

22nd Street Kino Parkway to Tucson Boulevard

Pedestrian/Bicycle Bridge Enhancements Memorandum



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Prepared For:
City of Tucson
Department of Transportation

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PHOTOGRAPHY CREDITS

All photographs contained herein are by Barbara Grygutis

1.0 INTRODUCTION

The City of Tucson Department of Transportation (TDOT) and RTA began planning efforts for the intersection of Kino and 22nd Street and the section of 22nd Street between Kino Parkway and Tucson Boulevard in 2006. The project location is shown in Figure 1. A Citizen Advisory Committee (CAC) was established to work with the design team and provide guidance on various project elements including the development of a concept or theme that could be integrated into the project roadway, structure and/or hardscape elements where possible.

During the planning phase, the artist for the Kino Parkway/22nd Street intersection project, Barbara Grygutis, worked with the CAC and the design team to develop a theme for integrated art and other enhancements. The theme, "structure in nature", has been incorporated into the intersection project, and is now being extended east on 22nd Street to Tucson Boulevard as established during the planning phase.

Opportunities for artwork and integrated aesthetic enhancements within the segment of 22nd Street from Kino Parkway to Tucson Boulevard exist generally at three locations; the open area on the south side of 22nd Street east of Wilson Avenue, the open area on the north side of 22nd Street east of Plumer Avenue, and the pedestrian/bicycle bridge over the Union Pacific Railroad/Maclovio Barraza Parkway. Tucson Pima Arts Council will extend two separate call-to-artists for developing opportunities on the south side with the Parkway Terrace neighborhood, and on the north side of 22nd Street with the Arroyo Chico neighborhood. This memorandum addresses only the proposed enhancements for the pedestrian/bicycle bridge over the Union Pacific Railroad (UPRR) and Maclovio Barraza Parkway.

