultant (one per project under contract with the County, with sub-consultants under contract with the Design Consultant), the Program Manager (one per Precinct under contract with the County) and County Staff.

Waterlines and sanitary sewers shall be designed in accordance with the latest requirements of the City or MUD that has jurisdiction in the project location.

Any variation from the Mobility Bond Program Design Manual requires prior approval from Fort Bend County Engineering. The Program Manager and Design Consultant are to coordinate and present a design exception memo to the County Staff.

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1 PRELIMINARY DESIGN

1.1 INTRODUCTION

It is within this phase of the engineering contract that the Design Consultant should make a reasonable effort to explore possibilities, conflicts and alternate solutions with corresponding costs.

The preliminary design goals consist of the following nine points:

A. Establish a typical cross section and cross sections in non-standard areas

B. Determine drainage system needs (drainage report and/or preliminary roadway drainage design)

C. Positively determine right-of-way acquisition needs

D. Determine potential conflicts with existing facilities

E. Identify critical path items

F. Identify problem areas and potential resolution(s)

G. Determine permit and regulatory requirements

H. Prepare a reasonable construction cost estimate

I. Identify impacts to pipelines by locating the drainage high point at pipeline intersections.

J. Prepare 30 percent plan set, consisting of all existing features (seen and unseen) shown in plan and profile, and proposed improvements in plan only with minor annotation.

1.2 PRELIMINARY ENGINEERING REPORT

A Preliminary Engineering Report (PER) will be prepared for preliminary design, and the purpose of the report is to document the nine goals stated above. A digital copy in Adobe Acrobat format (PDF) of the PER will be required and shall be submitted to the Program Manager. Upon preliminary review and approval of the PER, the Design Consultant and Program Manager will conduct a review meeting to include key Fort Bend County staff. It is intended that all approvals or change requirements are given at this meeting, which shall be reflected in the final PER.

For all new location projects and projects that require major alignment changes, an alignment meeting with Fort Bend County staff is recommended prior to the PER review meeting. The Design Consultant shall conduct the meeting and shall discuss the location of the proposed alignment as well as all pertinent items that have impacts on the alignment. Also, the Design Consultant is to bring a roll plot exhibit to the meeting. The exhibit should include the ultimate configuration (dashed) to confirm that it fits within the proposed ROW. Refer to Chapter 3 – Roadway for ultimate configuration description.
The Preliminary Engineering Report should include, at a minimum, the following sections:

A. Project location and scope of the project

B. Existing Conditions

C. Existing Utilities, including potential conflicts

D. Proposed Roadway Design, highlighting any deviation from applicable design criteria

E. Existing and Proposed Drainage and Detention

F. Proposed Right-of-Way

G. Proposed Traffic Signal, if applicable

H. Geotechnical Investigation

I. Environmental Investigation (letter report to be provided to Design Consultant by the County)

J. Permit and Regulatory Requirements

K. Cost Estimate

L. Appendices

1. PER review meeting minutes
2. Project Location Map
3. Alignment Exhibit showing ultimate configuration
4. Roundabout Exhibit, if applicable
5. FEMA Flood Insurance Rate Maps (FIRM)
6. Preliminary Drainage Area Map and calculations taking into account the ultimate roadway configuration
7. Sight Triangle Exhibit
8. Right-of-Way Exhibit
9. Cost Estimate
10. Utilities
    a. Utility Conflict Table. CenterPoint and AT&T ID numbers are to be included in the table. See Appendix B for Fort Bend County Utility Conflict Table.
    b. Include any correspondence with utility companies (AT&T, CenterPoint, pipelines, etc.) that contain pertinent information.
11. 30 percent drawing submittal, to include:
    a. Typical sections

b. Plan and profile sheets shall consist of all existing features (seen and unseen) shown in plan and profile, as well as proposed improvements in plan only with minor annotation.

c. Traffic control plan (preliminary phasing and detour needs)

d. Bridge layout, if applicable

12. Reports to be included are:

a. Drainage Study taking into account the ultimate roadway configuration

b. Geotechnical Report

c. Environmental Report (provided by Fort Bend County)

d. Signal Warrant Analysis, if applicable

2 BRIDGE

2.1 REFERENCES

All bridges are to be designed to a minimum of HL-93 loading. Designs are to be in accordance with Texas Department of Transportation's "Bridge Design Manual – LRFD", latest edition.

2.2 GEOMETRY

A. The proposed bridge width shall match the approaching pavement plus raised sidewalks on both sides and raised section(s) where there is no sidewalk (e.g. beyond inside curbs of twin bridges). See Appendix A for Bridge Typical Layout.

B. A vertical curve should be provided. Include curve data as well as the elevations for proper cap placement, deck, bents, abutment and top of grout pad.

C. If possible, place bridge on a tangent.

D. For new bridges, the low chord (at the center of the bridge) must be at least 1.5 feet above the 100-year water surface elevation. At no point shall the low chord of the new bridge be less than one foot above the 100-year water surface elevation.

2.3 RAILS

A. Use TxDOT standard C223 concrete rail, which includes a 42-inch handrail.

B. The Design Consultant shall verify that the bridge rail does not create a sight distance problem at the adjacent existing or potential street or driveway. Current lot ownership must be considered, and a parcel shall not be landlocked. If there is a concern about the sight distance, an open galvanized rail is to be used or a restricted access shall be determined and obtained with the right-of-way acquisition.

2.4 TRAFFIC CONTROL

A traffic control plan should be included for the construction of the bridge. The Design Consultant shall also determine if a construction easement is required.

2.5 MISCELLANEOUS

A. Use sand-cement grout in keyways. Do not use non-shrink grout.

B. Wingwalls should be designed separately from the bridge, with their own supports. Lengths shall be adequate to contain the appropriate side slopes.

C. The correct piling embedment (minimum of 3 inches) and strand embedment (minimum of 1 inch to 6 inches) in the cap should be assured.

D. All bridge expansion joints shall extend through sidewalks.

E. Slope paving shall be a minimum of 4.5 inches in thickness with designed reinforcement, weep holes, and toe walls.

F. Pile schedules are required for interior bent and abutment schedules.

G. A 15-foot to 30-foot maintenance berm, depending on channel size, shall be included to allow for maintenance equipment access. This may necessitate pipe(s), stabilized access location or concrete lining. The Design Consultant should coordinate maintenance access location(s) with the Fort Bend County Drainage District. The table below depicts the required maintenance berm width depending on the top width of channel.

Table 2-1 Maintenance Berm Width

Channel Top Width (TW)	Maintenance Berm Width
TW ≤ 30 feet	15 feet
30 feet < TW < 60 feet	20 feet
TW ≥ 60 feet	30 feet

2.6 BRIDGE PLAN REQUIREMENTS

The following shall be shown on the plans:

A. Typical sections through bridge

B. Width and location of sidewalks

C. Number of bridges as well as begin and end stations

D. Number of spans and length at center

E. Utilities attached on bridge, if any

F. Ultimate channel profile and section

G. 100-year water surface elevation

H. Normal water surface elevation

I. Any additional proposed right-of-way

J. Direction of traffic

K. Horizontal and vertical control features

3 ROADWAY

3.1 REFERENCES

All requirements of the "Texas Manual on Uniform Traffic Control Devices" shall be strictly adhered to. Roadway design shall comply with the latest edition of the AASHTO "Geometric Design of Highways and Streets".

3.2 GEOMETRY - HORIZONTAL

A. Traffic lanes shall be 12 feet and should be delineated in accordance with the "Texas Manual on Uniform Traffic Control Devices." Any design of lanes smaller in width than 12 feet requires approval from Fort Bend County Engineering.

B. Roadway centerline curves shall meet the following minima, unless otherwise approved by Fort Bend County Engineering.

Table 3-1 Minimum Centerline Radii

Roadway Classification	Centerline Radius	Design Speed
	(ft)	(mph)
Local	50	30
Collector	850	35
Major thoroughfare	1,500	45

C. Super elevation should not be used, unless curves are less than desirable, and approved by Fort Bend County.

D. The standard typical section for a major thoroughfare boulevard within a 100-foot right-of-way is four 12-foot lanes, 33-foot median face of curb to face of curb, and two 9.5-foot buffers from face of curb to the right-of-way. Each buffer should include a five-foot sidewalk. If sidewalk construction is not included in the project, the design shall accommodate the addition of a future sidewalk with minimal effort. Any deviation from this requirement must be approved by Fort Bend County.

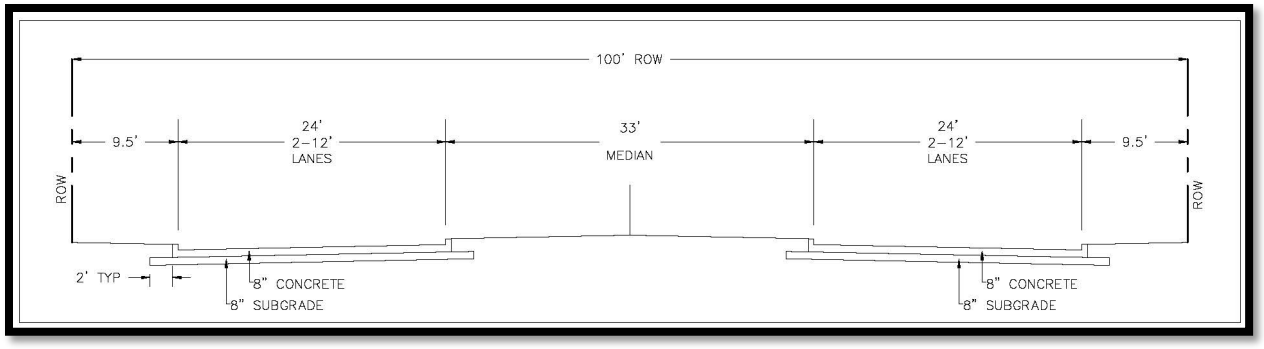


Figure 3-1 Standard Typical Section

E. A future 6-lane configuration for major thoroughfares shall be planned. The typical section would include six 11-foot lanes, 15-foot median face of curb to face of curb, and two 9.5-foot buffers from face of curb to the right-of-way with five-foot sidewalks.

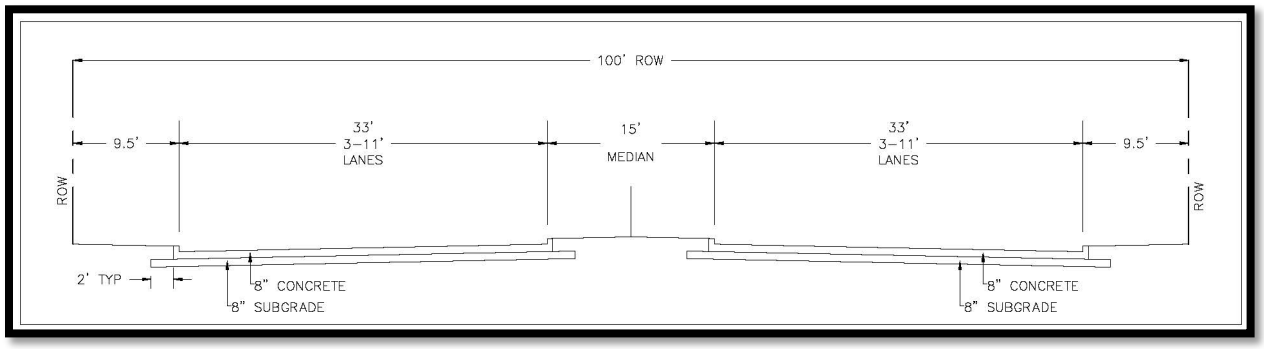


Figure 3-2 Future Typical Section

F. An intersection should not be skewed unless existing conditions require it. No skew shall exceed 10 degrees from a right angle, unless otherwise approved by Fort Bend County Engineering.

G. Transition lengths should be based on:

1. For speeds of 40 mph or less,

$$Merging\ transition\ length = L = \frac{WS^2}{60}$$

$$Shifting\ transition\ length = L/2$$

2. For speeds of 45 mph or greater,

$$Merging\ transition\ length = L = WS$$
$$Shifting\ transition\ length = L/2$$

Where:

L	=	length in feet,
S	=	design speed in mph,
W	=	offset on one side, in feet of the traveled lanes or may be expressed as the difference in overall width of the pavement.

H. A WB-50 design vehicle shall be used for the following intersection types:

1. Thoroughfare/Thoroughfare
2. Thoroughfare/Collector
3. Collector/Collector

I. A B-40 (Bus 40-foot) design vehicle will be generally used for all other intersections. If the Design Consultant feels that a design vehicle larger than a B-40 is applicable for other intersections, they should use the appropriate larger vehicle.

3.3 GEOMETRY – VERTICAL

A. Cross slope shall be 2 percent. Cross slopes are to be labeled in the typical sections. Intersections shall be designed to appropriate drivability.

B. The minimum longitudinal grade on a proposed curb-and-gutter street shall be 0.35 percent. The profile grade line (PGL) shall be located at the outside top of curb. Non-curbed flat pavements are acceptable when the pavement is adequately crowned to drain the surface water laterally. Proposed grades shall be labeled on plans. Centerline grades are acceptable for open ditch sections and through intersections.

C. The minimum grade line around a cul-de-sac shall be 0.70 percent.

D. There shall be a minimum 1 percent grade and a maximum 2.08 percent grade around curb returns.

E. For roads with design speeds of 45 mph and lower, vertical curves shall be installed when the algebraic difference in longitudinal grade is greater than 1 percent. For design speeds of 50 mph or higher, vertical curves shall be installed when the algebraic difference in longitudinal grade is greater than 0.5 percent.

F. Determine minimum vertical curve length based on AASHTO design criteria:

1. $L = KA$

Where:

L	=	length of the vertical curve in feet
K	=	design constant (see Figure 3-3 and Figure 3-4)
A	=	the algebraic difference of grades [percent]

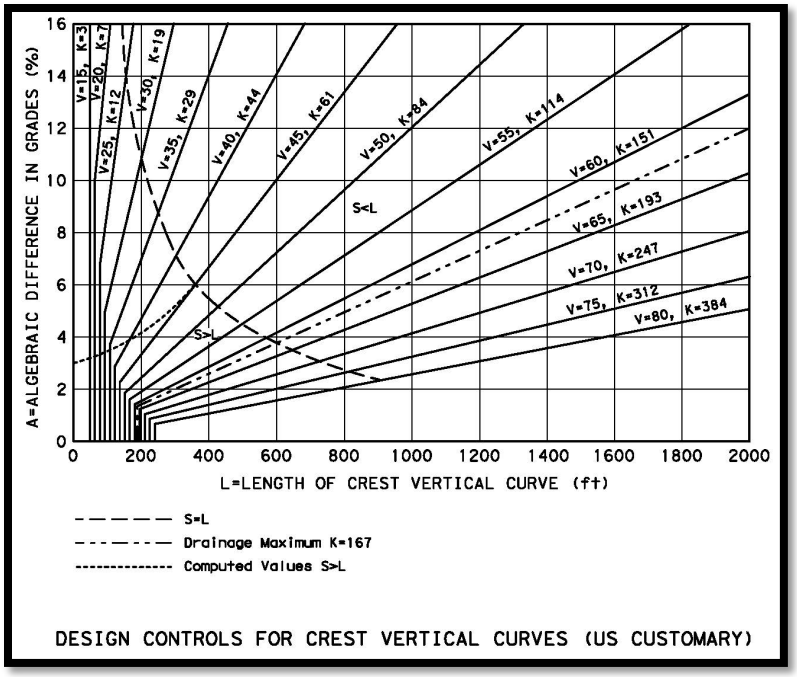


Figure 3-3 Design Controls for Crest Vertical Curves

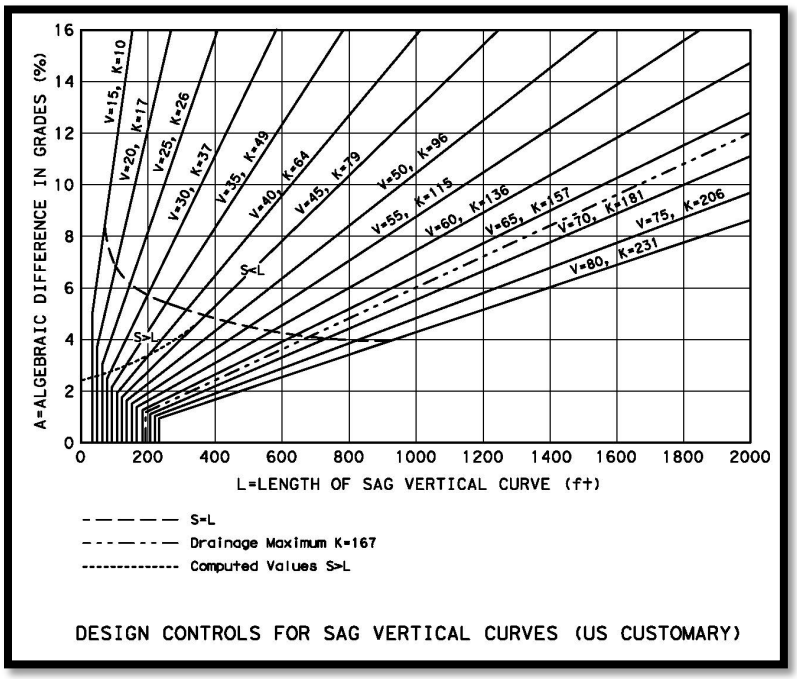


Figure 3-4 Design Controls for Sag Vertical Curves

G. The minimum vertical curve length shall not be less than 3 times the design speed.

H. A 45 mph sight distance should be used on all crest vertical curves. If, for some reason, a greater speed limit is allowed, then a greater sight distance shall be used.

3.4 CURB RADII

A. The table below depicts the minimum pavement radii at intersections:

Table 3-2 Intersection Curb Radius Requirements

Intersection Type	Minimum Curb Radius By Intersection Angle		
	90 Degrees	85-90 Degrees	80-85 Degrees
Collector - Local	25 FT	30 FT	30 FT
Collector - Collector	30 FT	30 FT	35 FT
Major Thoroughfare - Collector	30 FT	35 FT	35 FT
Major Thoroughfare – Major Thoroughfare	35 FT	35 FT	40 FT

B. Following are the minimum radii for cul-de-sacs:

1. For single family areas, 42.5-foot minimum with no island in the center, or 50-foot minimum with island in the center.
2. For areas other than single family areas, 50-foot minimum with island in the center.

3.5 MEDIANS

A. Medians with widths less than 6 feet back to back, and the first 6 feet from a median nose, shall be paved and colored black.

