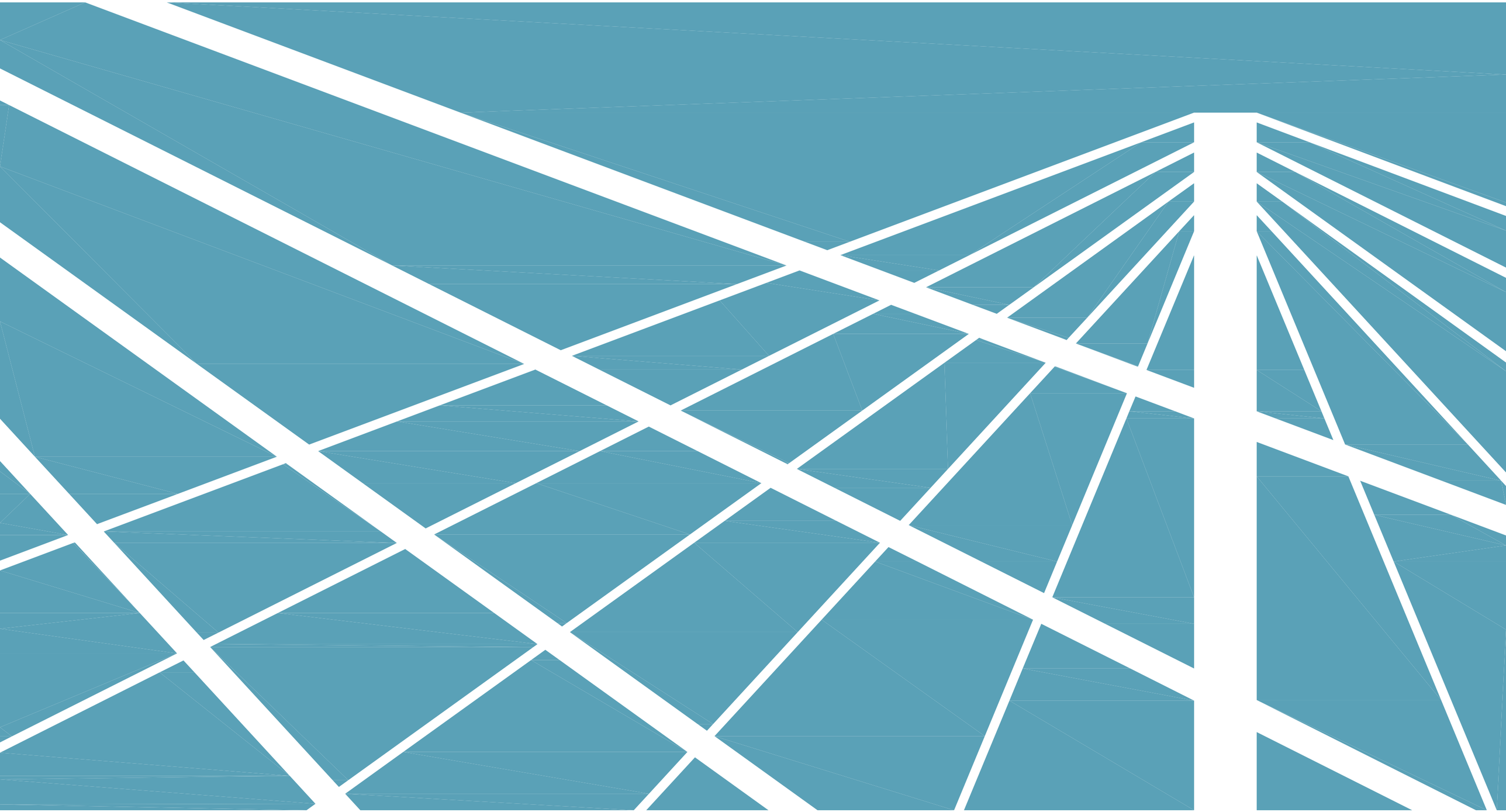
US 181 Harbor Bridge Project



ATTACHMENT 15-1 Aesthetic Guidelines

Addendum 4

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Project Overview

The US 181 Harbor Bridge Project includes the design, construction and maintenance of the US 181 Harbor Bridge, and portions of US 181, I 37 and SH 286 in Corpus Christi, Texas. The Project limits extend both north and south along US 181 and SH 286 and east and west along I 37 and includes: US 181 to Beach Avenue on the north; Crosstown Expressway to Morgan Avenue on the south; I 37 to Up River Road on the west; and I 37 to Carancahua Street on the east.

Third party relationships to note are the Port of Corpus Christi Authority (PCCA), the Union Pacific Railroad (UPRR), the United States Coast Guard (USCG), the Federal Aviation Administration (FAA), and the US Army Corps of Engineers (USACE).

This document delineates the treatment criteria that serve as the preliminary aesthetic design of the corridor. It establishes the standards necessary to produce the intended form, function and appearance of each bridge and highway feature and component. This document is not intended to define the design of the project, but rather serve as a set of parameters that will be incorporated into final engineering design. Certain elements may be subject to Design Exception requests, but only by approval from TxDOT. All aesthetic and landscape design shall be in conformance with the pertinent sections of the Project's Techical Provisions (TP). Where conflicts exist between this document and the TP, the TP shall govern.

The Project shall incorporate aesthetics that reflect of the Corpus Christi community and local heritage. The US 181 Harbor Bridge will become a treasured landmark and serve as a jewel of the community. The character of the Project will be unique and have an elegant and sleek appearance.

The architectural and landscape aesthetic guidelines found in this document are based upon community stakeholders' input and visual preferences. In summary, the Project shall receive one, continuous aesthetic theme to be reflected in the corridor. The theme should summon the sense of community of Corpus Christi and complement the historic, industrial and unique areas in the corridor such as North Beach, downtown, the marine port, and the ocean's significance to Corpus Christi.

Examples of such significant components could include ocean waves, ecology of the sea or wetlands, nautical history of the region, industry (shipping/ fishing), and recreation and tourism as they relate to the Gulf of Mexico. Graphic examples of the theme seen throughout this document are guidance for the Developer's Final Design. The Developer's team is expected to create its own thematic design for the Project.

Corrosive salt air, wind and rain shall be considered when selecting materials and types of aesthetic applications. The Developer shall make efforts to minimize the appearance of these environmental effects on the facility to the extent reasonable and practical.

The Developer shall include roosting bird prevention measures where required per *TP Section 13.2.1.19, Maintenance and Inspection*, however they shall not detract from aesthetic treatments.

Figure i – Project Limits Map

1.1 Overview

The US 181 Harbor Bridge design must realize the vision of TxDOT and the local community to create a safe and functional new harbor crossing. This highly visible city landmark is intended to be an elegant, unique, and memorable structure.

Design and construction objectives:

- To combine functional requirements and aesthetic objectives in one structural design.
- To recognize the technical aspects of the structure as design features.
- To provide a design for concrete components that allows consistent, smooth surface finish concrete form-work. Textured form-work shall be of consistent high quality. The pattern of form-work will be an important design element.
- To integrate best practices in transportation sustainability by employing a "triple bottom line" (social, environmental, economic) approach to design, as described by the FHWA's INVEST initiative.

1.2 Tower and Cable Configuration

The towers are a significant visible feature of the bridge, designed for both structural capacity and aesthetic integrity. The Developer shall consider space requirements for the towers' component parts: stay cable anchorages; diaphragms; and tension ties. Also to be considered are inspection activities; maintenance facilities; lighting for ship channel navigation; aviation and port requirements; and roadway and architectural lighting. The towers shall be a dominant feature of the bridge that define the viewer's perception of the entire crossing. When illuminated at night, they shall be further enhanced (see subchapter 8.1 Architectural Lighting).

All tower configurations, with the exception of H-shaped towers with a horizontal strut above deck level, are be permitted. An H-shaped tower with a horizontal strut under the deck is permitted. A fan arrangement of cables is required.

1.3 Deck and Superstructure

The deck and superstructure aesthetics shall be governed by constructibility and life-cycle serviceability. Their appearance shall be consistent with the technical and aesthetic aspects of the towers. The deck and superstructure transitions between the approach bridges and the US 181 Harbor Bridge shall be seamless, elegant and well-resolved. The deck layout shall at all times ensure traffic flow while fulfilling safety and maintenance requirements.

1.4 Anchor Piers and Deck Transitions

Piers shall be elegant and sleek.

1.5 Mid-Span Belvedere

A cantilevered belvedere shall be provided at mid-span of the Harbor Bridge over the Corpus Christi Ship Channel, gulf side. It shall serve as a scenic overlook for pedestrians and bicycle riders on the shared use path. The belvedere shape and layout shall be designed to provide safe and easy access for path users.

Figure 1.1 – US 181 Harbor Bridge location

A pedestrian fence shall run continuously from the shared use path and along the outer edge of the belvedere. Refer to Chapter 6.0, Pedestrian Fencing.

1.6 Concrete Traffic Barrier

TxDOT Concrete Traffic Barrier (CTB) railing type T80HT shall be used for the US 181 Harbor Bridge per *TP Section 15.3.6, Traffic Railings*. This railing will allow motorist views off the bridge. Maintaining visibility from the bridge to the vistas below is a high priority. See *Figure 1.2* for required aesthetic surface treatments. Paint on concrete shall meet all criteria in the *TxDOT Departmental Material Specifications (DMS),* Section DMS-8110, Coatings for Concrete. Metal components shall only receive finish treatment (galvanization, opaque sealer, stainless steel). Opaque sealer on metal components shall meet all criteria in the *TxDOT DMS,* Section DMS-8100 Structural Steel Paints - Formula and Section DMS-8101 Structural Steel Paints - Performance. No physical modifications to rail components that change their structural integrity or tested abilities are permitted. Life-cycle maintenance and cleaning shall be a primary factor when selecting aesthetic applications to the T80HT rail surface.

