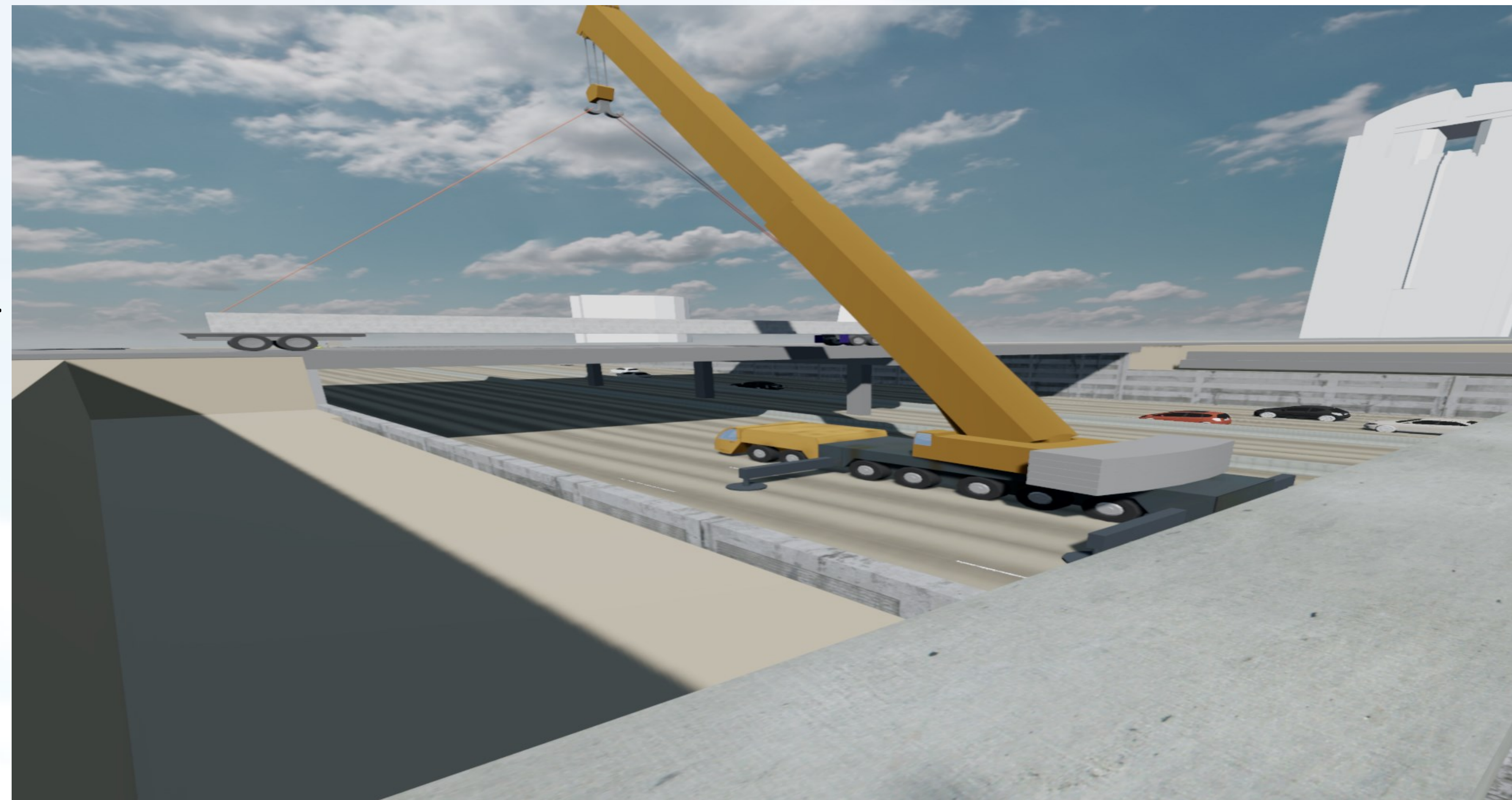


Computer visualization (3D and 4D) of transportation construction project has proven exceptionally valuable for analyzing complex engineering information, communicating internally for project teams or externally for the public and other stakeholders, and education for the public. The authors have analyzed sign placements, analyzed shadow patterns generated by a partially covered open cut section of highway, assisted in communication of ROW acquisition, educated a city council about a complex construction sequence of an intersection, shown project sequencing and duration benefits from construction acceleration, and many more applications. An emerging technology, Virtual Reality (VR) is a new visualization tool that has potential to be very valuable for transportation construction projects.