B. Median openings shall be included at street intersections when median length requirements are met. Fort Bend County may direct the Design Consultant to add median openings at other locations.

C. Turning templates are to be used to confirm median nose locations.

D. When a divided street intersects a major thoroughfare or a collector, the minimum length of the medians at the intersection is 500 feet. The minimum length for all other medians is 350 feet.

E. Drawings should include a pair of six-inch diameter Schedule 80 PVC sleeves extending from three feet behind the outside back of the proposed pavement curb to three feet into each proposed median for future landscape irrigation and/or electrical use. The sleeves should be installed three feet below top of pavement, bedded and backfilled in cement stabilized sand. The sleeves should include a capped riser at each end, which should be incidental to the sleeve linear feet quantity. The exact location of the sleeves will be determined during construction.

F. The table below depicts typical median opening widths according to number of Left Turn Bays and what is interrupting the median:

Table 3-3 Typical Median Opening

Median Interruption for	No LTB	1 LTB	2 LTB
No receiving facility	45 feet	N/A	N/A
Private Drive	N/A	52.5 feet	60 feet
Undivided Street <40 44 feet	 N/A N/A	 52.5 feet 55’	 60 feet 80 feet
Divided Street	N/A	Width of intersecting street + 22 feet	Width of intersecting street + 22 feet

Note: For intersections other than 90 degrees, apply design vehicle turning template to determine dimension to median nose cut off.

G. Refer to Appendix A for median with left turn lane geometry.

3.6 DEDICATED TURN LANES

A. Left-turn lanes should be included at all median openings that have a street or driveway receiving turning traffic.

1. Not including a left-turn lane at a median opening requires Fort Bend County Engineering prior approval.

B. Dual left-turn lanes, or proven accommodation for future dual left-turn lanes, are to be located at the intersection of two major thoroughfares.

C. Right-turn lanes are to be located at the intersection of two major thoroughfares, and should be discussed for inclusion at the intersection of a major thoroughfare and a collector.

D. The Design Consultant is to discuss with Fort Bend County any unique situation that seems to warrant dedicated turn lanes.

E. Refer to Appendix A for median with left turn lane geometry.

3.7 DRIVEWAYS

A. All driveways are to be paved to the right-of-way line and are to be of the same material and thickness as the roadway. Driveway subgrade shall be cement-stabilized sand, and shall match the roadway subgrade thickness.

B. All driveways shall include a 5-foot crossing at 2-percent maximum cross slope for future sidewalk connections.

C. Residential driveway aprons shall have minimum radii of 5 feet and maximum radii of 20 feet. Commercial driveway aprons shall have minimum radii of 25 feet on major thoroughfares and 10 feet on collectors or local streets.

D. Residential driveways shall have a maximum driveway grade of 6 percent. Right-of-entry will be required where driveway construction must extend beyond the right-of-way line in order to meet grade requirements. Residential right-of-entry shall be noted on the plans and will be acquired by the contractor/construction manager. (If a commercial right of entry is needed, it must be acquired by coordination with the property owner via the design consultant and project

manager) If extending onto private property, existing obstructions, such as gates, landscaping and irrigation should be taken into account and included in the bid form as applicable.

E. Commercial driveways shall have a maximum driveway grade of 6 percent. In instances where a commercial driveway is anticipated to be high-use, efforts should be made to reduce the grade as much as possible to allow for easy entry into the property. Temporary construction easements (TCE) will be required where driveway construction must extend beyond the right-of-way line in order to meet grade requirements. Note, County-owned improvements cannot be placed within a TCE. A TCE shall be prepared using a County standard form and a sketch of the area of encroachment. The TCE's should be (1) listed as a table on each plan and profile sheet where they are located (See Table 3-4 Temporary Construction Easement Information for an example) and (2) shown hatched. Legal survey documents (map and metes and bounds description) will not be required. The TCE must be acquired before construction begins. Existing obstructions, such as gates, landscaping and irrigation, should be taken into account with TCE acquisition and included in the bid form as applicable.

Table 3-4 Temporary Construction Easement Information

TCE #	SHEET NO	BL STATION	OFFSET	LENGTH (FT)	WIDTH (FT)	TCE (L' X W')	OWNER INFORMATION
7	17 &19-20	50+71-56+92	50' LT	621	15	9,315	Taylor Morrison of Tx, Inc. CF NO. 2012132796, ORFBC

F. When an expansion joint intersects a driveway, the expansion joint shall be carried to the right-of-way line.

G. If there is an existing curb on a driveway, connect proposed curb to existing curb, otherwise taper curb height from 6 inches to 2 inches in the last 2 feet. See Driveway Details for Major Roadway Construction.

H. All-weather access to all existing streets and properties shall be maintained at all times.

I. A proposed residential driveway to be built on a corner lot cannot be located within any portion of a street intersection curb radius.

J. A driveway summary sheet shall be included in the plans. See Appendix B for Fort Bend County's Driveway Summary template.

K. See the Fort Bend County detail, "Driveway Details for Major Roadway Construction" for driveway details.

3.8 RAILROAD CROSSINGS

A. Following are the typical grades for tangents to vertical curves at railroad crossings:

   1. For local streets, 8.0 percent

   2. For major thoroughfares, 3.5 percent

B. For a concrete roadway, the roadway shall terminate at a railroad header, 6 feet from the centerline of the track.

C. Roadway grades at railroad crossings shall be zero percent from the centerline of the track to 10 feet either side of the track's centerline.

D. Roadway grades should not cause a drop of more than 3 inches from the top of rail elevation at a distance of 30 feet from the outermost rail.

E. Gutter elevations are required for vertical curves where a railroad track is being crossed.

F. Curbs shall be decreased from 6 inches to zero inches in 10 feet when approaching railroad tracks.

G. The Design Consultant shall coordinate with the railroad company, TxDOT and other agencies having jurisdiction regarding their requirements and quiet zone criteria.

H. If there is a traffic signal adjacent to the railroad crossing, railroad pre-emption shall be provided.

3.9 ROUNDABOUTS

3.9.1 GENERAL

A. All roundabouts shall comply with the latest editions of Texas Manual on Uniform Traffic Control Devices, NCHRP Report 672: Roundabouts: An Informational Guide, and AASHTO's "A Policy on Geometric Design of Highways and Streets."

B. Refer to Appendix A for Roundabout Features.

C. Each roundabout design should be checked to ensure that fire trucks and school buses can navigate the roundabout without any use of the truck apron. The design vehicle should navigate with 1-foot clearance from the turning radius to any non-mountable curb face. The table below depicts the design vehicle to be used when designing a roundabout:

Table 3-5 Design Vehicle

Roadway Classification	Truck Apron	Circulatory Road
Major thoroughfare	WB-67	BUS
Collector	WB-50*	BUS
Local	Mountable center island	BUS

*Verify whether a WB-67 will track over the outside curbs and provide external truck aprons as needed.

3.9.2 ROUNDABOUT GEOMETRY

A. An offset left approach design is required to achieve target entry speeds; any deviation requires Fort Bend County Engineering approval.

B. Roundabouts can have three, four or five approaches.

C. The centerlines of adjacent approaches should intersect as close to 90 degrees as is practicable.

D. Following are the truck apron requirements:

1. The width of a truck apron ranges from 3 to 15 feet, although the ultimate need for and width of a truck apron should be determined by analysis of the design vehicle and roundabout performance metrics.
2. The cross slope of the truck apron shall be 2 percent down from the central island.
3. The outside edge of the truck apron shall be 4 inches above the circulatory roadway.
4. An 18-inch mountable curb shall be used between truck apron and the circulatory roadway.
5. The truck apron shall be constructed of stamped concrete and of contrasting color.
6. If no truck apron is necessary, a 3-foot mow strip shall be provided around the central island.

E. Dimensions for the splitter island components are included in the table below:

Table 3-6 Splitter Island Geometry

Splitter Island Attribute	Minimum Dimension
Yield line to tip length	50 ft, 100 ft preferable
Crosswalk cut through width	10 ft
Crosswalk cut through length	6 ft
Yield line to cross walk setback	20 ft

F. The table below depicts the dimensions for inscribed circle diameter, entry width, circulatory roadway width, entry and exit radii:

Table 3-7 Roundabout Geometry

Roundabout Geometry	Typical Inscribed Circle Diameter	Maximum Entry Width	Typical Circulatory Roadway Width	Typical Entry Radius	Typical Exit Radius
Single Lane	90-150 ft	16 ft desirable 20 ft max	16-20 ft	50-90 ft	50-800 ft
Two-Lane	150-220 ft	28 ft desirable 32 ft max	28-32 ft	Initial Radius 60-12 ft Secondary Radius >150 ft (or tangent)	200-1000 ft

G. The circulatory roadway shall be constructed with Portland cement concrete. Joint patterns shall be concentric and radial to the circulatory roadway within the roundabout. The joints should not conflict with pavement markings.

H. No driveway access shall be allowed to the roundabout unless it acts as one of the roundabout legs.

I. Unless the central island will contain additional landscaping, it shall be mounded to a height of three feet above the truck apron.

J. The central island shall be block sodded 16 inches wide along the back of curb and hydromulch seeded in the remaining area.

3.9.3 SIGNAGE AND PAVEMENT MARKINGS AT ROUNDABOUTS

A. A wide dotted pavement marking shall delineate the edge of the circulatory roadway at each entry.

B. Yield triangles shall be used to mark the location at which drivers must yield to circulating traffic. For each approach lane, the yield markings shall extend from the point at which the edge of the inside lane line intersects the circulatory roadway to a point that is perpendicular to the edge of the outside lane line.

C. Yellow edge lines shall be placed along the left edge of the entry and exit of each approach roadway along the edge of the splitter islands. Splitter island curbs may be painted yellow in lieu of painted edge lines.

D. White edge lines are required along the portion of the splitter island which outlines the outside of the circulatory roadway.

E. Advance roundabout warning signs (W2-6) with cross street name signs are required on all approaches to the roundabout.

F. Yield signs shall be placed on both the right and left sides of the road at all roundabout approaches. The signs should be placed at the point where vehicles are to yield when entering the roundabout.

G. Lane assignment signs depicting the lanes maneuvering around the roundabout shall be provided on all multi-lane approaches, including single lane approaches with auxiliary turn lanes. These signs shall be located 175 feet to 200 feet from the yield line.

H. Street name signs with a minimum of 6-inch lettering shall be placed on the splitter islands oriented toward traffic on the circulatory roadway.

I. The roundabout directional signs (R6-4 series) shall be used in the central island oriented towards each entry approach. The standard R6-4 sign shall be used for single-lane roundabouts, and the larger R6-4a or R6-4b should be used on two-lane roundabouts. These signs shall be mounted with the sign bottoms four feet above the elevation of the near edge of the traveled way.

J. Refer to Roundabout Construction Details for signage and pavement markings.

3.9.4 PEDESTRIAN FACILITIES AT ROUNDABOUTS

A. Roundabouts should accommodate ADA-compliant wheelchair ramps. Wheelchair ramps shall be installed at all roundabouts. Refer to Appendix A, Roundabout Features.

B. The future walkway through the splitter island shall be cut through instead of ramped.

3.9.5 DRAINAGE AT ROUNDABOUTS

A. Roundabouts should be designed to drain away from the central island. A two percent cross slope is typical.

B. Drainage inlets will typically be located along the outer curb line.

C. Inlets and low points should be located upstream of the cross walks.

3.9.6 ILLUMINATION AND IRRIGATION AT ROUNDABOUTS

A. Accommodation for lighting shall be provided at all four quadrants. Drawings should include a four-inch diameter Schedule 80 PVC sleeves under each pedestrian crossing extending three feet behind each back of the proposed pavement curb. The sleeves should be installed three feet below top of pavement, bedded and backfilled in cement stabilized sand. The sleeves should include a capped riser at each end, which should be incidental to the sleeve linear feet quantity.

B. Poles shall be installed 5 feet from back of curb. If the pole cannot be installed at the preferred location, it shall be a break away pole.

C. Lighting shall be aimed toward the pavement and shielded to prevent uplighting.

D. Lighting should not backlight pedestrian crosswalks.

E. Two six-inch diameter Schedule 80 PVC sleeves shall be installed for irrigation and/or electrical access to the roundabout central island. The exact location of sleeves will be determined during construction.

3.10 ROADWAY TIE-INS AND DEAD-END ROADWAY

A. When tying a proposed concrete roadway to an existing soon-to-be expanded roadway, an asphalt transition shall be used. The current design should include as much ultimate pavement as possible without restricting the design of the future expanded road. The transition shall be 2.5 inches of asphalt surface, 8 inches of black base course, and 8 inches of treated subgrade.

B. When transitioning from a four lane section to a two lane section, the asphalt transition should be placed across the median opening as shown on Figure 3-5.

1. Do not place steel reinforcement stirrups where future curb is to be placed.
2. At the transition, all temporary pavement markings shall be raised pavement markers (no paint on concrete pavement).

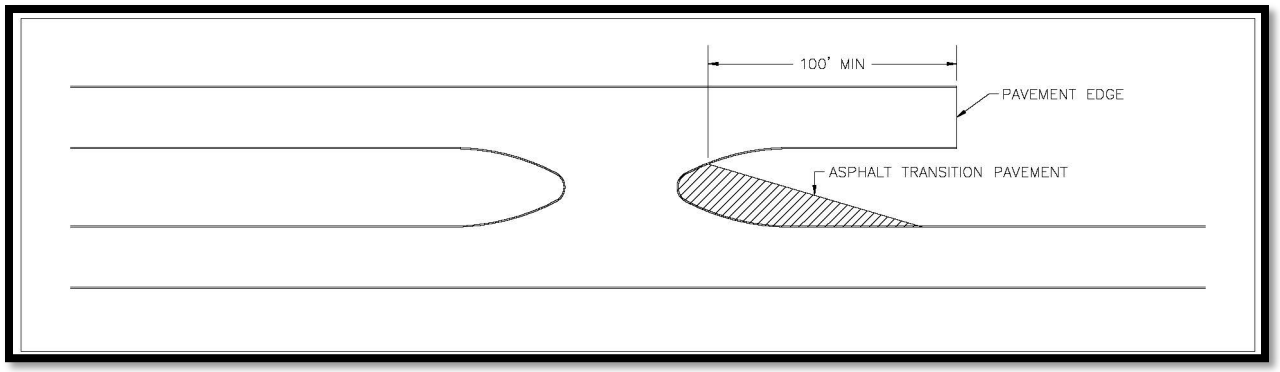


Figure 3-5 Transition from Four Lane to Two Lane Section

C. When a curb roadway radius is placed where an existing cross street intersects, the turnout should be sized to fit the ultimate pavement width and then transitioned to the existing roadway.

D. Dead-end streets designed to be extended in the future shall have 15 inches of reinforcing steel exposed beyond the pavement (include a keyway joint at the pavement terminus), coated with asphalt and wrapped with burlap for future pavement tie-in. Alternatively, the concrete pavement may end with a pavement header.

E. Dead-end streets shall be designed such that drainage flows away from the dead-end.

F. Type III barricades shall be placed at the end of all dead-end streets.

3.11 DRAINAGE

A. The minimum grade on ditches for a roadway section with open ditches is 0.10 percent.

B. Inlets should be placed away from the major thoroughfare and on the side streets at street intersections. Also, inlets should be kept away from median openings.

C. When a curb and gutter street intersects a culvert crossing, the gutter shall be above the 100-year water surface elevation.

D. Refer to Chapter 4 – Drainage and Storm Sewer Design for details on drainage design.

3.12 PAVEMENT AND REINFORCING STEEL REQUIREMENTS

A. The pavement structure for concrete roadways shall be 8 inches of concrete with 8 inches of lime and/or fly-ash stabilized subgrade. Heavier structures must be justified in a geotechnical report and must be approved by Fort Bend County Engineering. Lighter structures will not be considered. Subgrade extension past the back of curb shall be 2 feet.

B. Reinforcing bar size, reinforcing bar spacing and joint spacing shall be in accordance to Fort Bend County “Concrete Pavement Details.”

C. A continuous longitudinal reinforcing bar shall be used in curbs.

D. All concrete pavement, other than high early strength or fast track pavement, shall be 5½-sack cement per cubic yard with a minimum compressive strength of 3,500 psi at 28 days, with a 6 inch maximum slump.

E. In certain circumstances, high early strength or fast track pavement may be used. In such cases, the Design Consultant should recommend either Harris County specification for high early strength pavement or TxDOT specification for fast track pavement.

F. The pavement structure for permanent asphalt roadways shall consist of 8 inches of lime and/or fly-ash stabilized subgrade with 8 inches of asphalt base course and 3 inches of surface course.

3.13 PEDESTRIAN FACILITIES

A. Include pedestrian ramps at all cross streets and intersections. Two Type 7 ramps at each corner should be placed in accordance with the Fort Bend County “PED-18 Ramp Details” standard detail sheet. Other types of ramps require Fort Bend County Engineering approval.

B. Intersecting streets and driveways shall include 5-foot crossings at 2 percent maximum cross slopes for future sidewalk connections.

C. If sidewalks are to be included as part of the project, they should be installed 2 feet from the right-of-way, if possible, but shall be a minimum of 2 feet from back of curb. If this is not possible, approval from Fort Bend County Engineering must be secured for a variance.

D. The typical sidewalk width shall be 5 feet, or 6 feet along the back of curb with Fort Bend County Engineering prior approval.

E. Submit construction documents to a Registered Accessibility Specialist (RAS) for review, if required, and include filing, review and inspection fees in proposal.

3.14 PAVEMENT MARKINGS AND SIGNAGE

A. Pavement markings and signage shall be in accordance to the Texas Manual on Uniform Traffic Control Devices.

B. All R1-1 stop signs shall be 36-inch x 36-inch with diamond grade sheeting.

C. Street name signage shall be on a 9-inch high sign flat blade with reflective green background. Street names shall be upper and lower case lettering with uppercase letters of 6-inch minimum height and lowercase letters of 4.5-inch minimum height. The letters shall be reflective white. Street name signs shall be mounted on stop sign posts and where street names change at corners, as applicable.

D. A blue double reflectorized button shall be placed at all fire hydrant locations. The button shall be placed 12 inches off the centerline of the street on the same side as the hydrant.

E. High visibility continental crosswalks shall be used whenever placed in a non-stop condition.

3.15 DETOURS

A. The use of a detour should be avoided unless its use creates a significant savings in construction time or cost. Detours are permitted only with initial approval from Fort Bend County Engineering and Commissioner's Court approval.

B. Avoid detouring traffic through a residential neighborhood.

C. Message boards shall be placed two weeks prior to initiating a detour or a significant traffic pattern change. The message board should include the dates of detours or traffic pattern changes.