22ND STREET - KINO PARKWAY TO TUCSON BOULEVARD
PEDESTRIAN/BICYCLE BRIDGE ENHANCEMENTS

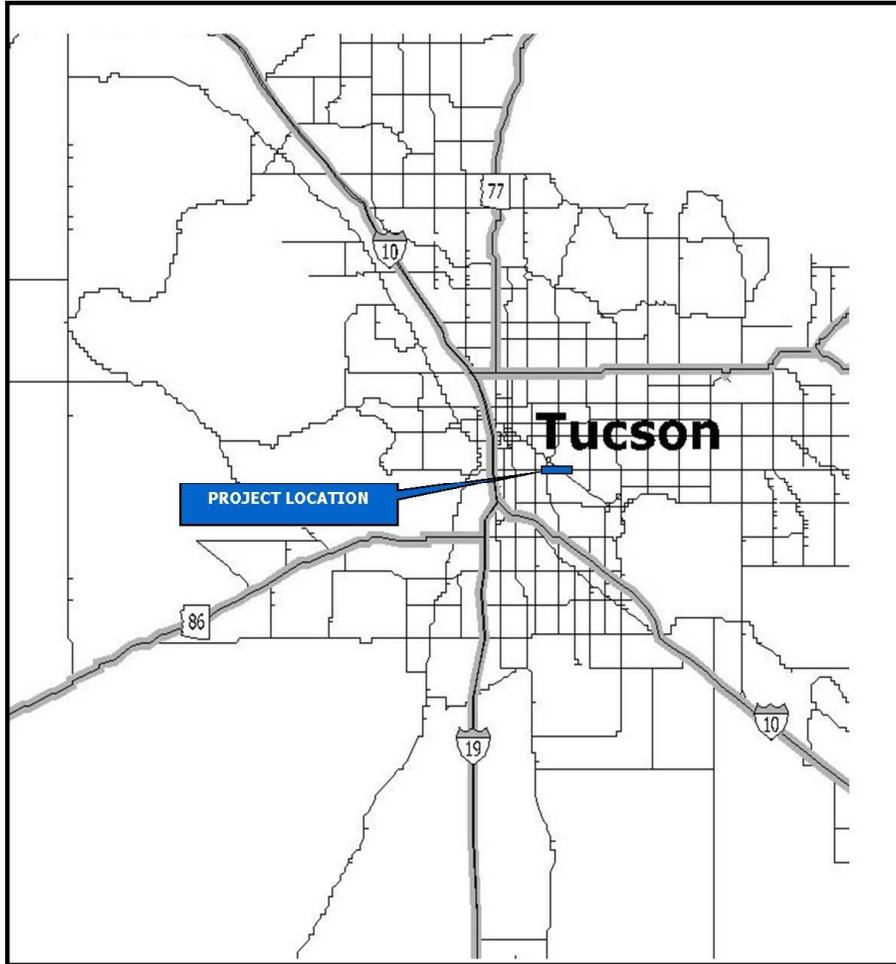


FIGURE 1
Location Map

2.0 CONSIDERATIONS FOR BRIDGE THEMATIC DESIGN

The project team met with the CAC beginning in June of 2006 to solicit their input for key design criteria to use in the overall design of the project. In the fall of 2007, the 22nd Street from Kino Parkway to Tucson Boulevard, which includes the bridge over the UPRR and Maclovio Barraza Parkway, was added to the responsibilities of the CAC.

The bridge criteria that have been collaboratively developed within the parameters of the CAC for the Kino Parkway Overpass at 22nd Street are also to be applied to the 22nd Street bridge over UPRR and Maclovio Barraza as determined during the planning phase. The criteria are summarized below:

- Maximize the length of the bridge to minimize the fill required and minimize the height of retaining walls
- Design to make this a positive addition for the neighborhoods, not an eyesore
- Make sure the bridge has some meaning to the citizens
- Integrate thematic elements within the structure of the bridge; do not use “plop art”, surface public art applications that lack meaning
- Focus on safety for the motorist, bicyclist and pedestrian
- Develop both the Kino Parkway Overpass over 22nd Street and the 22nd Street over UPRR and Maclovio Barraza bridge with the same thematic concepts
- Do not develop any steel structures with a ‘weathered-rust’ finish
- Maximize project efficiency from a cost perspective and a planning perspective

2.1 STEEL PEDESTRIAN/BICYCLE BRIDGE STRUCTURE

The 22nd Street Kino Parkway to Tucson Boulevard project is taking a unique approach to pedestrian and bicycle access over the UPRR and the Maclovio Barraza Parkway. Rather than the traditional approach of providing sidewalk and bike lanes to the outside of the roadway, a separate steel pedestrian/bicycle bridge structure between the eastbound and westbound 22nd Street bridges is being proposed. Entry and egress to this separate bridge structure will be provided from ground level at either end of the bridge adjacent to the bridge abutments. The pedestrian/bicycle bridge will connect to existing bicycle and pedestrian facilities, including the multi-use pedestrian/bicycle facility paralleling the Maclovio Barraza Parkway and the newly constructed path on the north side of 22nd Street between Plumer Avenue and Tucson Boulevard. This also improves the connectivity between the existing pedestrian and bicycle facilities on a more area-wide basis.

STRUCTURE DESCRIPTION

The pedestrian/bicycle structure is a 1,475 foot long bridge that is supported by columns at either end and suspended from the eastbound and westbound roadway bridges in the section over the UPRR and the Maclovio Barraza Parkway. The structure will be fully enclosed with no opening size greater than two inches when spanning across city streets, the UPRR yard or the Maclovio Barraza Parkway. The structure has a 14'-10" wide enclosure with an interior clear dimension of 13'-4" (see Figure 2). The structure will be "roofed" with a steel frame and perforated steel roof. The entire structure is based on a 10-foot long module assembled in 40 foot sections for ease of fabrication. These 40 foot sections are made up of 30-foot long ramps at 12:1 with 10-foot long landings between ramps to maintain compliance with the Americans with Disabilities Act (ADA) standards (see Figure 3).

The roof structure is vaulted to create as much interior space as possible while keeping the spring line of the arch as low as possible for material efficiency. At each 40 foot section, the roof framing will step down 2'-6" creating the opportunity for a clerestory opening, or high "window". These clerestories will be visible as pedestrians and bicycles descend the ramp sequences in the eastbound and westbound directions.

The entire structure will be designed per the AASHTO bridge code and will meet ADA standards. The deck will be slip-resistant and ambient safety lighting and accent lighting will be provided throughout. Transparency of the enclosure will be achieved using a two inch maximum opening size welded wire fabric and/or laser cut artistic panels to provide for safe visibility from outside-in and view from inside-out, and to provide ventilation for the public using the bridge.