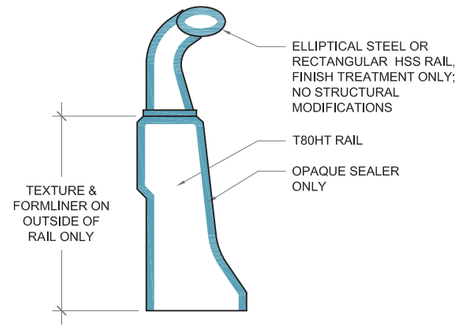

Figure 1.2 – Required aesthetic surface treatments on T80HT rails

1.7 Utility and Maintenance Structures

Utility components shall be designed and located to have minimal adverse visual impacts on major bridge components. Consolidate minor components and integrate them into the overall architectural composition.

All utilities that are exposed on the bridge structure shall be painted to match the structure.

2.1 Overview

The transition from the US 181 Harbor Bridge to the approach bridges shall be seamless. Aesthetic treatments and forms of the bridge elements discussed in the subsequent chapters shall not differ between the bridge segments, unless otherwise noted. The location of approach bridges in the Project corridor are illustrated in Figure 2.1.

The Developer shall minimize the number of approach bridge bents to the extent reasonable and practical. The intent of fewer bents is to prevent the appearance of a "forest of columns" as observed from below the bridges.

TxDOT will initiate public involvement activities to help define the uses and aesthetics beneath the Approach Bridge where the right-of-way intersects the Northside Neighborhood. The general location of the neighborhood/Approach Bridge intersection is illustrated in *Figure 2.1*. The Developer shall coordinate with TxDOT to ensure that development in this area is consistent with the outcome of the public involvement activities. Refer to *TP Section 3.2.5, Customer Groups*.

Figure 2.1 – Approach bridge limits

2.1 Overview (continued)

The transition from the approach bridges to the remainder of the corridor facilities shall be seamless. Aesthetic treatments and architectural forms and shapes of the facility elements shall not differ between the approach bridges and corridor facilities. The location of corridor connections in the Project corridor are illustrated in *Figure 2.2*.

At corridor termini, the aesthetics shall blend into the existing roadway facilities. Methods of blending aesthetics include the continuation of aesthetic treatments on CTB rails beyond the project limits. A logical stopping point would be where a CTB terminates at a ramp, ends at a bridge rail, or the rail transitions to a metal beam guard fence. This approach shall be developed in concept and presented to TxDOT for approval prior to the formal Design Submittal.

Figure 2.2 – Corridor connections limits

3.1 Rail

The applied aesthetics of the rails at the approach bridges shall be the same or complementary to that of the US 181 Harbor Bridge rail. Required aesthetic surface treatments are illustrated in *Figure 3.1*.

CTB rail types used in the remainder of the corridor shall be per *TP Section 13.2.1.12*. Applied aesthetics shall be complementary to that of the US 181 Harbor Bridge and approach bridge rails. Required aesthetic surface treatments are illustrated in *Figure 3.2.*

Opaque sealer on concrete shall meet all criteria in the *TxDOT DMS,* Section DMS-8110, Coatings for Concrete. Metal rails and other metal components shall only receive finish treatment (galvanization, opaque sealer, stainless steel). Metal components shall only receive finish treatment (galvanization, opaque sealer, stainless steel). Opaque sealer on metal components shall meet all criteria in the *TxDOT DMS,* Section DMS-8100 Structural Steel Paints - Formula and Section DMS-8101 Structural Steel Paints - Performance. No physical modifications to rail components that diminish their structural integrity or crash tested abilities will be accepted. Aesthetic applications to the selected rail(s) shall meet all TxDOT standards.

3.2 Beams and Girders

Aesthetic treatment on concrete beams and girders is limited to opaque sealer, which shall be applied to the underside of each beam and outer surfaces of the outside beams as illustrated in *Figure 3.3*. Steel girders shall receive opaque sealer applications on all surfaces as illustrated in *Figure 3.4*.

Opaque sealer on concrete beams shall meet all criteria in the *TxDOT DMS,* Section DMS-8110, Coatings for Concrete.

Opaque sealer on steel girders shall meet all the criteria in the *TxDOT DMS,* Section DMS-8100 Structural Steel Paints - Formula and Section DMS-8101 Structural Steel Paints - Performance.

Texture applications or other aesthetics modifications shall not diminish the structural integrity of beam.

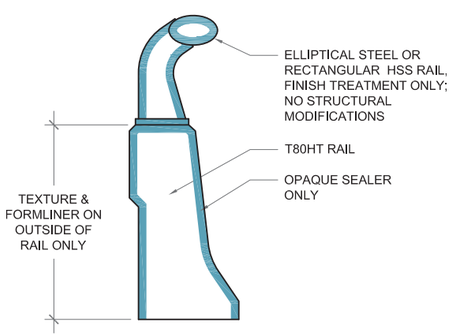

Figure 3.1 – Required aesthetic surface treatments on T80HT rails

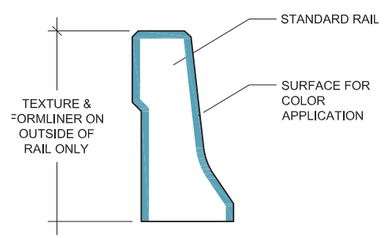

Figure 3.2 – Required aesthetic surface treatments on rails

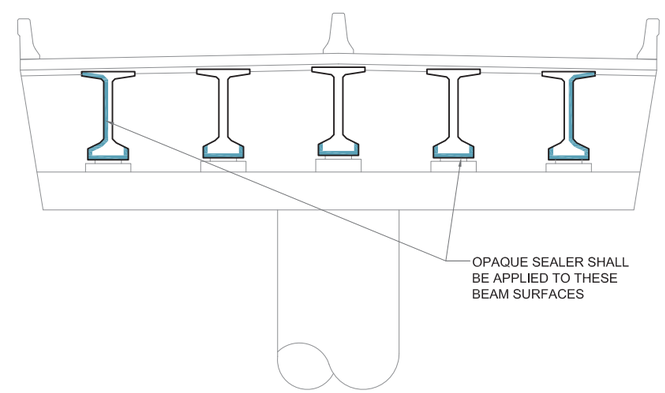

Figure 3.3 – Required surfaces for aesthetic treatment on concrete beams

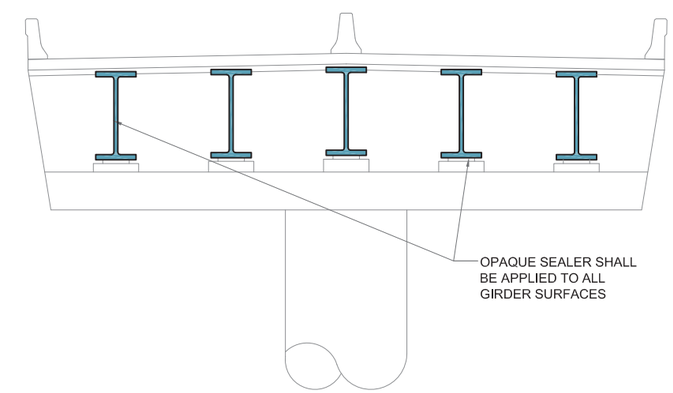

Figure 3.4 – Required surfaces for aesthetic treatment on steel girders

4.1 Bents

Bent aesthetics shall complement and support the Project's aesthetic theme. The scale and level of detail of applied aesthetics shall be appropriate for the structure's size and location as well as for an observer traveling at the designated speed limit and/or stopped at a traffic signal.

Surfaces that shall receive aesthetic treatment are, but are not limited to, those illustrated in *Figure 4.2*. Acceptable aesthetic treatments are opaque sealers, texture, and/or mounted, cast-in-place forms.

Opaque sealer on concrete shall meet all criteria in the *TxDOT DMS,* Section DMS-8110, Coatings for Concrete.

Single column bents may show a clear distinction in width between a bent cap and the column, or they can be constructed as a unit that transitions in width (flared column). Bents shall be proportioned so that horizontal lines of the superstructure are not interrupted. Bent columns shall not be too slender nor caps too tall so as they convey a feeling of instability.

The column shape shall be rectangular or square. Circular columns are prohibited per the *TP Section 15.3.2, Bridges*. Chamfered and rounded corners are allowable. Rounded corners shall not exceed 1/4 the length of each face; see *Figure 4.1.*

Tapered columns or those with wider bases are allowable. If tapered columns are designed, the base of the column shall not exceed 150% of the width at the top. If columns with a wider base are designed, the wider base shall not offset from the main column width by more than 150% of the column's width, and the height shall not exceed one-third of the height of the shortest column in a bridge span.

Although a variety of shapes and sizes are permissible, the Developer should use restraint when combining/selecting aesthetic preferences. Too much ornamentation or variety is not in keeping with the sleek, elegant vision for the bridge.

Aesthetic applications shall not diminish the structural integrity of the bent.

It is allowable for the applied aesthetic to be focused at the top or bottom portions of the bent. Where the height of adjacent bents vary due to sloping roadway and superstructure and/or finished grade changes, the applied aesthetics shall remain consistent and justified toward the chosen top or bottom of the bent; see *Figures 4.3, 4.4 and 4.5*.

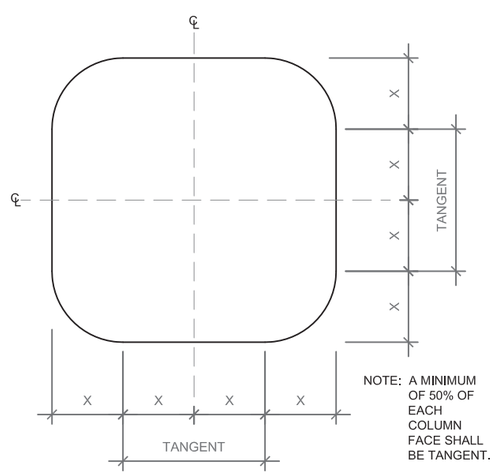

Figure 4.1 – Limits of rounded corners on square columns.

