Texas Department of Transportation
Book 2 – Technical Provisions

Grand Parkway Project

Attachment 8-1
Houston District Guidelines for Foundation Design

May 3, 2012

September 12, 1988

MEMORANDUM TO: District 12 Bridge Designers and Laboratory Geotechnical Engineers

FROM: E. J. Suchicki, P.E.
Michael Ho, P.E.

SUBJECT: Guidelines for Foundation Design

The purpose of this memo is to record the foundation practices and design assumptions used over the years in this district and to standardize guidelines for foundation design.

Square Concrete Piles

Precast prestressed square concrete piles have become the standard, most used, pile in this district. The main reasons being economy and durability. The most commonly used sizes are the 16", 18", and 20" square pile. The 14" sq. pile is not recommended for use because of frequent breakage during driving and handling. The 16" sq. is the most frequently used pile and is recommended for general use. The 18" sq. and 20"sq. are used for high loads and/or when slenderness is a factor. The 24" sq. pile is seldom used and the fabricators do not stock the forms which leads to higher unit cost.

1. Maximum Design Loads & Total Length

Concrete Piling Max Service Load & Lengths				
	At Abutments & Trestle Bents		Under Footings	
Size	Max Load	Max Length	Max Load	Max Length
16" Sq.	75 Tons	75 Ft.	125 Tons	75 Ft.
18" Sq.	90 Tons	90 Ft.	175 Tons	90 Ft.
20" Sq.	110 Tons	100 Ft.	225 Tons	100 Ft.

2. Piling Lengths

Abutment Bents:

All fill material should be disregarded for load carrying capacity. Minimum length of 20 ft. At least 15 ft. penetration into natural ground except for wingwall piles.

Interior Bents:

Dry Crossings: Minimum effective penetration 20 ft. Discount the top 5 ft. of pile to allow for moisture fluctuation.

Wet Crossings: Minimum effective penetration 20 ft. below scour line. Discount the top 10 ft. below flow line for scouring. If a stream has a history of turbulent flow, more footage should be discounted for scouring.

3. Piling Length for Stability

Trestle pile bents:
Piling below scour line shall not be less than 70% of pile and cap above scour line.

Individual or strapped column footing on piling: Minimum length 30' below scour line.

One homogenous footing as under a river bridge pier: Minimum length 30' below scour line.

4. Skin friction is used in the design of a pile foundation. Point bearing is neglected in the capacity calculation.

Drilled Shafts

The amount of footage to be disregarded due to moisture fluctuations and non-reliable friction transfer is 10 ft. from finished grade.

Total capacity is based on skin friction and point bearing on soils.

For shafts with or without casing, drilled dry or with drilling mud and concrete placed normally, use soil reduction factor (S_R) of 0.7.

Maximum skin friction is 1.25 tons/sq. ft. which is further reduced by the 0.7 reduction factor.

In general, use 2 tons/sq. ft. for point bearing, regardless of soil type where the shaft is tipped in. No point bearing capacity is assumed for drilled shafts with diameter equal to or less than 24". For drilled shafts with diameters over 5 ft., the allowable point bearing load is based on Cone Penetrometer tests (Blow counts) and Figure 2 in the Foundation Exploration and Design Manual.

General Information

Piling/drilled shafts should not tip into or just above soft stratum.

When soil condition varies quite considerably from one test hole to another, the designer should consider the use of test piling. He/She shall discuss this matter with the Laboratory Engineer before making any final decision.

If the piling/drilled shafts are located in the vicinity between two test holes, a weaker hole design curve should be used for calculating the capacity.

The above are intended as guidelines only. If you have any questions on foundation design, please contact either Michael Ho, District laboratory Engineer, at extension 619 or Stanley Yin at extension 620.

All foundation designs are to be sent to the District lab for design and/or final review prior to submission to D-5. The District Laboratory is also responsible for any discussion with D-5 Geotechnical Division pertaining to foundation design matters.

Ed Jucnicki
District Bridge Engineer

Michael C. Ho
District Laboratory Engineer

EJS:ach

Texas Department of Transportation
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Grand Parkway Project

Attachment 8-2
ESALs and Traffic Data

SH99 - ESALs and Traffic Data

Mainlanes - 30yrs

Location	Average Daily Traffic		Percent Truck		ATHWLD	% Tandem Axles in ATHWLD	Total # of 18K ESAL Applications in One Direction Expected for a 30 Year Period (2011 to 2041)	
	2011	2041	ADT	DHV			Flexible Pavement	Rigid Pavement
From IH 10 to SH 249	45,500	82,800	14.5	9.6	15,700	40	NA	62,381,000
From SH 249 to US 59N	65,000	118,300	11.1	7.3	15,800	40	NA	68,269,000

Frontage Roads - 30yrs

Location	Average Daily Traffic		Percent Truck		ATHWLD	% Tandem Axles in ATHWLD	Total # of 18K ESAL Applications in One Direction Expected for a 30 Year Period (2011 to 2041)	
	2011	2041	ADT	DHV			Flexible Pavement	Rigid Pavement
From IH 10 to SH 249	5,100	9,300	31.4	23.6	13,500	50	8,618,000	10,715,000
From SH 249 to US 59N	11,500	20,900	20.9	15.7	14,000	50	12,967,000	16,111,000

Frontage Roads - 20yrs

Location	Average Daily Traffic		Percent Truck		ATHWLD	% Tandem Axles in ATHWLD	Total # of 18K ESAL Applications in One Direction Expected for a 20 Year Period (2011 to 2031)	
	2011	2031	ADT	DHV			Flexible Pavement	Rigid Pavement
From IH 10 to SH 249	5,100	8,300	31.4	23.6	13,400	50	5,346,000	6,647,000
From SH 249 to US 59N	11,500	18,600	20.9	15.7	13,900	50	8,030,000	9,978,000

Texas Department of Transportation
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Grand Parkway Project

Attachment 9-1
Survey Controls

Segment F-1 (From South of US 290 to North of SH 249)

All bearings and coordinates are based on the Texas Coordinate System, South Central Zone, North American Datum of 1983 (NAD 83), (1993 adj.) All distances and coordinates are expressed in U.S. survey feet. All distances and coordinates are surface and may be converted to grid by dividing a combined adjustment factor of 1.00013, control provided by Brown & Gay. Points F14, F19, F30, F40, F65 and F71 were held fixed.

F -1 Project Elevation Datum

All Project Elevations are referenced to the North American Vertical Datum of 1988 (NAVD 88), 1995/1996 Adjustment, and were based on Houston Galveston Coastal Subsidence District (HGCSD) Monuments.
Monuments were originally set by Brown & Gay Engineers, Inc. Additional monuments were set by Weisser Engineering Co. and RODS Surveying, Inc. All elevations were adjusted by RODS Surveying, inc., based on the most stable monuments set by Brown & Gay Engineers, Inc.
TSARP conversion

It was determined that TSARP Monuments were at an average of 0.28 feet below the Project Elevation Datum.

Segment F-2 (From North of SH 249 to East of IH 45)

All bearings and coordinates are based on the Texas Coordinate System, South Central Zone, North American Datum of 1983 (NAD 83), 1993 Adj. All distances and coordinates shown are surface values and may be converted to grid by dividing by a combined adjustment factor of 1.00013. NGS Monuments HGCSD-1, HGCSD-24, and Clevport were held for horizontal control as provided by TxDOT.

F-2 Project Elevation Datum

All project elevations are referenced to the North American Vertical Datum of 1988 (NAVD 88), 1995/1996 Adjustment, and were based on Houston Galveston Coastal Subsidence District (HGCSD) monuments.
Monuments were originally set by Brown & Gay Engineers, Inc. Additional monuments were set by Weisser Engineering Co. and Landtech Consultants, Inc. All elevations were adjusted by Landtech Consultants, Inc., based on the most stable monuments set by Brown & Gay Engineers, Inc.

TSARP conversion

TSARP Monuments are at an average of 0.64 feet below the project elevation datum.

Segment G-1 (From East of IH 45 to West of Montgomery County Line)

All bearings and coordinates are based on the Texas Coordinate System, South Central Zone, North American Datum of 1983, 1993 Adjustment. All distances and coordinates shown are surface and may be converted to grid by dividing by a combined adjustment factor of 1.00013.

G-1 Project Elevation Datum:

All project elevations are referenced to the North American Vertical Datum of 1988 (NAVD 88), 1995/1996 Adjustment, and were based on Houston Galveston Coastal Subsidence District (HGCSD) Monuments.
Monuments were originally set by Brown & Gay Engineers, Inc. Additional Monuments were set by Baseline Corporation.
All elevations were adjusted by Baseline Corporation based on the most stable monuments set by Brown & Gay Engineers, Inc.

Segment G-2 (From West of Montgomery County Line to US 59)

All bearings and coordinates and based on the Texas Coordinate System, South Central Zone, North American Datum of 1983 (NAD 83), 1993 Adjustment. All distances and coordinates shown are surface and may be converted to grid by dividing by a combined scale factor of 1.0000437.

G-2 Project Elevation Datum:

All project elevations are referenced to the North American Vertical Datum of 1988 (NAVD 88), 1995/1996 Adjustment, and were based on Houston Galveston Coastal Subsidence District (HGCSD) Monuments.
Monuments were originally set by Brown & Gay Engineers, Inc. Additional Monuments were set by Transystems Corporation, Inc. All elevations were adjusted by Transystems, based on the most stable monuments set by Brown & Gay Engineers, Inc.

TSARP conversion

TSARP Monuments are at an average of 0.40 feet below the project elevation datum.

FEMA conversion

It was determined that FEMA Monuments were at an average of 0.66 feet above the project elevation datum.

Texas Department of Transportation
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Grand Parkway Project

Attachment 11-1
Cross-Street Design Criteria Matrices

GRAND PARKWAY
SEGMENT F-1

ULTIMATE BUILD		INITIAL BUILD														
						EASTBOUND / NORTHBOUND						WESTBOUND / SOUTHBOUND				
Intersecting Street	Jurisdiction	Roadway Classification	Design Speed (mph)	Position (over/under)	Design Vehicle	U-Turn (each)	Clear Zone for Cross Street Thru Lanes	Curb Section	Offset to face of curb	Through Lanes	Median & Turn Lanes	Through Lanes	Offset to face of curb	Curb Section	Clear Zone for Cross Street Thru Lanes	U-Turn (each)
Future Cypresswood Dr.	Harris Co.	Local Urban	45	under SH 99	WB-50	1	6'	Y	1'	2 (12')	2 (12')	2 (12')	1'	Y	6'	1
Future Cumberland Ridge Dr.	Harris Co.	Local Urban	45	under SH 99	WB-50	1	6'	Y	1'	3 (12')	2 (12')	3 (12')	1'	Y	6'	0
Schiel Rd.	Harris Co.	Local Urban	40	under SH 99	WB-50	0	No Initial Build Accommodate Ultimate Typical Section									0
Future Bauer Hockley/ Grant Rd.	Harris Co.	Local Urban	40	under SH 99	WB-50	0	No Initial Build Accommodate Ultimate Typical Section									0
Future Mason Rd.	Harris Co.	Local Urban	45	under SH 99	WB-50	0	No Initial Build Accommodate Ultimate Typical Section									0
Future Botkins / Juergen	Harris Co.	Local Urban	40	under SH 99	WB-50	0	No Initial Build Accommodate Ultimate Typical Section									0
Mueschke Rd.	Harris Co.	Local Urban	45	under SH 99	WB-50	0	6'	Y	1'	2 (12')	N	2 (12')	1'	Y	6'	0
Future Cypress Hill Rd.	Harris Co.	Local Urban	40	under SH 99	WB-50	0	No Initial Build Accommodate Ultimate Typical Section									0
Cypress-Rosehill Rd.	Harris Co.	Local Urban	45	under SH 99	WB-50	0	6'	Y	1'	2 (12')	2 (12') with 8' curbed median	2 (12')	1'	Y	6'	0
Lindsey Ln.	Harris Co.	Local Rural	20	under SH 99	WB-50	0	10'	N	N	1 (12')	N	1 (12')	N	N	10'	0
Cedar Lane / Future Barker Cypress	Harris Co.	Local Urban	45	under SH 99	WB-50	0	No Initial Build Accommodate Ultimate Typical Section									0
Telge Rd.	Harris Co.	Local Urban	45	under SH 99	WB-50	0	6'	Y	1'	2 (12')	2 (12') with 8' curbed median	2 (12')	1'	Y	6'	0
Future Shaw Rd.	Harris Co.	Local Urban	40	under SH 99	WB-50	0	No Initial Build Accommodate Ultimate Typical Section									0
Boudreaux Rd. (STA 3037+00)	Harris Co.	Local Urban	45	under SH 99	WB-50	0	6'	Y	1'	1 (12')	2 (12')	1 (12')	1'	Y	6'	1

Assumptions:

Urban - Minimum 5' sidewalk and curb and gutter on all urban roadways. Ped accommodations only on Urban Facilities. If columns are placed in the median, use 6' minimum offset from face of column.