DESIGN CONSIDERATIONS

The profile geometry of the bridge is complex. From west to east the bridge must:

- clear under the eastbound 22nd Street roadway deck with adequate head room
- rise within applicable design guidelines and regulations to provide adequate clearance over the Campbell Avenue extension
- continue to elevate to clear the western-most UPRR yard siding track
- meet the profile grade of the 22nd Street roadway bridge
- begin to drop to meet grade at the east end of the bridge
- maintain enough elevation to clear Maclovio Barraza Parkway
- provide adequate clearance over the Maclovio Barraza multi-use path
- touch down adjacent to the east abutments of the roadway structure meeting existing pedestrian/bicycle facilities

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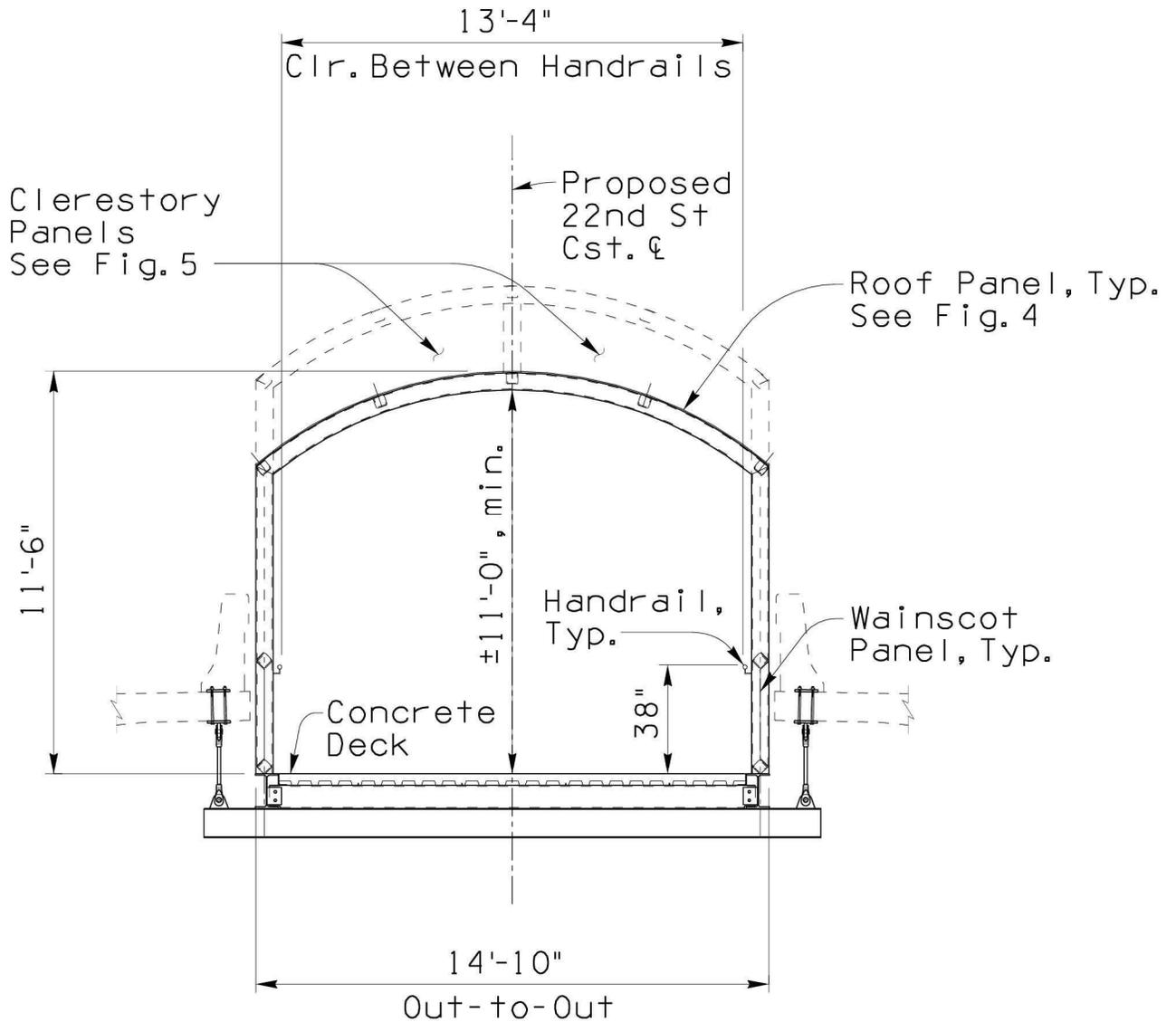