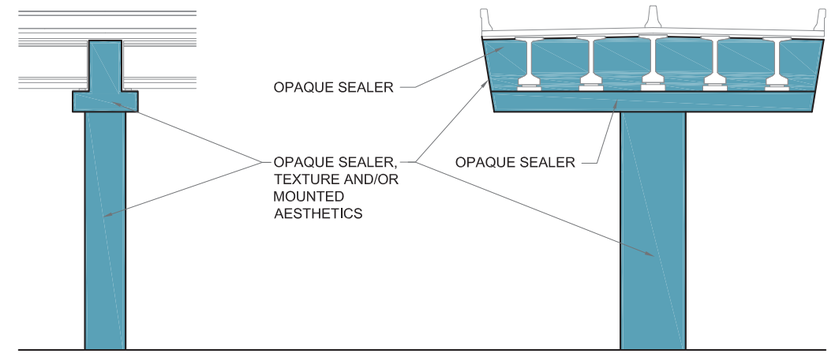

Figure 4.2 – Required aesthetic surface treatments on bents

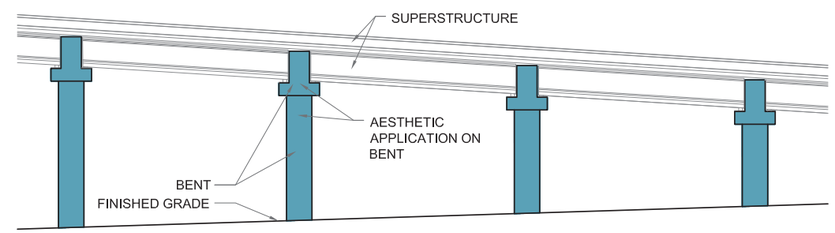

Figure 4.3 – Aesthetic treatment of bents in a sloping condition

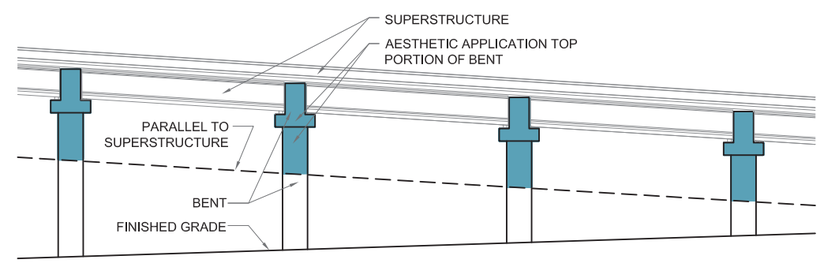

Figure 4.4 – Bents in a sloping condition with aesthetic treatment justified at the top.

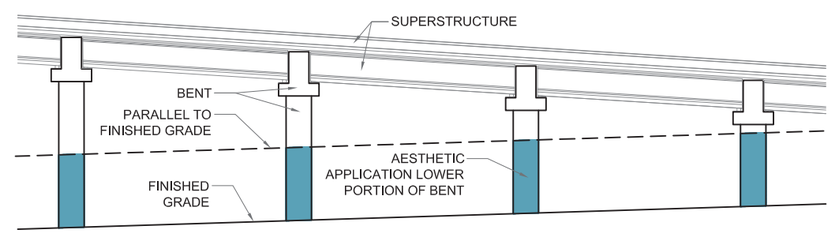

Figure 4.5 – Bents in a sloping condition with aesthetic treatment justified at the bottom.

5.1 Retaining Walls

Aesthetic applications on retaining walls shall rely on opaque sealers, form liners and/or applied textures. Retaining walls shall meet all criteria of Item 423 of *Attachment 13-1, Structure Provisions*. Opaque sealer on concrete shall meet all criteria in the *TxDOT DMS*, Section DMS-8110, Coatings for Concrete.

Applied aesthetics not permitted:

- Retaining wall texture type “fractured fin”; refer to *Figure 5.1* for an example.
- Painted murals, large and small

Continuously running horizontal lines, texture, pattern or design alignment are not permitted. Any settling and resulting rotation over time will be more noticeable in a highly linear application. Offsetting and breaking up horizontal lines will draw the eye away from any shifting of retaining wall panels that occurs.

The retaining wall aesthetics shall be developed in a way that supports and complements the Project’s aesthetic theme. This is also defined in *TP Section 15.3.4, Retaining Walls*.

Aesthetics on walls will be seen from a variety of vehicular speeds, elevations and directions. The aesthetics shall employ scale, level of detail, depth of reveal/relief and color to befit those conditions in which the motorist/pedestrian/bicyclist will be viewing them.

Retaining walls shall carry the higher-detailed aesthetic application within the bottom 10 feet of the wall (measured from finished grade). See *Figure 5.2* for the envelope of higher detail and *Figure 5.3* for an applied design example. Surface area outside of the envelope shall have a simpler, repetitive aesthetic application as illustrated in *Figure 5.4*.

Figure 5.1 – Fractured fin texture on retaining walls shall not be accepted

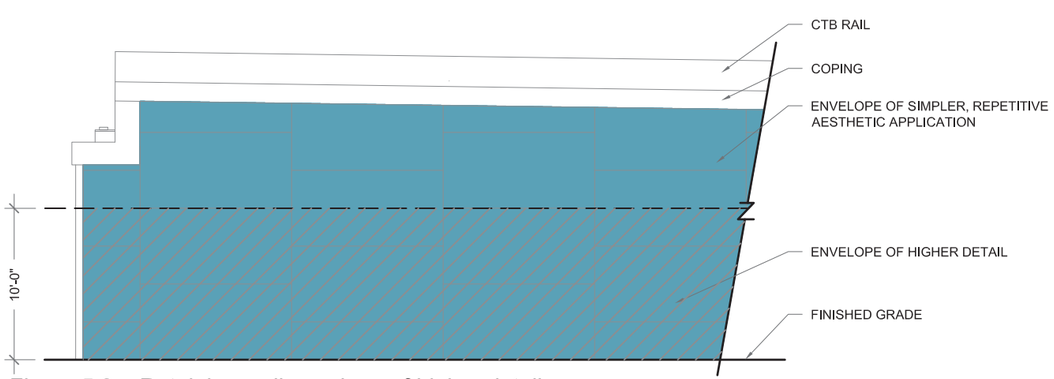

Figure 5.2 – Retaining wall envelope of higher detail

The Developer shall identify and account for the sloping conditions of the superstructure and finished grade as it relates to the layout of the applied aesthetic and the envelope of higher detail.

TxDOT reserves the right to require wall construction where existing land features shall be preserved.

For additional texture samples, refer to Chapter 11.0, Finish Schedule.

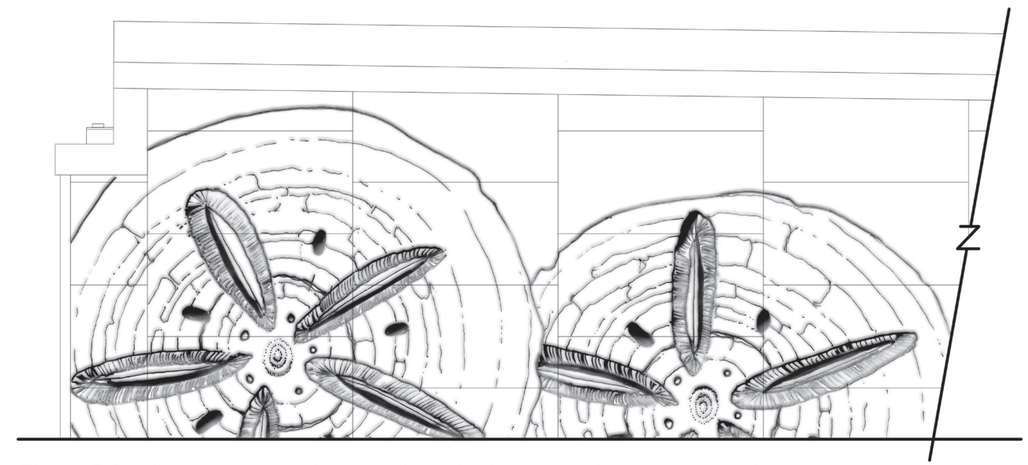

Figure 5.3 – Conceptual retaining wall aesthetics - sample accent graphic

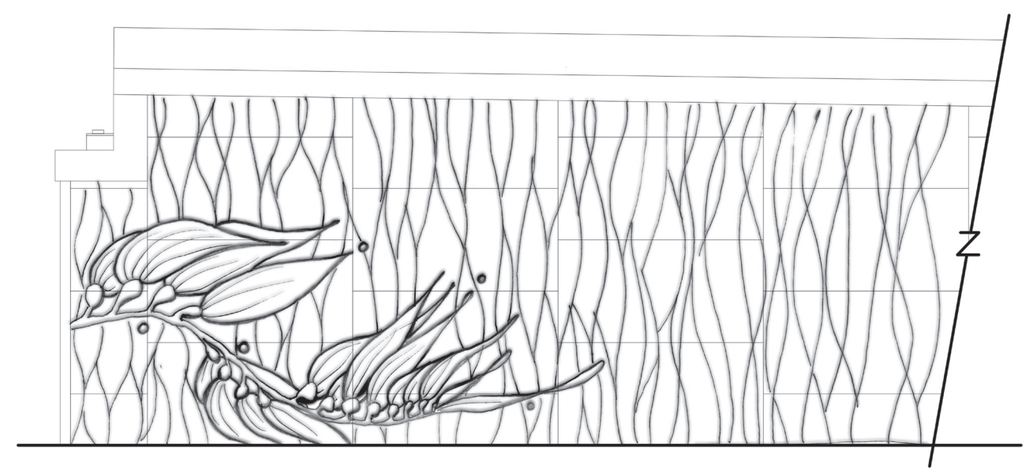

Figure 5.4 – Conceptual retaining wall aesthetics - sample accent graphic with texture background

5.2 Abutments

All proposed abutment walls shall be consistent with or complement the aesthetics of the adjacent retaining walls.

Figure 5.5 demonstrates two abutment walls and the components to which these guidelines apply. Where a vertical endwall is used, the wall shall carry the higher-detailed, dominating aesthetic application within the bottom 10 feet of the wall (measured from finished grade). Surface area outside of the envelope shall exhibit a simpler aesthetic pattern. Acceptable and unacceptable applied aesthetics are the same as those listed in subchapter 5.1, Retaining Walls.

Abutments shall satisfy the requirements of Item 420 in *Attachment 13-1, Structure Provisions*.