Rural - No curb and gutter and sidewalk on all rural roadways.

GRAND PARKWAY
SEGMENT F-2

ULTIMATE BUILD		INITIAL BUILD														
						EASTBOUND / NORTHBOUND						WESTBOUND / SOUTHBOUND				
Intersecting Street	Jurisdiction	Roadway Classification	Design Speed (mph)	Position (over/under)	Design Vehicle	U-Turn (each)	Clear Zone for Cross Street Thru Lanes	Curb Section	Offset to face of curb	Through Lanes	Median & Turn Lanes	Through Lanes	Offset to face of curb	Curb Section	Clear Zone for Cross Street Thru Lanes	U-Turn (each)
Future Boudreaux Rd. (STA 3073+50)	Harris Co.	Local Urban	45	under SH 99	WB-50	1	6'	Y	1'	2 (12')	(2) 12' with 6' curbed median	2 (12')	1'	Y	6'	0
Huffsmith-Kohrville Rd.	Harris Co.	Local Rural	40	under SH 99	WB-50	0	No Initial Build Accommodate Ultimate Typical Section									0
Gleannloch Forest Dr.	Harris Co.	Local Urban	40	under SH 99	WB-50	0	6'	Y	1'	2 (12')	N	2 (12')	1'	Y	6'	1
Champions Forest Dr.	Harris Co.	Local Urban	45	under SH 99	WB-50	1	6'	Y	1'	3 (12')	49' curbed median	3 (12')	1'	Y	6'	1
Max Conrad/ Glenwillow Dr.	Harris Co.	Local Rural	40	under SH 99	WB-50	0	No Initial Build Accommodate Ultimate Typical Section									0
FM 2920	TxDOT	Arterial Urban	45	over SH 99	WB-50	1	N/A	Y	1'	2 (12')	2 (12') with 12' curbed median	2 (12')	1'	Y	N/A	1
Boudreaux Rd. (STA 3305+00) / Future Stuebner Airline	Harris Co.	Local Urban	45	under SH 99	WB-50	1	6'	Y	1'	2 (12')	1 (12') with 2' curbed median	2 (12')	1'	Y	6'	0
Boudreaux Rd. (STA 3387+00)	Harris Co.	Local Urban	45	under SH 99	WB-50	1	6'	Y	1'	2 (11')	2 (11') with 6' striped median	2 (11')	1'	Y	6'	0
Kuykendahl Rd.	Harris Co.	Local Urban	45	under SH 99	WB-50	0	6'	Y	1'	2 (12')	2 (12') with 6' curbed median	2 (12')	1'	Y	6'	1
Hildebrandt Rd.	Harris Co.	Local Rural	40	under SH 99	WB-50	0	10'	Y	1'	1 (12')	N	N	N	N	10'	0
Northcrest Dr.	Harris Co.	Local Rural	40	under SH 99	WB-50	0	No Initial Build Accommodate Ultimate Typical Section									0
*Gosling Rd.	Harris Co.	Local Urban	40	under SH 99	WB-50	0	6'	Y	1'	1 (12')	6' curbed median	1 (12')	1'	Y	6'	0
Rothwood Rd.	Harris Co.	Local Rural	40	under SH 99	WB-50	0	No Initial Build Accommodate Ultimate Typical Section									0
Mossy Oaks Rd.	Harris Co.	Local Rural	40	under SH 99	WB-50	0	No Initial Build Accommodate Ultimate Typical Section									0
Springwoods Village Pkwy	Harris Co.	Local Urban	45	over SH 99	WB-50	0	Overall bridge width will match Holzwarth Road bridge, see RID document									0
Holzwarth Rd	Harris Co.	Local Urban	45	over SH 99	WB-50	0	By Others									0
Energy Drive	Harris Co.	Local Urban	45	under SH 99	WB-50	0	By Others SH 99 bridge bents to clear a 100' span centered about Energy Drive									0

Assumptions:

Urban - Minimum 5' sidewalk and curb and gutter on all urban roadways. Ped accommodations only on Urban Facilities. If columns are placed in the median, use 6' minimum offset from face of column.

Rural - No curb and gutter and sidewalk on all rural roadways.

*Initial Build indicates striping. Initial pavement will be constructed as shown in the schematic.

GRAND PARKWAY
SEGMENT G

ULTIMATE BUILD		INITIAL BUILD														
						EASTBOUND / NORTHBOUND						WESTBOUND / SOUTHBOUND				
Intersecting Street	Jurisdiction	Roadway Classification	Design Speed (mph)	Position (over/under)	Design Vehicle	U-Turn (each)	Clear Zone for Cross Street Thru Lanes	Curb Section	Offset to face of curb	Through Lanes	Median & Turn Lanes	Through Lanes	Offset to face of curb	Curb Section	Clear Zone for Cross Street Thru Lanes	U-Turn (each)
Northgate Crossing Blvd.	Harris Co.	Local Urban	45	under SH 99	WB-50	0	No Initial Build Accommodate Ultimate Typical Section									0
Nelson St.	Harris Co.	Local Rural	45	under SH 99	WB-50	0	No Initial Build Accommodate Ultimate Typical Section									0
East Hardy Rd.	Harris Co.	Local Rural	45	under SH 99	WB-50	0	No Initial Build Accommodate Ultimate Typical Section									0
Old Westfield Rd / Spring Creek Trail	Harris Co.	Local Urban	45	under SH 99	WB-50	0	No Initial Build Accommodate Ultimate Typical Section									0
Riley Fuzzel Rd	Montgomery Co.	Collector Urban	45	under SH 99	WB-50	0	The location crossing under the Grand Parkway functions as a frontage road. A 6' minimum offset is required from face of column.									1
Future Rayford Rd	Montgomery Co.	Local Urban	45	under SH 99	WB-50	1	6'	Y	1'	2 (12')	2 (12') with 4' curbed median	2 (12')	1'	Y	6'	1
Birnham Woods Dr.	Montgomery Co.	Local Urban	45	under SH 99	WB-50	1	6'	Y	1'	2 (12')	2 (12') with 4' curbed median	2 (12')	1'	Y	6'	1
Future Townsen Blvd.	Montgomery Co.	Local Urban	45	under SH 99	WB-50	1	6'	Y	1'	2 (12')	2 (12') with 4' curbed median	2 (12')	1'	Y	6'	0
Future Riverwalk Dr.	Montgomery Co.	Local Urban	45	under SH 99	WB-50	0	6'	Y	1'	2 (12')	2 (12') with 4' curbed median	2 (12')	1'	Y	6'	0
FM 1314	TxDOT	Arterial Rural	45	under SH 99	WB-50	0	16'	N	N	2 (12')	2 (12') with 4' curbed median	2 (12')	N	N	16'	0
Future Rd. (STA 4267+00)	Montgomery Co.	Local Urban	45	under SH 99	WB-50	0	No Initial Build Accommodate Ultimate Typical Section									0
Valley Ranch Blvd.	Montgomery Co.	Local Urban	45	under SH 99	WB-50	0	6'	Y	1'	2 (12')	2 (12') with 4' curbed median	2 (12')	1'	Y	6'	1
Future Rd. (STA 4395+00)	Montgomery Co.	Local Urban	45	under SH 99	WB-50	1	6'	Y	1'	2 (12')	2 (12') with 4' curbed median	2 (12')	1'	Y	6'	1

Assumptions:

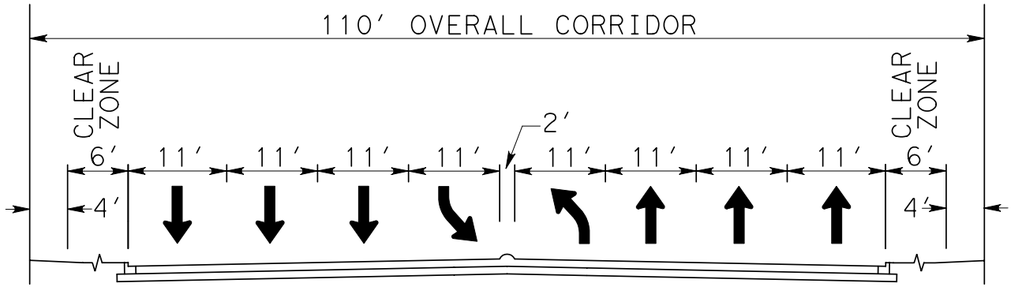
Urban - Minimum 5' sidewalk and curb and gutter on all urban roadways. Ped accommodations only on Urban Facilities. If columns are placed in the median, use 6' minimum offset from face of column.

Rural - No curb and gutter and sidewalk on all rural roadways.

Texas Department of Transportation
Book 2 – Technical Provisions

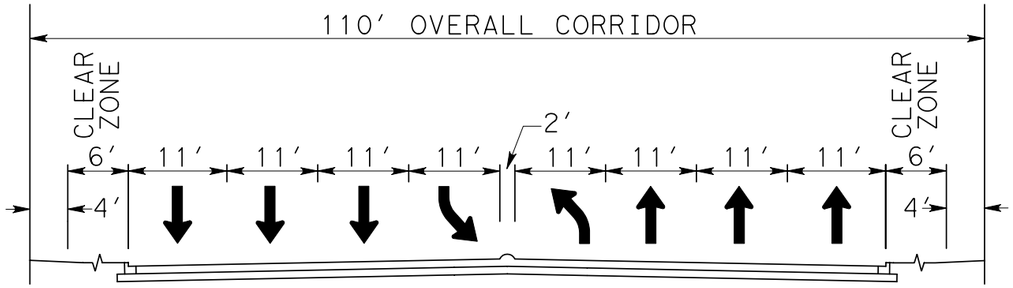
Grand Parkway Project

Attachment 11-2
Ultimate Cross-Street Typical Sections



FUTURE CYPRESSWOOD DR.

NOTE: MINIMUM 2′ MEDIAN REPRESENTS MOUNTABLE OR BARRIER CURB.
5′ SIDEWALK INCLUDED WITHIN 6′ CLEAR ZONE

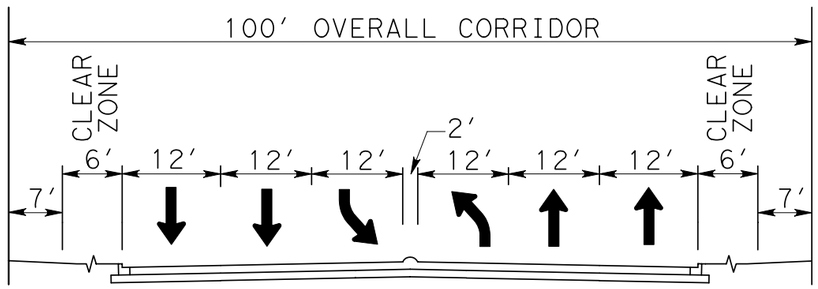


FUTURE CUMBERLAND RIDGE DR.

NOTE: MINIMUM 2′ MEDIAN REPRESENTS MOUNTABLE OR BARRIER CURB.
5′ SIDEWALK INCLUDED WITHIN 6′ CLEAR ZONE.

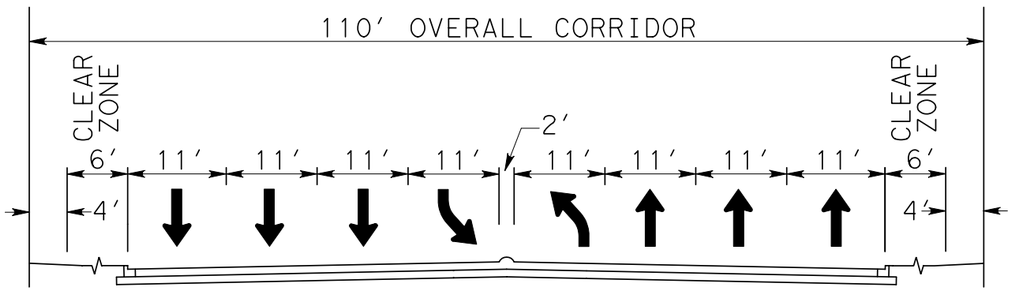
GENERAL NOTES

1. THE PURPOSE OF THESE TYPICAL SECTIONS IS TO SHOW CROSS STREET INFORMATION ONLY.
2. TYPICALS ARE AT CENTER LINE OF MAIN LANES. DEVELOPER TO DESIGN MEDIANS AT FRONTAGE ROADS TO END OF RIGHT OF WAY (ROW).
3. ULTIMATE TYPICALS REPRESENT FUTURE WIDENINGS.
4. THE "OVERALL CORRIDOR" ACCOMMODATES THE ULTIMATE TYPICAL SECTION AND AN ADJACENT, PARALLEL CORRIDOR FOR UTILITIES. THE GRAND PARKWAY OVERPASS IS TO ACCOMMODATE THE "OVERALL CORRIDOR" AT EACH CROSS-STREET.



SCHIEL RD.