Figure 2
Typical Pedestrian/Bicycle Facility Cross Section

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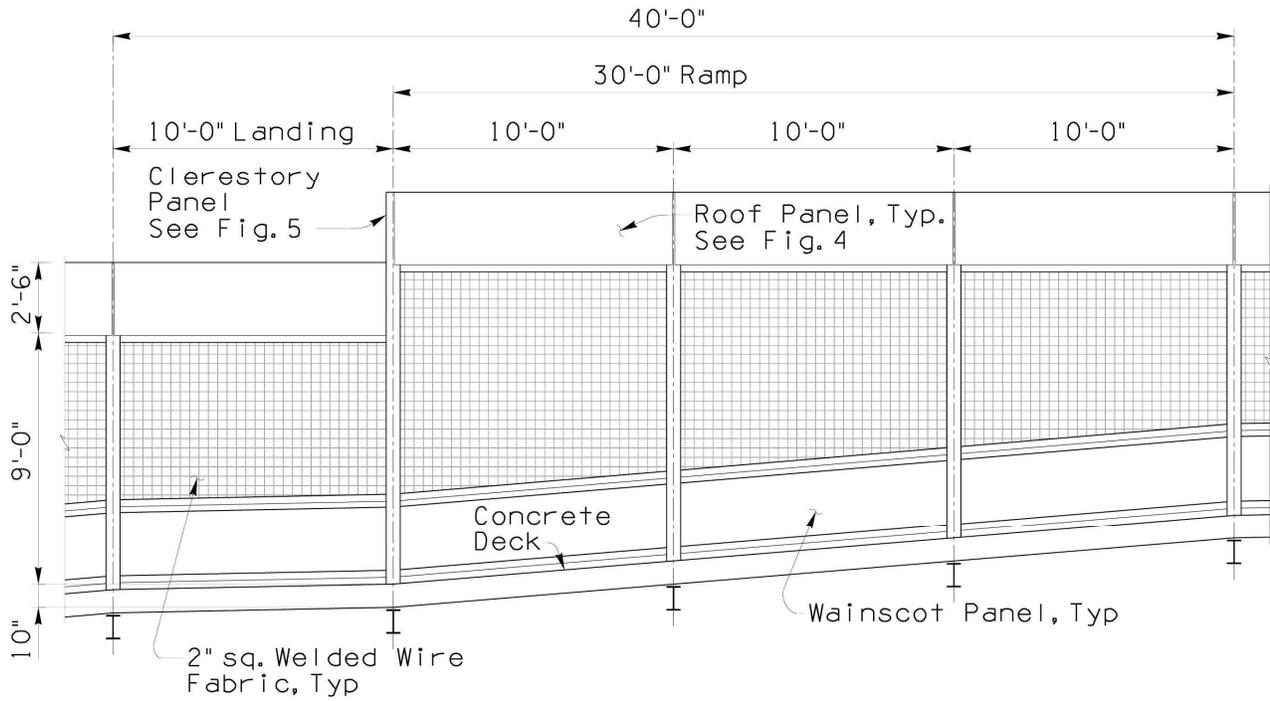


Figure 3
Typical Pedestrian/Bicycle Facility Longitudinal Section

2.2 PEDESTRIAN/BICYCLE EXPERIENCE

Of the 1,475 foot bridge length, approximately 1,180 feet will be fully enclosed as previously described with maximum two inch opening welded wire fabric and/or laser cut artistic panels. Although every effort has been made to maximize the interior width and interior height of the bridge, it remains a very long and narrow structure with a relatively low "roof." Important elements that can relieve the experience of "enclosure" are:

- The introduction of light, maximizing both daylight and lighting at night
- Variation in form to vary the spacial experience by changing the height of the roof plane, changing the configuration of the floor plane, vertical articulation along the bridges length and with the use of scale reducing horizontal elements to minimize large planar surfaces and create interest
- View extension to extend the pedestrian's or bicyclist's experience beyond the limits of the enclosure, by (as quickly as code allows) ramping up to a height above the top of the twin vehicle structures to allow views to the north and the south and ramping down below the bottom of the twin segmental bridge boxes to allow views below the vehicular bridges
- View extension longitudinally on the descent portions of the pedestrian/bicycle bridge structure with the creation of a clerestory panel ("high window" by definition) at each ramp and landing transition

With these elements incorporated in what is primarily an interior experience for the pedestrian/bicyclist, the primary design effort regarding these architectural criterion will focus on enhancing the interior experience as much as is practicable, and secondarily considering the pedestrian/bicycle bridge's appearance from the outside while adhering to the structural requirement of the longitudinal section.