3.16 SIGHT TRIANGLES

A. Sight triangle exhibits are required during the preliminary engineering phase of a project in order to determine the need for unrestricted visibility easements (UVE). Sight triangle exhibits are to be included in the Preliminary Engineering Report.

B. Sight triangles are to be determined by following the requirements of the latest edition of the AASHTO "Geometric Design of Highways and Streets" and with a minimum of 15-feet set back on the intersecting road.

C. Sight triangles for roundabouts should be constructed from 50 feet back from the yield line to vehicles on the circulatory roadway and vehicles entering the roundabout on the upstream approach.

3.17 MISCELLANEOUS

A. When paving only one roadway of a proposed two roadway thoroughfare, all left turn lanes and median crossovers in the one-half of the right-of-way where the roadway is being paved shall be paved to the center line of the street right-of-way.

B. When removing concrete, remove it to either an existing joint or a sawed joint.

C. 4-inch x 12-inch reinforced concrete curbs shall be placed in front of single family lots in residential areas, with 6-inch curbs placed through curb returns. All other areas shall utilize 6-inch reinforced concrete curb.

D. Curbs shall be decreased from 6 inches to 2 inches in 2 feet when approaching an existing roadway without curb.

E. Design Consultant shall identify areas where high fill is used between existing and proposed grades, and shall add a note for the area to be inspected more frequently and/or more compaction testing performed.

F. Carry full-width improvements through intersections. Consider including the reconstruction of an intersection at the project limits where the existing intersection is substandard, and transition down to existing road beyond the intersection.

G. Access to all existing streets and properties shall be maintained at all times unless a detour is approved.

H. For a vertical drop-off greater than 2 feet, a low concrete traffic barrier (LCTB) must be installed. For drop-offs less than 2 feet, Design Consultant shall consider the use of LCTB on a case by case basis or provide an adequate safety zone.

I. Consider the possibility of future sidewalks when designing ground slopes between the edge of pavement and right-of-way. Efforts should be made to minimize these slopes, including the use of temporary easement or landscape reserves adjacent to the right-of-way for grading. In no case should slopes exceed 2:1 (H:V) without the use of slope paving and Fort Bend County Engineering approval.

4 DRAINAGE AND STORM SEWER DESIGN

4.1 GENERAL

A. Methodologies for determining existing and proposed flows, detention requirements and outfall structures should follow Fort Bend County Drainage District criteria. It is recommended that HEC-HMS and HEC-RAS modeling be used for detention calculations. Detention facilities shall be designed such that there is no increase in flow rate and water surface elevation at the outfall point. Consult with Fort Bend County Drainage District staff prior to design of detention facilities.

B. Storm sewers shall be designed such that the 5-year hydraulic grade line (HGL) is below the proposed top of pavement at the gutter line.

C. The storm sewer and roadway system shall be designed such that the 100-year HGL is below the proposed inside top of curb (on a divided roadway) or below the right-of-way elevation, whichever is lower. The 100-year HGL elevation for an undivided roadway may be decided on a case-by-case basis but shall never be above the right-of-way elevation. Any variance on the HGL elevation must be approved by Fort Bend County Engineering.

D. The 5-year and 100-year tailwater conditions shall be the higher elevation of top of outfall pipe or as calculated from following outfall scenarios.

1. Storm sewers discharging into a detention pond; the 5-year tailwater shall be 60% of the design 5-year detention depth and the 100-year tailwater shall be 60% of the design 100-year detention depth.

2. Storm sewers discharging to a channel: tailwater is based on the ratio of the drainage area of the storm sewer to the drainage area of the channel at the point o discharge according to the following equation:

$$Ytw = Yf\left(\frac{As}{Ach}\right)^{1/3}$$

where:

Ytw is the resulting tailwater depth in feet;

Yf is the depth in the receiving channel for the storm frequency being analyzed in feet;

Ach is the drainage of the channel at the point of discharge; and

As is the contributing drainage area of the storm system.

3. Storm sewers connecting to an existing storm sewer; the 5-year design event shall be the lowest gutter elevation of the two existing inlets near the proposed connection. The tailwater for the 100-year overflow calculations shall be the top of curb, or in absence of a curb, the natural ground.

The Engineer has the option to use the tailwater elevation obtained with hydraulic grade line calculations of the existing system for the 5-year and

100-year events, accounting for the entire drainage area including the proposed connection.

E. The 5-year and 100-year hydraulic grade lines shall be shown in the plan and profile drawings.

F. Inlets shall be designed such that street ponding in a two-lane undivided road does not exceed the center of the lane in a 2-year frequency event. For roadways with more than one lane in each direction, inlets shall be designed such that the street ponding does not exceed the outside lane.

G. The Design Consultant shall submit drainage calculations to support line sizes and slopes. The "n" coefficient in Manning's formula for storm sewers shall be the following:

1. 0.013 for concrete pipes
2. 0.015 for concrete boxes
3. 0.012 for corrugated profile polypropylene pipe (smooth interior)
4. 0.024 for corrugated metal pipe (used only at storm sewer outfalls into unlined channels with polymer or other approved coating)

H. For ditches, "n" shall be a minimum of 0.04 for unlined ditches.

I. Account for cross slope transition at major/major intersections and confirm that the gutter line drainage path is not inadvertently reversed or flattened by cross slope transition.

J. When calculating the increased impervious area, the Design Consultant shall use the ultimate typical section. Refer to typical layouts in Appendix A for ultimate typical layouts.

4.2 DITCHES

A. A metal guard rail or 9-inch high curb along the top of the front slope is required where ditches exceed 4 feet in depth or side slope is steeper than 4:1 (H:V). Such a design requires Fort Bend County Engineering approval.

B. The maximum desirable front side slope for a roadside ditch shall be 4:1 (H:V). The back side slope for a roadside ditch should be 3:1 (H:V). Steeper side slopes may be approved by Fort Bend County.

C. The minimum grade for roadside ditches shall be 0.10 percent.

D. Erosion control methods shall be utilized in ditch designs where the velocities of flow are calculated to be greater than 5 feet per second, or where geotechnical investigations indicate that soil conditions dictate their need.

E. Ensure all offsite drainage swales are identified and captured in the drainage system.

4.3 STORM SEWER PIPE

A. The velocity in the storm sewer shall be a minimum of 3 feet per second when flowing full. The maximum velocity shall be 10 feet per second. The maximum velocity at the outfall shall be 8 feet per second without erosion protection.

B. Storm sewers shall have a minimum size of 24 inches inside diameter, or equivalent cross-sectional area.

C. Pipes shall conform to ASTM Specification C-76, Class III, for reinforced concrete pipe, or ASTM Specification F2881 for polypropylene pipe.

4.4 MANHOLES AND INLETS

A. Manholes are required:

1. at all pipe size or conduit cross-sectional changes;
2. at all pipe sewer intersections;
3. at all grade changes or drops;
4. at a maximum spacing of 600 feet.

B. Manhole design shall meet or exceed HS-20 loading per ASTM C478 and ASTM C913 requirements.

C. Gasketed joints shall meet ASTM C443 requirements.

D. Manhole frame and cover shall be East Jordan Iron Works Model V-1420 or approved equal.

E. Refer to Fort Bend County “Precast Concrete Storm Sewer Manhole Details” and “Junction Box/Manhole Details” for more details. Manholes and inlets can be cast in place with an approved contractor submittal.

F. The concrete for manholes, junction boxes, and inlets shall have a minimum compressive strength of 4,000 PSI at 28 days.

G. Curb inlets shall be spaced so that the maximum travel distance of water in the gutter does not exceed 300 feet.

H. Curb inlets should be located on intersecting side streets along a major thoroughfare. Also, inlets should be kept away from median openings and curb radii.

I. Curb inlets shall be Type C. The following table shows the application and nominal capacity of a Type C inlet with or without extension(s).

Table 4-1 Type "C" Inlet Capacity

Inlet	Application	Nominal Capacity
Type C	Residential/Commercial	2.50 cfs
Type C-1	Commercial	5 cfs
Type C-2	Commercial	10 cfs
Type C-2A	Commercial	10 cfs

Note: The nominal capacity values provided in this table are to be used for initial sizing only. The actual inlet size shall be based on hydraulic analysis of the required inlet capacity. Inlet capacities are calculated using either orifice and or weir equations depending upon their location and type of inlet openings with or without plates.

J. Type "B" inlets, type "B-B" inlets and modified type "B-B" inlets are not permitted unless approval from Fort Bend County Engineering is granted.

K. Cement stabilized sand around inlets shall extend to the bottom of subgrade or slope paving, or 12 inches below the surface if the inlet is located in an unpaved area.

L. In combined storm sewer configurations where curb inlets and area inlets are in the same system, check hydraulic grade line elevations of the trunk line versus the top of grate of area inlets for backflow scenarios or use of private property for ponding. At a minimum, confirm that a ponding situation is not made worse by the project and specify that grates or manholes are to be bolted down in these scenarios.

5 TRAFFIC SIGNALS

5.1 GENERAL

A. If the project includes major intersections, the Design Consultant is to coordinate with Fort Bend County and the Program Manager regarding the addition of a traffic signal, even if the potential signal is not budgeted.

B. A traffic signal warrant study must be prepared for every proposed signal unless the County has a previous study.

C. Place traffic signal foundations for the ultimate intersection buildout including future right-turn lanes.

D. Traffic signals shall be mast arm of sufficient length to accommodate the ultimate cross section unless otherwise directed. Span wire may be used for temporary or interim signals.

E. Traffic standards shall follow TxDOT standards.

F. Traffic signal design should include a basis of estimate with quantities of material that match the bid form.

G. When a new traffic signal is included in the scope of project, the Design Consultant shall submit a CenterPoint SOL (Service Outlet Location) request for power service.

H. When a traffic signal is maintained by other entities such as TxDOT or a City, the Design Consultant shall submit drawings for applicable review and comply with their guidelines.

I. Include the County's Approved Signal Equipment List in the drawings. Request the current list from the Program Manager.

6 SURVEY

6.1 GENERAL

Field surveying used in the development of construction drawings, calculations and preparation of metes & bounds descriptions and right-of-way maps, shall be performed by or under the direct supervision of a Registered Professional Land Surveyor (RPLS) in good standing with the Texas Board of Professional Engineers and Land Surveyors.

A. The surveyor shall be responsible for obtaining right-of-entry for any survey operations required outside of the right-of-way.

B. Topographic survey should be completed during preliminary design, unless the project includes a completely new roadway alignment that needs to be approved by Fort Bend County. Normally, right-of-way acquisition will be required for road expansions, and part of preliminary design includes determining where to expand. To cover all options, topographic survey should be taken within existing right-of-way and then at least 20 feet beyond the existing or proposed right-of-way on each side, or as determined in a scoping meeting.

C. Cross sections shall be taken at intervals of 100 feet. Cross sections shall include a reading at the following points: street centerline, curbs and gutters or pavement edges, tops and flow lines of ditches, edges of sidewalks, the existing or proposed right-of-way line, and 20 feet beyond the right-of-way line. The limits of topography on intersecting streets will extend for a minimum distance of 100 feet beyond proposed pavement.

D. Structures in clear view and within 100 feet of the existing or proposed right-of-way should be surveyed.

E. Identify all visible underground structures, such as inlets, manholes, and junction boxes, with size, depth, and type. In cases where structures are visible but not accessible, notice to the Design Consultant will be required.

F. Temporary benchmarks and baseline control should be set, both with 1,000-foot maximum spacing between points. Baseline control shall be recovered or re-established immediately prior to construction.

G. The traverse line and design baseline must be monumented at its beginning, end, street intersections, at angle points, at even 1,000-foot stations, and at the beginning and end of curves with markers of a substantial nature (e.g. iron rods, PK nails, and cut “X” in concrete).

H. An overall survey control map is to be prepared as a cover sheet with an additional sheet depicting individual control monument details and ties to planimetric features, to allow easy recovery.

I. Show the stations of all side street construction centerlines with angular relationships or bearings in relation to the main roadway centerline station.

J. For bridges, overpasses and underpasses, show top of pavement elevations at gutter line and centerline for the following locations: construction joints and armor or expansion joints.

K. Property title abstracting should be performed to gain a preliminary determination of property ownership and existing right-of-way widths. During topographic survey, found property corners should be documented so that the location of the right-of-way can be determined.

L. Once right-of-way needs have been determined and approved by Fort Bend County, a Texas Society of Professional Surveyors Category 1B, Condition II survey must be performed.

M. The surveyor shall provide the following to the Design Consultant once survey is complete:

1. An electronic text file in standard ASCII format (Point Number, Northing, Easting, Elevation, Description) containing all points collected, calculated and set for project
2. Computer Aided Drafting files, including an existing surface file.
3. Data Collection Files
4. Sealed and signed survey control maps

N. See Chapter 7 – Right-of-Way for right-of-way map details and requirements.

O. Follow these guidelines related to the survey datum:

1. Within an incorporated city: If the city/entity recognizes and maintains an established control network, then that control network should be utilized if approved by the Design Consultant.
2. Within unincorporated portions of the County – Current NGS or Houston-Galveston Coastal Subsidence District (HGCSD) survey control monuments should be utilized if approved by the Design Consultant.
3. When a project segment is tied to or related to another segment, coordination between surveying consultants and the Design Consultant is necessary to match the datum of an adjoining segment.

7 RIGHT-OF-WAY

7.1 RIGHT-OF-WAY WIDTH

A. Determination of right-of-way acquisition should be based on ultimate geometric design, alignment, fill requirements, and drainage requirements. Other items to be considered when determining the right-of-way should include:

1. Dedicated turn lanes
2. Transitions
3. Shoulders
4. Sidewalks
5. Future signalization

B. Unless otherwise discussed, curb and gutter major thoroughfares are to be constructed within a 100-foot right-of-way. For major thoroughfares, typical cross sections should allow for the median to expand to 6 lanes from 4 lanes of traffic.

C. Additional right-of-way is needed at:

1. Major thoroughfare intersections with major thoroughfares and collectors
2. Major thoroughfares with open ditches
3. Major thoroughfares with bridges/grade separations

D. Right-of-way width for collectors shall be determined on a case by case basis.

E. Projects within developed areas shall be studied to determine what right-of-way acquisition is feasible.

F. Avoid right-of-way alignment with micro-parcels (less than 50 square feet) if not required for functional design or construction.

G. Do not require right-of-way in such a way that a tract will be left undevelopable (too small to provide adequate detention, parking, etc., once building setbacks and easements are considered). Submit any questionable tracts to Fort Bend County Engineering for evaluation.

H. Do not leave any spite strips (small strips that separate a right-of-way line from adjacent tracts.

I. Refer to Appendix A, Typical Roadway Layout.

7.2 RIGHT-OF-WAY CORNER CUT-BACKS

A. Corner cut-backs are to be provided at all public/private street intersections when right-of-way is being expanded.

B. Provide corner clips instead of radii.

C. The table below depicts the approved cut-back dimensions:

Table 7-1 Right-of-Way Cutbacks Requirements

Curb Radius (FT)	Minimum Right-of-Way cut-back dimensions (FT x FT)
25	15x15
30	20x20
35	25x25
40	30x30
45	35x35

D. Corner clips need to be sized to provide space for sidewalks, curb ramps, traffic control devices, signs, street lighting, traffic signal equipment, and any other surface encroachment needed in the future. Skewed intersections might require larger cutbacks than those shown in the table above.

E. Unrestricted visibility easements (UVEs) may be required based on sight triangle calculations (see Chapter 3). UVEs should not be acquired as separate easements, but instead included in the proposed right-of-way acquisition.

7.3 RIGHT-OF-WAY DOCUMENTS

Following are the documents to be submitted for acquisition of new or additional right-of-way:

A. An overall project map showing existing and proposed right-of-way. The areas to be acquired shall be shaded and labeled. See section “Right-of-way maps requirements” for more details. Along with the overall map, provide a table listing each parcel and the parcel #.

B. A parcel map and metes-and-bounds description for each parcel to be acquired in the project. Parcels and proposed permanent easements are to be numbered consecutively. Occupied (prescriptive) right-of-way is to be

separated from new right-of-way by shading and separate area calculations. Occupied right-of-way does not need to be acquired from a tract of land where no other right-of-way is required. See Appendix B for a template.

C. KMZ file (used by Google Earth) showing existing right-of-way with ownership information, proposed takings with parcel numbers, and a preliminary roadway layout.

D. Right-of-way documents will be submitted separately from other design documents, and will be paid for on a per-parcel basis. Also, these documents shall be sealed and signed by a Registered Professional Land Surveyor (RPLS) in good standing with the Texas Board of Professional Land Surveying, after initial County review.

E. Prepare and submit documents according to the latest guideline: "ROW Taking Area Digital Submittals to GIS." Request this document from the Program Manager.

7.4 REQUIREMENTS FOR NEW OR ADDITIONAL RIGHTS-OF-WAY

A. Tie all points of beginnings (POB) for each parcel and points of commencing (POC) to the established survey coordinate system.

B. Set iron rods or other permanent monuments at the intersections of the proposed right-of-way and property lines of parcels to be acquired.

C. Identify monuments, corners, angle points, points of curve (PC), points of intersections (PIs), points of tangency (PTs) and other points as either "found" or "set."

D. Describe each monument in such a way as to clearly define size, type of material and the nature of the monument (e.g. ¾-inch iron pipe, 5/8-inch iron rod, mag nail).

7.5 RIGHT-OF-WAY MAPS REQUIREMENTS

A. Show X-Y values on control monuments. All bearings and coordinates shall be based on the established coordinate system for the project. When no coordinate system has been established, the Texas South Central Zone, Texas State Plane, North American Datum 1983 coordinate system should be utilized.

B. Distances on proposed right-of-way lines shall be continuous from the beginning to the end of each parcel of the project.

C. Survey drawings for parcels to be acquired must show the dimensions, bearings and distances, and area (acreage and square footage) of the remainder parent tract based on recorded information. If multiple remainder

tracts are created from the parent tract due to the acquisition, show the aforementioned information for each tract. This can be included in a table if needed.

D. X-Y values are to be shown for PCs, PTs, and PIs of curves on the proposed right-of-way lines. Curve data must include the following: delta, radius, arc length, chord length, and chord bearing.

E. X-Y values must be shown for both the POC and POB of each parcel on the right-of-way maps and metes and bounds descriptions with a scale factor.

F. Property title abstracting information used for the project shall be shown and labeled on the right-of-way map sheet.

8 GEOTECHNICAL INVESTIGATIONS

8.1 GENERAL

Except for new alignment roadways, geotechnical investigations and reporting should be completed during preliminary design and included in the Preliminary Engineering Report.

