



# I-395 RECONSTRUCTION

## Signature Bridge Option "C"

Aesthetics Signature Bridge Proposal  
June 20, 2016  
**FINAL SUBMITTAL**

Submitted to FDOT District 6  
Project# E-6J53

# Option C – The WAVE

**W**eaving communities together and providing a focus for redevelopment, the Wave forms the focal point of improvements to the I-395 corridor. In an area where the original construction of I-395 divided neighborhoods, this project will rejoin those communities. And the centerpiece of this redevelopment will be a contemporary infrastructure icon – a signature bridge - which will also improve the quality of space at ground level.

## WHAT IS A SIGNATURE BRIDGE?

A signature bridge provides a landmark, an icon, an inspiration and a source of pride for the community it represents. It is unique and instantly recognizable. It reflects to the community's aspirations and ambitions and sits comfortably in the local environment. A beautifully designed bridge can be transformative – turning an element of practical infrastructure into an elegant object that combines technological intelligence with poetry to enhance the sense of identity and cultural significance of the city.

In developing our design concept the Kiewit Granite team began our process more than a year ago, and met with key stakeholders to gather their views on the project and to reflect on the history and culture of Miami – getting to the very essence of what makes it unique. The key objectives for our design are as follows:

- » The bridge is a “real” structure – a functional and practical crossing. It also needs to be a single unified structure incorporating east and westbound roadways
- » Height and scale are important in making an impressive visual impact. The structure fits into its environment and provides an iconic addition to the Miami skyline
- » The bridge is dynamic and looks different from every viewpoint. It will have an interesting and intimate quality when seen up close in the surrounding plaza area, and be impressive and intriguing from afar
- » The experience of those using the bridge is important too. Motorists will enjoy the approach and the crossing, feel safe and find it easy to continue to their destinations
- » This structure will present unique and dynamic view at night with feature lighting

## THE DESIGN CONCEPT

Our signature bridge architect, Erik Behrens, has the vision to create a beautiful new icon for the city that will also help improve the quality of life. He is an explorer and inquisitive creator whose restless creativity will be translated into a practical technical reality by our chief bridge engineer Dr. Steven Stroh (AECOM) and the Kiewit Granite Constructors, JV team.

Miami is known as a dream destination and oceanfront city. The design of the structure has a deep affinity of an ocean wave which resonates in sympathy with the beauty and power of the natural formations. In its pure form it is a single unified bridge structure, an “authentic” bridge, where nothing has been added or is artificial.

The defining feature of this scheme is the white concrete arch which rises and returns to the ground with an elegant lightness of touch. The cables are arranged like a harp, adding a majestic gracefulness to the structure. Using a single arch to support and unite both roadways, the large arch cross-section provides a purposeful and bold profile. The arch varies substantially in dimension from its base to the top, providing a graceful leap over Biscayne Boulevard and the plaza. The Wave creates a clear signature and recognizable silhouette for the new cultural hub of downtown, which is elegant in its simplicity.

- » The form of the arch is inspired by the shape of a rolling ocean wave.

While other arch structures have been proposed for this site, the Wave seeks clarity of form in its design concept and execution, providing an elegant bridge structure that is well proportioned in relation to this site. The use of concrete in the construction is important; a steel arch is burdened by visible connection details, bolts and splices that blemish the smooth shape of the arch. Concrete allows us to provide smooth uninterrupted surfaces, and gives more latitude in shaping the member. This is crucial to the form that is desired for this bridge concept. It is also important to note that concrete is a material native to Florida.

## THE WAVE SYMBOLIZES MIAMI

The goal we repeatedly heard from stakeholders was that the signature bridge should be an authentic bridge structure. Our understanding is that this means the form of the bridge meets the structural demands of the loading - form follows function. In nature and in constructed works this rule provides graceful structures that are visually and structurally suited to their purpose. And that is the strength of the Wave, with its one solitary elegant arch and a graceful waterfall of hanger cables flowing to the deck. Miami is known for a modern approach to architecture; the Wave is a timeless form that will not go out of style, and it will reflect the city's leadership in clean and graceful architectural design.