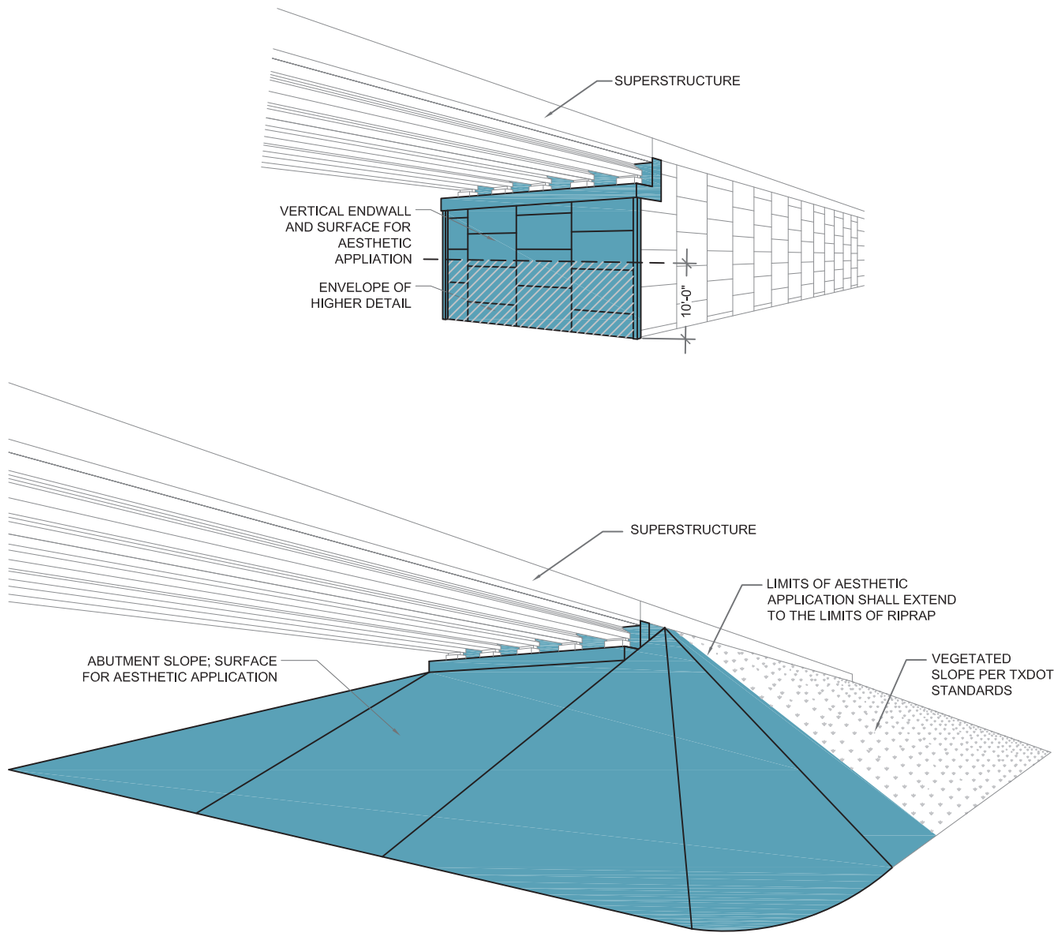

Figure 5.5 – Abutment wall and slope treatment areas

5.3 Riprap

Riprap shall meet all criteria in *TP Section 15.3.14*. Enhanced riprap shall incorporate the Project's aesthetic theme only at highly visible areas, including US 181/SH 286 and I 37 interchange, North Port Avenue, Brownfield Boulevard, Leopard Street, Broadway Street, Broadway Boulevard, and Burleson Street. This treatment includes areas between roadway and structures with a distance or width greater than ten feet or where ramps transition between mainlanes and frontage roads at widths greater than ten feet.

Ease of maintenance shall be the Developer's priority when selecting aesthetically enhanced non-grass riprap materials. Riprap shall, at minimum, meet all criteria in Item 432 of *Attachment 13-1, Structure Provisions*, however use of loose aggregate and pavers is not permitted. Enhanced aesthetics include but are not limited to:

- Colored - integral color, stained or acid-etched (all surfaces shall be non-slip in pavement applications)
- Exposed aggregate - seeded, colored, or hand-cast
- Other textural finishes - stamped, scored, salt, tined/grooved, stippled, stenciled, sponged, grouted cast-in-place forms or form liners

Non-enhanced, non-grass riprap includes concrete with a broom (coarse to fine), smooth troweled, or floated finish.

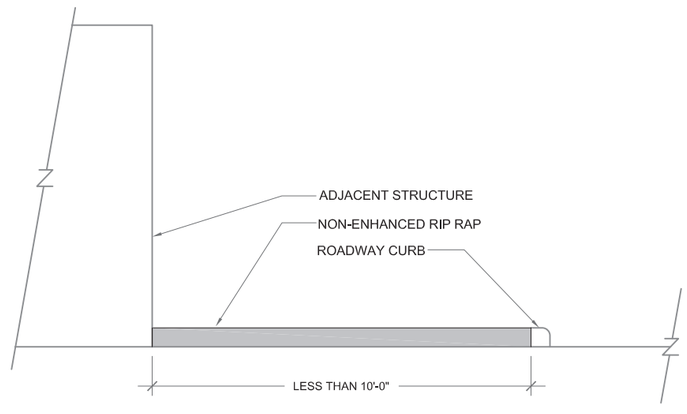

Figure 5.6 – Example delineating where enhanced riprap is not required

Instances where riprap doesn't require enhanced aesthetic application include:

- Areas between roadway and structures with a distance or width of less than ten feet, as illustrated in *Figure 5.6*
- Where ramps transition between mainlanes and frontage road (freeway gores) at widths of less than ten feet, as shown in *Figure 5.7*
- Areas between or adjacent to guard fence posts, sign posts, bent columns, retaining walls, paved ditches, flumes, and ditch inlets

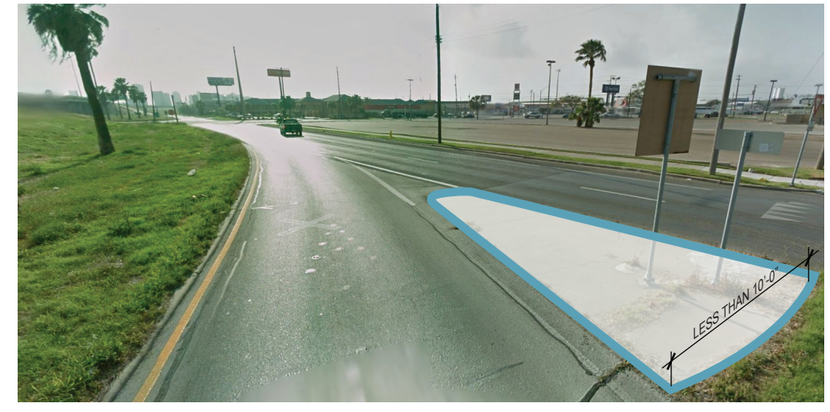

Figure 5.7 – Example delineating where enhanced riprap is not required

6.1 Overview

Pedestrian fence on the Project shall, meet all requirements found in *TP Sections 15.3.11, Fencing; 15.3.12 Color and Surface Palette; 13.2.1 Bridge; TxDOT DMS,* Section DMS-8100 Structural Steel Paints - Formula and Section DMS-8101 Structural Steel Paints - Performance.

6.2 Pedestrian Fencing at the Harbor Bridge and Approach Bridges

Fence design shall be developed in relation to other US 181 Harbor Bridge components and reflect the technical and aesthetic elegance of the towers, cables, and superstructure. Fence panels shall have an open design so as to minimally obstruct views. Height of pedestrian fencing shall be 54 inches; refer to *Figure 6.1*.

The pedestrian fencing on the US 181 Harbor Bridge shall have an arched top and meet the minimum height requirements in accordance with the *Joint BNSF/UPRR Guidelines for Railroad Grade Crossing Separations Projects*, or its most current edition, and be designed to meet shared use path clearances in accordance with AASHTO in the publication *Guide for the Development of Bicycle Facilities, 2012v*, or its most current edition; refer to *Figure 6.2.* The Developer shall consult the UPRR and PCCA regarding locations, if any, that require the protective containment cage per the *TxDOT Bridge Railing Manual*, Section 2, Bridge Railing for Pedestrians. Additionally, any protection structures over railroads shall follow AREMA standards. Refer to *Figure 6.3* for railroad crossing locations.

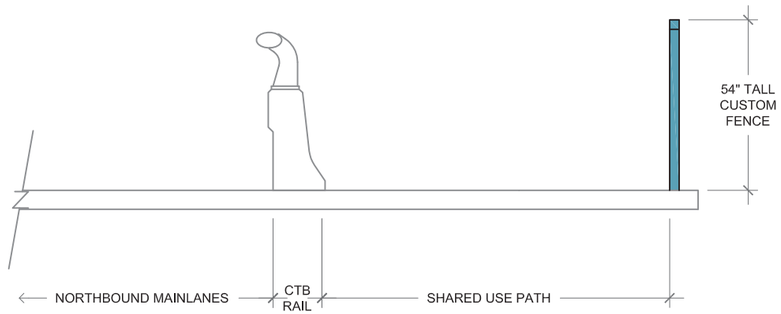

Figure 6.1 – 54" pedestrian fence

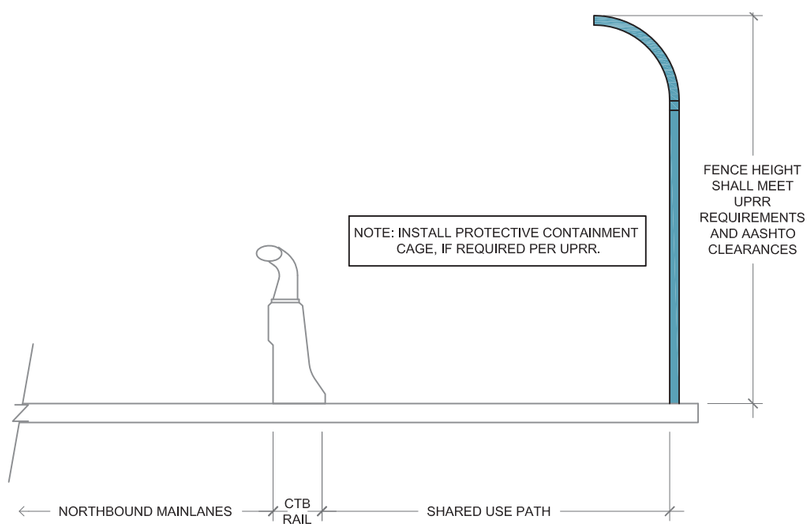

Figure 6.2 – US 181 Harbor Bridge pedestrian fence

Figure 6.3 – Railroad and port crossing locations

Fence fabric shall be installed on pedestrian fencing. Fence fabric shall be made of welded wire mesh or metal pickets. Maximum opening of mesh shall be 2 inches. Metal pickets shall be spaced at 4 inches on center, or that a 4 inch orb may not pass between pickets. Fence fabric shall not be climbable. Material alternatives include painted and/or treated corrosion-resistant metal fabric.