A. For water crossing structures, use standard TxDOT criteria with boring depths based on the depth of the outfall channel. For other infrastructure refer to Table 8-1.

Table 8-1 Geotechnical Design Criteria for Type of Infrastructure

Other Infrastructure	**Criteria**
Lift stations	City of Houston
Open channels	Harris County Flood Control District
Detention ponds	Harris County Flood Control District
Ground storage tanks	City of Houston
Bridges and retaining walls	TxDOT - Except TCP testing and associated analysis will not be required.

B. The geotechnical engineer should calculate the equivalent single axle load (ESAL) for Fort Bend County's standard pavement design (8 inches of concrete with 8 inches of lime and/or fly-ash stabilized subgrade).

C. Soil boring and sampling should be conducted to obtain information about the subsurface soil stratigraphy and ground water conditions. Borings should be located in the vicinity of the area of interest and away from any existing underlying or overhead utility lines. The minimum depth and frequency of borings are depicted in the table below. Bore a minimum of 5 feet below any water producing sand layer.

Table 8-2 Boring Depth and Frequency Requirements

	Boring Depth	Frequency
Storm Sewer Construction Trench Depth Up to 10 feet 10.01 to 25 feet over 25 feet	 Trench depth plus 5 feet Trench depth plus 10 feet 1.5 times trench depth	 500 feet max 500 feet max 500 feet max
Street Paving	10 feet below existing grade or the final grade elevation, whichever is greater.	500 feet max
Building Foundations	20 feet	one bore hole per 2,000 SF of slab area, with a minimum of two borings.
Parking Areas	10 feet below finished grade.	one bore hole per 20, 000 SF of proposed parking.

A. Drilling and sampling methods should comply with the appropriate ASTM methods. Continuous sampling should be performed to a minimum depth of 15 feet, and at 5-foot intervals below that depth. Following are the ASTM standards to be used:

1. Undisturbed samples should be recovered in cohesive soils using a thin-walled metal tube sampler that complies with ASTM D1587 requirements.

2. For granular soils, Standard Penetration Split-Barrel samplers should be used in compliance with ASTM D1586 requirements. The “blow counts” for the SPT samples should be recorded.

B. Soil descriptions should be based on visual inspection of the samples and the requirements of ASTM D2488. Soil descriptions should include texture, color, and inclusions such as nodules, stains, organic materials, etc. Layer variations should be recorded when applicable.

C. After 24 hours of drilling, measure and record the depth of groundwater and total depth of the borehole. Piezometric water level readings should be

presented in tabular form, including the reading dates. Any unusual conditions should be noted.

D. The bore hole should be covered as soon as drilling and sampling is complete to avoid flow of surface water into the hole.

E. Each boring must have reference points or ties so that the location of the boring can be recovered. The ties can be a distance to two or more permanent objects or X-Y coordinates with a recoverable reference point.

F. Fort Bend County should be notified and drilling should stop if environmental concerns are encountered during geotechnical drilling and no previous provisions for environmental sampling protocol have been put in place. If the project scope includes environmental protocol sampling, the geotechnical engineering consultant is responsible for adhering to all pertinent federal, state, and local regulations and laws.

G. Where necessary, it is the responsibility of the geotechnical engineering consultant to remove cuttings resulting from the geotechnical exploration upon completion of drilling and sampling activities. In the case of borings through pavements, similar or equivalent materials should be used to restore the site. Backfilling of borings and sealing off piezometers should be conducted by using non-shrink grout placed with a tremie pipe.

H. Temporary piezometers should be installed when included in the project scope. The piezometers should be read at least 24 hours after initial installation and periodically during 30 days after installation. Piezometers should be spaced no further than 2,500 feet apart along underground utilities where water-bearing layers are encountered. Piezometers are to be abandoned in accordance with Texas Commission on Environmental Quality (TCEQ) requirements when they are no longer necessary.

I. To determine the stratification and classification of the soils, a laboratory analysis should be conducted and geologic information should be used. Laboratory testing should be conducted in accordance with the corresponding ASTM standards. Wherever a soil sample or soil type is referenced in the geotechnical report, the ASTM group name and symbol should be provided.

J. Fort Bend County requires that the boring log soil descriptions be in the following order, from top to bottom:

1. ASTM classification and group symbol, e.g. Fat Clay (CH)
2. Consistency, e.g. stiff, very stiff. For cohesive soils, consistency should be described as very soft, soft, firm, stiff, very stiff, or hard.
3. Descriptor for plasticity, e.g. slight plasticity, high plastic

4. Color

5. Description of the moisture conditions

K. The relative density of cohesionless soils including silts shall be described as very loose, loose, medium dense, dense, and very dense.

L. Soil parameters to be provided are strength data, classification test results, and moisture content. Following are the required tests as a minimum:

1. For cohesive soils

   a. Atterberg limits

   b. Dry density

   c. Strength

   d. Minus 200 sieve (to be performed on at least one sample within each distinct layer)

   e. Shear strength can be estimated using pocket penetrometer and/or torvane tests.

2. For granular soils

   a. Minus 200 sieve (to be conducted on at least one sample)

   b. Shear strength can be estimated using SPT blow counts.

M. The geotechnical report should include the following sections and appendices:

1. Transmittal letter with professional engineer's seal and approval signatures.

2. Executive summary

3. Introduction (Brief background information of the project)

4. Purpose and scope of work (Description of the work to be done in the report and description of the proposed facility, e.g. type, length)

5. Site exploration (physical description of area and geology)

6. Field Work (soil boring and sampling, piezometer installation, if applicable, and environmental issues, if applicable)

7. Laboratory testing

8. Description of subsurface soil and groundwater conditions (description of soil stratigraphy, groundwater conditions, and soil properties)

9. Engineering analysis and recommendations (Description of engineering methods and assumptions, pavement analysis, subgrade treatment recommendation, drilled shaft and driven pile analysis, if applicable).
10. Construction considerations
11. Appendices
    a. Site vicinity map
    b. 11”x17” boring location map showing cross streets, outfall channels or any other feature that can be used to describe the location.
    c. Laboratory test results
    d. Boring logs, which should include the following:
        i) Geographical locations
        ii) Depths of borings and/or piezometers
        iii) Date, weather conditions, and methods of drilling
        iv) Elevation data and X-Y values provided by the project surveyor.
    e. Soil profile drawings showing the subsurface soil and groundwater conditions along a line of borings for the full depth of the borings. The borings should be located in such a way to represent the subsurface soil and ground water conditions in the project area. Soil profile drawings should also include soil group name and consistency to represent the site subsurface soil conditions.
    f. Engineering data
    g. Geologic fault study, which includes the following:
        i) Review of available existing fault maps
        ii) A field visit to identify any visual fault activity
        iii) Phase 1 fault study, if the above points identified potential fault activity or it is recommended by the geotechnical engineer and approved by Fort Bend County Engineering.
        iv) Phase 2 fault study, if Phase 1 study showed evidence of the presence of a fault that could impact the project

area. Phase 2 study requires the collection and analysis of existing geophysical logs and/or drilling and logging of the geophysical borings.

v) Phase 3 fault study, if Phase 2 study establishes the presence of a fault in the project area. This study includes topographic survey and additional geophysical borings drilled/logged. The Phase 3 study should also include:

(1) The location and width of the fault zone, strike, and dip of the fault.

(2) Prediction of the movement of the fault.

(3) Impact of the fault activity on the site structures.

9 ENVIRONMENTAL INVESTIGATIONS

9.1 GENERAL

A. Preliminary wetlands investigations and project notification to the Texas Historical Commission will be performed by Fort Bend County on a program-wide basis, so these efforts should not be needed on a project level.

B. The Design Consultant will be notified in a scoping meeting if further efforts are needed for a particular project. The Design Consultant will also be notified if a Phase 1 Environmental Site Assessment is needed for the project, which typically can be performed by the geotechnical consultant.

C. The Design Consultant is to include the Environmental Report in the Preliminary Engineering Report and discuss if any permits and/or additional coordination with an agency is needed.

10 STORM WATER POLLUTION PREVENTION PLAN

10.1 GENERAL

A. Filter fencing is not typically required along the right-of-way line unless storm water flows from the right-of-way onto private property, which should be avoided.

B. Block sod strip (16 inches wide) shall be placed behind back of curb and each side of sidewalks, if included in the project. All other disturbed areas should be hydromulch seeded. Show the limits of block sod and hydromulch seeding in the typical sections.

C. Filter fencing shall not be placed any closer than two feet behind the curb. Filter fencing is not needed once the area is graded and sod is installed. Cut grade 2 inches below top-of-curb so that sod is flush.

D. The front-end documents provided by Fort Bend County Purchasing Office include the Contractor Acknowledgement of Stormwater Management Program, which refers to TPDES General Permit No. TXR040000. Under this general permit Fort Bend County was required to submit a Notice of Intent (NOI) and Storm Water Management Program (SWMP) as a “small MS4.” Fort Bend County is covered under the authorization number TXR040045.

E. Individual roadway projects do not require separate Notices of Intent, Construction Site Notices, and Notices of Termination as typically seen with TPDES General Permit TXR150000.

F. Following are the requirements for a storm water pollution prevention plan (SWPPP):

1. Develop a SWPPP.
2. Post the signed copy of the approved site notice TXR040045.
3. Ensure the project specifications provide adequate best management practices and meet the requirements of the SWPPP.
4. Ensure all contractors are aware of the SWPPP, which is accomplished by Purchasing’s form and the plans.
5. Ensure that the SWPPP identifies the agency personnel responsible.
6. All other requirements of the TXR150000 process must be met.

11 UTILITIES

11.1 GENERAL

Research to determine the existence and location of underground utilities (pipelines, duct banks, etc.) is the Design Consultant's responsibility. Any level A subsurface utility engineering (exposing or probing) should be at the expense of the utility company when the utility is located in Fort Bend County's right-of-way or easement. Utility company signatures will not be required on completed drawings.

11.2 DESIGN CONSULTANT RESPONSIBILITIES

A. Perform records research and field visits to determine the presence of underground or overhead private or public utilities during the Preliminary Design phase. A reasonable amount of research should be conducted, including but not limited to contact with companies identified on above-ground markers, Railroad Commission website research, and map requests from prominent companies (i.e. CenterPoint Energy, AT&T, etc.).

B. Send records requests to utility companies and obtain I.D. numbers (CenterPoint and AT&T).

C. Depict utilities to a reasonable degree of accuracy on the plan and profile drawings.

D. Prepare a conflict table during the Preliminary Design phase to highlight conflicts between existing utilities and proposed improvements, to be updated during the Final Design phase as required. Refer to Appendix B, Fort Bend County Utility Conflict Table template.

E. Submit milestone-level drawings to applicable utility companies for their review.

11.3 FORT BEND COUNTY AND PROGRAM MANAGER RESPONSIBILITIES

A. Assist the Design Consultant in identifying major utilities, and provide contact information for various utilities as needed.

B. Program Manager to coordinate directly with utility companies to facilitate utility adjustments required by the proposed improvements. Fort Bend County is to support this coordination.

C. Program Manager to coordinate with utility companies during the Construction phase as required. Fort Bend County is to support this coordination.

11.4 DRAWING REQUIREMENTS (MINIMUM) FOR UTILITIES

A. Below are examples of utilities that must be shown on construction drawings.

1. Pipelines
2. Power lines
3. Communication lines, including fiber optic lines owned by TxDOT, cities, or Fort Bend County Toll Road Authority
4. Water lines
5. Sanitary Sewer lines
6. Gas lines

B. A plan note should be provided warning the contractor to call the respective company when working in the vicinity of a pipeline.

12 CONSTRUCTION DRAWING REQUIREMENTS

12.1 CONSTRUCTION DRAWINGS TYPICAL SHEET LIST AND ORDER

Following is the typical order of construction drawings:

1. Cover Sheet*
2. Index of sheets
3. General Notes*
4. Typical Sections
5. Project Layout Sheet
6. Survey Control
7. Right-of-way (Existing & Proposed)
8. Horizontal Alignment Data
9. Roadway Plan & Profile
10. Intersection Plan & Profile
11. Bridge Design & Details (Bridge and Railing)
12. Drainage Area Maps & Computations
13. Traffic Control Plan
14. Traffic Signals & Details
15. Signing & Striping Plan
16. Storm Water Pollution Prevention Plan (SWPPP)
17. Details*
    - Roadway, Pavement, Curb
    - Driveway (schedule & details), Sidewalks, Ramps
    - Drainage, Manholes, Inlets, Outfalls
    - Signing & Striping
    - Retaining Wall, Slope Paving
    - Storm Water Pollution Prevention
    - Project Sign
18. Cross Sections with Earthwork Quantities

* Refer to Fort Bend County standard details.

12.2 GENERAL REQUIREMENTS FOR PLANS

A. Plans shall be submitted electronically in PDF format and page size of 11-inch height x 17-inch width.

B. Plan and profile sheets are to have a scale of 1" = 40' for horizontal and 1" = 4' for vertical. The scale above is a minimum; larger scales may be used to show details of construction.

C. Separate drawings for roadway and storm sewer are not necessary.

D. Stationing must run from left to right, except for short streets or lines originating from a major intersection, where the full length can be shown on one sheet.

E. A north arrow must be included on all plan sheets and should be oriented either upward or to the right.

F. A scale bar must be included on all plan sheets.

G. Match lines should not be placed at intersections, including cross street right-of-way.

H. The engineer's seal and signature including date is required on each sheet at the 100 percent level; interim seal shall be appropriate for previous submittal levels.

I. Alignments for all roads shall be shown on the plans. Alignment shall include PCs, PTs, and curve data. Alignment data shall be included in the Horizontal Alignment Data sheet or added on the Project Layout sheet at the Design Consultant's discretion.

J. Details of special structures not covered by approved standard drawings should be included in the plans and shall be drawn with vertical and horizontal scales equal to each other.

12.3 COVER SHEET REQUIREMENTS

A. Below are specifications to be included on the construction plans cover sheet. Refer to Fort Bend County Cover Sheet template.

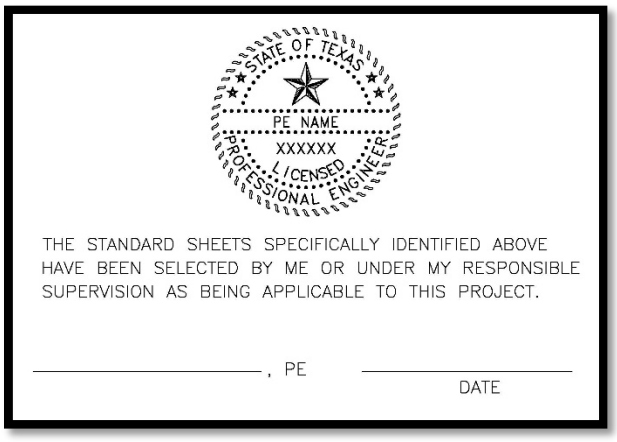
1. Road name
2. Limits of proposed construction
3. Fort Bend County's project number
4. Name of the County Judge and each Commissioner
5. County Engineer signature block in lower right corner
6. Project Location and Vicinity Maps, including the Key Map information

7. Engineer's seal, date and signature

8. A stamp indicating the submittal level (e.g. 30% Submittal, 70% Submittal, etc.) as appropriate for the plan set submittal.

12.4 INDEX OF SHEETS REQUIREMENTS

A. Design Consultant shall sign and seal the Index of Sheets instead of signing and sealing each individual Fort Bend County standard detail. The following statement shall be included on the Index of Sheets:



B. A standard detail shall be sign and sealed only when it has been modified by the Design Consultant.

12.5 TYPICAL SECTIONS AND NON-STANDARD SECTION REQUIREMENTS

A. Below are specifications to be included on the construction typical sections and non-standard sections. Refer to Fort Bend County's typical sections detail.

1. Station limits for each section

2. Pavement/subgrade material and thickness

3. Proposed and existing right-of-way and roadway width

4. Applicable dimensions

5. Profile grade line

6. General location of existing and proposed utilities

12.6 PLAN AND PROFILE SHEET

A. All utility lines shall be shown in plan view, regardless of the size. Show utility lines 4 inches in diameter or larger within right-of-way or construction easement in profile view. Refer to Appendix A for Linetype Styles.

B. Plan view

1. Labels (shown back to back):
    a. Pavement width and thickness
    b. Pavement material (existing and proposed)
    c. Right-of-way and easement widths (existing and proposed). Make sure that the line weights for existing and proposed right-of-way are significantly different to assure clarity. Proposed lines shall have a linetype thickness of 0.004 inches thicker than existing.
    d. Median widths and proposed station median noses
    e. Curbs
    f. Intersection radii
    g. Existing utilities (type and location)
2. Show direction of flow for all existing and proposed ditches.
3. Property lines are to be included in plan view.
4. Existing roads, drainage facilities, utilities, power poles, buildings, etc. within the proposed right-of-way shall be shown.
5. Horizontal curve data shall be included in the Horizontal Alignment Data sheet or added on the Project Layout sheet at the Design Consultant's discretion.

C. Profile view

1. Natural ground profiles at each proposed right-of-way and/or easement line.
2. Proposed profile grade line (PGL) at outside top of curb except at railroad crossings. Centerline grades are acceptable only for paving without curb and gutter and through major intersections. Label all proposed grades of the PGL on each plan and profile sheet.
3. Gutter elevations are required for vertical curves, where a railroad track is crossed.
4. Vertical curve data shall be included in the profile.
5. Drainage structures (inlets, manholes, outfall structures, storm sewer) shall be labeled including flowline, top elevations, and parallel culverts size and length.

6. Locations of utility pipeline and adjustments required. If the pipeline is deeper than the lowest elevation shown on the profile view of the sheet, add a note in the profile stating the utility and its elevation.

7. Flow line elevation and direction of flow for proposed ditches.

D. Cross Sections

1. Cross sections are to be drawn at maximum 100-foot stations and other intermediate locations as required to show significant changes.

2. Earthwork quantities shall be computed by the average end area method. Volume for total roadway excavation and embankment (roadway and drainage) shall be shown between cross sections, and the sums of the volumes should match the bid form quantities.