## THE WAVE IS UNIQUE

The Wave takes a novel approach to the hanger-cable suspension system, with closely spaced hangers (15' spacing) and four hangers supporting the deck system at each location. The upper attachment points are concentrated in the upper regions of the arch giving an orderly progression of the cables across the span, not unlike a harp. This gives a strong visual attachment of the arch to the roadway, provides a unique view for the motorists passing through the bridge on I-395. The Wave is a one-of-a-kind bridge that will be identified with Miami.

- » The graceful concrete arch of the Wave, combined with the wide roadways and the waterfall of closely spaced hanger cables gives this bridge a one-of-a-kind appearance which will be identified as Miami.

## THE WAVE PROVIDES SPECIAL OPPORTUNITIES FOR NIGHT VIEWS

Our approach will create a comfortable lighting scheme that beautifies the bridge structure and enhances the nighttime plaza atmosphere. The lighting concept for the Wave is one of musical composition, playing with the closely spaced waterfall of cables to create dynamic waves of light, creating a canvas on which light patterns and color will be projected to give this bridge a different and distinctive appearance from the day time. As evening approaches, the bridge will transform its appearance from a gleaming unified form to one that changes its color to match that of the environment of the city...from a cool blue ocean wave to the hot pink of the summer or lush green after tropical rainfalls...perhaps even a colorful rainbow after a summer storm or the glowing amber of a Miami sunset.

The arch rib itself is selectively uplit from locations at ground and between the road decks. It will be brightly illuminated with various color tones to manifest its monumental character. All of the luminaires including those on the underside of the deck will be LED and programmable RGB (red, green, blue) LEDs to allow for a choreographed lighting scheme that will change the color compositions over the course of the evening. The ability to contrast the colors of the arch rib from the cables will allow music to figuratively be played across the harp of closely-spaced cables.

The road deck will be lit from LED luminaires mounted in bollards that use a new flat beam distribution technology. This concept avoids the clutter of conventional pole-mounted lighting so as to enhance the view of the bridge at night and not spoil the iconic bridge scenography with highly visible light poles.

## HOW DOES THIS DESIGN EXCEED THE PROJECT GOALS?

The Wave meets all of the signature bridge goals articulated in the project Aesthetics Manual, and in most cases exceeds these goals:

1. The Wave has a constant depth superstructure and provides smooth transitions within the approach spans
2. The Wave is a single bridge. The eastbound and westbound roadways are joined at deck level and supported by a single pylon.
3. The Wave cable pattern is dynamic, with a changing view of a closely spaced waterfall of cables the motoring public will drive through while on I-395.
4. The Wave has a single arch supporting the bridge, and has eliminated the piers east of Biscayne Boulevard by lengthening the arch structure length, thereby eliminating all piers near Biscayne Boulevard.

5. Height is important in creating this landmark. The wave soars to a height 252 feet, above the minimum 245 foot height required by the RFP.
6. Cable connections are shielded from view within superstructure edge features that provide a smooth and clean appearance from different view-sheds and complement lighting opportunities. The cables are white.
7. The Wave is unique. The waterfall of closely spaced cables, combined with the sculptured shape of the single concrete arch is found on no other bridge and will provide an instantly recognizable signature for Miami.