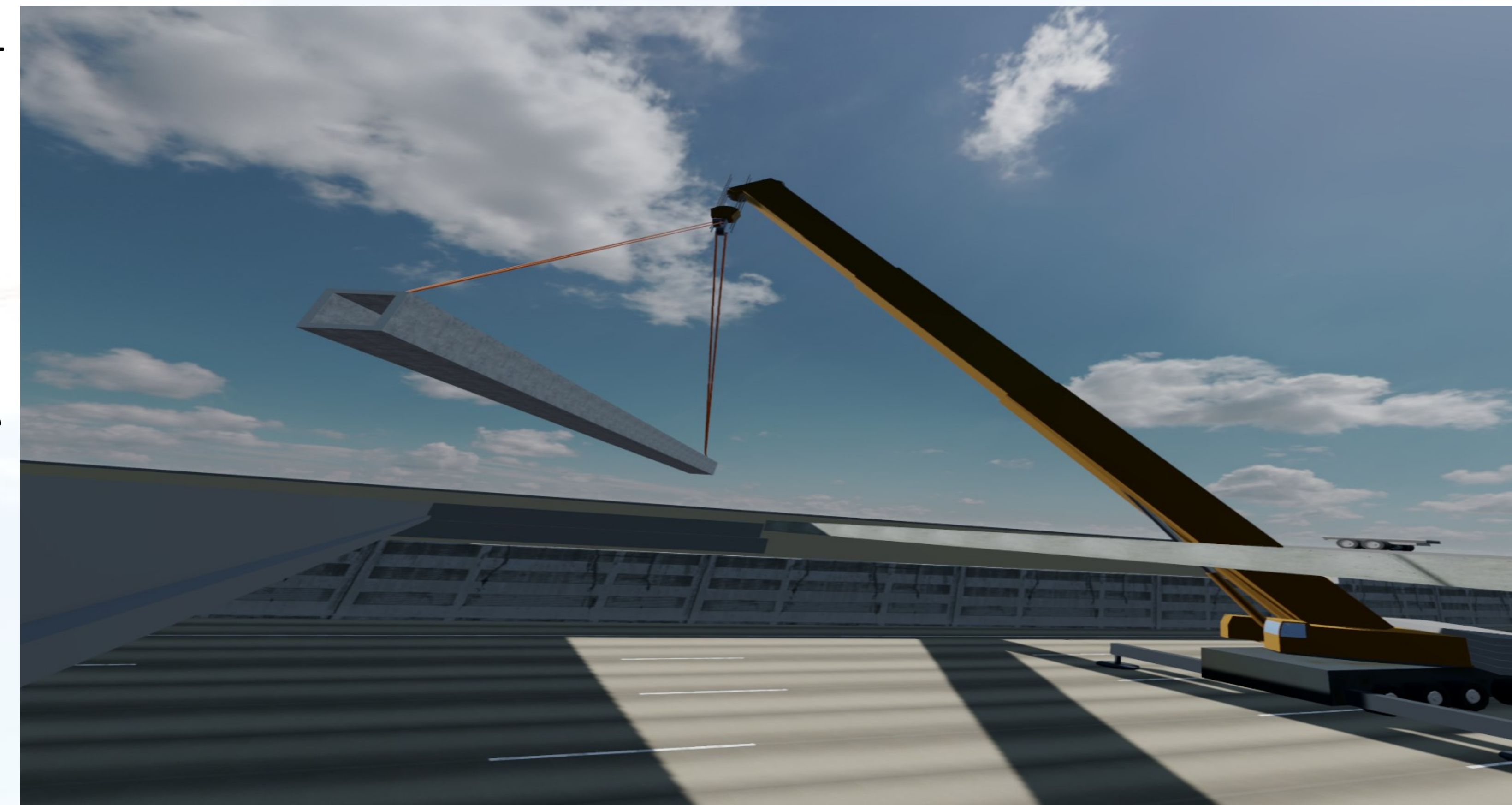


Above: Figure 1. Crane picking beam from cross street — viewed from utility bridge