12.7 BRIDGE DRAWING REQUIREMENTS

A. Layout

1. Position, size and length of piling. Pile schedules shall be on the abutment and bent detail sheets

2. Proposed slope and width of channel. Also, show the length of proposed improvement of channel.

3. Design criteria (showing design load, HL93)

4. Transition from new bridge roadway to existing width of roadway

5. Bridge typical section

6. Labels:

a. Length of bridge and approach slab, width of roadway, curb and sidewalk

b. Station at centerline of each bent

c. Elevation of top and bottom of cap at centerline on bent detail sheet

d. Elevation of top of decking at centerline

e. Rail post spacing

B. Abutment detail, which includes:

1. Plan and profile view, including beam spacing

2. Bearing pad outline

3. Piling positions in plan and profile view

4. Sections at centerline showing reinforced steel, approach slab and joint detail. Two or more sections may be required for retaining walls.
5. Section at sidewalk showing reinforcing steel
6. Sections at wingwall showing reinforcing steel
7. All reinforcing steel shall be identified as to size and spacing
8. Details should be to scale

C. Interior bent detail, which includes:

1. Plan and profile view, including beam spacing
2. Piling positions in plan and profile view
3. Sections at centerline showing reinforced steel and connection of box girders
4. All reinforcing steel shall be identified as to size and spacing
5. Pile schedule
6. Beam seat details for abutment and bents
7. General notes (class of concrete, 28-day strength, etc.)
8. Details should be to scale

D. Bent girder detail, which includes:

1. Plan view
2. Deck section in profile view, showing centerline of roadway, girders, decking and its reinforcing steel, curb and sidewalk, slope of roadway, drain holes, etc.
3. Typical section of box girder showing spacing and size of prestress strand, prestress force, stirrups, dowels, bond breakage, etc. Also, deck slope, number of box girders, sidewalk reinforcing detail and guard rail connection shall be included in the typical section.
4. Deflection tables shall be included on the plans to ensure proper stressing is employed in the box girders.
5. All reinforcing steel, identified as to size and spacing
6. Connection between box girder (grout key, shear plate)
7. Bearing pad details
8. Details should be to scale

E. Piling/drilled shaft and underreamed footing detail, which includes:

1. Reinforcing detail, including cutback and buildup details
2. Piling handling detail
3. Underreamed footing detail showing base diameter, angle of bell, etc.
4. General construction notes

F. Railing detail, which includes:

1. Plan and profile view showing spacing of rail posts
2. Connection of posts and bridge detail
3. Connection of post and rail

G. Miscellaneous details, which could include:

1. Armor joints
2. Drains
3. Slope paving
4. Approach slab

13 DESIGN SUBMITTALS

13.1 GENERAL

The Design Consultant is to fill out the appropriate Review Checklist and include it with the submittal. This will ensure that submittals are complete. Refer to Appendix C for Fort Bend County Submittal Checklists.

Following are the requirements for each Submittal:

13.2 PRELIMINARY ENGINEERING REPORT

Refer to Chapter 1, Preliminary Design for details on this phase of the project.

13.3 70% SUBMITTAL

A. A digital copy (Adobe Acrobat format, PDF) of the drawings, specifications, and estimate will be required and shall be submitted to the Program Manager.

B. The 70 percent submittal shall include the following:

1. Cover Sheet with a 70 percent interim seal
2. Index of Sheet
3. General Notes
4. Typical and Non-standard Cross Sections
5. Project Layout Sheet
6. Survey Control
7. Right-of-way (Existing and Proposed)
8. Horizontal Alignment Data
9. Plan and Profile Sheets (detailed callouts not required at 70 percent)
10. Bridge Layout and Details (if applicable)
11. Drainage Area Map with Hydraulic Calculations
12. Traffic Control Plan
13. Signing and Striping Plan
14. Traffic Signal and Details (if applicable)
15. Storm Water Pollution Prevention Plan
16. Cross Sections (100 foot intervals with earthwork calculations)
17. Specification Table of Contents (Use Harris County Specifications. TxDOT Specifications and others to be used as necessary depending

on jurisdiction). Refer to Appendix B for Fort Bend County Specification Table of Contents template.

18. Construction Cost Estimate (PDF and Excel format)
19. Bid Form (PDF and Excel format). Ensure that bid items and units match those shown in the applicable specification. Refer to Appendix B for Fort Bend County Bid template.
20. KMZ file of current design with proposed right-of-way.
21. 70 Percent Review Checklist.

13.4 95% SUBMITTAL

A. A digital copy (Adobe Acrobat format, PDF) of the drawings, specifications, and estimate will be required and shall be submitted to the Program Manager.

B. The 95 percent submittal should be considered complete with 95 percent interim seal, and shall include all of the 70 percent requirements plus the following:

C. Verify earthwork quantities with cross sections at 100-foot intervals.

D. Standard construction details.

E. Project manual (bid form, specification table of contents, any special specifications or conditions; contract documents excluded)

F. KMZ file of current design with proposed right-of-way.

G. Responses to 70 percent comments

H. 95 Percent Review Checklist.

13.5 100% SUBMITTAL

A digital copy in Adobe Acrobat format (PDF) of the drawings (sealed and signed),

The 100 percent submittal should be considered ready for project advertisement and should include the following:

A. Project manual

B. Construction cost estimate

C. KMZ file of current design with proposed right-of-way.

D. Responses to 95 percent comments

E. Recommended maximum number of calendar days for construction

F. 100 Percent Review Checklist

13.6 QUALITY CONTROL

All documents shall be internally reviewed in accordance with the Design Consultant's documented Quality Assurance/Quality Control (QA/QC) process prior to submittal to the Program Manager. Fort Bend County reserves the right to audit QA/QC documents to ensure the process has been followed.

13.7 DESIGN COMPLETION

All items shall be submitted to the Program Manager. Final design efforts will be considered complete when Fort Bend County has approved the documents as evidenced by the Fort Bend County Engineer's signature on the cover sheet.

14 BID AND CONSTRUCTION PHASE SERVICES

14.1 BID PHASE SERVICES

Upon completion of final design services, Fort Bend County will determine an advertisement and bid opening schedule. All administrative project manual documents (cover page, Notice to Bidders, etc.) will be prepared by Fort Bend County Purchasing Department and provided to the Program Manager and Design Consultant in PDF format.

A. The Design Consultant will prepare a single project manual file in PDF format, consisting of:

   1. The bid form (prepared by the Design Consultant)
   2. A sealed and signed specification table of contents (prepared by the Design Consultant)
   3. Applicable specifications and other design documents (prepared by the Design Consultant)

B. The Design Consultant will also prepare the bid form in Excel format. The file should have all cells locked except for the unit pricing. The Design Consultant is to ensure that formulas are provided so that the spreadsheet will calculate the totals for the vendors.

C. The single project file in PDF format, the bid form in Excel format and one drawing plan set (including signed cover sheet) will be sent to the Program Manager. Printed documents are not required. Purchasing will draft and include the front-end documents in the bid set and upload all the documents to the County's website.

D. The Design Consultant will attend a pre-bid meeting at the Fort Bend County Purchasing Office. It is not necessary to prepare for the meeting, other than to be able to briefly describe the project and answer questions.

E. The Purchasing Agent will forward bidder questions to the Program Manager/Design Consultant. Answers to questions, as well as any other required changes, will be included in an addendum, prepared by the Design Consultant if necessary. The Purchasing Agent will distribute the addendum.

F. After the bid, the Program Manager will prepare a bid tabulation and provide a copy to the Design Consultant for filing.

14.2 CONSTRUCTION PHASE SERVICES

A. The Design Consultant will attend a pre-construction meeting with Fort Bend County staff, Program Manager, Construction Manager, general contractor, and construction materials testing contractor. Prior to the meeting, the Program Manager will inform the Design Consultant of how many drawing plan sets and project manuals are required, and the Design Consultant will provide these documents at the pre-construction meeting.

B. The Design Consultant will be responsible for reviewing contractor submittals and responding to Requests for Information.

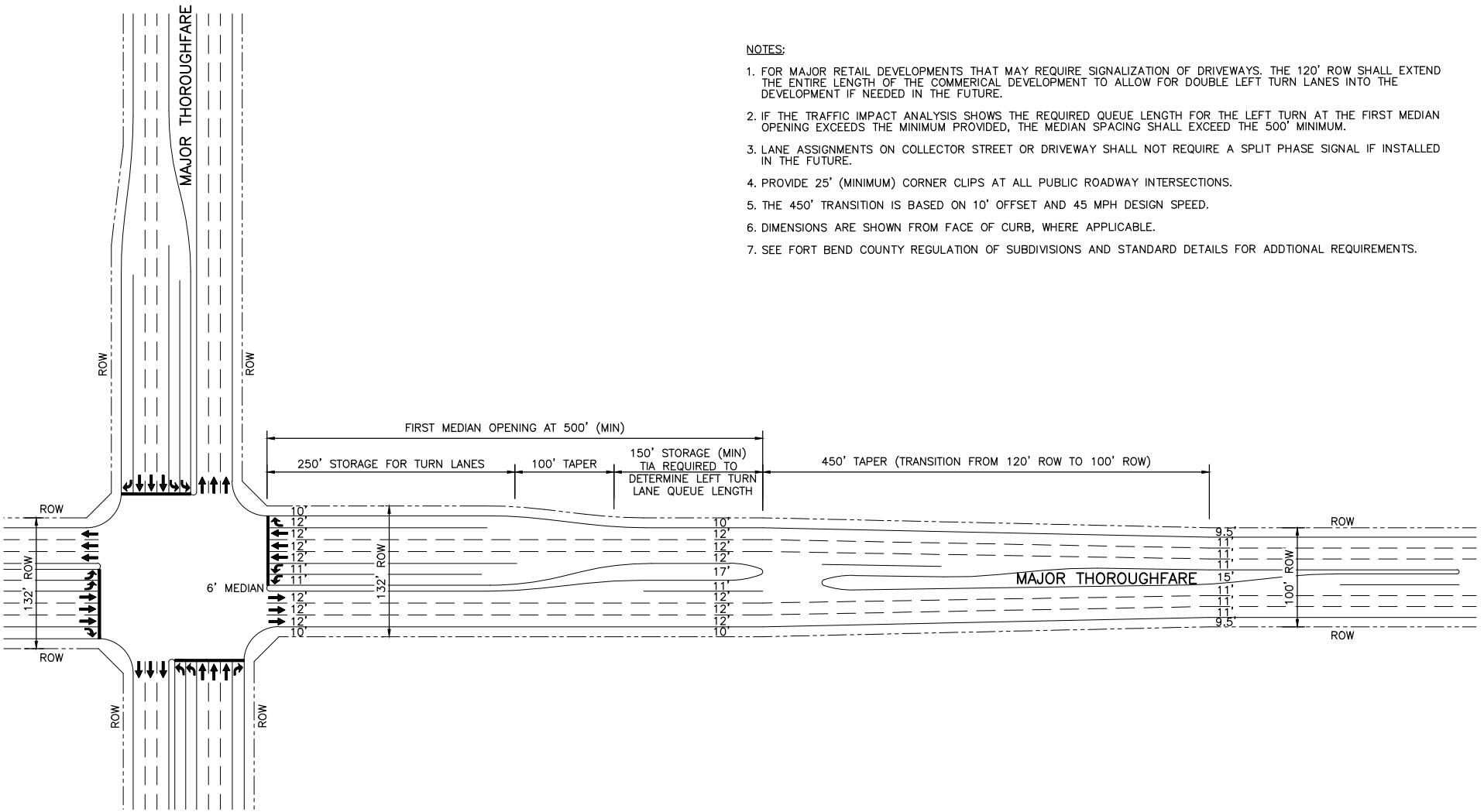
C. Field visits and progress meetings will not be required unless requested by Fort Bend County.

D. The Design Consultant will participate in a substantial completion walkthrough.

E. After project completion, the Design Consultant will prepare record drawings based on contractor as-built markups. The sheets that have deviations from the original plans should have clouds around the changes and should be signed and dated by the Engineer. All sheets should be stamped Record Drawings, including the cover sheet. The cover sheet should be signed, sealed, dated and include the following statement: "This project was constructed in general conformance with the plans, and elevations on these drawings represent what was constructed within engineering tolerances." The Design Consultant is to deliver to Fort Bend County one set of the record drawings in pdf format on a CD/DVD with each sheet stamped “Record Drawings.” The CD/DVD shall also include electronic files (AutoCAD or Microstation) as well as a KMZ file showing the existing/proposed right-of-way and proposed improvements. The information contained on this CD/DVD shall also be uploaded to the appropriate folder within Masterworks.

Appendix A Figures

List of Figures



NOTES:

1. FOR MAJOR RETAIL DEVELOPMENTS THAT MAY REQUIRE SIGNALIZATION OF DRIVEWAYS. THE 120' ROW SHALL EXTEND THE ENTIRE LENGTH OF THE COMMERICAL DEVELOPMENT TO ALLOW FOR DOUBLE LEFT TURN LANES INTO THE DEVELOPMENT IF NEEDED IN THE FUTURE.
2. IF THE TRAFFIC IMPACT ANALYSIS SHOWS THE REQUIRED QUEUE LENGTH FOR THE LEFT TURN AT THE FIRST MEDIAN OPENING EXCEEDS THE MINIMUM PROVIDED, THE MEDIAN SPACING SHALL EXCEED THE 500' MINIMUM.
3. LANE ASSIGNMENTS ON COLLECTOR STREET OR DRIVEWAY SHALL NOT REQUIRE A SPLIT PHASE SIGNAL IF INSTALLED IN THE FUTURE.
4. PROVIDE 25' (MINIMUM) CORNER CLIPS AT ALL PUBLIC ROADWAY INTERSECTIONS.
5. THE 450' TRANSITION IS BASED ON 10' OFFSET AND 45 MPH DESIGN SPEED.
6. DIMENSIONS ARE SHOWN FROM FACE OF CURB, WHERE APPLICABLE.
7. SEE FORT BEND COUNTY REGULATION OF SUBDIVISIONS AND STANDARD DETAILS FOR ADDTIONAL REQUIREMENTS.

NO.	REVISIONS	DATE	NAME
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FORT BEND COUNTY
ENGINEERING DEPARTMENT

MOBILITY BOND PROGRAM DESIGN MANUAL

ROADWAY
MAJOR THOROUGHFARE – MAJOR THOROUGHFARE INTERSECTION TYPICAL LAYOUT

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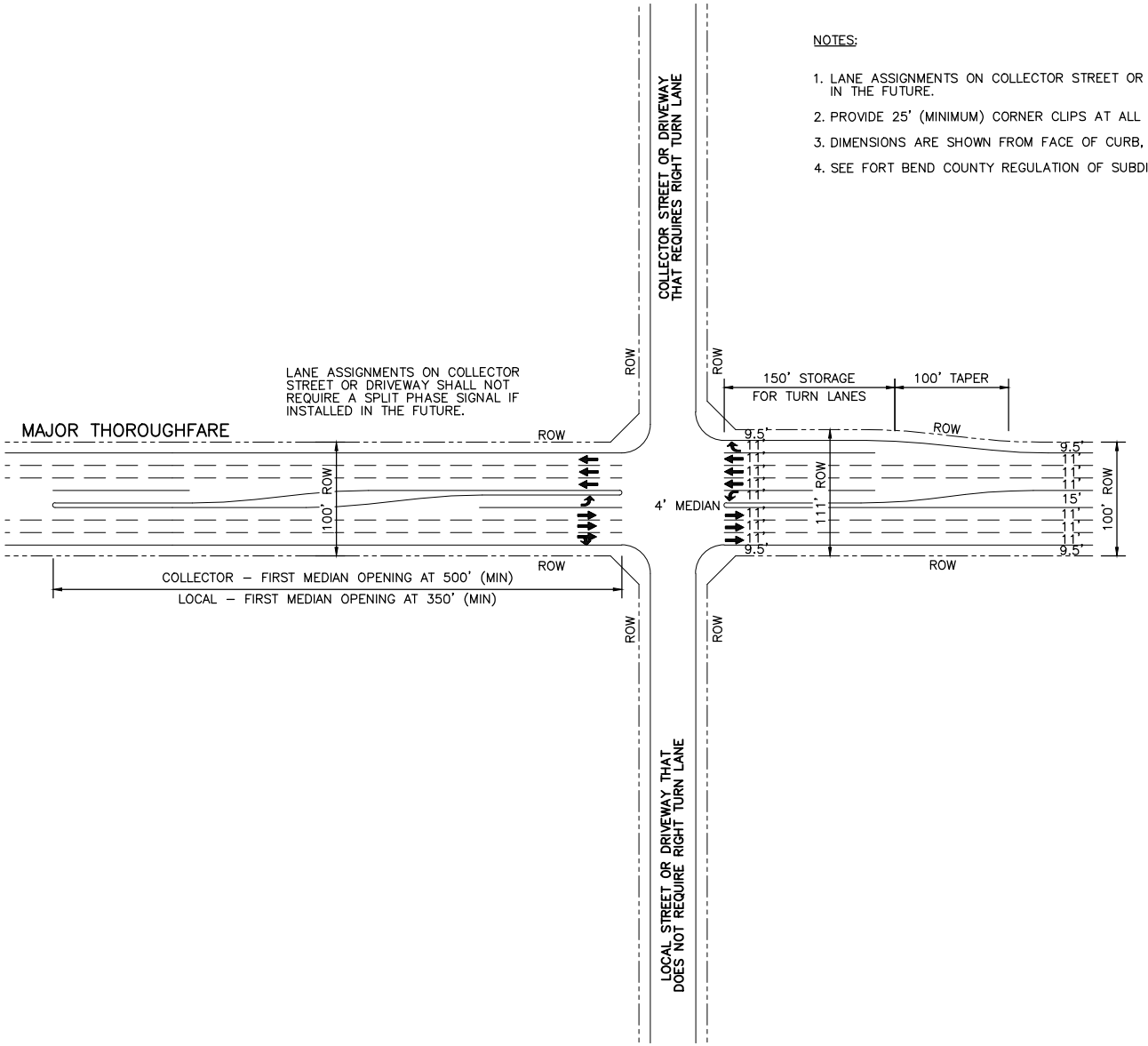

NOTES:

1. LANE ASSIGNMENTS ON COLLECTOR STREET OR DRIVEWAY SHALL NOT REQUIRE A SPLIT PHASE SIGNAL IF INSTALLED IN THE FUTURE.
2. PROVIDE 25' (MINIMUM) CORNER CLIPS AT ALL PUBLIC ROADWAY INTERSECTIONS.
3. DIMENSIONS ARE SHOWN FROM FACE OF CURB, WHERE APPLICABLE.
4. SEE FORT BEND COUNTY REGULATION OF SUBDIVISIONS AND STANDARD DETAILS FOR ADDTIONAL REQUIREMENTS.