2.3 RAILROAD, ROADWAY AND OTHER SAFETY REQUIREMENTS AND PROVISIONS

Most pertinent to this memorandum are the safety requirements specific to the steel pedestrian/bicycle bridge. AASHTO, AREMA, and Burlington Northern Santa Fe (BNSF) Railway & UPRR Guidelines for Railroad Grade Separation Projects codes and guidelines have all been used in determining clearance, opening size, separation, and the like regarding design criterion.

Vertical clearance criterion over City of Tucson streets, over the UPRR rail yard, and over the Maclovio Barraza Parkway governs the vertical profile of the structure. The vertical profile measured at the bottom of structure for the pedestrian/bicycle bridge meets the minimum vertical clearances required by BNSF Railway & UPRR Guidelines for Railroad Grade Separation Projects at 23'-4" above top of rail. In addition, the bridge profile

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provides the 17 foot minimum vertical clearances required over the realigned Campbell Avenue and the existing Maclovio Barraza Parkway.

Additionally, the UPRR requirement for enclosure fencing over an active rail line is the most stringent. For the fully enclosed pedestrian/bicycle bridge, for those elements that are not solid panel or a solid structural member, the maximum allowable opening size in fencing or perforated laser cut panel will not be more than two inches in any direction.

Emergency exit gates will be provided mid-span where the deck elevation of the pedestrian/bicycle bridge is approximately the same as the adjacent twin concrete roadway bridge decks. Emergency telephones will be provided along the enclosed length of the bridge as well as nighttime ambient lighting and emergency lighting in the event of power loss at night. All pedestrian/bicycle bridge components will be designed to be low maintenance and vandalism resistant.

3.0 BRIDGE THEMATIC ELEMENT DESIGN CRITERIA

The pedestrian/bicycle bridge is being designed based on the following fundamental criterion: economy, constructability, serviceability, and an aesthetic that is appropriate and acceptable for the proposed site. In addition, the “structure in nature” theme developed with the CAC is driving the bridge architecture and enhancement development as much as practical given the fundamental criterion.

The CAC stated throughout the design process that they would like to see continuity of design and experience along 22nd Street from Park Avenue to Tucson Boulevard in roadway, bridge design, and public art. The “structure in nature” theme was integrated with the bridge and public art components at the Kino Parkway/22nd Street intersection project. Continuity of this thematic criterion is a primary goal in the design of the pedestrian/bicycle bridge.

Barbara Grygutis has continued to work with the design team to consider opportunities and develop an overall patterning concept for the pedestrian/bicycle bridge. The aesthetic treatments that have been developed are entirely integrated into the pedestrian/bicycle bridge, and will meet City of Tucson standards, minimize disruption to the operations of the UPRR yard, and adhere to design criteria established with the project’s CAC and approved applicable planning documents.

3.1 OVERALL 22ND STREET CORRIDOR ART CONCEPT

The structure of plants native to the Sonoran Desert is the central theme for the development of a visual language for this project. The use of Sonoran Desert plant structure is appropriate and responds to all points raised by participants in the CAC process. It is a unifying theme, shared by all cultures which call the Tucson valley home. These forms are unique to Tucson, in the heart of the Sonoran Desert.

The pedestrian/bicycle bridge experience is designed to create continuity with these thematic elements first designed for the Kino Parkway/22nd Street intersection project. Further development of the thematic concept “structure in nature”, to guide aesthetic design decisions and create a link between the natural environment and the built environment, is continued on the pedestrian bridge as it crosses over Campbell Avenue, the UPRR rail yard and the Maclovio Barraza Parkway.

There are two primary structural panels that provide the opportunity to display the thematic concept of “structure in nature”; the roof panel and clerestory panel. These panels will be laser cut in patterns to allow for light penetration and additional air flow into the modular spaces which are the bridge’s building blocks.