NOTE: MINIMUM 2′ MEDIAN REPRESENTS MOUNTABLE OR BARRIER CURB.
5′ SIDEWALK INCLUDED WITHIN 6′ CLEAR ZONE.



FUTURE MASON RD.

NOTE: MINIMUM 2′ MEDIAN REPRESENTS MOUNTABLE OR BARRIER CURB.
5′ SIDEWALK INCLUDED WITHIN 6′ CLEAR ZONE.

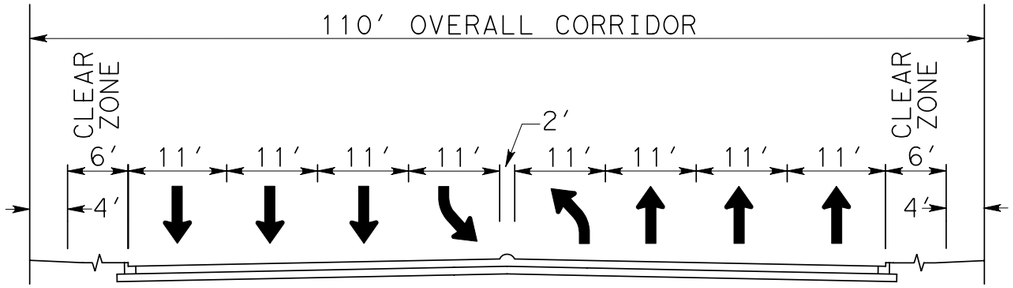
SCALE = N.T.S

Texas Department of Transportation

ATKINS
1250 WOOD BRANCH PARK DRIVE
SUITE 300
HOUSTON, TEXAS 77079
281-493-5100
TBPE REG. #F-474

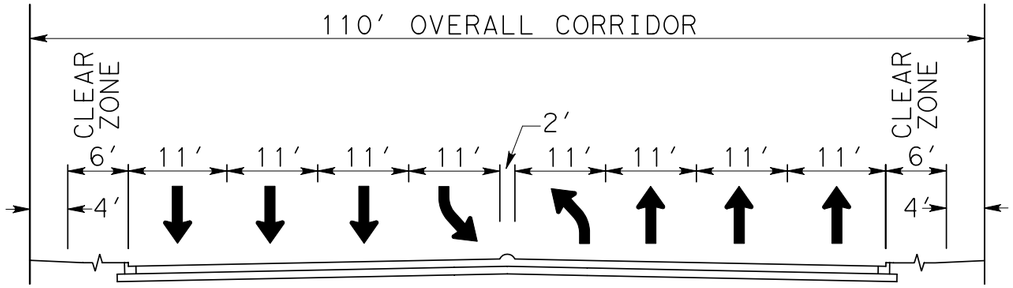
GRAND PARKWAY (SH 99)
SEGMENT F-1
PROPOSED ULTIMATE CROSS STREET TYPICAL SECTIONS
ATTACHMENT 11-2

PRELIMINARY SUBJECT TO CHANGE



MUESCHKE RD.

NOTE: MINIMUM 2′ MEDIAN REPRESENTS MOUNTABLE OR BARRIER CURB.
5′ SIDEWALK INCLUDED WITHIN 6′ CLEAR ZONE

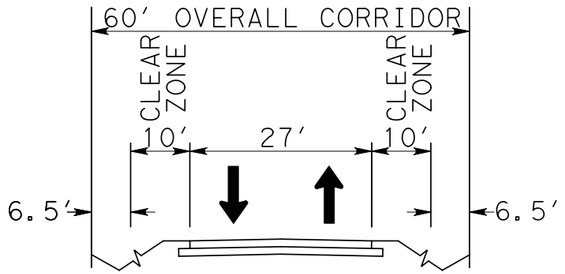


CYPRESS-ROSEHILL RD.

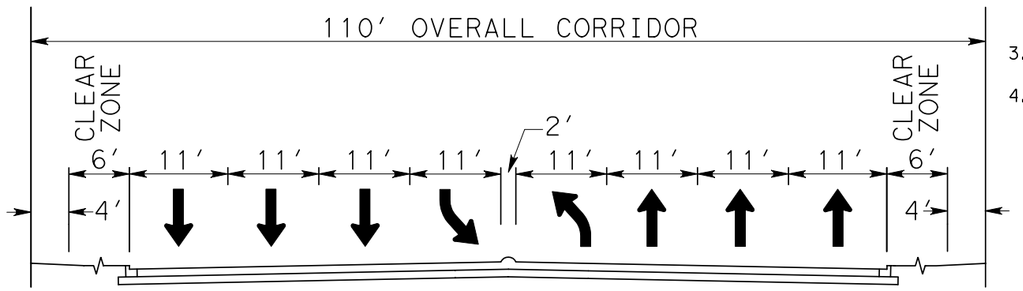
NOTE: MINIMUM 2′ MEDIAN REPRESENTS MOUNTABLE OR BARRIER CURB.
5′ SIDEWALK INCLUDED WITHIN 6′ CLEAR ZONE

GENERAL NOTES

1. THE PURPOSE OF THESE TYPICAL SECTIONS IS TO SHOW CROSS STREET INFORMATION ONLY.
2. TYPICALS ARE AT CENTER LINE OF MAIN LANES. DEVELOPER TO DESIGN MEDIANS AT FRONTAGE ROADS TO END OF RIGHT OF WAY (ROW).
3. ULTIMATE TYPICALS REPRESENT FUTURE WIDENINGS.
4. THE "OVERALL CORRIDOR" ACCOMMODATES THE ULTIMATE TYPICAL SECTION AND AN ADJACENT, PARALLEL CORRIDOR FOR UTILITIES. THE GRAND PARKWAY OVERPASS IS TO ACCOMMODATE THE "OVERALL CORRIDOR" AT EACH CROSS-STREET.



LINDSEY LN.



CEDAR LANE / FUTURE BARKER CYPRESS

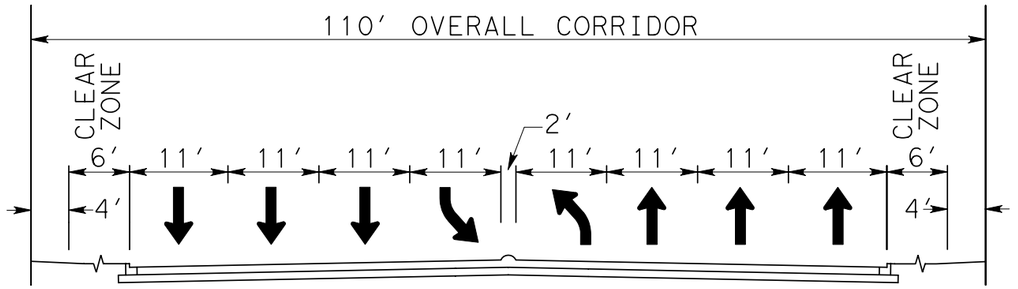
NOTE: MINIMUM 2′ MEDIAN REPRESENTS MOUNTABLE OR BARRIER CURB.
5′ SIDEWALK INCLUDED WITHIN 6′ CLEAR ZONE

SCALE = N.T.S

ATKINS
1250 WOOD BRANCH PARK DRIVE
SUITE 300
HOUSTON, TEXAS 77079
281-493-5100
TBPE REG. #F-474

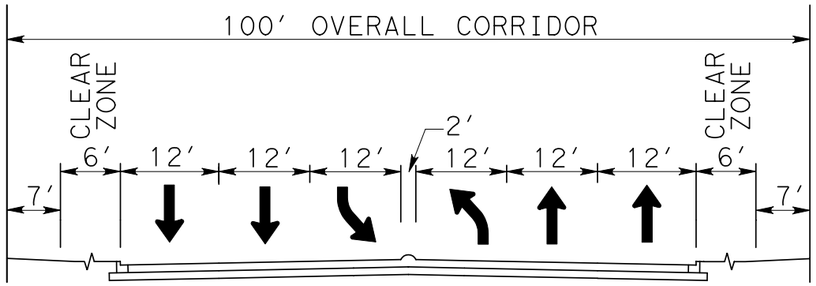
GRAND PARKWAY (SH 99)
SEGMENT F-1
PROPOSED ULTIMATE CROSS STREET TYPICAL SECTIONS
ATTACHMENT 11-2

PRELIMINARY SUBJECT TO CHANGE



TELGE RD.

NOTE: MINIMUM 2′ MEDIAN REPRESENTS MOUNTABLE OR BARRIER CURB.
5′ SIDEWALK INCLUDED WITHIN 6′ CLEAR ZONE



BOUDREAUX RD. (STA 3037+00)

NOTE: MINIMUM 2′ MEDIAN REPRESENTS MOUNTABLE OR BARRIER CURB.
5′ SIDEWALK INCLUDED WITHIN 6′ CLEAR ZONE

GENERAL NOTES

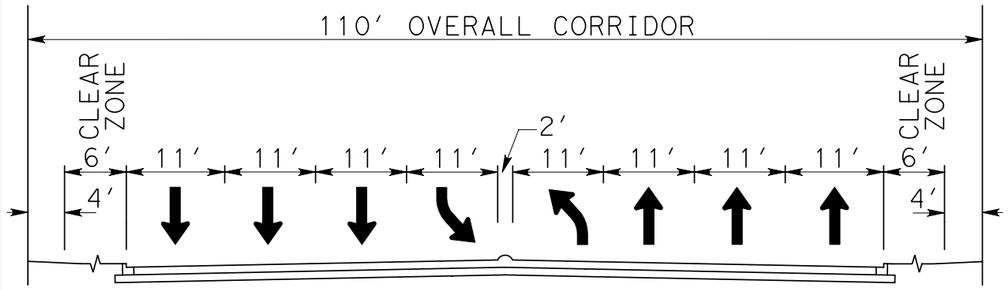
1. THE PURPOSE OF THESE TYPICAL SECTIONS IS TO SHOW CROSS STREET INFORMATION ONLY.
2. TYPICALS ARE AT CENTER LINE OF MAIN LANES. DEVELOPER TO DESIGN MEDIANS AT FRONTAGE ROADS TO END OF RIGHT OF WAY (ROW).
3. ULTIMATE TYPICALS REPRESENT FUTURE WIDENINGS.
4. THE "OVERALL CORRIDOR" ACCOMMODATES THE ULTIMATE TYPICAL SECTION AND AN ADJACENT, PARALLEL CORRIDOR FOR UTILITIES. THE GRAND PARKWAY OVERPASS IS TO ACCOMMODATE THE "OVERALL CORRIDOR" AT EACH CROSS-STREET.

SCALE = N.T.S

ATKINS
1250 WOOD BRANCH PARK DRIVE
SUITE 300
HOUSTON, TEXAS 77079
281-493-5100
TBPE REG. #F-474

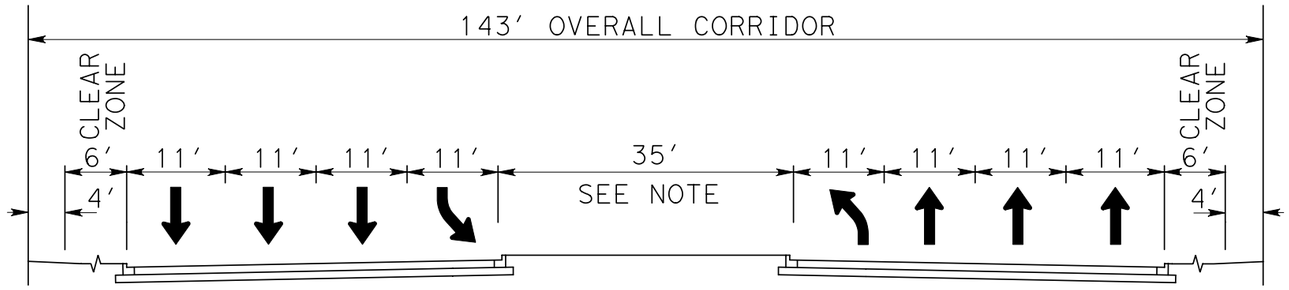
GRAND PARKWAY (SH 99)
SEGMENT F-1
PROPOSED ULTIMATE CROSS STREET TYPICAL SECTIONS
ATTACHMENT 11-2

PRELIMINARY SUBJECT TO CHANGE



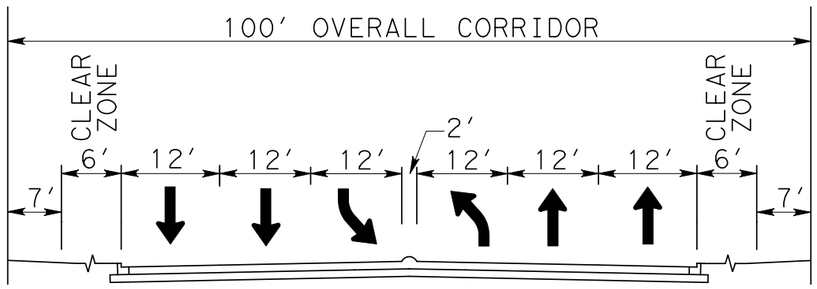
FUTURE BOUDREAUX RD. (STA. 3073+50)

NOTE: MINIMUM 2′ MEDIAN REPRESENTS MOUNTABLE OR BARRIER CURB. 5′ SIDEWALK INCLUDED WITHIN 6′ CLEAR ZONE.