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FORT BEND COUNTY
ENGINEERING DEPARTMENT

MOBILITY BOND PROGRAM DESIGN MANUAL

ROADWAY
MAJOR THOROUGHFARE – COLLECTOR INTERSECTION
TYPICAL LAYOUT

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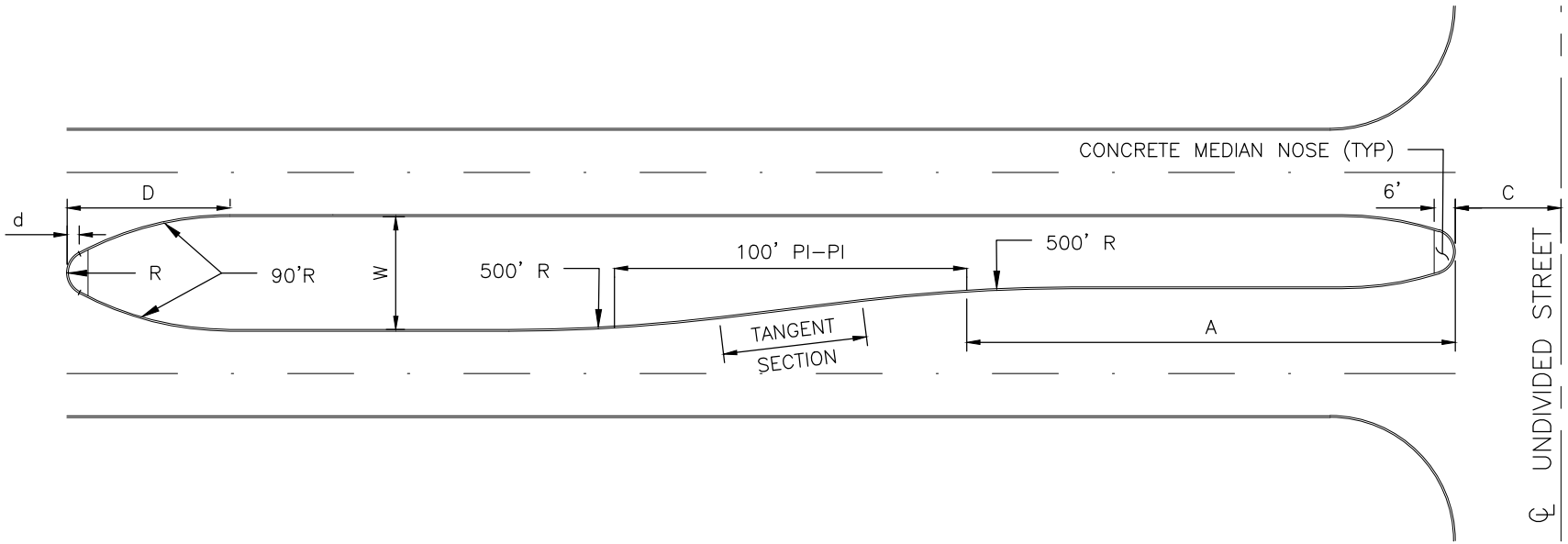

TYPICAL MEDIAN OPENING 'C'			
MEDIAN INTERRUPTION FOR	No LTB	1 LTB	2 LTB
PRIVATE DRIVE	45 FEET	52.5 FEET	60 FEET
UNDIVIDED STREET			
<40	N/A	52.5 FEET	60 FEET
44 feet	N/A	55'	80 FEET
DIVIDED STREET	N/A	WIDTH OF INTERSECTING STREET + 22 FEET	WIDTH OF INTERSECTING STREET + 22 FEET

W (BACK TO BACK)	8	9	10	12	13	14	23	24	32	34	35
R (BACK OF CURB)	1	1.5	1.5	2	2	2.5	4	4.5	6	6.5	6.5
D	22.38	22.83	24.78	27	28.65	29.08	38.38	38.78	45.18	46.5	47.41
d	1.15	1.53	1.48	1.8	1.75	2.1	2.72	3.01	3.49	3.67	3.59

INTERSECTION TYPE	DESIGN SPEED	A
MAJOR THOROUGHFARE - MAJOR THOROUGHFARE	≤ 35 MPH	150'
	> 35 MPH	150'
MAJOR THOROUGHFARE - COLLECTOR	≤ 35 MPH	150'
	> 35 MPH	150'
ALL OTHER	< 35 MPH	100'
	> 35 MPH	100'

NO.	REVISIONS	DATE	NAME
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FORT BEND COUNTY
ENGINEERING DEPARTMENT

MOBILITY BOND PROGRAM DESIGN MANUAL

LEFT TURN LANE DESIGN

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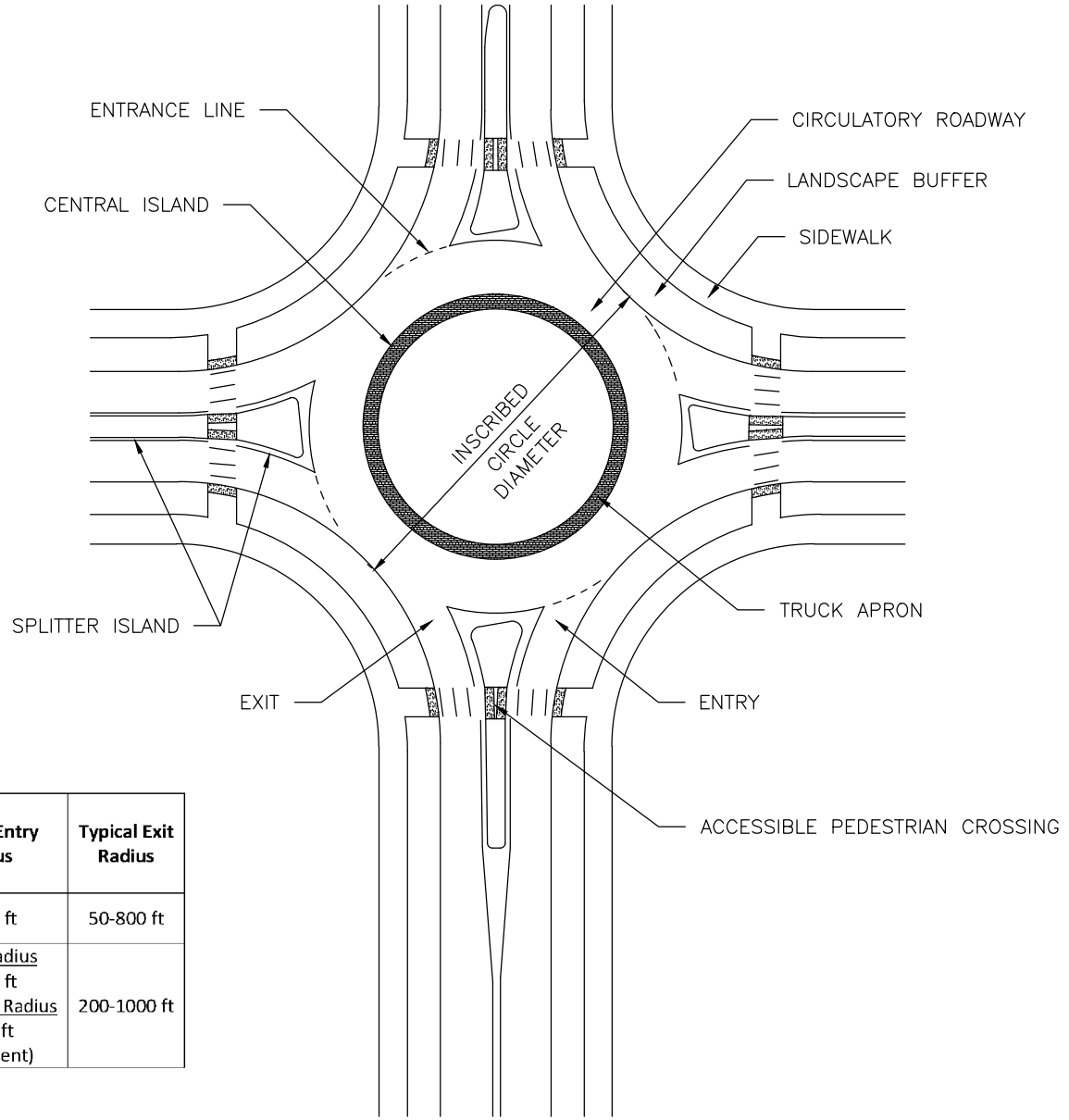

Roundabout Geometry	Typical Inscribed Circle Diameter	Maximum Entry Width	Typical Circulatory Roadway width	Typical Entry Radius	Typical Exit Radius
Single Lane	90-150 ft	16 ft desirable 20 ft max	16-20 ft	50-90 ft	50-800 ft
Two-Lane	150-220 ft	28 ft desirable 32 ft max	28-32 ft	Initial Radius 60-12 ft Secondary Radius >150 ft (or tangent)	200-1000 ft

NO.	REVISIONS	DATE	NAME
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FORT BEND COUNTY
ENGINEERING DEPARTMENT

MOBILITY BOND PROGRAM DESIGN MANUAL

ROUNDABOUT FEATURES

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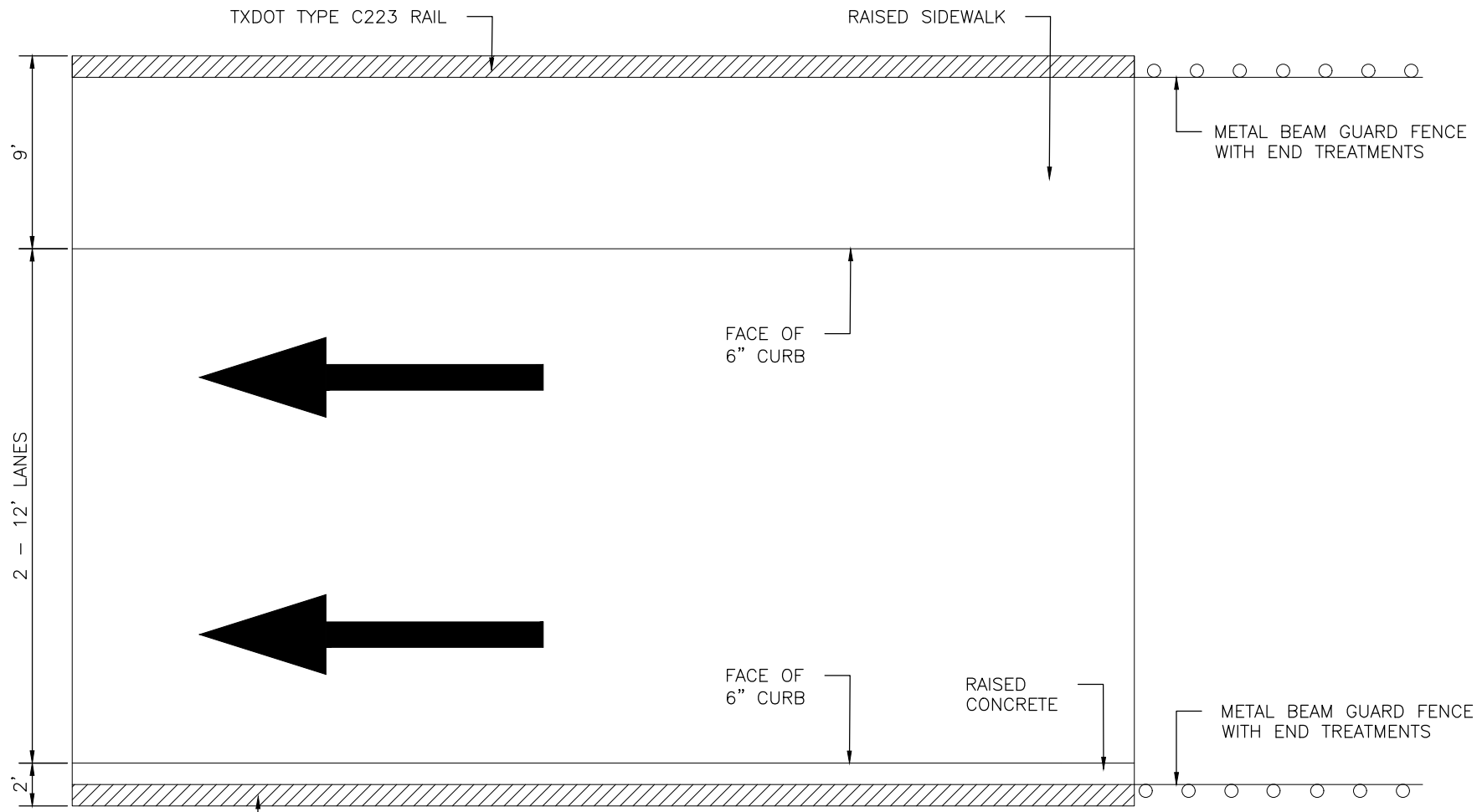

NOTE:

SECTION SHOWN IS FOR TWIN BRIDGE. SINGLE BRIDGE TRAVEL LANE WIDTHS CAN VARY. INCLUDE SIDEWALKS ON BOTH SIDES OF SINGLE BRIDGE.

NO.	REVISIONS	DATE	NAME
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FORT BEND COUNTY
ENGINEERING DEPARTMENT

MOBILITY BOND PROGRAM DESIGN MANUAL

BRIDGE
TYPICAL LAYOUT

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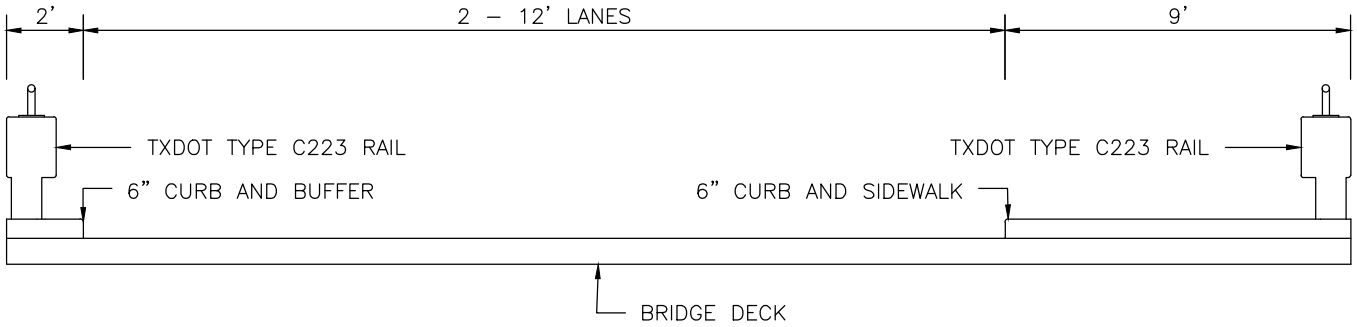

NOTES:

SECTION SHOWN IS FOR TWIN BRIDGE. SINGLE BRIDGE TRAVEL LANE WIDTHS CAN VARY. INCLUDE SIDEWALKS ON BOTH SIDES OF SINGLE BRIDGE.

STRUCTURAL COMPONENTS NOT SHOWN FOR CLARITY.

NO.	REVISIONS	DATE	NAME
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FORT BEND COUNTY
ENGINEERING DEPARTMENT

MOBILITY BOND PROGRAM DESIGN MANUAL

BRIDGE
TYPICAL SECTION

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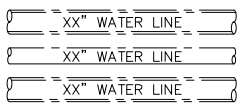
WATER LINE

PLAN VIEW – WATER LINE (20" AND SMALLER)

PLAN VIEW – WATER LINE (24" AND LARGER)

PROFILE VIEW – WATER LINE (20" AND SMALLER)

PROFILE VIEW – WATER LINE (24" AND LARGER)



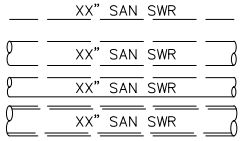
SANITARY SEWER LINES

PLAN VIEW – SANITARY SEWER LINE (24" AND SMALLER)

PLAN VIEW – SANITARY SEWER (30" AND LARGER)

PROFILE VIEW – SANITARY SEWER LINE (24" AND SMALLER)

PROFILE VIEW – SANITARY SEWER LINE (30" AND LARGER)



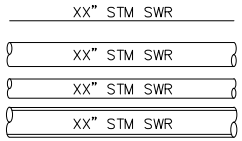
STORM SEWER LINES

PLAN VIEW – STORM SEWER LINE (24" AND SMALLER)

PLAN VIEW – STORM SEWER (30" AND LARGER)

PROFILE VIEW – STORM SEWER LINE (24" AND SMALLER)

PROFILE VIEW – STORM SEWER LINE (30" AND LARGER)



DITCH/SWALE LINES

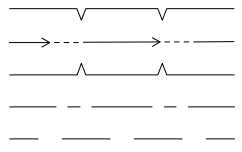
PLAN VIEW – DITCH HIGH BANK

PLAN VIEW – DITCH/SWALE FLOW LINE

PLAN VIEW – DITCH HIGH BANK

PROFILE VIEW – NORTH OR EAST DITCH

PROFILE VIEW – SOUTH OR WEST DITCH



PROPERTY LINES

PLAN VIEW – RIGHT-OF-WAY

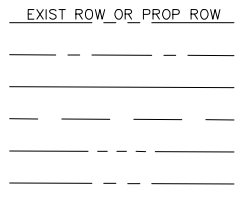
PLAN VIEW – CENTER LINE OF RIGHT-OF-WAY

PLAN VIEW – PROPERTY/LOT LINE

PLAN VIEW – EASEMENT

PROFILE VIEW – NORTH OR EAST RIGHT-OF-WAY

PROFILE VIEW – SOUTH OR WEST RIGHT-OF-WAY



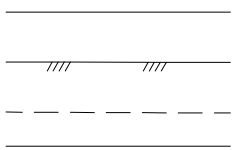
PAVEMENT LINES

PLAN VIEW – EDGE OF CONCRETE PAVEMENT/BACK OF CURB

PLAN VIEW – EDGE OF ASPHALT PAVEMENT (TICKS TOWARDS THE ROAD)

PLAN VIEW – EDGE OF GRAVEL PAVEMENT

PROFILE VIEW – TOP OF CURB

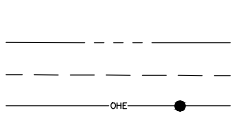


UTILITY LINES

PLAN VIEW – GAS LINE

PLAN VIEW – UNDERGROUND COMMUNICATION

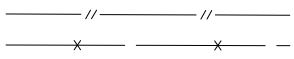
PLAN VIEW – OVERHEAD ELECTRIC AND POWER POLE



MISCELLANEOUS LINES

PLAN VIEW – WOOD/CHAIN LINK FENCE

PLAN VIEW – BARBED WIRE FENCE



NOTES:

1. EXISTING AND PROPOSED FEATURES SHALL HAVE THE SAME LINETYPE STYLES.
2. EXISTING FEATURES SHALL BE GRAYSACALED.
3. PROPOSED FEATURES SHALL HAVE A LINETYPE THICKNESS OF 0.004 INCHES THICKER THAN EXISTING.