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These laser cut patterns create a pedestrian walking experience as well as interest for the bicyclist. The intent is to focus the design aesthetic of the pedestrian bridge on the interior experience by creating diversity in the design elements and interest along the length of the enclosure. The theme of "structure in nature" is conveyed here as a walk through the landscape, with all senses alert to form and light.

Walking through the pedestrian bridge is envisioned as a multi-layered experience. Light, as it penetrates the bridge walls, forms perceptions of a rich visual experience highlighting the overall theme of structure in nature, and the relationship to objects made by the human footprint. This is especially relevant in a structure such as this bridge, which creates an aerial leap over other objects in the built environment.

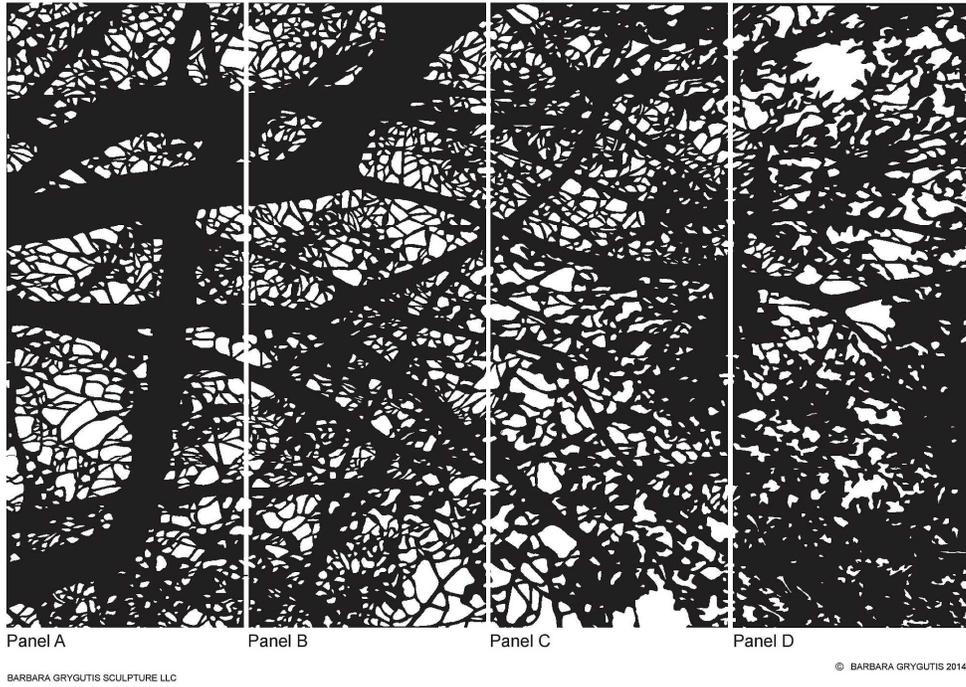
Structure in the natural environment is the central theme for the structural panels in each bridge module. The visual experience created is a walk through landscape strata as flora exists in the Sonoran Desert. From the ground plane to the intermediate plane of tree canopies to the elevated plane of the skies, the roof panels and the high clerestory panels echo the feel of a tree covered boulevard.

Landscape architecture and the structure itself can be woven throughout the project with emphasis on this theme. The integration of the central theme into the panels is described below.