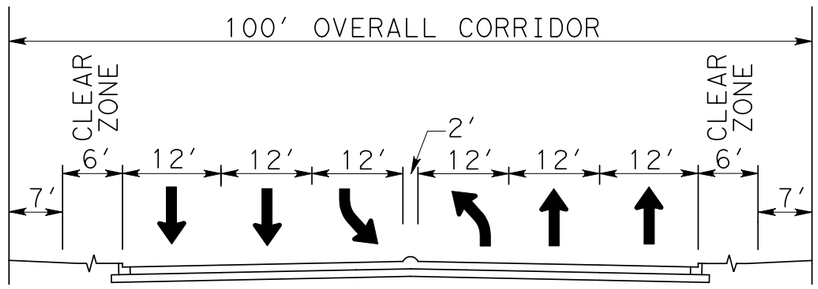
CHAMPIONS FOREST DR.

NOTE: 5′ SIDEWALK INCLUDED WITHIN 6′ CLEARZONE. ULTIMATE MEDIAN WIDTH NORTH AND SOUTH OF THE FRONTAGE ROADS WILL BE 2′.



GLEANNLOCH FOREST DR.

NOTE: MINIMUM 2′ MEDIAN REPRESENTS MOUNTABLE OR BARRIER CURB. 5′ SIDEWALK INCLUDED WITHIN 6′ CLEAR ZONE.



HUFFSMITH-KOHRVILLE RD.

NOTE: MINIMUM 2′ MEDIAN REPRESENTS MOUNTABLE OR BARRIER CURB. 5′ SIDEWALK INCLUDED WITHIN 6′ CLEAR ZONE.

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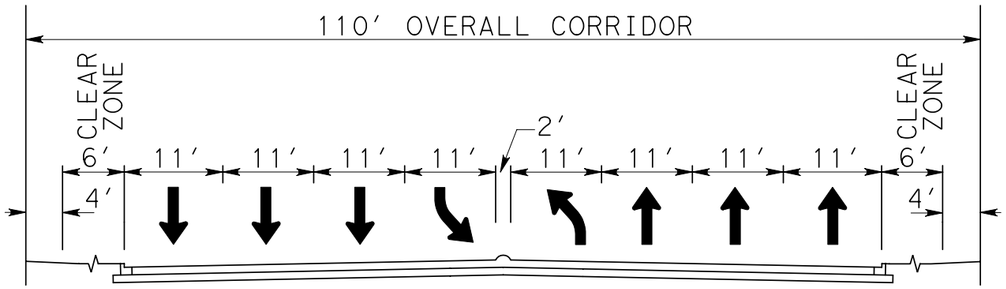
SCALE = N.T.S

ATKINS
1250 WOOD BRANCH PARK DRIVE
SUITE 300
HOUSTON, TEXAS 77079
281-493-5100
TBPE REG. #F-474

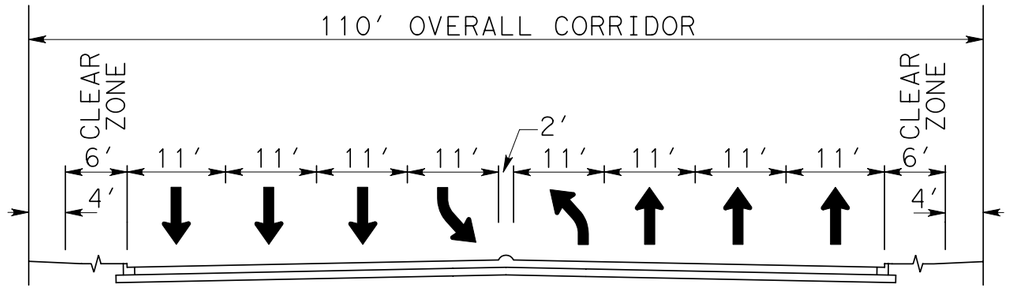
GRAND PARKWAY (SH 99)
SEGMENT F-2
PROPOSED ULTIMATE CROSS STREET TYPICAL SECTIONS
ATTACHMENT 11-2

PRELIMINARY SUBJECT TO CHANGE



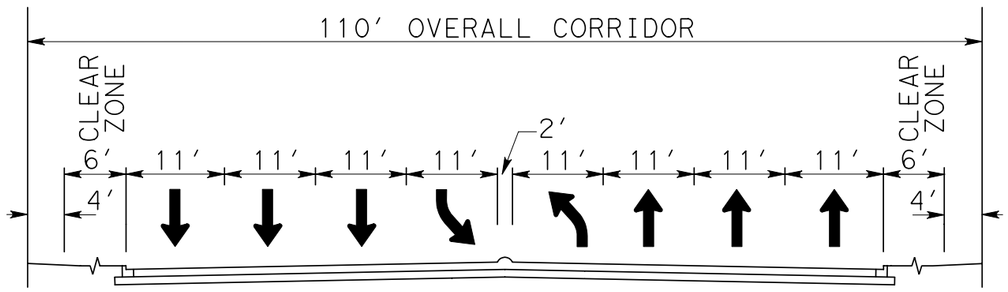
BOUDREAUX RD. / FUTURE STUEBNER AIRLINE (STA. 3305+00)

NOTE: MINIMUM 2′ MEDIAN REPRESENTS MOUNTABLE OR BARRIER CURB.
5′ SIDEWALK INCLUDED WITHIN 6′ CLEAR ZONE.



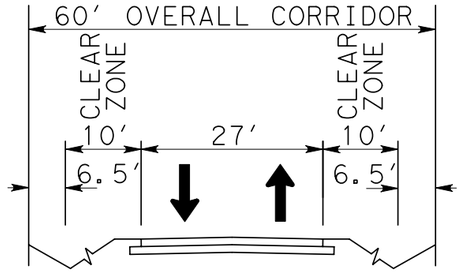
BOUDREAUX RD. (STA. 3387+00)

NOTE: MINIMUM 2′ MEDIAN REPRESENTS MOUNTABLE OR BARRIER CURB.
5′ SIDEWALK INCLUDED WITHIN 6′ CLEAR ZONE.



KUYKENDAHL RD.

NOTE: MINIMUM 2′ MEDIAN REPRESENTS MOUNTABLE OR BARRIER CURB.
5′ SIDEWALK INCLUDED WITHIN 6′ CLEAR ZONE.



HILDEBRANDT RD.

GENERAL NOTES

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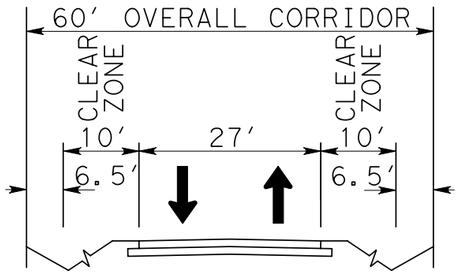
5. FM 2920 INITIAL SECTION ACCOMMODATES ULTIMATE PAVEMENT WIDTH AND WILL BE STRIPED FOR INITIAL NUMBER OF LANES SHOWN IN SCHEMATIC.

SCALE = N.T.S

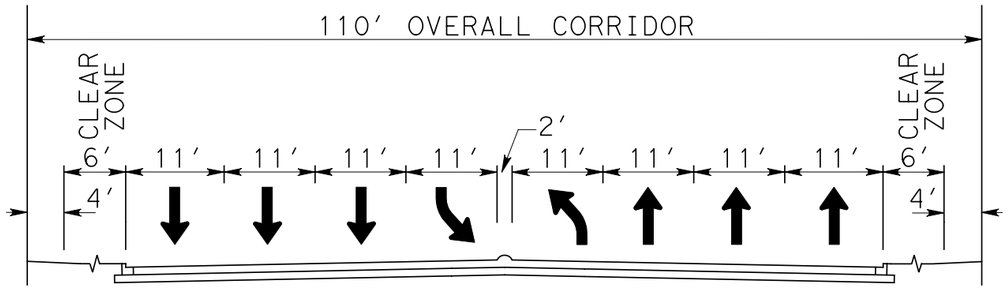
PRELIMINARY SUBJECT TO CHANGE

ATKINS
1250 WOOD BRANCH PARK DRIVE
SUITE 300
HOUSTON, TEXAS 77079
281-493-5100
TBPE REG. #F-474

GRAND PARKWAY (SH 99)
SEGMENT F-2
PROPOSED ULTIMATE CROSS STREET TYPICAL SECTIONS
ATTACHMENT 11-2



NORTHCREST DR.



GOSLING RD.

NOTE: MINIMUM 2′ MEDIAN REPRESENTS MOUNTABLE OR BARRIER CURB.
5′ SIDEWALK INCLUDED WITHIN 6′ CLEAR ZONE.

GENERAL NOTES

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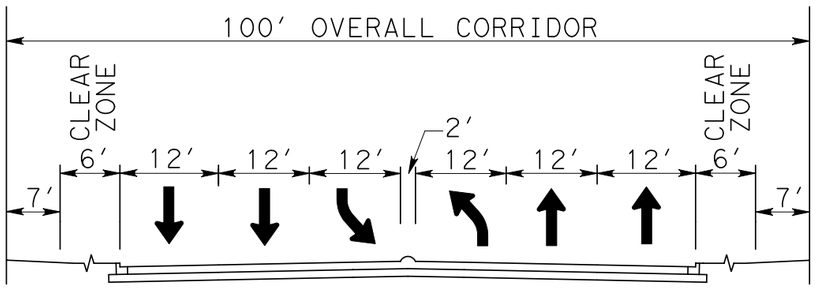
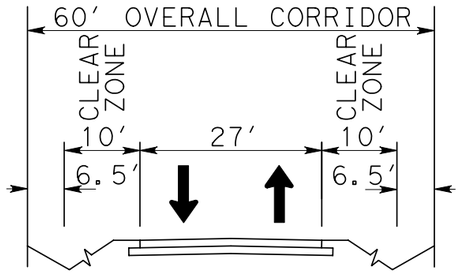


ROTHWOOD RD.

NOTE: MINIMUM 2′ MEDIAN REPRESENTS MOUNTABLE OR BARRIER CURB.
5′ SIDEWALK INCLUDED WITHIN 6′ CLEAR ZONE.



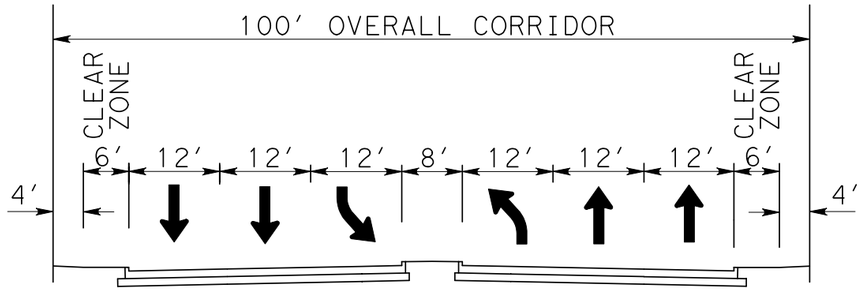
MOSSY OAKS RD.

SCALE = N.T.S

ATKINS
1250 WOOD BRANCH PARK DRIVE
SUITE 300
HOUSTON, TEXAS 77079
281-493-5100
TBPE REG. #F-474

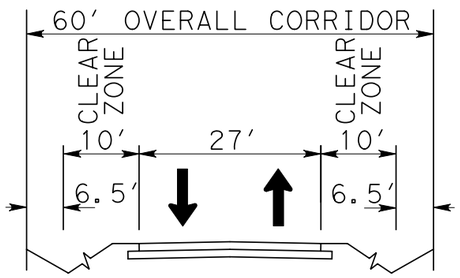
GRAND PARKWAY (SH 99)
SEGMENT F-2
PROPOSED ULTIMATE CROSS STREET TYPICAL SECTIONS
ATTACHMENT 11-2

PRELIMINARY SUBJECT TO CHANGE

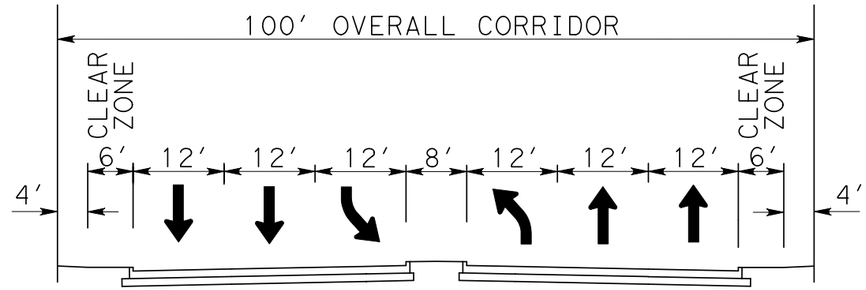


NORTHGATE CROSSING BLVD.