NO.	REVISIONS	DATE	NAME
1			
2			
3			
4			
5			

FORT BEND COUNTY
ENGINEERING DEPARTMENT

MOBILITY BOND PROGRAM DESIGN MANUAL

LINETYPE STYLES

T:\2_Projects\300703.00 Fort Bend County 2017 Bond Program\SPI Management\Design Manual\Design Manual\LINETYPES.dwg

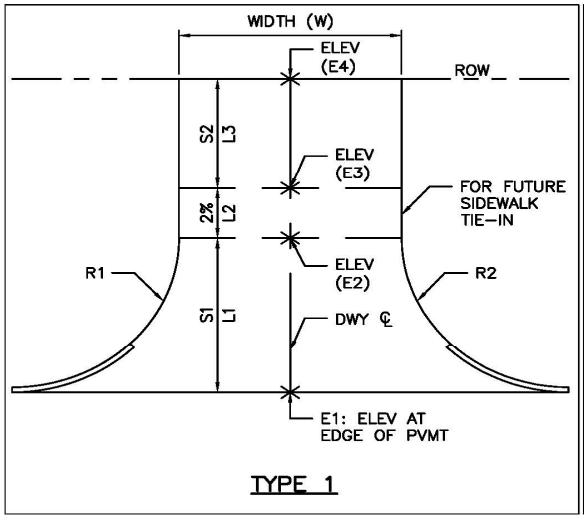
Appendix B Templates

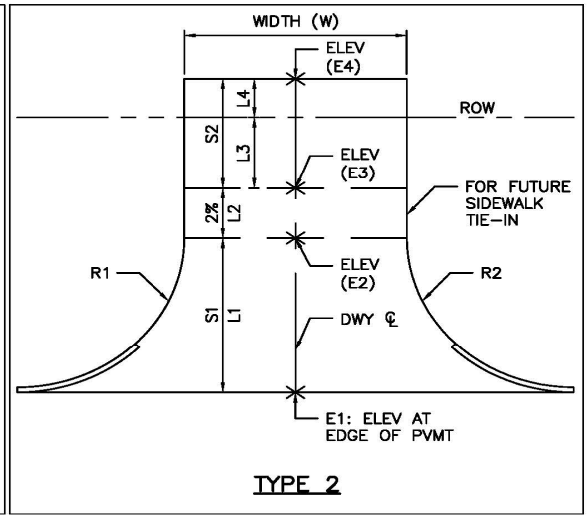
List of Templates

Driveway Summary
Utility Contact/Conflict Table
ROW Documents
Bid Form
Index of Technical Specifications
Special Conditions

DRIVEWAY SUMMARY

SHEET NO	DRIVEWAY NUMBER	CL STATION	LT/RT	DRIVEWAY TYPE	WIDTH W (FT)	LENGTH L1 (FT)	LENGTH L2 (FT)	LENGTH L3 (FT)	LENGTH L4 (FT)	RADIUS R1 (FT)	RADIUS R2 (FT)	ELEVATION E1 (FT)	ELEVATION E2 (FT)	ELEVATION E3 (FT)	ELEVATION E4 (FT)	SLOPE S1 (%)	SLOPE S2 (%)	DRIVEWAY AREA (SY)	Commercial Driveway TCE (FTxFT)





Fort Bend County
Utility Contact/Conflict Table

Project Name: _____
Project Limits: _____
Fort Bend County Project No. _____
Consultant Name/Project Mgr: _____

CenterPoint Energy ID: _____
AT&T Research Log # _____

No.	Station	Utility Type	Owner	Does Utility Co. have an Easement Yes/No	Conflict Yes/No	Probed Yes/No	Contact Name	Address	Phone No. Email	Describe Conflict (if applicable)	Est. Cost	Reloc. Start Date	Reloc. Com. Date
1													
2													
3													
4													
5													
6													
7													
9													
10													
11													
12													
13													
14													
15													
16													
17													
18													
17													
18													
19													

KELLY R. KALUZA & ASSOCIATES, INC.
Consulting Engineers & Surveyors
Engineering Firm No. F-1339 ■ Surveying Firm No. 10010000
3014 Avenue I, Rosenberg, Texas 77471
(281) 341-0808 ■ FAX (281) 341-6333

August 21, 2017
Revised: November 28, 2017

Old Needville-Fairchilds Road Parcel 1

A FIELD NOTE DESCRIPTION of 0.181 acre of Land (7,897 square feet) being a portion of the Jason Gregory and Julie K. Gatti call 1.42 acre tract (Fort Bend County Clerk's File No. 2002082301) out of Partition Tract "K" (call 2.745 acres – Marion Cloud) of the partition of the Henry Banker call 141.265 acre tract (Fort Bend County District Court Case No. 78-DCV-033772), all being in the H. and T.C. Railroad Company Survey Section No. 27, Abstract No. 219, Fort Bend County, Texas. The bearing basis for this description is referenced to the Texas Coordinates System of 1983 (South Central Zone) and was determined by Global Positioning System methods.

FOR CONNECTION, begin at a mag nail set in asphalt pavement in the intersection of the approximate centerline of Old Needville-Fairchilds Road (width varies, no dedication information available) with the approximate centerline of Padon Road (width varies, no dedication information available); Said corner being the East corner of said call 141.265 acre tract and being the North corner of a call 218.225 acre tract of Land (Fort Bend County Clerk's File No. 2015005996); Said corner being the East corner of said Section No. 27 Survey, being the South corner of the H. and T.C. Railroad Company Survey Section No. 28 (Henry Benker Survey), Abstract No. 465, being the West corner of the H. and T.C. Railroad Company Survey Section No. 34 (William Leminski Survey), Abstract No. 582, and being the North corner of the H. and T.C. Railroad Company Survey Section No. 35, Abstract No. 223; Said corner bears North 41 degrees, 56 minutes, 8 seconds East – 2262.00 feet along the Southeasterly line of said call 141.265 acre tract along a line in said Old Needville-Fairchilds Road from a mag nail set in asphalt pavement for a Northwesterly re-entrant corner of said call 218.225 acre tract in a Northeasterly line of the existing city limits of the City of Needville (Ordinance No. XII-97 - call 2.57 acre Tract Four; Fort Bend County Clerk's File No. 9748226); **THENCE;** South 41 degrees, 56 minutes, 8 seconds West, at 1910.37 feet pass a point for the East corner of Partition Tract "H" (call 2.745 acres – Melba Lawler) of said call 141.265 acre tract and from which a three-quarter inch inside diameter iron pipe with plastic cap found for reference bears North 48 degrees, 3 minutes, 52 seconds West – 30.00 feet and a one-and-one half inch inside diameter iron pipe found for the North corner of said Partition Tract "H" bears North 48 degrees, 3 minutes, 52 seconds West – 446.20 feet, in all 2178.37 feet along the Southeasterly line of said call 141.265 acre tract and along the Southeasterly line of said Section No. 27 Survey with the Northwesterly line of said Section No. 35 Survey being along a line in said Old Needville-Fairchilds Road to a point for the East corner of said call 1.42 acre tract and for the South corner of a call 1.3722 acre tract (Fort Bend County Clerk's File No. 2010060893) out of said Partition Tract "H"; Said corner being the East corner of and **PLACE OF BEGINNING** for this 0.181 acre tract of Land;

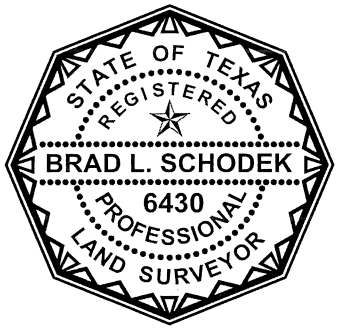
THENCE; South 41 degrees, 56 minutes, 8 seconds West, at 83.63 feet pass said mag nail set in asphalt pavement in the existing city limits line, in all 142.14 feet continuing along the Southeasterly line of said call 141.265 acre tract and along the Southeasterly line of said Section No. 27 Survey with the Northwesterly line of said Section No. 35 Survey being along a line in said Old Needville-Fairchilds Road to a mag nail in asphalt pavement set for the South corner of this tract; Said corner being the South corner of said call 1.42 acre tract and being the South corner of an original call 0.0459 acre tract of Land (Fort Bend County Clerk's File No. 9860224) out of a call 1.3725 acre tract (Volume 1076, Page 104; Deed Records of Fort Bend County, Texas);

THENCE; North 48 degrees, 3 minutes, 52 seconds West, at 30.00 feet pass a one-half inch diameter iron rod found for reference in the existing Northwesterly right-of-way line of said Old Needville-Fairchilds Road as occupied and monumented on the ground (deed call right-of-way at 30.00 feet; Fort Bend County Clerk's File No. 2002082301) and from which a one-half inch diameter iron rod found for reference bears North 41 degrees, 56 minutes, 8 seconds East – 8.00 feet, in all 55.62 feet crossing into said call 1.3725 acre tract along the Southwesterly line of said original call 0.0459 acre tract being a Southwesterly line of said call 1.42 acre tract to a 5/8 inch diameter iron rod with plastic cap set for the West corner of this tract;

THENCE; North 41 degrees, 58 minutes, 59 seconds East – 142.14 feet crossing said call 1.42 acre tract along the proposed Northwesterly right-of-way line of Old Needville-Fairchilds Road (100 feet wide) to a 5/8 inch diameter iron rod with plastic cap set for the North corner of this tract;

THENCE; South 48 degrees, 3 minutes, 52 seconds East, at 25.50 feet pass a three-quarter-inch inside diameter iron pipe found for reference in the existing Northwesterly right-of-way line of said Old Needville-Fairchilds Road as occupied and monumented on the ground, in all 55.50 feet along the Northeasterly line of said call 1.42 acre tract with the Southwesterly line of said call 1.3722 acre tract to the **PLACE OF BEGINNING** and containing 0.181 acre of Land of which 0.098 acre (4,264 square feet) is within the existing right-of-way of Old Needville-Fairchilds Road as occupied on the ground.

Brad L. Schodek, R.P.L.S. No. 6430



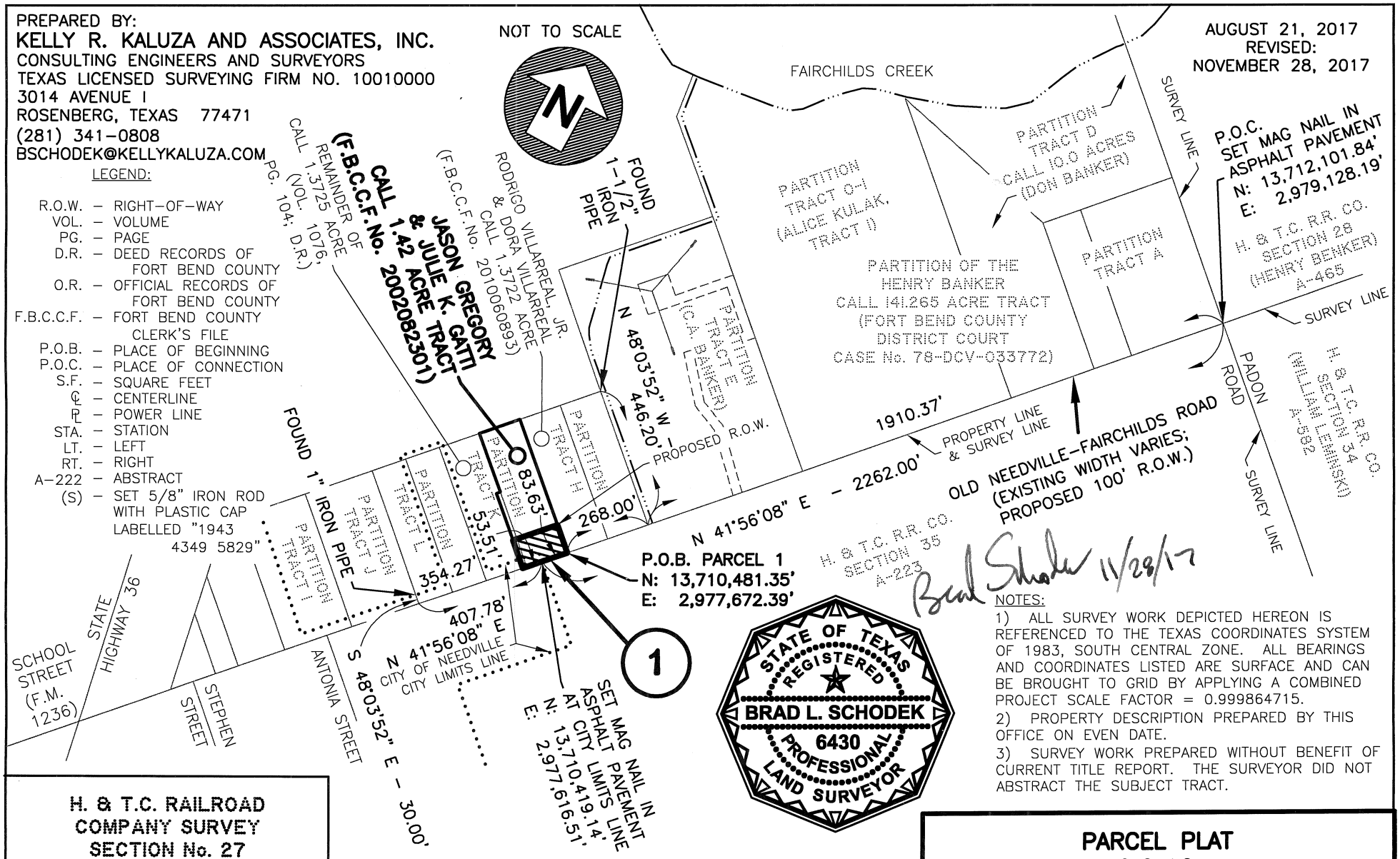
This description prepared in conjunction with survey exhibit by this office of even date.

PREPARED BY:
KELLY R. KALUZA AND ASSOCIATES, INC.
CONSULTING ENGINEERS AND SURVEYORS
TEXAS LICENSED SURVEYING FIRM NO. 10010000
3014 AVENUE I
ROSENBERG, TEXAS 77471
(281) 341-0808
BSCHODEK@KELLYKALUZA.COM

AUGUST 21, 2017
REVISED:
NOVEMBER 28, 2017

LEGEND:

R.O.W.	–	RIGHT-OF-WAY
VOL.	–	VOLUME
PG.	–	PAGE
D.R.	–	DEED RECORDS OF FORT BEND COUNTY
O.R.	–	OFFICIAL RECORDS OF FORT BEND COUNTY
F.B.C.C.F.	–	FORT BEND COUNTY CLERK'S FILE
P.O.B.	–	PLACE OF BEGINNING
P.O.C.	–	PLACE OF CONNECTION
S.F.	–	SQUARE FEET
℄	–	CENTERLINE
ℙ	–	POWER LINE
STA.	–	STATION
LT.	–	LEFT
RT.	–	RIGHT
A-222	–	ABSTRACT
(S)	–	SET 5/8" IRON ROD WITH PLASTIC CAP LABELLED "1943 4349 5829"



STATE OF TEXAS REGISTERED
BRAD L. SCHODEK
6430
PROFESSIONAL
LAND SURVEYOR

Brad Schodek 11/28/17

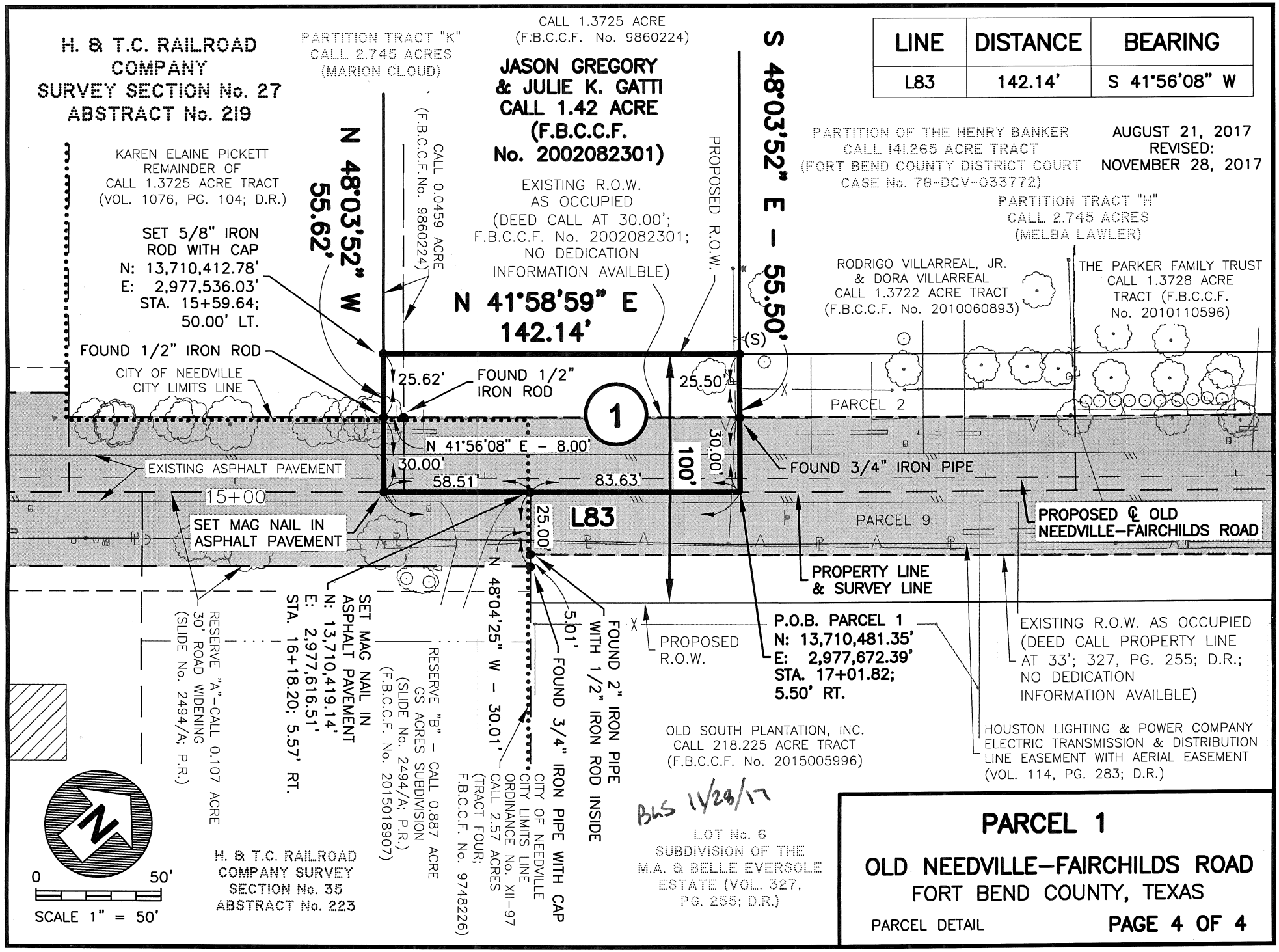
NOTES:
1) ALL SURVEY WORK DEPICTED HEREON IS REFERENCED TO THE TEXAS COORDINATES SYSTEM OF 1983, SOUTH CENTRAL ZONE. ALL BEARINGS AND COORDINATES LISTED ARE SURFACE AND CAN BE BROUGHT TO GRID BY APPLYING A COMBINED PROJECT SCALE FACTOR = 0.999864715.
2) PROPERTY DESCRIPTION PREPARED BY THIS OFFICE ON EVEN DATE.
3) SURVEY WORK PREPARED WITHOUT BENEFIT OF CURRENT TITLE REPORT. THE SURVEYOR DID NOT ABSTRACT THE SUBJECT TRACT.