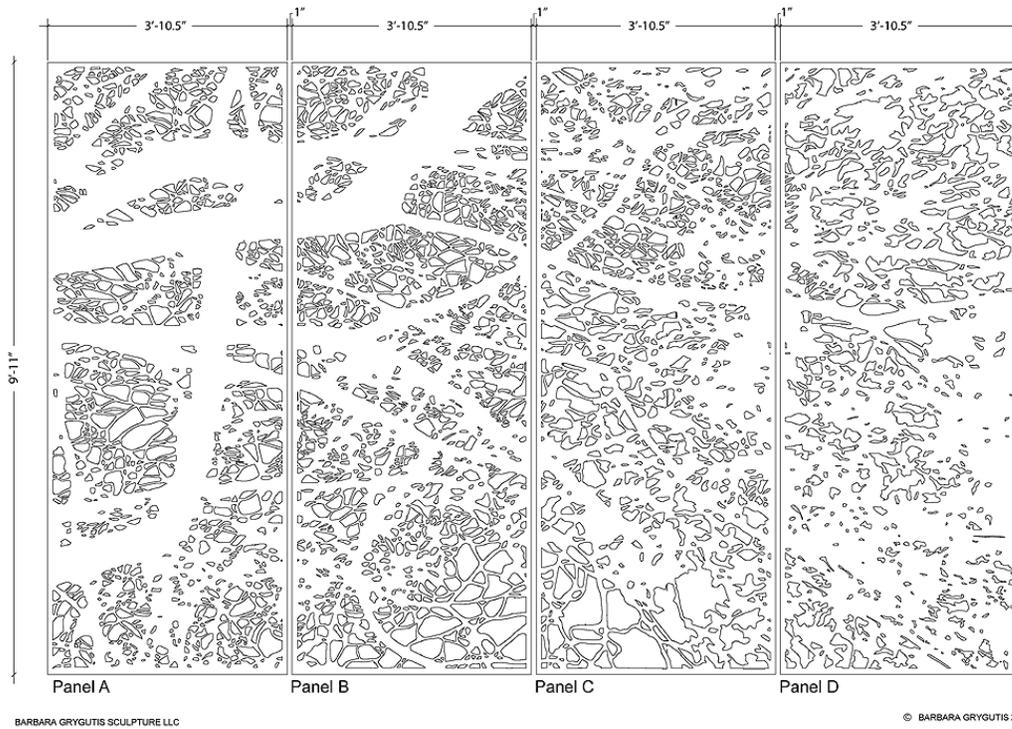
- The roof panels will be abstracted laser cut forms derived from photographic images taken looking up and into a native Hackberry tree. This is the medium layered strata in our landscape (see Figure 4)
- The clerestory panels highlight the magnificence of our desert skies with emphasis on cloud patterns after a summer storm (see Figure 5)

All cut out designs for light penetration are based on photographs taken by artist Barbara Grygutis. Computer files for cut out designs will be created in the artist studio using methods requested by area fabricators who were consulted for this project. The computer files will be construction ready.

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Black Areas Indicate Solid Metal