## THE WAVE IS PRACTICAL

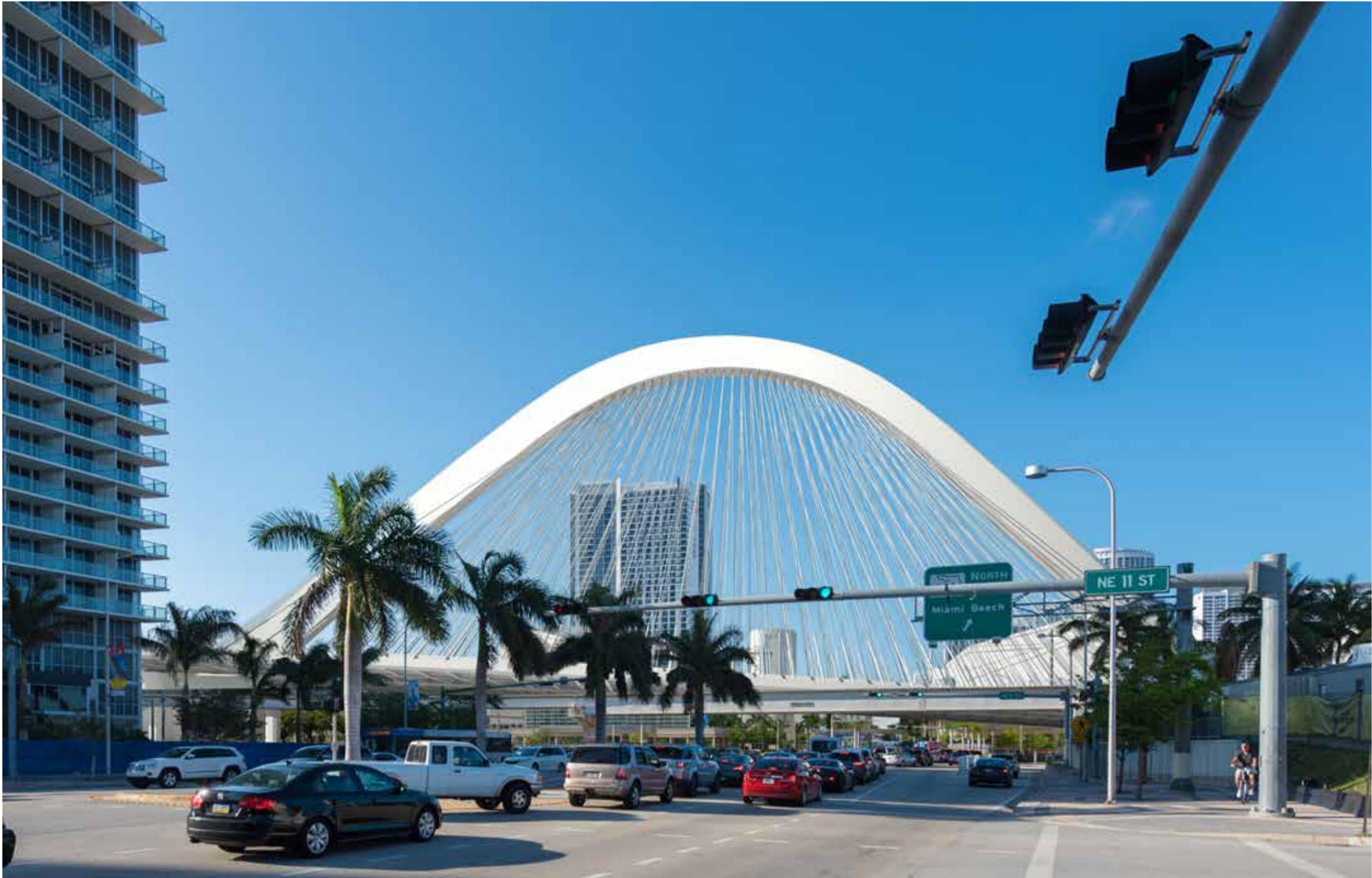
While the Wave has a dramatic appearance, it is based on a solid and reliable design concept and can be constructed with proven methods. The concrete arch rib can be constructed in its entirety in the first traffic phase of construction. It is a straightforward, cast-in-place concrete element that will be constructed using temporary falsework supports. The superstructure roadways will be constructed on temporary piers in subsequent traffic phases. Once the cables are installed, they will be jacked, transferring the load from the temporary piers to the arch rib.

The Wave is also developed to be a durable and maintenance friendly structure. The single arch houses all of the hanger cable anchorages, which are accessible internally for inspection. Internal access is provided by a ladder and stair system that provides safe access to all cable anchorage locations. The superstructure is an open steel grid system with good access for inspection, with no enclosed spaces. The superstructure is redundant, with no fracture critical members. Anchorages are bolted to the sides of the edge girder webs, and detailed for good fatigue performance. The edge feature on the superstructure has access slits below to allow access to the anchorages for inspection. Roadway and aesthetic lighting is accessible for maintenance without special access requirements.

The Wave is at its essence a proven concrete bridge design that can be constructed with confidence and low risk.