H. & T.C. RAILROAD COMPANY SURVEY
SECTION No. 27
ABSTRACT No. 219

EXISTING PROPERTY	TOTAL TAKING AREA	AREA WITHIN EXISTING R.O.W. AS OCCUPIED	AREA OF PROPOSED ADDITIONAL R.O.W.
1.419 ACRE CALL 1.42 ACRE TRACT (F.B.C.C.F. No. 2002082301)	**0.181 ACRE (7,897 S.F.)** (WIDTH VARIES)	0.098 ACRE (4,264 S.F.)	0.083 ACRE (3,633 S.F.)

PARCEL PLAT
SHOWING
PARCEL 1
OLD NEEDVILLE-FAIRCHILDS ROAD
FORT BEND COUNTY, TEXAS

PARCEL VICINITY MAP



LINE	DISTANCE	BEARING
L83	142.14'	S 41°56'08" W

PARCEL 1

OLD NEEDVILLE-FAIRCHILDS ROAD
FORT BEND COUNTY, TEXAS

PARCEL DETAIL

A. SITE PREPARATION AND EXCAVATION ITEMS

Item No.	Spec. No.	Item Description	Unit Measure	Unit Quantity	Unit Price	Total in Figures
1	102	Clearing and Grubbing	LS	1		
2	110	Roadway Excavation Including 3" Topsoil	CY	27,250		
3	130	Borrow	CY	16,500		
4	671	Fort Bend Project Sign	EA	2		
SUBTOTAL SITE PREPARATION AND EXCAVATION ITEMS						

B. PAVEMENT ITEMS

Item No.	Spec. No.	Item Description	Unit Measure	Unit Quantity	Unit Price	Total in Figures
5	220	Lime Stabilized Subgrade (8" Depth)	SY	52,000		
6	221	Hydrated Lime And Lime Slurry (6% By Dry Weight)	TON	1,250		
7	230	Crushed Aggregate Base Course (8-Inch)	SY	5,900		
8	310	Prime Coat	GAL	2,050		
9	340	Hot Mix - Hot Laid Asphaltic Concrete, (Type "D" Surface Course, 2" Depth) (Roadway)	TON	665		
10	360	8" Concrete Pavement	SY	43,000		
11	TxDOT 360	Reinforced concrete pavement for pedestrian underpass sidewalk and ramps, 6 inches thick	CY	60		
12	TxDOT 420	Reinforced concrete pavement for pedestrian underpass retaining wall, including drians, 6 inches thick	CY	20		
13	TxDOT 450	Handrail for pedestrian underpass complete in place	LF	800		
14	535	Concrete Median Pavement (6" Thick)	SY	45		
15	536	Coloring Concrete For Median Noses (6" Thick)	SY	45		
SUBTOTAL PAVEMENT ITEMS						

C. BRIDGE ITEMS

Item No.	Spec. No.	Item Description	Unit Measure	Unit Quantity	Unit Price	Total in Figures
16	TXDOT 409-6002	Prestressed concrete pile (18-inch sq.)	LF	1,140		
17	TXDOT 420-6013	Class "C" concrete (abutment)	CY	47		
18	TXDOT 420-6025	Class "C" concrete (bent)	CY	29		
19	TXDOT 422-6001	Reinforced concrete slab (CL "S")	SF	5,400		
20	TXDOT 425	Prestressed concrete beam (Type "A")	LF	750		
21	TXDOT 450	Arch traffic rail	LF	400		
22	TXDOT 450	Arch pedestrian rail	LF	200		
23	TXDOT 454-6003	Armor Joint	LF	75		
24	TXDOT 428-6001	Concrete surface treatment	SY	511		
SUBTOTAL BRIDGE ITEMS						

D. STORM SEWER ITEMS

Item No.	Spec. No.	Item Description	Unit Measure	Unit Quantity	Unit Price	Total in Figures
25	429	Trench Safety System, 5' To 10' Depth	LF	6,000		
26	430	24" Storm Sewer	LF	3,250		
27	430	30" Storm Sewer	LF	200		
28	430	36" Storm Sewer	LF	1,100		
SUBTOTAL STORM SEWER ITEMS						

E. WATER LINE ITEMS

Item No.	Spec. No.	Item Description	Unit Measure	Unit Quantity	Unit Price	Total in Figures
29	COH 02511	16-inch ductile iron or PVC offset assembly, including materials , connections, notices to residetns, complete in place	EA	2		
SUBTOTAL WATER LINE ITEMS						

F. TRAFFIC SIGNAL

Item No.	Spec. No.	Item Description	Unit Measure	Unit Quantity	Unit Price	Total in Figures
30	TxDOT 416-6032	Drill shaft (trf sig pole) (36 in)	VF	17		
31	TxDOT 416-6034	Drill shaft (trf sig pole) (48 in)	VF	154		
32	TxDOT 618-6046	Condt (pvc) (sch 80) (2")	LF	200		
33	TxDOT 618-6047	Condt (pvc) (sch 80) (2") (bore)	LF	130		
34	TxDOT 618-6053	Condt (pvc) (sch 80) (3")	LF	95		
35	TxDOT 618-6054	Condt (pvc) (sch 80) (3") (bore)	LF	490		
36	TxDOT 618-6058	Condt (pvc) (sch 80) (4")	LF	40		
37	TxDOT 618-6059	Condt (pvc) (sch 80) (4") (bore)	LF	590		
SUBTOTAL TRAFFIC SIGNAL						

G. SIGNING AND STRIPING ITEMS

Item No.	Spec. No.	Item Description	Unit Measure	Unit Quantity	Unit Price	Total in Figures
38	624	Aluminum Signs (Ground Mounted)- Furnish & Install	EA	22		
39	660	Reflectorized Pavement Markings Type I (Thermoplastic) 4" White/Solid - Furnish & Applied	LF	8,700		
40	660	Reflectorized Pavement Markings Type I (Thermoplastic) 8" White/Solid - Furnish & Applied	LF	900		
41	660	Reflectorized Pavement Markings Type I (Thermoplastic) 24" White/Solid - Furnish & Applied	LF	150		
42	660	Reflectorized Pavement Markings Type I 4" Yellow/Solid - Furnish & Applied	LF	4,500		
SUBTOTAL SIGNING AND STRIPING ITEMS						

H. TRAFFIC CONTROL ITEMS

Item No.	Spec. No.	Item Description	Unit Measure	Unit Quantity	Unit Price	Total in Figures
43	665	Work Zone Pavement Markings 4" White/Solid (Removable) Furnished - Applied, Removed	LF	6,500		
44	665	Work Zone Pavement Markings 24" White/Solid (Removable) Furnished - Applied, Removed	LF	250		
45	671	Traffic Control Plan	MO	12		
SUBTOTAL TRAFFIC CONTROL ITEMS						

I. STORM WATER POLLUTION PREVENTION ITEMS

Item No.	Spec. No.	Item Description	Unit Measure	Unit Quantity	Unit Price	Total in Figures
46	713	Reinforced Filter Fabric Barrier, Install And Remove	LF	140		
47	719	Inlet Protection Barrier (Stage 1, With Fiber Rolls) - Furnish, Install, And Remove	EA	28		
48	724	Construction Exits (Install And Remove)	SY	275		
SUBTOTAL STORM WATER POLLUTION PREVENTION ITEMS						

TOTAL BID PRICE (ITEM A THROUGH ITEM I)	

Project Name
for Fort Bend County
Bid XX-XXX

INDEX OF TECHNICAL SPECIFICATIONS

Reference Harris County Standard Engineering Design Specifications (20XX revision) where applicable.

Harris County Specifications

Item No.	Specification Title
102	Clearing and Grubbing
104	Removing Old Concrete
110	Roadway Excavation
130	Borrow
132	Embankment
162	Sodding for Erosion Control (Block Sodding)
164	Seeding for Erosion Control
165	Hydro-Mulch Seeding
166	Fertilizer
200	Stripping
205	Subgrade
220	Lime Stabilized Subgrade
221	Hydrated Lime and Lime Surry
222	Portland Cement Stabilized Subgrade
223	Lime-Flyash or Flyash Stabilized Subgrade
230	Crushed Aggregate Base Course
250	Hot Mix Asphaltic Concrete Base Course (Black Base)
310	Prime Coat
340	Hot Mix Laid Asphaltic Concrete
360	Concrete Pavement
402	Bank Sand Backfill
429	Trench Safety System
430	Construction of Underground Utilities (with drawings)
433	Cement Stabilized Sand Bedding and Backfill Material
435	Timber Ordered Left in Trench
440	Reinforcing Steel
460	Reinforced Concrete Pipe
463	Safety End Treatment (with drawings)
464	PVC Pipe
465	Remove and Dispose of Existing Concrete or Metal Pipe
470	Brick Manholes (with drawings)
471	Precast Concrete Manholes
472	Inlets (with drawings)

Item No.	Specification Title
473	Adjusting Manholes and Inlets
491	Reinforced Concrete Slope Paving
520	Weighing and Measurement Equipment
526	Membrane Curing
530	Concrete Curb, Gutter , Curb and Gutter, Sidewalks and Driveways (with drawings)
535	Esplanades, Medians and Directional Islands
536	Coloring Concrete Medians and Sidewalks
540	Removing and Disposing of Existing Asphaltic Surface and Flexible Base Material
550	Fencing Removal
556	Four Strand Barbed Wire Fence (with drawings)
560	Maintenance and Cleanup of the Project Site
562	Preparing the Right-of-Way
624	Aluminum Signs
646	Roadside Traffic Sign Support (with drawing)
648	Encapsulated Lens Reflecting Sheeting for Traffic Control Signs (Hi-Intensity Grade)
649	Wide Angle Prismatic Retroreflective Sheeting for Traffic Control Signs (Diamond Grade)
660	Reflectorized Pavement Markings
661	Traffic Paint
662	Glass Reflective Spheres for Traffic Paint
663	Traffic Buttons and Pavement Markers
665	Work Zone Pavement Markings
666	Prefabricated Pavement Markings
669	Pavement Surface Preparation for Markings
670	Barricades (with drawings)
671	Traffic Control
672	Flagmen
673	Constructing Detours and Maintaining Two-Way Traffic
674	Removing Pavement Striping and Markings
675	Traffic Paint Striping (Water Based)
676	Traffic Pain (Water Based)
713	Reinforced Filter Fabric Barrier
719	Inlet Protection Barriers
724	Stabilized Construction Access
725	General Source Controls

Project Name
for Fort Bend County
Bid XX-XXX

INDEX OF TECHNICAL SPECIFICATIONS (CONTINUED)

City of Houston Standard Specifications

For water line construction of this project, the contractor shall reference the City of Houston, Department of Public Works and Engineering, STANDARD CONSTRUCTION SPECIFICATIONS (20XX revision), when identified in the Bid Form specification reference as "COH"

Item No.	Specification Title
02511	Water Lines
02512	Water Tap and Service Line Installation
02513	Wet Connections
02514	Disinfection of Water Lines
02515	Hydrostatic Testing of Pipelines
02516	Cut, Plug, and Abandonment of Mains
02517	Water Line in Tunnels
02520	Fire Hydrant
02521	Gate Valves
02525	Tapping Sleeves and Valves
02526	Water Meters
02527	Polyurethane Coatings on Steel or Ductile Iron Pipe
02528	Polyethylene Wrap
02529	Tape Coatings on Steel Pipe

Texas Department of Transportation Standard Specifications

Reference Texas Department of Transportation Standard Specifications for Construction of Highways, Streets and Bridges (20XX revision) where applicable when identified in the Bid Form specification reference as "TxDOT"

Item No.	Specification Title
416	Drilled Shaft Foundations
423	Retaining Walls
466	Headwalls and Wingwalls
472	Removing and Relaying Culvert and Storm Drain Pipe
536	Concrete Medians and Directional Islands
618	Conduits
620	Electrical Conductors
624	Ground Boxes
628	Electrical Services
644	Small Roadside Sign Supports and Assemblies
680	Installation of Highway Traffic Signals
682	Vehicle and Pedestrian Signal Heads
684	Traffic Signal Cables
686	Traffic Signal Pole Assemblies (Steel)
687	Pedestal Pole Assemblies
688	Pedestrian Detectors and Vehicle loop detectors
6114	Wireless Magnetometer Vehicle Detection Systems
SS1123	GPS Emergency Vehicle Traffic Signal Priority Control System

ENGINEER'S SEAL

Other specifications to be listed as applicable.

Storm Water Pollution Prevention Plan (included herein)

Geotechnical Investigation (included herein)

Fort Bend County Bid XX-XXX

SPECIAL CONDITIONS
FOR
PROJECT NAME

1. Subject

   Notes

2. Subject

   Notes

Appendix C Review Checklists

List of Review Checklists

Preliminary Design
70% Submittal
95% Submittal
100% Submittal

Project: _____

Program Manager: _____

Design Firm: _____

Preliminary Design

- [ ] Right of Way Acquisition Needs
  - _____ Provide proposed ROW map
- [ ] Identify Potential Conflicts with Facilities & Utilities
- [ ] Utiliy Conflicts List
  - _____ Public water and sewer
  - _____ Private utilities and pipelines
- [ ] Identify Critical Paths Items
  - _____ Level 1 schedule with design, ROW, bidding, and construction
- [ ] Identify Problem Areas and Potential Resolutions
- [ ] Identify Permit and Regulatory Requirements
  - _____ TxDOT permitting
  - _____ Environmental, FEMA, others as needed
- [ ] Construction Cost Estimate
- [ ] Drainage Analysis
  - _____ In accordance with Fort Bend County Drainage District
- [ ] Geotechnical Report
- [ ] Topographic Survey Complete
- [ ] Environmental Report (provided by Fort Bend County)
- [ ] Signal Warrant Analysis (If applicable)
- [ ] 30% Plans
  - _____ Existing Typical Section
  - _____ Proposed Typical Section
  - _____ Plan & Profile
    - _____ Existing Features in Plan & Profile
    - _____ Proposed Features in plan view only
    - _____ Minor Annotation
  - _____ Preliminary Traffic Control Plan
    - _____ Preliminary phasing
    - _____ Detour Concept
  - _____ Bridge Layout (If applicable)
  - _____ Include KMZ file of current design with proposed right-of-way

Project: _____

Program Manager: _____

Design Firm: _____

70% Submittal

☐ 30% Comments Addressed

☐ Cover Sheet

☐ Index of Sheets

☐ General Notes

☐ Existing and Proposed Typical Sections
- _____ Station Limits
- _____ Pavment/subgrade material and thickness
- _____ Right-of-Way and Roadway Width
- _____ Dimensions
- _____ Profile Grade Line

☐ Project Layout Sheet

☐ Survey Control

☐ ROW (Existing and Proposed)

☐ Horizontal Alignment Data

☐ Plan & Profile
- _____ 1" = 40' for horizontal ; 1" = 4" for vertical
- _____ Existing Facilities shown correctly
- _____ Proposed Facilities shown correctly
- _____ Check for Design Issues

☐ Bridge Layout & Details (If applicable)

☐ Drainage Area Map

☐ Hydraulic Calculations

☐ Traffic Control Plan
- _____ Phasing & Traffic Control
- _____ Avoid detours unless approved by the County
- _____ Construction Zone Standards (Encouraged)

☐ Traffic Signal & Details (If applicable)

☐ Signing and Striping Plan

☐ Storm Water Pollution Prevention Plan
- _____ Drawings with Text
- _____ Layout & Details

☐ Cross Sections (100 foot intervals w/ earthwork calcs)

☐ Specification table of contents

☐ Construction Cost Estimate
- _____ PDF format
- _____ Excel format

☐ Bid Form
- _____ PDF format
- _____ Excel format

☐ 70% plans
- _____ PDF files
- _____ Include KMZ file of current design with proposed right-of-way

☐ Regulatory permits submitted
- _____ Permit application for TxDOT access
- _____ Others if required

☐ Private and public utilty submitted separately for review
- _____ Update utility table identifying utilities in ROW and conflicts
- _____ Private utilties including Centerpoint, ATT, pipelines
- _____ Public utilities including MUD and city utilities

Project: _____

Program Manager: _____

Design Firm: _____

95% Submittal

☐ 70% Comments Addressed

☐ 95% Bid Ready Plans (Not Sealed)

- _____ PDF files
- _____ Include KMZ file of current design with proposed right-of-way

☐ Standard Details

- _____ Roadway, Pavement, Curb
- _____ Driveway, Sidewalks, Ramps
- _____ Drainage, Manholes, Inlets, Outfalls
- _____ Signing & Striping
- _____ Retaining Wall, Slope Paving
- _____ Storm Water Pollution Prevention
- _____ Project Sign

☐ Construction Cost Estimate

- _____ PDF format
- _____ Excel format

☐ Project Manual

- _____ Bid Form (PDF and Excel format)
- _____ Specification Table of Contents
- _____ Special Specifications or Conditions
- _____ Contract Documents Excluded

Project: _____

Program Manager: _____

Design Firm: _____

100% Submittal

☐ 95% Comments Addressed

☐ Bid Ready Plans (Sealed)

- _____ PDF files
- _____ Include KMZ file of current design with proposed right-of-way

☐ Construction Cost Estimate

- _____ PDF format
- _____ Excel format

☐ Project Manual

- _____ Bid Form (PDF and Excel format)
- _____ Specification Table of Contents
- _____ Special Specifications or Conditions
- _____ Contract Documents Excluded