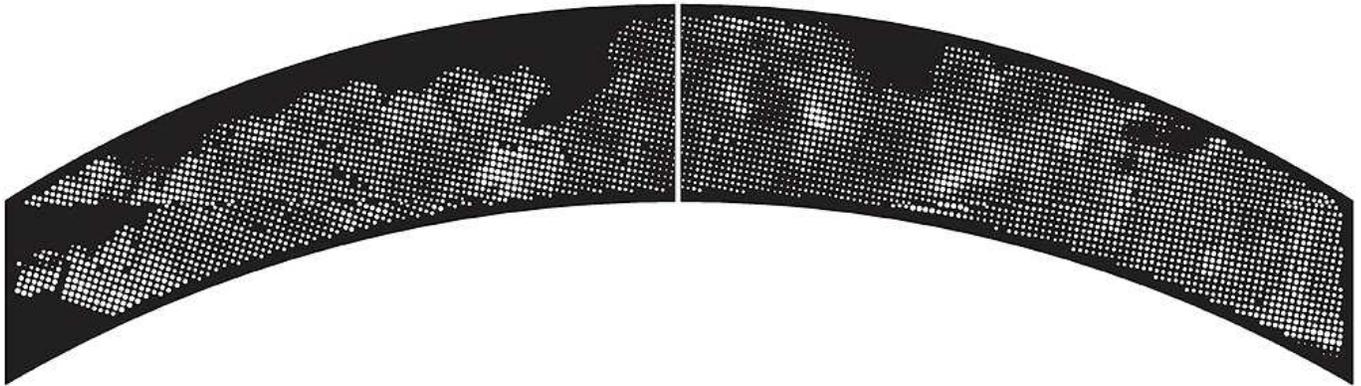


Overall Dimensions Indicated

Figure 4

Roof Panels Displaying Native Hackberry Tree

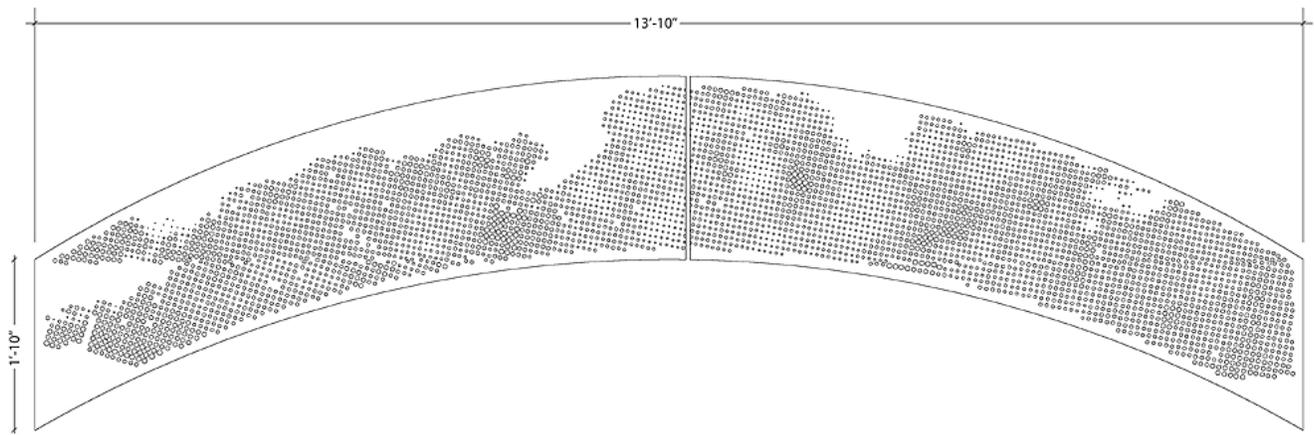
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Black Areas Indicate Solid Metal



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Left Side

Right Side

Overall Dimensions Indicated
Figure 5
Clerestory Panel Displaying Cloud Pattern

4.0 SUMMARY AND RECOMMENDATION

The scale of the pedestrian/bicycle bridge offers a significant opportunity for integrating aesthetic enhancements that support added comfort for pedestrians and bicyclists. The thematic criteria developed by the CAC and project team have provided the building blocks for development of the concept for the roof panels and clerestory panels on the bridge. In addition, the technical criteria of meeting applicable technical standards, guidelines, regulations, and procedures; minimizing disruption to the operations of the UPRR rail yard and ADOT's Maclovio Barraza Parkway; and adhering to the design criteria established by TDOT, ADOT, UPRR, and the RTA have been followed.

The integrated aesthetic treatments were collaboratively developed within the parameters of the CAC for the pedestrian/bicycle bridge utilizing artistically designed laser cut steel panels to be employed as the mandatory enclosure elements (roof and clerestory area) for the bridge. These enclosure panels include:

- The roof panels which will be abstracted laser cut forms derived from photographic images taken from below, looking up and into a native Hackberry tree.
- The clerestory panels that highlight the magnificence of our desert skies with emphasis on cloud patterns

The aesthetic concept for roof and clerestory laser cut panels as developed:

- Meets CAC parameters and mandates for public aesthetic elements
- Has a thematic continuity with the Kino Parkway Overpass at 22nd Street project by means of the structure of plants native to the Sonoran Desert as a central theme
- Provides meaningful, thematically consistent patterning, shade, ventilation and security/safety
- Maximizes the interior volume of the pedestrian/bicycle bridge given its length and enhances the traveler's experience through the interior
- Maximizes transparency through the enclosure while meeting maximum opening size criteria per UPRR and ADOT guidelines
- Will utilize landscape architecture (plant palate) and roadway, pedestrian, and bicycle level ambient and accent lighting to compliment aesthetic enhancements while meeting all safety requirements

The recommendation of this memorandum is to continue with the development of the final engineering for the roof and clerestory laser cut panels described in this memorandum. These panels shall be integral to the structural bridge design for the steel

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pedestrian/bicycle bridge creating the mandatory 'enclosure' safety element of the structure and shall be included in the project's construction documents.

The panels are integral to the overall construction of the bridge and should be designed jointly with the landscape and hardscape architecture, ambient and accent lighting, and structural and civil engineering elements of the bridge. It is recommended that the aesthetic treatments be included by the design consultants within the continued development of the engineered construction contract documents for further review and approval by the City of Tucson with an informational update provided to the CAC. This update, review, and approval process shall be within the standard City of Tucson submittal procedure for engineering documents.

Although not specifically related to the pedestrian/bicycle bridge, it is recommended that TPAC move forward with the selection of two separate artists, one for the north area and one for the south area of 22nd Street that are east of Maclovio Barraza Parkway. The artists selected will work with the two neighborhoods, Parkway Terrace and Arroyo Chico, to develop opportunities for art within these areas.



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