NOTE: MINIMUM 2′ MEDIAN REPRESENTS MOUNTABLE OR BARRIER CURB.
5′ SIDEWALK INCLUDED WITHIN 6′ CLEAR ZONE.

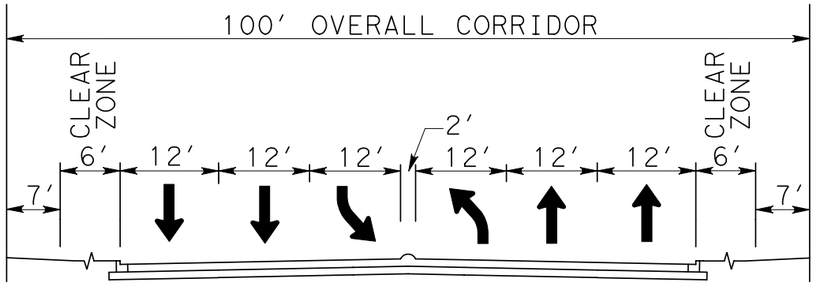


NELSON ST.



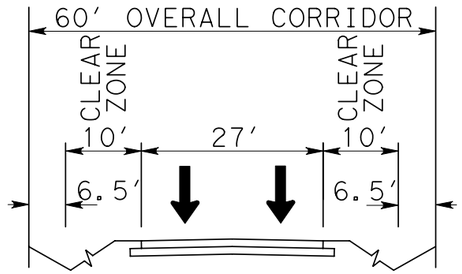
EAST HARDY ST.

NOTE: MINIMUM 2′ MEDIAN REPRESENTS MOUNTABLE OR BARRIER CURB.
5′ SIDEWALK INCLUDED WITHIN 6′ CLEAR ZONE.



SPRING CREEK TRAIL

NOTE: MINIMUM 2′ MEDIAN REPRESENTS MOUNTABLE OR BARRIER CURB.
5′ SIDEWALK INCLUDED WITHIN 6′ CLEAR ZONE.



RILEY FUZZEL RD.

GENERAL NOTES

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SCALE = N.T.S

Texas Department of Transportation

ATKINS
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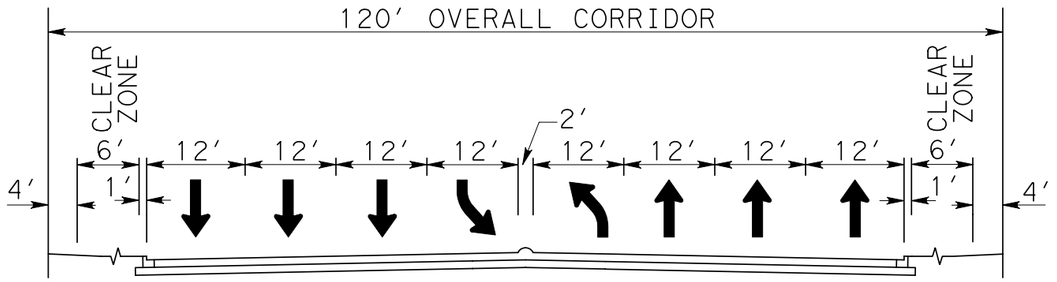
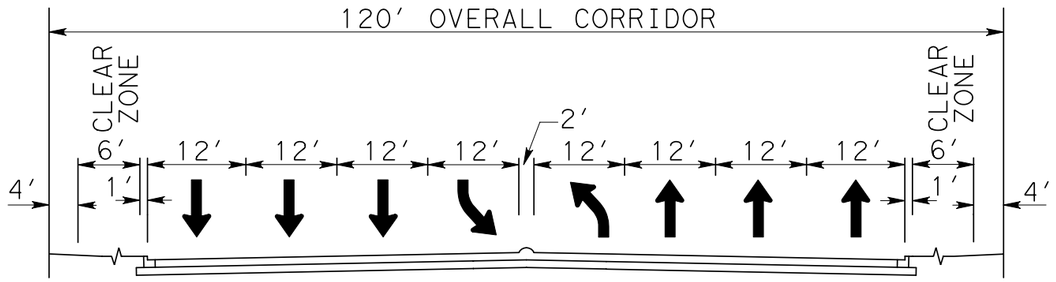
GRAND PARKWAY (SH 99)
SEGMENT G
PROPOSED ULTIMATE CROSS STREET TYPICAL SECTIONS
ATTACHMENT 11-2

PRELIMINARY SUBJECT TO CHANGE



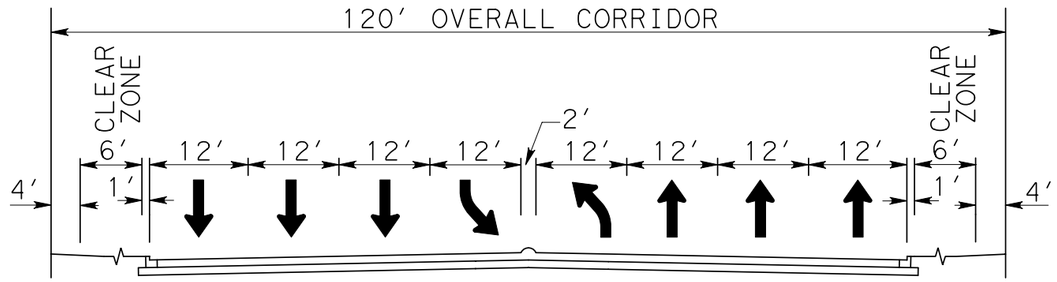
FUTURE RAYFORD RD.

NOTE: MINIMUM 2′ MEDIAN REPRESENTS MOUNTABLE OR BARRIER CURB.
5′ SIDEWALK INCLUDED WITHIN 6′ CLEAR ZONE.



BIRNHAM WOODS DR.

NOTE: MINIMUM 2′ MEDIAN REPRESENTS MOUNTABLE OR BARRIER CURB.
5′ SIDEWALK INCLUDED WITHIN 6′ CLEAR ZONE.



FUTURE TOWNSEN BLVD.

NOTE: MINIMUM 2′ MEDIAN REPRESENTS MOUNTABLE OR BARRIER CURB.
5′ SIDEWALK INCLUDED WITHIN 6′ CLEAR ZONE.

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SCALE = N.T.S

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GRAND PARKWAY (SH 99)
SEGMENT G
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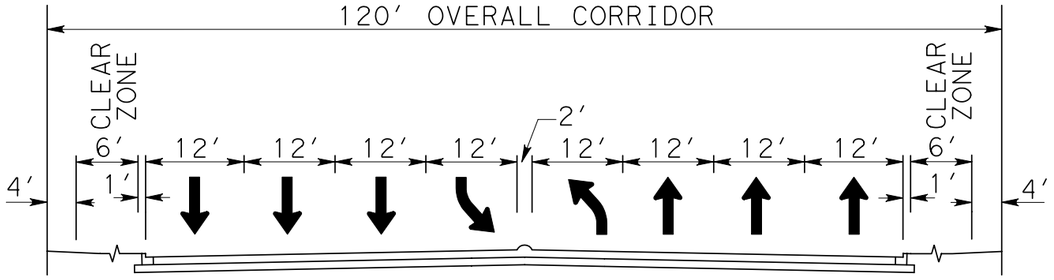
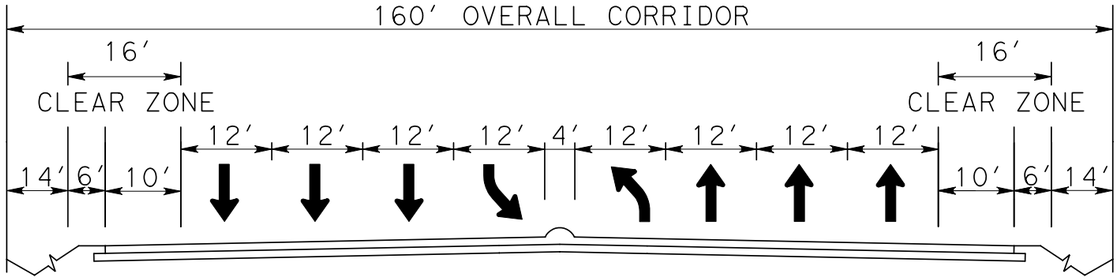
ATTACHMENT 11-2

PRELIMINARY SUBJECT TO CHANGE



FUTURE RIVERWALK DR.



FM 1314

NOTE: MINIMUM 2' MEDIAN REPRESENTS MOUNTABLE OR BARRIER CURB.
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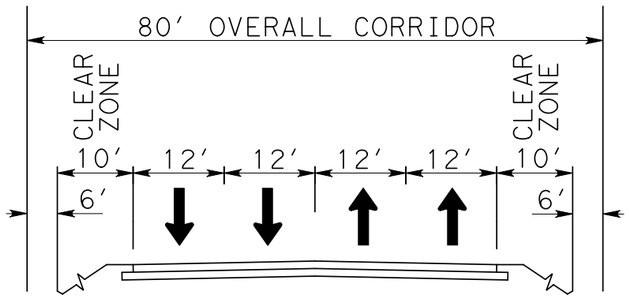
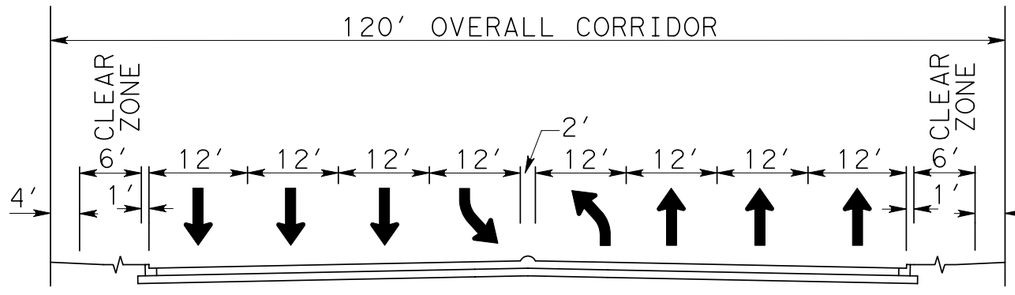


FUTURE RD. (STA 4267+00)



VALLEY RANCH BLVD.

NOTE: MINIMUM 2' MEDIAN REPRESENTS MOUNTABLE OR BARRIER CURB.
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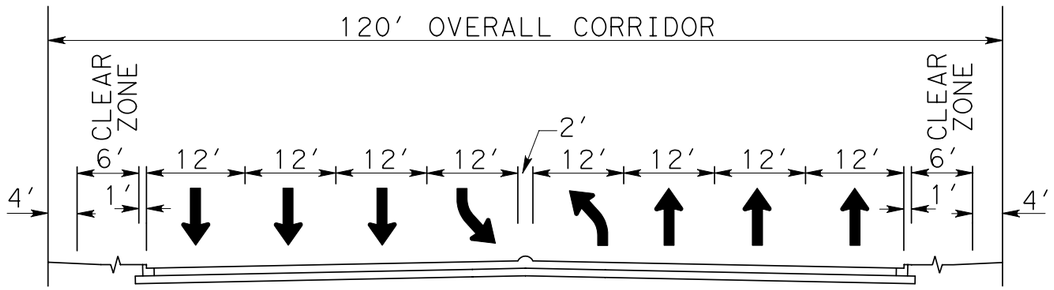

FUTURE RD. (STA 4395+00)

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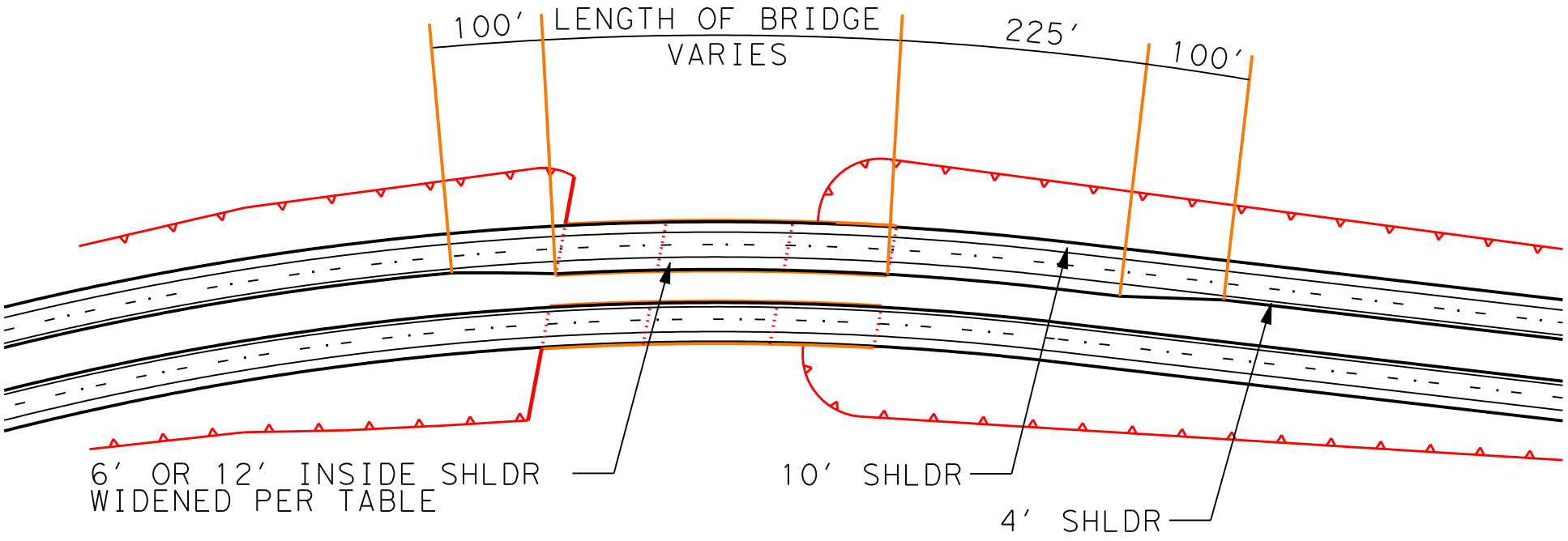
GRAND PARKWAY (SH 99)
SEGMENT G
PROPOSED ULTIMATE CROSS STREET TYPICAL SECTIONS
ATTACHMENT 11-2