Opaque sealer on metal components shall meet all criteria in the *TxDOT DMS*, Section DMS-8100 Structural Steel Paints - Formula and Section DMS-8101 Structural Steel Paints - Performance.

6.3 Pedestrian Fencing in the Corridor

Heights, picket spacing and materials of the pedestrian fencing shall meet all TxDOT standards.

6.4 Staples Bridge Pedestrian Crossing

The pedestrian bridge at North Alameda Street shall be demolished, however, the overhead steel structure shall be removed, transferred and re-installed or rebuilt. The pedestrian crossing shall be rerouted on the new North Staples Street bridge. The travel path currently meets shared use path design requirements. The Developer shall ensure that the design's shared use path clearances are maintained and that the design remains in accordance with AASHTO in the publication *Guide for the Development of Bicycle Facilities, 2012v*, or its most current edition.

Figure 6.4 – Examples of acceptable fence fabric

The steel structure on the pedestrian bridge shall be installed on the new North Staples Street bridge. The Developer shall determine if the steel structure on the pedestrian bridge will be salvaged and reinstalled, or reconstructed. See *Figure 6.5* for the existing structure on N. Alameda Street. See *Figure 6.6* for the installation of the structure on the new N. Staples Street bridge.

The Developer shall develop the details for installing the steel structure on the new bridge, complete with traffic barrier rails and pedestrian fence in accordance with TxDOT standards. Construction documents for the original steel structure are available.

The Developer shall plan, design for and install the steel structure in a manner identical to the original structure. Re-use of existing materials in originally specified condition or restored to original condition is encouraged. All new introduced components and/or components replacing failed/unusable original pieces shall be galvanized to match the galvanization of the re-used structure. Visible patches or corrosion will not be accepted. The Developer shall replace any elements of the structure which are damaged during salvage and reinstall operations. If the quality of salvage and reinstall does not meet TxDOT approval, it will be subject to reconstruction.

Figure 6.5 – Existing North Alameda Street bridge with steel pedestrian arch.

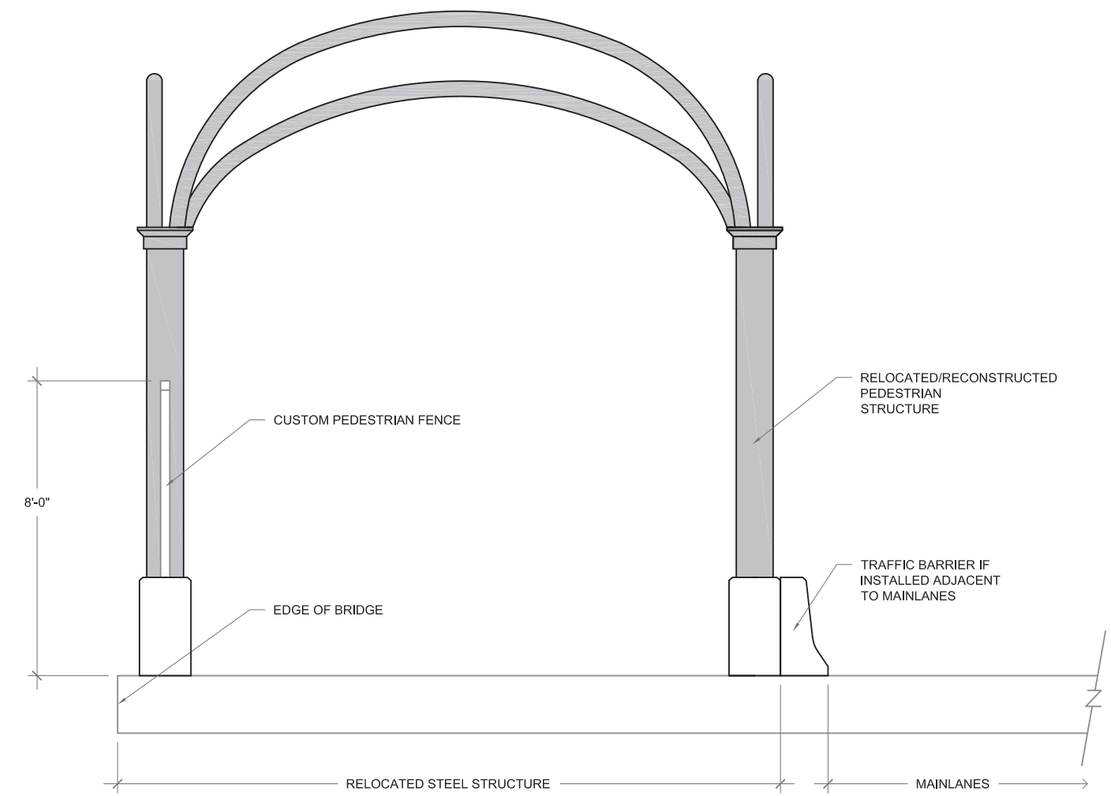

Figure 6.6 – North Staples Street bridge pedestrian crossing with steel pedestrian arch

7.1 Overhead Roadway Signage

Sign columns shall incorporate the Project's aesthetic theme. An open, vertical truss structure, as shown in *Figure 7.1*, is not permitted. Horizontal trusses are permitted. Refer to *Figure 7.2* for an example of acceptable roadway signage.

The color, geometry, texture and scale of the concrete columns shall complement the Project's aesthetic theme and be consistent throughout the Project limits. Acceptable aesthetic treatments include opaque sealer, texture, and/or mounted, cast-in-place forms. Opaque sealer on concrete shall meet all criteria in the *TxDOT DMS, Section DMS-8110, Coatings for Concrete.*

Sign structures used shall meet all *Texas Manual of Uniform Traffic Control and Devices (TMUTCD) for Streets and Highways* and *TP Section 13.1, Structures General Requirements* guidelines.

7.2 Shared Use Path Signage

Shared use path signage size, height, and text shall conform to the most current version of the *TMUTCD*.

Content for the informational/wayfinding signage at shared use path termini shall be submitted to and approved by TxDOT. (Refer to subchapter 9.3 Shared Use Path).

Shared use path signage shall not be placed adjacent to the mainlanes or adjacent roadway and shall not interfere with roadway users' navigation.

It is acceptable to paint poles and mounting pieces of signage in a fashion that is in keeping with the Project aesthetic and per *TP Section 16*. The Developer shall consider the relationship between signage and the two heights of fencing located on the shared use path (refer to subsection 6.2, Pedestrian Fencing).

Figure 7.1 – Overhead roadway signage, visibility of open vertical trusses shall not be accepted

Figure 7.2 – Example of concrete sign columns supporting horizontal trusses

8.1 Architectural Lighting

Architectural lighting shall only be developed and installed on the US 181 Harbor Bridge. Architectural lighting and roadway lighting shall complement each other in order to provide visual and functional efficiency. Maintaining the safety of vehicular and shared use path users shall be the priority of the Developer. Undesirable glare and distractions from the roadway are not permitted. Lighting shall not hinder the visibility of vehicles, pedestrians, bicyclists, nor ship and aviation navigation.

The US 181 Harbor Bridge will be a highly visible structure, especially when viewed from Whataburger Field, US 181 and the beaches of Corpus Christi. The Existing Harbor Bridge has a programmable, architectural lighting system capable of multi-color display; refer to *Figure 8.1*. The US 181 Harbor Bridge shall have an architectural lighting system that meets or exceeds the appearance and performance of the existing bridge's system. Architectural lighting design shall:

- Emphasize the bridge's structural design
- Minimize adverse visual impact - light equipment shall explicitly complement the surrounding architecture
- Light surfaces evenly; avoid hotspots/dark spots
- Select fixtures based on efficient power consumption
- Protect fixtures from vandalism if attached in a location accessible to the public
- Prioritize ease of maintenance shall be of high priority and reviewed by TxDOT
- Arrange fixtures in a manner that does not create glare or distraction to motorists, marine vessels, aviation, pedestrians or bicyclists
- Select fixtures that perform well given the high vibration environment of bridges and harsh characteristics of the coastal environment
- Employ robust and durable mounting armatures
- Propose/supply controller(s) based on architectural lighting objectives

All light fixtures shall be LED RGB. Architectural lighting methods shall include, but are not limited to:

- Up-lighting and down-lighting of the bridge towers
- Up-light washing of cables
- Washing of superstructure fascia

The proposed architectural lighting design shall be coordinated, reviewed and approved by the PCCA, USCG and FAA prior to final review and approval by TxDOT.

8.2 Roadway Lighting

Roadway light fixtures shall be upgraded from the TxDOT standard cobra heads and shall only appear on the US 181 Harbor Bridge. Fixtures shall utilize LED technology. The light pole, arm, metal fixture housing and mounting components shall be painted and/or treated with corrosion-resistant materials.

Figure 8.1 – Existing Harbor Bridge multi-color display

Proposed roadway lighting shall be reviewed and approved by TxDOT. Roadway lighting on the US 181 Harbor Bridge shall be coordinated, reviewed and approved by the PCCA, FAA, and the USCG prior to TxDOT final review and approval. Roadway lighting proposed on the approach bridges shall be coordinated, reviewed and approved by PCCA prior to TxDOT reviews.

Lighting shall, at minimum, meet all criteria in *TP Section 16.3.9, Lighting*.

8.2.1 US 181 Harbor Bridge

Architectural roadway poles and luminaires shall be vandal-resistant. The style of fixtures and poles shall be elegant and coordinate with the theme and appearance of the US 181 Harbor Bridge.