## DEVIATIONS

- Adjust EB mainline geometry to move taper off the bridge. ATC# 1 (submitted 6/17/16)
- Full depth precast concrete deck panels. ATC# 19 (submitted 6/15/16)
- Pier location in relationship to AACPA. ATC# 24 (submitted 6/15/16)
- Widened deck for stay cable clearance. ATC# 25 (submitted 6/20/16)
- Alternate flat beam low level LED roadway luminaire. ATC# 26 (submittal pending)













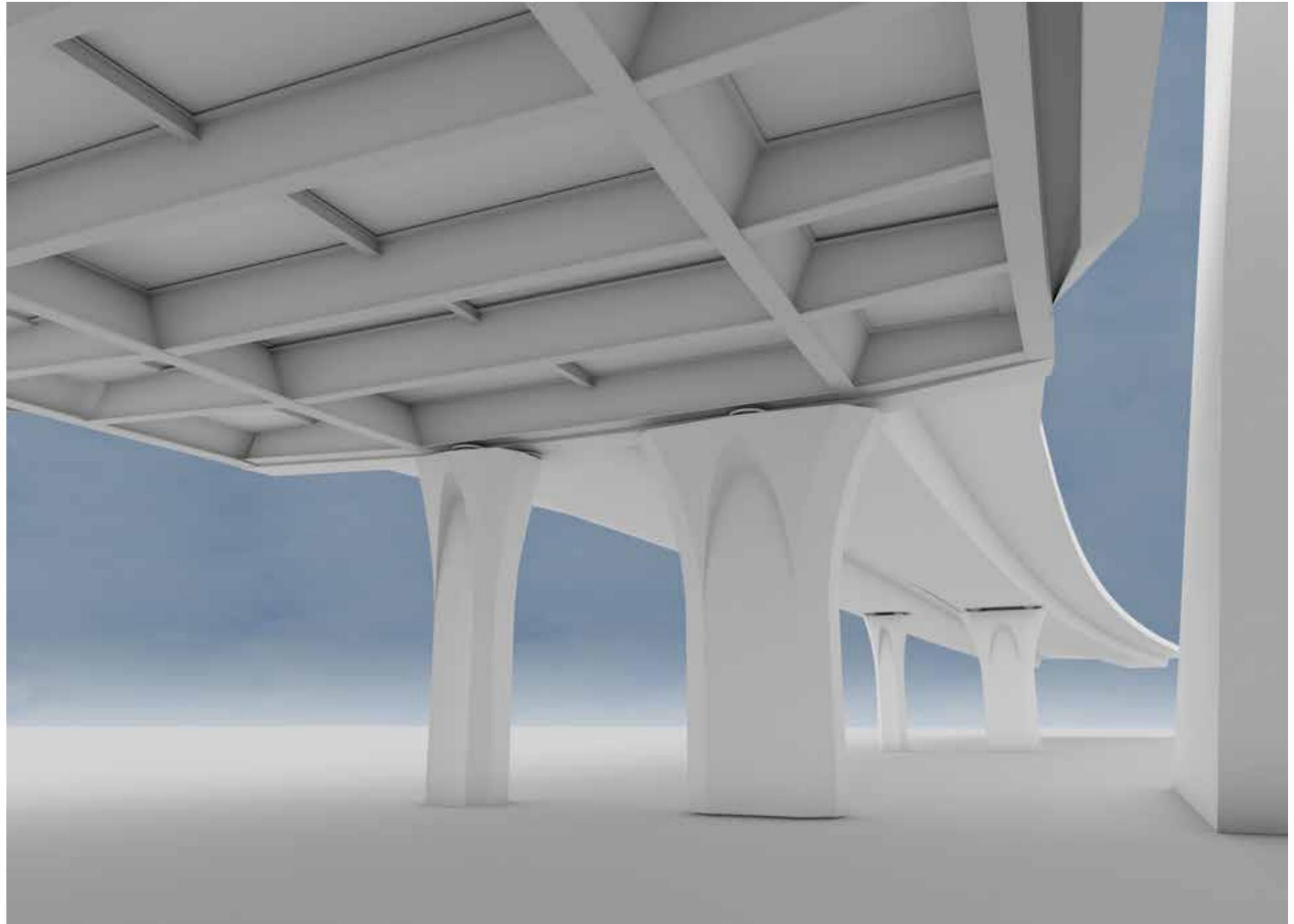




















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