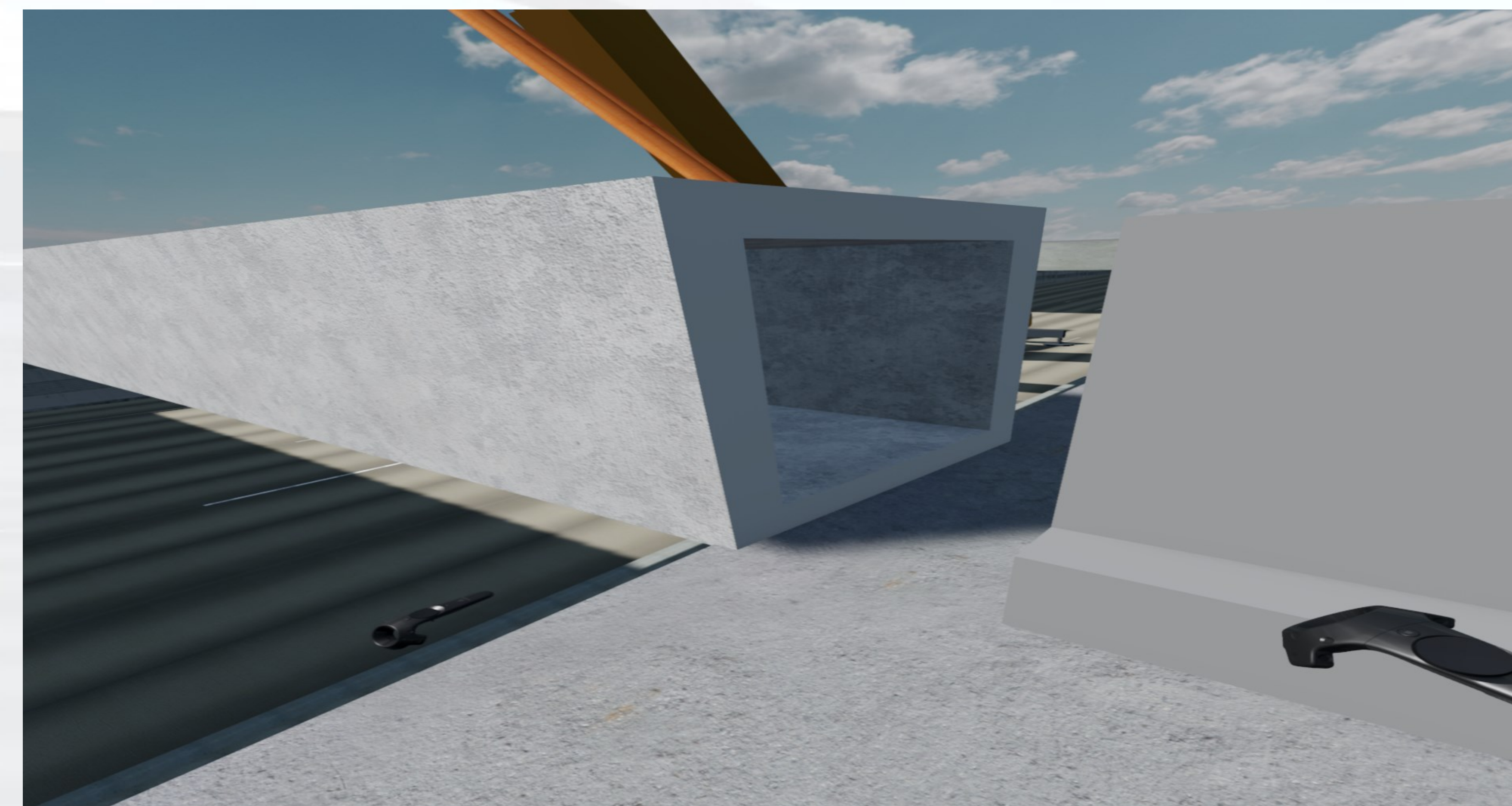


Above: Figure 2. Crane picking beam from cross street — viewed from highway

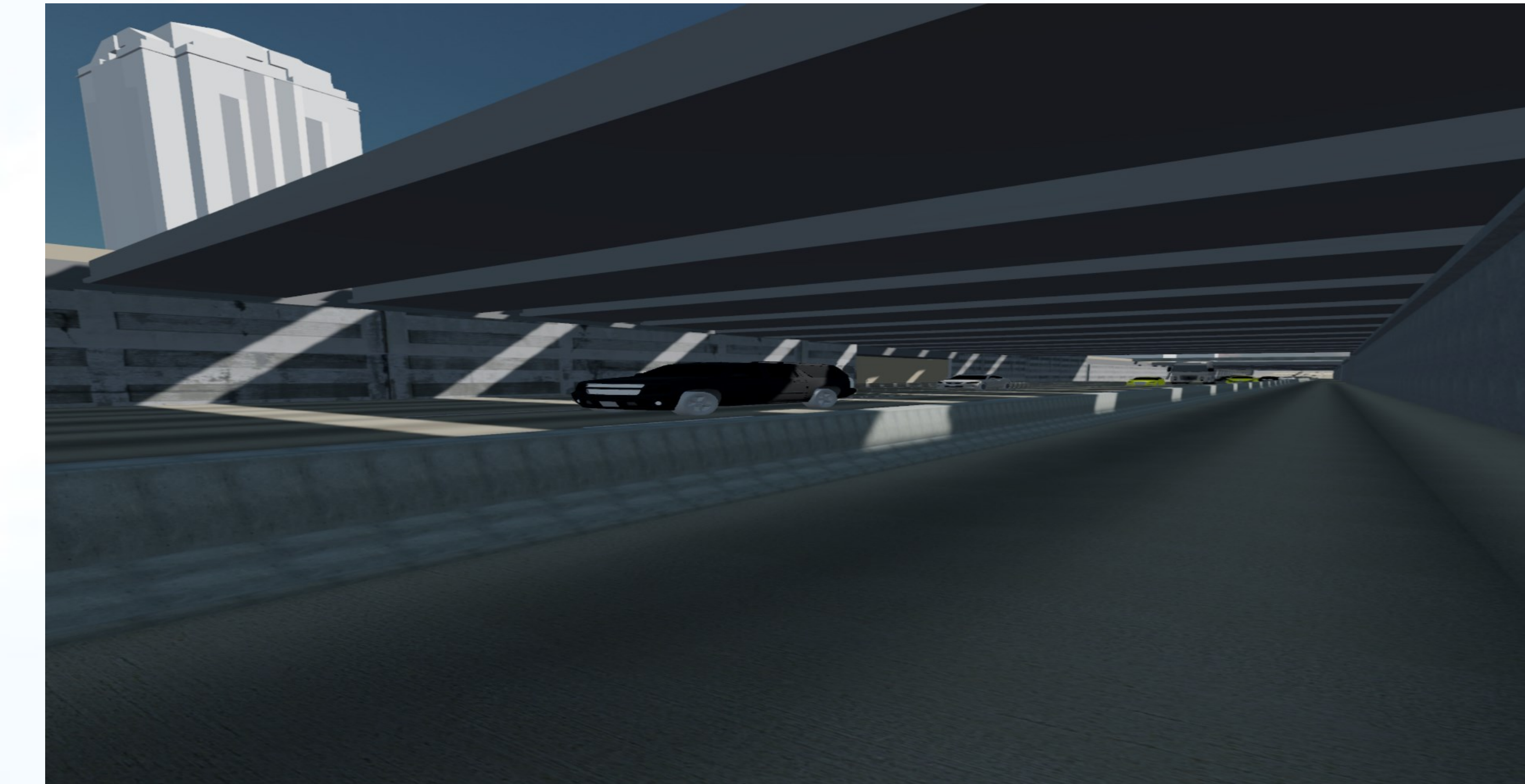
Virtual Reality (VR) allows users to experience 3D models at human scale through a head-mounted display (HMD). Users can have varying degrees of control over their movements inside the 3D model in a VR environment and various ways to interact with the 3D model. The technology has become robust enough that the mind accepts, to a certain degree, that what a user is seeing is real. Virtual reality is successfully being used for numerous applications in a plethora of industries, such as training, education, building visualization, even helping professional quarterbacks. However its uses for transportation are still being explored. The authors have successfully used VR to select the bridge colors on the North Tarrant Express 35W project in Fort Worth, but are exploring new applications for VR



Above: Figure 3. Crane placing beam on other side of utility bridge — viewed from middle abutment wall



Above: Figure 4. Large Box beam details — viewed from middle abutment wall



Above: Figure 5. Animating vehicles



Above: Figure 6. VR Headset with steering wheel and pedals.

A significant part of VR is the human scale and depth of field users are able to experience which can only happen when wearing a VR HMD. It transitions users from viewing a 3D model on a screen to being inside the model at the appropriate scale. The other benefit of VR is being able to interact with the 3D model. This includes moving around, moving the 3D objects, measuring distances, and triggering numerous pre-programmed events such as changing items colors or animating a crane placing a beams. There are numerous possibilities for interactions. In order to generate ideas from transportation engineers, stakeholders, and the public, the authors created a proof of concept VR model to experience and generate ideas. For this proof of concept the authors created a virtual construction site where a crane is placing a beam in a tight environment. In the model, a crane is on one side of the highway picking a 100 foot, 75 ton box beam from a cross street bridge above and placing it over the highway. Traffic is flowing on the opposite side of the highway and users can move around the model and review the crane activity from any vantage point they choose.

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