8.2.2 Approach Bridges and Corridor

Roadway poles and luminaires shall be vandal-resistant. Luminaires shall be LED fixtures. Where bridge structures intersect bicycle and pedestrian paths, under-bridge lighting is of the utmost importance for safety. Lighting provided under the bridge structures shall meet all safety regulations, and luminaires shall be LED fixtures.

Prior to selecting under approach bridge lighting, the Developer shall ensure aesthetic and photometric compatibility with Northside Neighborhood park improvements.

8.3 Shared Use Path Lighting

Shared use path light fixtures shall be vandal-resistant. The scale shall be appropriate for pedestrians and bicyclists. The appearance of the selected fixture shall be complement the corridor aesthetic. Shared use path lighting shall conform to the current AASHTO's Guide for the Development of Bicycle Facilities.

Where the proposed shared use path lighting falls within the limits of the US 181 Harbor Bridge, the design shall be reviewed and approved by the PCCA, USCG, and FAA prior to TxDOT final review and approval.

9.1 Noise Walls

Noise walls shall be designed by the Developer and shall complement the Project's aesthetic theme.

The applied aesthetics of the noise walls within the Project shall complement the aesthetic theme of the corridor.

Noise walls shall not be located on any bridge structures. Noise wall locations will be determined in accordance with NEPA. The Developer, in cooperation with TxDOT, shall engage affected property owners as they vote whether they would like a wall to be built. Walls will be built based on majority rule in each identified location. Refer to *TP Section 3.2.5, Customer Groups*.

Riprap shall be installed under noise wall panels at a width of two inches wider than the columns.

Where noise walls and buildings within the public right-of-way are less than 10 feet apart, the Developer shall place concrete riprap (four inch depth) between the two structures. This treatment shall facilitate access to utilities and greatly reduce maintenance concerns. Noise wall design shall consider accommodations for removable panels where conditions may not allow enough clearance for equipment access between the walls, utilities and other site structures. Any removable panels shall appear identical to permanent panels.

The noise wall design shall address sloping grades.

The distance between the bottom of the wall panels and the finished grade shall be two inches. A variance between zero to four inches is permissible if the average clearance within any single panel is two inches.

If the wall needs to step in height, it shall step in constant intervals of four, eight or 12 inches until a level section of at least three panels is incorporated. For example, if wall panels are 30 feet on center in length and the grade change is two feet over 120 feet, the walls shall incrementally step eight inches. The top edge of the subsequent three or more panels shall be at the same height before the next slope change is addressed in constant intervals.

If a dip in the ground plane occurs, an additional panel shall be added to the bottom of the wall, regardless of the wall height determined by the noise analysis at that location.

9.2 Paving

Paving within the facility for pedestrian use shall be low maintenance and non-skid. Paving enhancements are required. Acceptable paving enhancements include:

- Colored — integral color, stained or acid-etched (all surfaces shall be non-slip in pavement applications)
- Exposed aggregate — seeded, colored, or hand-cast
- Other textural finishes — stamped, scored, broom (coarse to fine), salt, troweled smooth, floated, tined/grooved, stippled, stenciled, or sponged

Use of topical paint/stain on paving is not permitted. Unit pavers are not permitted.

All pedestrian facilities in the Project shall adhere to the American with Disabilities Act (ADA) of 1990 requirements.

9.3 Shared Use Path

The shared use path facilities (its paving materials/ methods, layout and clearances) shall be designed in accordance with AASHTO in the publication *Guide for the Development of Bicycle Facilities, 2012v*, or its most current edition.

Pavement striping, signage, and signals shall be developed in accordance with the most current Texas version of the *TMUTCD*.

The shared use path design shall meet all guidelines set forth by the American with Disabilities Act (ADA) of 1990, as enforced in Texas by the Architectural Barriers Section of the Texas Department of Licensing and Regulation. An allowable exception, from *Proposed Guidelines for Pedestrian Facilities in the Public Right-of-Way (PROWAG),* is where the shared use path is aligned and adjacent with the main lanes of the corridor.

Shared use path connections to the hike and bike trail will be developed as trailheads. The community hike and bike trails will develop trailheads at connection points to the shared used path. Developer is responsible for providing connectivity where the corridor meets the planned local hike and bike trails, adjacent to the corridor. The connection at the north shall be made within the ROW to the south side of Beach Avenue; refer to *Figure 9.1*. The connection at the south shall be made within the ROW to the north side of Lake Street; refer to *Figure 9.2*.

The method the Developer chooses for the transition from the mainlanes to the hike and bike trails shall ensure that all grades, railing, switchback/turning radii, vertical clearances, safety lighting, and signage are in accordance with the current version of AASHTO's *Guide for the Development of Bicycle Facilities.*

All shared use path bridge structures and their components shall incorporate the Project's aesthetic theme.

Construction activities associated with the shared use path connections shall take place within the US 181 Harbor Bridge Project NEPA footprint.

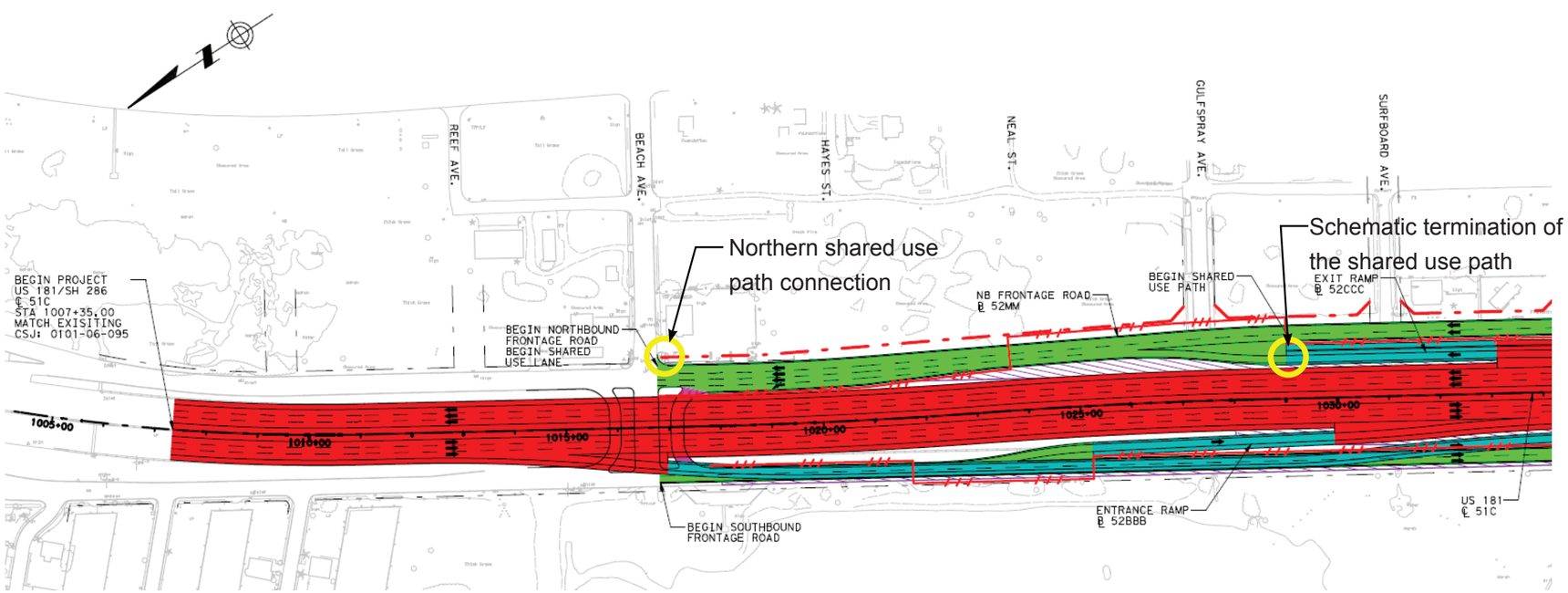

Figure 9.1 – Northern shared use path connection context

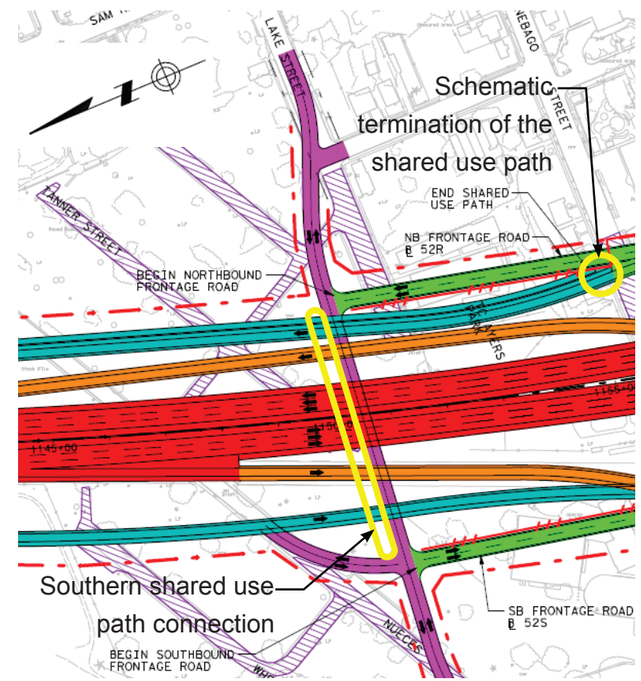

Figure 9.2 – Southern shared use path connection context

10.1 Overview

Landscape design shall prioritize low maintenance and low water use. Xeriscape plants shall be utilized. The work shall meet or exceed all criteria, in *TP Sections 15.3.13, Trees, Shrubs, and Other Plant Materials; 15.3.14 Maintenance and Establishment Period;* and *TxDOT Spec Book Item 193 Landscape Establishment*, and *Item 751 Landscape Maintenance*.

Plant material that creates sight hazards to facility users is prohibited. Vegetation shall meet setback and sight triangle requirements. No vegetation shall be placed where pruning will be required in the future to maintain safe sight-distances. Do not place plants near merging lanes. Refer to the *TxDOT Roadway Design Manual,* Chapter 2, Section 5 for requirements. All trees shall be located a minimum of 30 feet from back of curb. All shrubs and ornamental grasses shall be located a minimum of 15 feet from the back of curb. If there is no curb, measure from edge of pavement.