PRELIMINARY SUBJECT TO CHANGE

Texas Department of Transportation
Book 2 – Technical Provisions

Grand Parkway Project

Attachment 11-3
Proposed Shoulder Widening Detail



SCALE = N.T.S

Texas Department of Transportation

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HOUSTON, TEXAS 77079
281-493-5100
TBPE REG. NF-474

GRAND PARKWAY (SH99)

PROPOSED SHOULDER WIDENING FOR SSD
ATTACHMENT 11-3

PRELIMINARY SUBJECT TO CHANGE

Texas Department of Transportation
Book 2 – Technical Provisions

Grand Parkway Project

Attachment 12-1
Vertical Datum Adjustment Information

Monument	Northing	Easting	TSARP_Elev_pub_2001	Elev (GPS)	Level_Adj	Elev_Leveled_1995	2001 to 1995 Adjustment	Surveyor
RM 120055	13949300.00	3047300.00	149.43	150.32	-0.08	150.24	0.81	WEISSER
RM 120050	13951880.48	3051954.87	149.56	150.42	-0.11	150.31	0.75	WEISSER
RM 120135	13962374.57	3068347.51	146.73	147.48	-0.17	147.31	0.58	WEISSER
RM 100315	13961359.36	3082083.98	134.36	134.86	-0.09	134.77	0.41	WEISSER
RM 111000	13931719.76	2992127	186.90			187.10	0.20	RODS
RM 111005	13935352.61	2989595.01	188.66			188.95	0.29	RODS
RM 111055	13941229.08	2990234.11	196.71			197.06	0.35	RODS
RM 111070	13944928.6	2995861.71	212.30			212.60	0.30	RODS
RM 120080	13944594.14	3025081.01	161.86			162.18	0.32	RODS
RM 120220	13947486.25	3013202.36	178.42			178.62	0.20	RODS
RM 100060	13963342.47	3101720.41	95.86	96.44		96.33	0.47	WEISSER-Estimated
RM 100060	13965157.71	3102123.634	95.86			96.23	0.37	TranSystems
RM 100053	13962381.03	3103121.963	103.30			104.02	0.72	TranSystems
RM 100055	13963762.04	3105388.348	129.83			129.86	0.03	TranSystems
RM 070245	13957348.28	3164901.174	69.66			70.05	0.39	TranSystems
RM 070265	13950765.46	3162407.22	74.46			74.97	0.51	TranSystems
RM 070390	13967658.41	3172957.401	73.30			73.61	0.31	TranSystems
RM 070555	14001590.49	3172075.696	112.95			113.43	0.48	TranSystems

Harris County 2001 to 1995/1996 Adjustment						
Monument	TSARP Elevation	Leveled Elevation	Surveyor	Grand Parkway Station	2001 to 1995 Adjustment	Adjustment Used for Grand Parkway
RM 111000	186.9	187.1	RODS	2490+00	0.2	0.2
RM 111005	188.66	188.95	RODS	2520+00	0.29	0.2
RM 111055	196.71	197.06	RODS	2570+00	0.35	0.2
RM 111070	212.3	212.6	RODS	2623+00	0.3	0.2
RM 120220	178.42	178.62	RODS	2788+00	0.2	0.2
RM 120080	161.86	162.18	RODS	2912+00	0.32	0.32
RM 120055	149.43	150.24	WEISSER	3150+00	0.81	0.81
RM 120050	149.56	150.31	WEISSER	3230+00	0.75	0.75
RM 120135	146.73	147.31	WEISSER	3425+00	0.58	0.58
RM 100315	134.36	134.77	WEISSER	3558+00	0.41	0.41
RM 100060	95.86	96.23	TranSystems	3747+00	0.37	0.4
RM 100053	103.3	104.02	TranSystems	3755+00	0.72	0.4
RM 100055	129.83	129.86	TranSystems	3776+00	0.03	0.4
RM 070265	74.46	74.97	TranSystems	4235+00	0.51	0.4
RM 070245	69.66	70.05	TranSystems	4445+00	0.39	0.4
RM 070390	73.3	73.61	TranSystems	4465+00	0.31	0.4
RM 070555	112.95	113.43	TranSystems	4545+00	0.48	0.4

Montgomery County FIS to 1995/1996 Adjustment						
Monument	Effective FIS Elevation	Leveled Elevation	Surveyor	Grand Parkway Station	FIS to 1995 Adjustment	Adjustment Used for Grand Parkway
RM 850	117.59	117.05	TranSystems	4225+00	-0.54	-0.54
RM 848	118.48	117.96	TranSystems	3965+00	-0.52	-0.52
RM 676	130.61	129.86	TranSystems	3650+00	-0.75	-0.75
RM 677	138.37	137.56	TranSystems	3680+00	-0.81	-0.81

Segment	Station	NUSA Adjustment (2001 - 2008)	2001 to 1995 Adjustment	2008 LiDAR to to 1995 Adj (1995 - 2008)
E	2380+00	0.36	0.2	0.56
E	2385+00	0.36	0.2	0.56
E	2390+00	0.36	0.2	0.56
E	2395+00	0.36	0.2	0.56
E	2400+00	0.36	0.2	0.56
E	2405+00	0.36	0.2	0.56
E	2410+00	0.36	0.2	0.56
E	2415+00	0.36	0.2	0.56
E	2420+00	0.35	0.2	0.55
E	2425+00	0.35	0.2	0.55
E	2430+00	0.35	0.2	0.55
E	2435+00	0.36	0.2	0.56
E	2440+00	0.36	0.2	0.56
E	2445+00	0.35	0.2	0.55
E	2450+00	0.35	0.2	0.55
E	2455+00	0.35	0.2	0.55
E	2460+00	0.35	0.2	0.55
F1	2460+00	0.35	0.2	0.55
F1	2465+00	0.35	0.2	0.55
F1	2470+00	0.35	0.2	0.55
F1	2475+00	0.35	0.2	0.55
F1	2480+00	0.34	0.2	0.54
F1	2485+00	0.34	0.2	0.54
F1	2490+00	0.35	0.2	0.55
F1	2495+00	0.35	0.2	0.55
F1	2500+00	0.35	0.2	0.55
F1	2505+00	0.35	0.2	0.55
F1	2510+00	0.35	0.2	0.55
F1	2515+00	0.35	0.2	0.55
F1	2520+00	0.35	0.2	0.55
F1	2525+00	0.34	0.2	0.54
F1	2530+00	0.34	0.2	0.54
F1	2535+00	0.34	0.2	0.54
F1	2540+00	0.34	0.2	0.54
F1	2545+00	0.34	0.2	0.54
F1	2550+00	0.34	0.2	0.54
F1	2555+00	0.34	0.2	0.54
F1	2560+00	0.34	0.2	0.54
F1	2565+00	0.34	0.2	0.54
F1	2570+00	0.34	0.2	0.54
F1	2575+00	0.34	0.2	0.54
F1	2580+00	0.34	0.2	0.54

Segment	Station	NUSA Adjustment (2001 - 2008)	2001 to 1995 Adjustment	2008 LiDAR to to 1995 Adj (1995 - 2008)
F1	2585+00	0.34	0.2	0.54
F1	2590+00	0.34	0.2	0.54
F1	2595+00	0.34	0.2	0.54
F1	2600+00	0.34	0.2	0.54
F1	2605+00	0.34	0.2	0.54
F1	2610+00	0.34	0.2	0.54
F1	2615+00	0.34	0.2	0.54
F1	2620+00	0.34	0.2	0.54
F1	2625+00	0.34	0.2	0.54
F1	2630+00	0.34	0.2	0.54
F1	2635+00	0.34	0.2	0.54
F1	2640+00	0.34	0.2	0.54
F1	2645+00	0.34	0.2	0.54
F1	2650+00	0.34	0.2	0.54
F1	2655+00	0.34	0.2	0.54
F1	2660+00	0.34	0.2	0.54
F1	2665+00	0.34	0.2	0.54
F1	2670+00	0.35	0.2	0.55
F1	2675+00	0.35	0.2	0.55
F1	2680+00	0.35	0.2	0.55
F1	2685+00	0.35	0.2	0.55
F1	2690+00	0.35	0.2	0.55
F1	2695+00	0.35	0.2	0.55
F1	2700+00	0.35	0.2	0.55
F1	2705+00	0.35	0.2	0.55
F1	2710+00	0.35	0.2	0.55
F1	2715+00	0.35	0.2	0.55
F1	2720+00	0.35	0.2	0.55
F1	2725+00	0.35	0.2	0.55
F1	2730+00	0.35	0.2	0.55
F1	2735+00	0.35	0.2	0.55
F1	2740+00	0.35	0.2	0.55
F1	2745+00	0.35	0.2	0.55
F1	2750+00	0.35	0.2	0.55
F1	2755+00	0.35	0.2	0.55
F1	2760+00	0.35	0.2	0.55
F1	2765+00	0.35	0.2	0.55
F1	2770+00	0.35	0.2	0.55
F1	2775+00	0.35	0.2	0.55
F1	2780+00	0.35	0.2	0.55
F1	2785+00	0.35	0.2	0.55
F1	2790+00	0.35	0.2	0.55

Segment	Station	NUSA Adjustment (2001 - 2008)	2001 to 1995 Adjustment	2008 LiDAR to to 1995 Adj (1995 - 2008)
F1	2795+00	0.35	0.21	0.56
F1	2800+00	0.35	0.21	0.56
F1	2805+00	0.35	0.22	0.57
F1	2810+00	0.35	0.22	0.57
F1	2815+00	0.36	0.23	0.59
F1	2820+00	0.36	0.23	0.59
F1	2825+00	0.36	0.24	0.6
F1	2830+00	0.36	0.24	0.6
F1	2835+00	0.35	0.25	0.6
F1	2840+00	0.35	0.25	0.6
F1	2845+00	0.35	0.26	0.61
F1	2850+00	0.35	0.26	0.61
F1	2855+00	0.35	0.26	0.61
F1	2860+00	0.35	0.27	0.62
F1	2865+00	0.35	0.27	0.62
F1	2870+00	0.35	0.28	0.63
F1	2875+00	0.35	0.28	0.63
F1	2880+00	0.35	0.29	0.64
F1	2885+00	0.35	0.29	0.64
F1	2890+00	0.35	0.3	0.65
F1	2895+00	0.35	0.3	0.65
F1	2900+00	0.35	0.31	0.66
F1	2905+00	0.35	0.31	0.66
F1	2910+00	0.35	0.32	0.67
F1	2915+00	0.35	0.33	0.68
F1	2920+00	0.35	0.34	0.69
F1	2925+00	0.35	0.35	0.7
F1	2930+00	0.35	0.36	0.71
F1	2935+00	0.35	0.37	0.72
F1	2940+00	0.35	0.38	0.73
F1	2945+00	0.35	0.39	0.74
F1	2950+00	0.35	0.4	0.75
F1	2955+00	0.35	0.41	0.76
F1	2960+00	0.35	0.42	0.77
F1	2965+00	0.35	0.43	0.78
F1	2970+00	0.35	0.44	0.79
F1	2975+00	0.35	0.45	0.8
F1	2980+00	0.35	0.46	0.81
F1	2985+00	0.35	0.47	0.82
F1	2990+00	0.35	0.48	0.83
F1	2995+00	0.35	0.49	0.84
F1	3000+00	0.35	0.5	0.85