The Developer shall not plant trees, shrubs, ornamental grasses or groundcover in locations that receive shade from approach or corridor bridges for more than six hours of the day during the growing season.

Landscape planting beds are areas that include plant material such as trees, shrubs, ornamental grasses or groundcovers. Eighteen-inch wide, 6-inch deep mow curbs shall separate planting beds and turf grass. Two or more adjacent trees planted less than 15 feet on center are considered a tree grove and shall be contained by a mow curb as specified above. Turf grass shall not be located within plant beds or tree groves. The use of steel edging is prohibited.

Where mow curbs are used to separate turf grass and plant bed or tree grove, the curb shall facilitate ease of mowing. Angular mow curb are prohibited. Curvilinear mow curbs, as seen in *Figure 10.1*, are preferred.

The Developer is responsible for modifying landscape treatments where utilities will remain.

10.2 Approach Bridges

Landscape installations shall occur outside of the PCCA and UPRR right-of-ways.

The Developer shall coordinate with TxDOT for stakeholder meetings to determine the level of landscape installation where the approach bridges cross through neighborhoods. Refer to *TP Section 3.2.5, Customer Groups*.

10.3 Corridor

The Developer shall prepare a landscape design plan for the overall project area. Trees, shrubs and other plant materials shall be specified from the recommended plant lists as listed in the subchapter 10.5, Plant List and Details.

Trees shall be planted in groves. Groves in this Project shall include 7 to 25 trees and shall be installed within a tree bed. Shrub/ornamental grasses shall be installed in landscape planting beds.

The Developer's landscape plan shall emphasize key intersections as defined by the station points listed below and the minimum landscape planting requirements:

- I 37 between STA 80+00 and STA 91+00, 50 trees, 1000 shrubs/ornamental grasses
- I 37 between STA 106+50 and STA 122+50, 60 trees, 600 shrubs/ornamental grasses
- I 37 between STA 122+50 and STA 126+50, 16 trees, 300 shrubs/ornamental grasses
- I 37 between STA 126+50 and STA 143+50, 50 trees, 1000 shrubs/ornamental grasses
- I 37 between STA 143+50 and STA 155+00, no trees, 1000 shrubs/ornamental grasses
- US 181/SH 286 between STA 1159+00 and STA 1162+50 (see I 37 between STA 122+50 and STA 126+50)
- US 181/SH 286 between STA 1162+50 and STA 1166+50, 100 trees, 1000 shrubs/ornamental grasses.
- US 181/SH 286 between STA 1166+50 and STA 1174+00, 40 trees, 400 shrubs/ornamental grasses
- US 181/SH 286 between STA 1132.00 and STA 1159+00, refer to subchapter 10.2, Approach Bridges, for neighborhood landscape.

In addition to the key intersection plantings, the Developer's landscape plan shall provide landscape plantings that establish continuity along the corridor. The Developer's landscape plan shall address the following segments and minimum requirements:

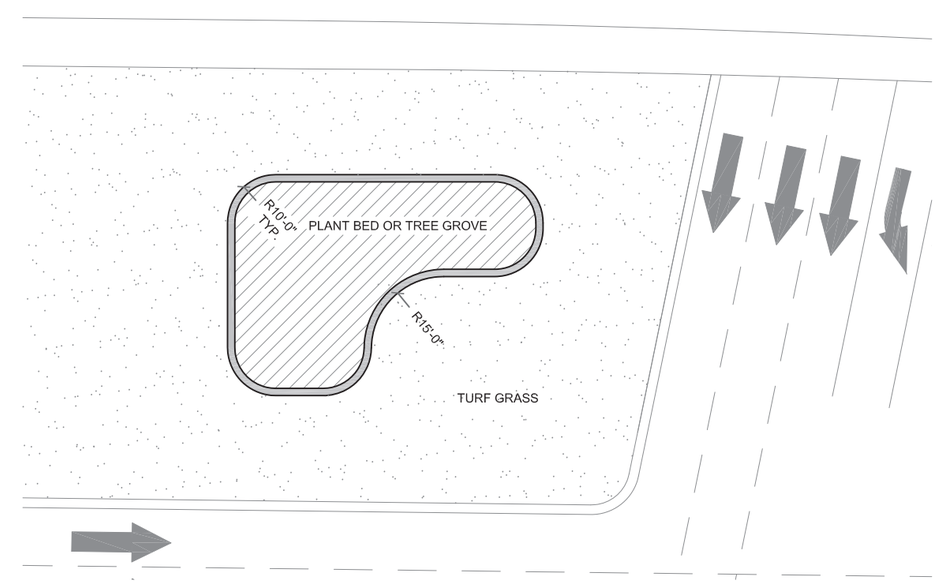

Figure 10.1 – Curved mow curbs preferred

- I 37 between STA 67+64.90 and STA 80+00, no trees, no shrubs/ornamental grasses
- I 37 between STA 91+00 and STA 106+50, 40 trees, 400 shrubs/ornamental grasses
- I 37 between STA 155+00 and STA 165+00, 25 trees, 300 shrubs/ornamental grasses
- I 37 between STA 165+00 and STA 185+00, no trees, 1000 shrubs/ornamental grasses
- US 181/SH 286 between STA 1007+35 and STA 1132.00, no trees, no shrubs/ornamental grasses
- US 181/SH 286 between STA 1174+00 and STA 1181+00, 20 trees, no shrubs/ornamental grasses
- US 181/SH 286 between STA 1181+00 and STA 1196+62.67, 35 trees, no shrubs/ornamental grasses

Trees shall be three-inch caliper or larger. Palm trees shall be a minimum height of 12 feet. All shrubs and ornamental grasses shall be three-gallon or larger. If a three-gallon size is not readily available in the region, the Developer shall request TxDOT approval for an alternate installation of three one-gallon plants in lieu of each proposed three-gallon plant.

Tree and shrub/ornamental grass planting quantities are minimums and are to be equally divided along each side of the roadway. The Developer shall relocate plantings in suitable locations, provided overall plant quantities remain intact, when:

- slopes exceed 4:1,
- the back of curb to ROW width is less than 25 feet, or
- 25-foot or greater clearances are impaired by ancillary structures and/or utility conflicts

Per subchapter 10.6, Irrigation, all plant material shall be irrigated by drip or bubbler underground irrigation system provided by the Developer.

Prior to planting, all landscape planting/tree beds shall be treated with herbicides from TxDOT's approved materials list.

10.4 Shared Use Path

Trees shall be located along the shared used path when located at grade. Proposed tree placement shall meet all TxDOT requirements for tree clearances, tree spacing, avoiding sight hazards, planting on slopes and maintenance.

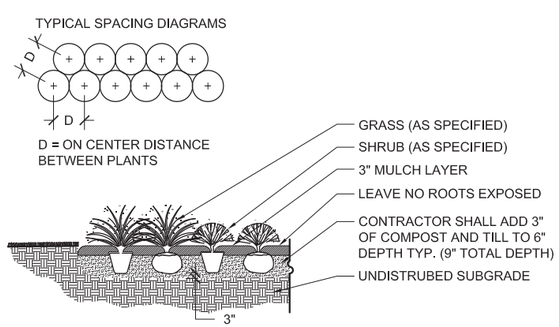

Figure 10.2 – Plant bed preparation and spacing

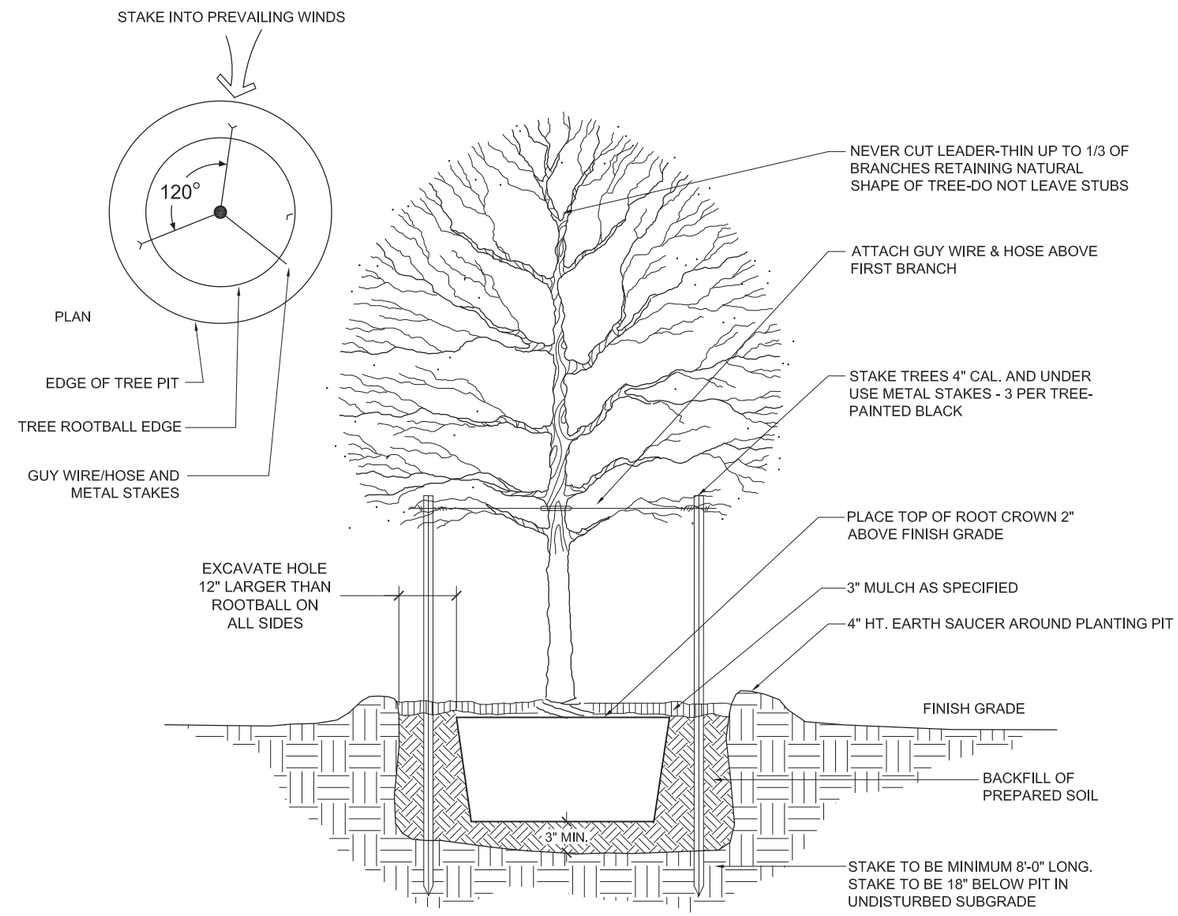

Figure 10.3 – Tree planting detail

Per 200 linear feet of shared use path, the Developer shall plant six shade trees of two different species and two ornamental trees. Minimum on-center spacing for all trees shall be 16 feet. All trees associated with the shared use path shall be located a minimum of 30 feet from back of curb. If there is no curb, measure from edge of pavement.

10.5 Plant List and Details

The plant list shall conform to *Corpus Christi Strategic Parks and Recreation Master Plan (CCSPRMP)* (2012) and/or the *Water Wise Plant List for Coastal Bend (WWPLCB)* developed by the Xeriscape Corpus Christi Program. Tree spacing shall meet the recommendations shown in the *CCSPRMP*. Any palm trees listed on the *WWPLCB* shall be spaced 10 to 15

feet apart on center. Spacing of any trees used from the *WWPLCB* shall be determined by comparing the tree's mature growth to those listed in the *CCSPRMP* and applying the spacing recommended for trees of similar mature height. Tree protection procedures shall conform to *Texas Technical Institute's Recommendations, Procedures, and Guidelines for the Protection of Trees and Sensitive Landforms*. Plant bed preparation shall conform to *Figure 10.1*, tree installation shall conform to *Figure 10.2*.

10.6 Irrigation

All landscape planting beds and trees shall have drip irrigation that is with battery-operated or solar powered. All irrigation improvements shall be of operational quality for a minimum of three years. The system(s) shall utilize a rain sensor(s).

Installation of all irrigation systems shall meet all City of Corpus Christi requirements and shall be safely accessible to maintenance personnel. Components requiring adjustment or maintenance shall be located away from traffic.

Irrigation mainlines shall maintain a distance between trees and structures equal to or greater than the radius of the mature dripline.

The Developer shall provide TxDOT with an irrigation design and submittals for review and approval.

Irrigation controller(s) locations(s) shall be reviewed by TxDOT. All irrigation controller boxes shall be mounted on a concrete footing and located in a safe, accessible location, away from vehicular traffic.

Refer to *Figures 10.4 through 10.7* for irrigation standards.

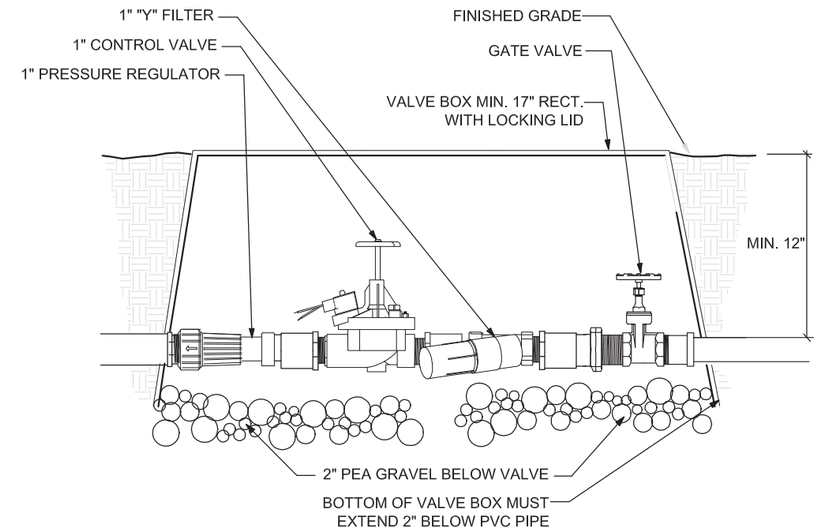

Figure 10.6 – Typical valve assembly for drip irrigation

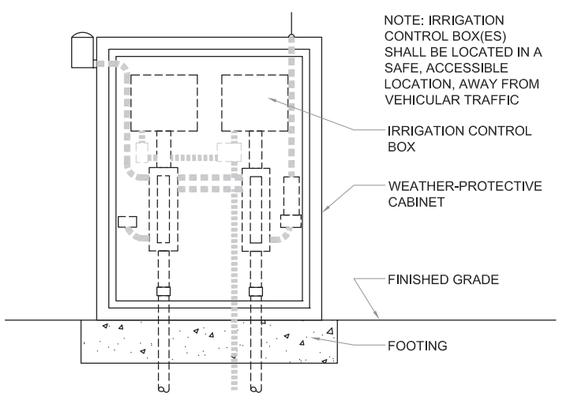

Figure 10.4 – Irrigation control boxes on footing

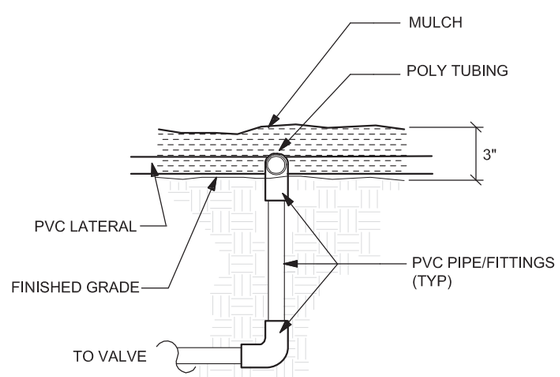

Figure 10.5 – Typical irrigation PVC/header connection

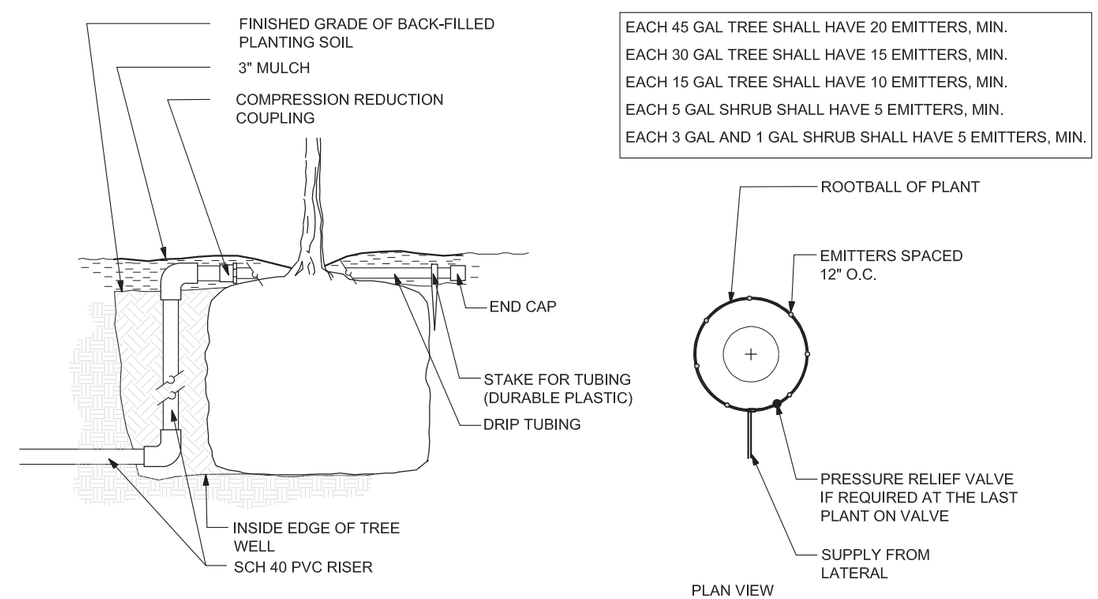

Figure 10.7 – Typical installation of drip irrigation at trees, section and plan view

11.0 Finishes Schedule

11.1 Color Palette

The colors selected for the Project shall be suitable for the intended purpose. The colors should help increase the safety and ease of use of the facility and increase the visual appeal. To make color selections:

- Link elements widely separated by space. Colors used to link elements should be similar in shade and brightness
- Highlight certain elements to attract attention. (Care shall be taken to avoid distracting motorists.)
- Reduce the visual prominence or conspicuous nature of an element. Muted colors that reflect less light than elements near or behind them will attract less attention.
- Contrast one element with another to enable quick identification and wayfinding. High-contrast colors used close to one another will attract attention to that location.

Colors that are intended to be distinguished at long distances should be brighter than those one would normally select for objects intended to be viewed from close range in order to compensate for haze, fog, rain and other atmospheric conditions. Narrow lines of color (only a few inches wide) will be lost when viewed from far distances.

The size of the roadway creates an important relationship between color, texture, pattern, and scale. In order to be appreciated, a color, pattern, or texture must be large enough to be visible. However, too much of a single treatment can become mundane or overpowering. Special treatments should accent rather than dominate a landscape.

Tones of blue and other cool colors shall be used in this Project. See *Figure 11.1* for an example of cool color palettes.

Provide color samples as specified in *TP Section 15.4, Construction Requirements*.

Figure 11.1 – Example of cool color palettes

11.2 Textures

Textures on concrete shall be achieved through the use of form liners, sandblasting, or washing to expose the integral aggregate. If sandblasting or washing is proposed, relief depths shall not diminish the structural integrity of the design component.

Textures are most visually effective where traffic speeds are slower. Rougher textures are more appropriate when viewed from a distance and by higher speed traffic.

The use of an uninterrupted horizontal texture or design alignment is discouraged. Any settling and resulting rotation over time will be more noticeable in a highly linear application. Offsetting and breaking up horizontal lines will draw the eye away from any shifting.

Figure 11.2 – Thematic textures

11.3 Opaque Sealer

Ensure the coating is smooth, even, continuous, and free of drips, runs, sags, holidays, wrinkles, or other coating defects. Ensure the coating has a uniform appearance within all portions of the painted piece and all related pieces and components of the Project.