Segment	Station	NUSA Adjustment (2001 - 2008)	2001 to 1995 Adjustment	2008 LiDAR to to 1995 Adj (1995 - 2008)
F1	3005+00	0.35	0.51	0.86
F1	3010+00	0.35	0.52	0.87
F1	3015+00	0.35	0.53	0.88
F1	3020+00	0.35	0.54	0.89
F1	3025+00	0.35	0.55	0.9
F1	3030+00	0.35	0.56	0.91
F1	3035+00	0.35	0.57	0.92
F1	3040+00	0.35	0.58	0.93
F1	3045+00	0.35	0.59	0.94
F1	3050+00	0.35	0.6	0.95
F1	3055+00	0.35	0.61	0.96
F1	3060+00	0.35	0.62	0.97
F1	3065+00	0.35	0.64	0.99
F1	3070+00	0.35	0.65	1
F1	3075+00	0.35	0.66	1.01
F1	3080+00	0.35	0.67	1.02
F1	3085+00	0.35	0.68	1.03
F1	3090+00	0.35	0.69	1.04
F2	3100+00	0.35	0.71	1.06
F2	3105+00	0.34	0.72	1.06
F2	3110+00	0.34	0.73	1.07
F2	3115+00	0.34	0.74	1.08
F2	3120+00	0.34	0.75	1.09
F2	3125+00	0.34	0.76	1.1
F2	3130+00	0.34	0.77	1.11
F2	3135+00	0.34	0.78	1.12
F2	3140+00	0.34	0.79	1.13
F2	3145+00	0.34	0.8	1.14
F2	3150+00	0.34	0.81	1.15
F2	3155+00	0.34	0.81	1.15
F2	3160+00	0.34	0.8	1.14
F2	3165+00	0.34	0.8	1.14
F2	3170+00	0.34	0.8	1.14
F2	3175+00	0.34	0.79	1.13
F2	3180+00	0.34	0.79	1.13
F2	3185+00	0.34	0.78	1.12
F2	3190+00	0.34	0.78	1.12
F2	3195+00	0.34	0.78	1.12
F2	3200+00	0.34	0.77	1.11
F2	3205+00	0.34	0.77	1.11
F2	3210+00	0.34	0.77	1.11
F2	3215+00	0.34	0.76	1.1

Segment	Station	NUSA Adjustment (2001 - 2008)	2001 to 1995 Adjustment	2008 LiDAR to to 1995 Adj (1995 - 2008)
F2	3220+00	0.34	0.76	1.1
F2	3225+00	0.34	0.75	1.09
F2	3230+00	0.34	0.75	1.09
F2	3235+00	0.34	0.75	1.09
F2	3240+00	0.34	0.74	1.08
F2	3245+00	0.34	0.74	1.08
F2	3250+00	0.33	0.73	1.06
F2	3255+00	0.33	0.73	1.06
F2	3260+00	0.33	0.72	1.05
F2	3265+00	0.33	0.72	1.05
F2	3270+00	0.33	0.72	1.05
F2	3275+00	0.33	0.71	1.04
F2	3280+00	0.33	0.71	1.04
F2	3285+00	0.33	0.7	1.03
F2	3290+00	0.33	0.7	1.03
F2	3295+00	0.33	0.69	1.02
F2	3300+00	0.33	0.69	1.02
F2	3305+00	0.33	0.68	1.01
F2	3310+00	0.33	0.68	1.01
F2	3315+00	0.33	0.68	1.01
F2	3320+00	0.33	0.67	1
F2	3325+00	0.33	0.67	1
F2	3330+00	0.33	0.66	0.99
F2	3335+00	0.33	0.66	0.99
F2	3340+00	0.33	0.65	0.98
F2	3345+00	0.33	0.65	0.98
F2	3350+00	0.32	0.65	0.97
F2	3355+00	0.32	0.64	0.96
F2	3360+00	0.32	0.64	0.96
F2	3365+00	0.32	0.63	0.95
F2	3370+00	0.32	0.63	0.95
F2	3375+00	0.32	0.62	0.94
F2	3380+00	0.32	0.62	0.94
F2	3385+00	0.32	0.61	0.93
F2	3390+00	0.32	0.61	0.93
F2	3400+00	0.32	0.6	0.92
F2	3405+00	0.32	0.6	0.92
F2	3410+00	0.32	0.59	0.91
F2	3415+00	0.32	0.59	0.91
F2	3420+00	0.32	0.58	0.9
F2	3425+00	0.32	0.58	0.9
F2	3430+00	0.31	0.57	0.88

Segment	Station	NUSA Adjustment (2001 - 2008)	2001 to 1995 Adjustment	2008 LiDAR to to 1995 Adj (1995 - 2008)
F2	3435+00	0.31	0.57	0.88
F2	3440+00	0.31	0.56	0.87
F2	3445+00	0.31	0.55	0.86
F2	3450+00	0.31	0.55	0.86
F2	3455+00	0.31	0.54	0.85
F2	3460+00	0.31	0.54	0.85
F2	3465+00	0.31	0.53	0.84
F2	3470+00	0.31	0.52	0.83
F2	3475+00	0.31	0.52	0.83
F2	3480+00	0.31	0.51	0.82
F2	3485+00	0.31	0.5	0.81
F2	3490+00	0.31	0.5	0.81
F2	3495+00	0.31	0.49	0.8
F2	3500+00	0.31	0.48	0.79
F2	3505+00	0.31	0.48	0.79
F2	3510+00	0.31	0.47	0.78
F2	3515+00	0.31	0.46	0.77
F2	3520+00	0.31	0.46	0.77
F2	3525+00	0.31	0.45	0.76
F2	3530+00	0.31	0.45	0.76
F2	3535+00	0.31	0.44	0.75
F2	3540+00	0.31	0.43	0.74
F2	3545+00	0.31	0.43	0.74
F2	3550+00	0.3	0.42	0.72
F2	3555+00	0.3	0.41	0.71
F2	3560+00	0.3	0.41	0.71
F2	3565+00	0.3	0.41	0.71
F2	3570+00	0.3	0.41	0.71
F2	3575+00	0.3	0.41	0.71
F2	3580+00	0.3	0.41	0.71
F2	3585+00	0.3	0.41	0.71
F2	3590+00	0.3	0.41	0.71
F2	3595+00	0.3	0.41	0.71
F2	3600+00	0.3	0.41	0.71
F2	3605+00	0.3	0.41	0.71
F2	3610+00	0.29	0.41	0.7
F2	3615+00	0.29	0.41	0.7
F2	3620+00	0.29	0.41	0.7
F2	3625+00	*	0.41	N/A
F2	3630+00	*	0.41	N/A
F2	3635+00	*	0.41	N/A
F2	3640+00	*	0.41	N/A

Segment	Station	NUSA Adjustment (2001 - 2008)	2001 to 1995 Adjustment	2008 LiDAR to to 1995 Adj (1995 - 2008)
F2	3645+00	*	0.41	N/A
F2	3650+00	*	0.41	N/A
F2	3655+00	*	0.4	N/A
F2	3660+00	*	0.4	N/A
F2	3665+00	*	0.4	N/A
F2	3670+00	*	0.4	N/A
F2	3675+00	*	0.4	N/A
F2	3680+00	*	0.4	N/A
F2	3685+00	*	0.4	N/A
F2	3690+00	*	0.4	N/A
F2	3695+00	*	0.4	N/A
F2	3700+00	*	0.4	N/A
F2	3705+00	*	0.4	N/A
F2	3710+00	*	0.4	N/A
F2	3715+00	*	0.4	N/A
F2	3720+00	*	0.4	N/A
F2	3725+00	*	0.4	N/A
G	3725+75	*	0.4	N/A
G	3730+00	*	0.4	N/A
G	3730+00	*	0.4	N/A
G	3735+00	*	0.4	N/A
G	3740+00	*	0.4	N/A
G	3745+00	*	0.4	N/A
G	3750+00	*	0.4	N/A
G	3755+00	*	0.4	N/A
G	3760+00	*	0.4	N/A
G	3765+00	*	0.4	N/A
G	3830+00	0.26	0.4	0.66
G	3930+00	0.25	0.4	0.65
G	4130+00	0.2	0.4	0.6
G	4330+00	0.15	0.4	0.55
G	4480+00	0.14	0.4	0.54

Note: Montgomery county 2008 to 2001 adjustment estimated visually by extending contour lines from Harris County comparison.

Station	BGE 2001 to 1995 Adjustment	Interpolated New Adjustment	Difference
2729+00	0.2	0.2	0
2743+00	0.2	0.2	0
2810+00	0.23	0.22	-0.01
2848+00	0.29	0.26	-0.03
2879+00	0.36	0.29	-0.07
2936+00	0.43	0.37	-0.06
2959+00	0.44	0.42	-0.02
2975+00	0.4	0.45	0.05
3036+00	0.36	0.58	0.22
3122+00	0.51	0.75	0.24
3174+00	0.48	0.79	0.31
3230+00	0.45	0.75	0.3
3298+00	0.4	0.69	0.29
3398+00	0.35	0.6	0.25
3454+00	0.39	0.54	0.15
3474+00	0.4	0.52	0.12

Segment G:	BGE 2001 Adj to 1995 Adj	Used New Adjustment
Woodson Gully	0.4	0.4
San Jacinto River	0.4	0.4
White Oak Creek	0.4	0.4

		2001 to 1995		NUSA Adj	2008 to 1995
3940+00		0.4		0.25	0.65
4055+00		0.4		0.22	0.62
4377+00		0.4		0.15	0.55

HydroID	Station	Station_Txt	River	Adj_2008_to_1995
100	243000	2430+00	SegF1	0.55
101	248000	2480+00	SegF1	0.54
102	253000	2530+00	SegF1	0.54
103	258000	2580+00	SegF1	0.54
104	263000	2630+00	SegF1	0.54
105	268000	2680+00	SegF1	0.55
106	273000	2730+00	SegF1	0.55
107	278000	2780+00	SegF1	0.55
108	283000	2830+00	SegF1	0.60
109	288000	2880+00	SegF1	0.64
110	293000	2930+00	SegF1	0.71
111	298000	2980+00	SegF1	0.81
112	303000	3030+00	SegF1	0.91
113	308000	3080+00	SegF1	1.02
114	315000	3150+00	SegF2	1.15
115	320000	3200+00	SegF2	1.11
116	325000	3250+00	SegF2	1.06
117	330000	3300+00	SegF2	1.02
118	335000	3350+00	SegF2	0.97
119	340000	3400+00	SegF2	0.92
120	345000	3450+00	SegF2	0.86
121	350000	3500+00	SegF2	0.79
122	355000	3550+00	SegF2	0.72
123	360000	3600+00	SegF2	0.71
124	365000	3650+00	SegF2	N/A
125	370000	3700+00	SegF2	N/A
85	378000	3780+00	SegG	0.00
86	383000	3830+00	SegG	0.66
87	388000	3880+00	SegG	0.66
88	393000	3930+00	SegG	0.65
89	398000	3980+00	SegG	0.64
90	403000	4030+00	SegG	0.63
91	408000	4080+00	SegG	0.61
92	413000	4130+00	SegG	0.60
93	418000	4180+00	SegG	0.59
94	423000	4230+00	SegG	0.58
95	428000	4280+00	SegG	0.56
96	433000	4330+00	SegG	0.55
97	438000	4380+00	SegG	0.55
98	443000	4430+00	SegG	0.54
99	448000	4480+00	SegG	0.54
A				

Add this value to 2008 LiDAR to get to 1995 Adj

N/A Use New LiDAR + Adj

N/A Use New LiDAR + Adj

N/A Use New LiDAR + Adj

Station	2008 to 2001	2001 to 1995	2008 to 1995
383000	0.26	0.4	0.66
393000	0.25	0.4	0.65
413000	0.2	0.4	0.6
433000	0.15	0.4	0.55
447999.97	0.14	0.4	0.54

Texas Department of Transportation
Book 2 – Technical Provisions

Grand Parkway Project

Attachment 13-1
TxDOT Standard Bridge Railing

Table 1 lists currently approved TxDOT Bridge Railing Standards:

Table 1: TxDOT Standard Bridge Railing

TRAFFIC RAILS		
Rev Date	**Std Name**	**Description**
05-11	T1F	Stl Post w/Alum Tube & Opt Curb Drains (33” tall)
05-11	T1W	Stl Post w/Stl Tube & Opt Curb Drains (32” tall)
04-09	T101	Steel Post with W-Beam (27” tall)
05-11	T221	Concrete Parapet (32” tall)
05-11	T223	Conc Bm & Post w/6’ Openings (32” tall)
05-11	T401	Concrete Parapet w/Stl Post and Rail (33” tall)
05-11	T402	Concrete Parapet w/Stl Post and Rail (42” tall)
05-11	T411	Conc Traf Rail w/Windows(Tx Classic)(32” tall)
05-11	T551	Concrete Safety F-Shape (32” tall)
05-11	T552	T551 w/Multiple Drain Slots (32” tall)
04-09	T6	Steel Post w/Doubled W-Beams (27.125” tall)
05-11	T66	Conc Bm, Post & Curb w/5.25’ Max Open (32” tall)
05-11	SSCB	Single Slope Concrete Barrier, Type 1 (42” tall)
05-11	SSTR	Conc Single Slope Traffic Rail (36” tall)
COMBINATION RAILS		
Rev Date	**Std Name**	**Description**
05-11	C1W	Steel Post w/Stl Tube & Opt Curb Drain (42” tall)
05-11	C221	T221 w/Steel Pipe Rail (42” tall)
05-11	C223	T223 w/Steel Pipe Rail (42” tall)
05-11	C402	T402 w/Steel Pipe Rail (42” tall)
05-11	C411	Comb Rail w/windows (Tx Classic) (42” tall)
05-11	C412	Conc Comb Rail w/Windows (TL-4) (42” tall)
MISCELLANEOUS RAILS		
Rev Date	**Std Name**	**Description**
05-11	C-RAIL-R	Retrofit Guide for Concrete Rails
04-09	T101RC	Retrofit Guide for T101 on Curbs
04-09	T1-101R	Retrofit (Convert T1 to T101)
04-09	T2/T201TR	Guide for T2/T201(Retrofit Thrie-Beam Transition)
04-09	T202TR	Guide for T202 (Retrofit Thrie-Beam Transition)
05-11	TRF	Traffic Rail Foundation
04-09	PR1	Pedestrian Rail,Steel Pipe (42” tall)
05-11	PR2	Pedestrian Rail,Steel Pipe on Parapet (42” tall)
04-09	PR3	Pedestrian Rail,Steel and Conc (43.75” tall)
04-09	PR3-HD	Handrail Details for PR3 Pedestrian Rail
04-09	CLF-RO	8 Ft Chain Link Fence for Railroad Overpass
05-11	C-RAIL-R	Retrofit Guide for Concrete Rails

Texas Department of Transportation
Book 2 – Technical Provisions

Grand Parkway Project

Attachment 21-1
Toll Systems Responsibility Matrix

ATTACHMENT 21- 1

Texas Department of Transportation **Toll Systems Responsibility Matrix**

LEGEND		Work Description		
Primary Responsibility	A	1	2	3
Support Responsibility	B	Design	Procure	Install and/or Construct
Coordination Responsibility Only	C			
No Responsibility	D			

Element/Task/Component/ Sub-system	D/B CDA Developer (D/B)			System Integrator (SI)			Comments Other Responsibility/Information
	1	2	3	1	2	3	
FACILITIES							
Toll Plaza Layout	A	A	A	B	D	D	SI to provide system design. D/B to incorporate into Project Design. Preliminary plaza locations provided in existing schematics.
Metered power service to roadside equipment cabinet	A	A	A	B	D	C	SI to provide power requirements and special requirement for construction of utilities near toll collection point.
Complete backup power systems: generators, automatic transfer switches, and fuel tanks	C	D	B	A	A	A	
Foundation and conduits for backup power systems	A	A	A	B	D	C	D/B to provide foundations and conduits between foundations. SI will ensure foundations and conduits are adequate.
Uniform Uninterruptible Power Supplies	C	C	C	A	A	A	
Lightning Protection & Grounding	A	A	A	B	C	C	
Duct Bank	A	A	A	B	D	C	D/B to install conduit Duct Bank complete with pull strings
Fiber Optic cables in Duct Bank for Toll Systems	A	A	A	B	D	C	
Data/Communication service to roadside equipment cabinet	A	A	A	B	D	C	SI to provide power and communication/data requirements. D/B to install up to the roadside equipment cabinet.
Data/Communication wire/fiber from roadside equipment cabinet to toll systems equipment	C	C	C	A	A	A	SI to install from roadside equipment cabinet to toll systems equipment.

LEGEND		Work Description		
Primary Responsibility	A	**1**	**2**	**3**
Support Responsibility	B	Design	Procure	Install and/or Construct
Coordination Responsibility Only	C			
No Responsibility	D			

Element/Task/Component/ Sub-system	D/B CDA Developer (D/B)			System Integrator (SI)			Comments Other Responsibility/Information
	1	**2**	**3**	**1**	**2**	**3**	
Pavement, inclusive of special nonferrous zones and conduit stub outs for in pavement sensors	A	A	A	B	D	C	SI to provide any special requirements for pavement design
Pavement sensors	C	C	C	A	A	A	SI to saw cut and install pavement sensors
Gantries including special framing for equipment mounts	A	A	A	B	D	C	SI to provide requirements for specific equipment mounts, conduits, J boxes, power and data wiring. D/B to incorporate into structural design
Toll Equipment mounts on Gantries	B	D	C	A	A	A	SI to install any required equipment mounts on gantries. SI to coordinate with D/B during the design phase to incorporate any required framing to support equipment mounts.
Roadside equipment cabinet slabs	A	A	A	B	D	C	SI to provide requirements for size of slab needed.
Roadside equipment cabinets (including HVAC systems)	B	D	C	A	A	A	SI to install complete
Lane Controller Hardware	D	D	C	A	A	A	D/B will coordinate access to roadway for installations.
Communication Equipment	D	D	C	A	A	A	D/B will coordinate access to roadway for installations.
ELECTRONIC TOLL COLLECTION SUB-SYSTEMS (ETC)							
Installation/Electrical Design and Plans	C	D	C	A	A	A	
Automatic Vehicle Classification System and Image Capturing System (ICS) Hardware	C	C	C	A	A	A	
Roadside Equipment Cabinets	D	D	C	A	A	A	D/B will coordinate access to roadway for installations.

LEGEND		Work Description		
Primary Responsibility	A	1	2	3
Support Responsibility	B	Design	Procure	Install and/or Construct
Coordination Responsibility Only	C			
No Responsibility	D			

Element/Task/Component/ Sub-system	D/B CDA Developer (D/B)			System Integrator (SI)			Comments Other Responsibility/Information
	1	2	3	1	2	3	
Computer rack system, routers, hubs, switches, firewalls, VPN, modems, patch/distribution panels,	D	D	C	A	A	A	D/B will coordinate access to roadway for installations.
Toll Plaza Host Computer	D	D	C	A	A	A	
Back-up Host Computer	D	D	D	A	A	A	
Support equipment at TxDOT or HCTRA Customer Service Center	D	D	D	A	A	A	
Workstations/Printers	D	D	D	A	A	A	
Commissioning and Operational Testing	D	D	C	A	A	A	
Lane controller software	D	D	D	A	A	A	
Plaza Computer Software	D	D	D	A	A	A	
Host Computer Software	D	D	D	A	A	A	
Toll Collection System Application Software	D	D	D	A	A	A	
Security Access System Software	D	D	D	A	A	A	
Maintenance Online Management System Software	D	D	D	A	A	A	
Factory Acceptance Test	D	D	C	A	A	A	D/B will coordinate access to roadway for testing.
Project Acceptance Test	D	D	C	A	A	A	D/B will coordinate access to roadway for testing.
Training	D	D	D	A	A	A	
Documentation	D	D	D	A	A	A	
FCC Licenses/Regulations as applies to toll systems	D	D	D	A	A	A	
Tolling location phone service	A	A	A	B	C	C	

Texas Department of Transportation
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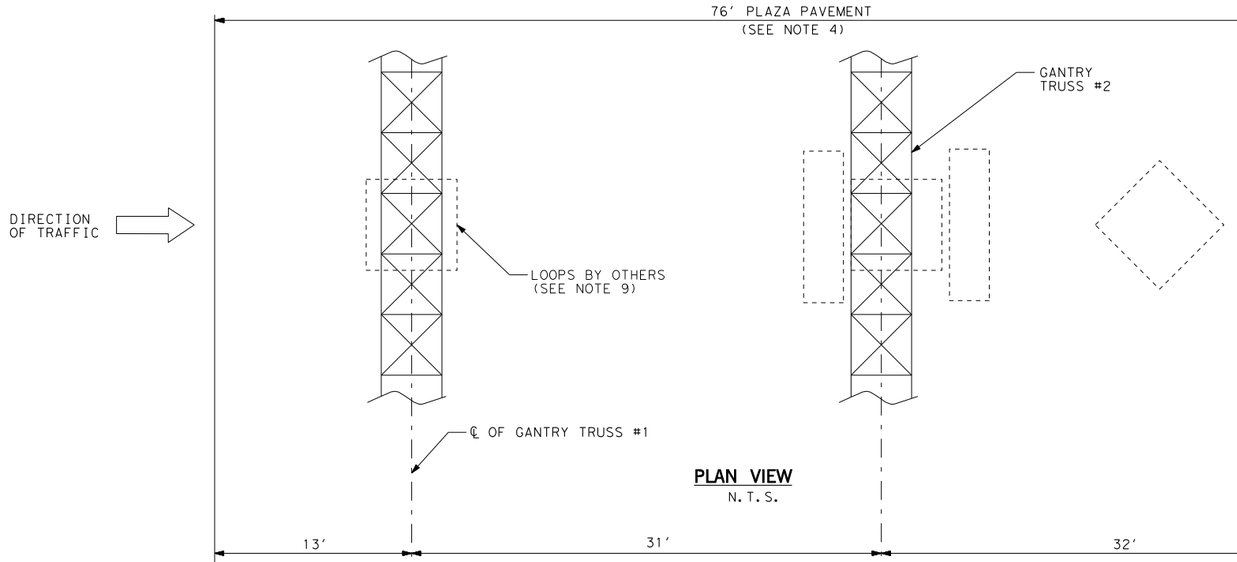
Grand Parkway Project

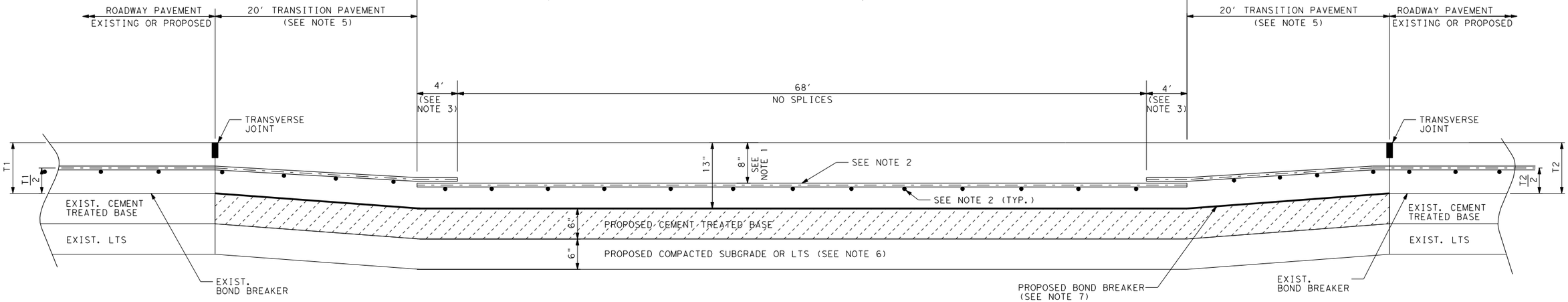
Attachment 21-2
Plaza Pavement Details



PLAN VIEW
N.T.S.

NOTES:

1. 8" IS MEASURED FROM TOP OF PAVEMENT TO TOP OF STEEL.
2. REINFORCING STEEL TO MATCH EXISTING OR PROPOSED ROADWAY PAVEMENT REINFORCEMENT. SEE CRCP (HOUSTON DISTRICT) FOR DETAILS.
3. NO MORE THAN 1/3 OF BARS MAY BE SPLICED WITHIN A 2′ LENGTH.
4. NO TRANSVERSE JOINTS ARE ALLOWED WITH THE PLAZA PAVEMENT AREA. LONGITUDINAL JOINTS ARE ONLY ALLOWED ON LANE LINES.
5. TRANSITION PAVEMENT PAID AS PLAZA PAVEMENT.
6. COMPACTED SUBGRADE SHALL BE DENSITY CONTROLLED AND MAY BE USED AT RAMP PLAZA. LTS SHALL BE USED AT MAINLANE PLAZA.
7. REINFORCEMENT MUST BE EPOXY COATED WITHIN THESE LIMITS, INCLUDING TRANSITION PAVEMENT.
8. ALL ACCESSORIES AS TIES, BAR CHAIRS, SUPPORTS OR CLIPS WILL BE NON-FERROUS. PLASTIC, PRECAST MORTAR OR CONCRETE BLOCK SUPPORTS AS APPROVED BY THE ENGINEER MAY BE USED.
9. CONSTRUCTION OF DATA AND POWER CONDUITS FOR LOOPS SHOULD BE COORDINATED WITH SYSTEMS INTEGRATOR PRIOR TO CONSTRUCTION OF PAVEMENT.



PROFILE VIEW
N.T.S.

T1 = APPROACH PAVEMENT THICKNESS
T2 = DEPARTURE PAVEMENT THICKNESS

Texas Department of Transportation
Houston District

PLAZA PAVEMENT DETAILS ATTACHMENT 21-2

FILE:	DN:	CK:	DW:	CK:	
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REVISIONS	HOU	6			
	COUNTY		CONTROL	SECT	JOB	HIGHWAY