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Advancing Infrastructure



Project Summary

Organization:
AECOM

Solution:
Roads and Highways

Location:
Miami, Florida, United States

Project Objectives:

- To develop a new intersection design that will improve traffic operations and safety at an existing railroad crossing.
- To create a collaborative environment that was easily accessible for all project participants.

Project Playbook:

ContextCapture, iModelHub™, LumenRT, MicroStation®, OpenBridge™, OpenRoads™, ProjectWise®, SYNCHRO™

Fast Facts

- FDOT adopted a new program to expedite the planning and design of roadway and highway projects.
- The project involved constructing a new 355-foot-long pedestrian bridge, widening an existing bridge, and constructing two new ramp bridges.
- OpenRoads Designer helped model and design roadways, grading, and cross sections.

ROI

- AECOM delivered over 700 plan sheets, 10 horizontal alignments, eight profiles, 215 cross sections, 14 corridors, and 1,900 linear feet of bridges to FDOT.
- ProjectWise helped save 480 resource hours by eliminating the need to email files back and forth or provide external access to internal local servers.
- With ProjectWise, interdisciplinary reviews reduced the number of printed sheets by 1,400 pages, helping lessen AECOM's environmental impact.

AECOM Redesigns Highway and Railway Intersection in South Florida Using 3D Modeling

OpenRoads Helps Develop Visually Appealing Informational Model within a Connected Data Environment

Streamlining Delivery of Roadway Projects

The Florida Department of Transportation (FDOT) manages all roadways and highways in the state, including Miami-Dade County in southern Florida. In 2015, FDOT adopted a new program to expedite the planning and design of roadway and highway projects to quickly deliver the project benefits to the general public and surrounding communities. One of the first projects involved in this new program is the Northeast 203rd Street Intersection Improvements Project.

AECOM was awarded the project for the initial planning phase to evaluate various concepts and determine a preferred design. The organization was then tasked with proposing the final highway design that would reroute foot traffic and road access within tight property limits. The motivation for the project was to enhance safety for pedestrians and vehicles crossing over the railroad corridor at Northeast 203rd Street due to the high number of trains in the area. The organization also needed to minimize the environmental impact on nearby stormwater infrastructure and existing ponds.

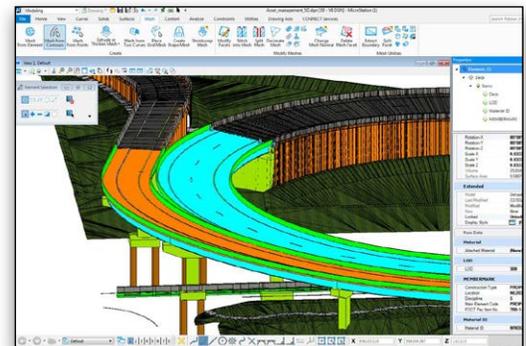
AECOM was chosen because of its global network of experts working with clients, communities, and colleagues to develop and implement innovative solutions to the world's most complex challenges, including in the commercial, residential, and transportation industries. The organization has a history of providing services for every asset stage—including architecture and design, engineering, and asset management, all of which the project required.

Redesigning an Intersection for Improved Safety and Traffic Flow

The USD 35 million highway and railway intersection redevelopment project consists of removing an at-grade railroad crossing and constructing a new 355-foot-long pedestrian bridge, widening an existing bridge, and constructing two new ramp bridges of 592 feet and 600 feet. Additionally, the project includes multiple signal, lighting, and drainage improvements.

The main objective of this project is to improve traffic operations and safety at the existing railroad crossing.

AECOM needed to provide sheets for multiple alignments and bid structures. After the project is let for contractor bids, which needs to occur in 2021 to keep the project on schedule, AECOM must also provide continuous post-design support. To meet these goals, the project team needed to improve visualization of the design for all participants while also enhancing all means of communication.



AECOM used Bentley applications to model the proposed roadway structures.

Increase Visualization of the Complex Expansion Project

To improve visualization of the design across all participants, AECOM used OpenRoads, OpenBridge, and LumenRT to model the proposed structures, including the vehicle and pedestrian bridge modeling. This practice helped the team avoid impacts to adjacent structures, wetlands, and sensitive areas. Additionally, the team modeled all utilities in a 3D environment to allow for evaluation of a proposed drainage design that maximizes the use of green space to increase water quality treatment within the project limit.

Bentley applications were also used to create 3D, 4D, and 5D deliverables that showcased AECOM's innovative design and provide marketing material for FDOT's project proposal. For example, OpenRoads Designer helped with modeling and designing the roadways, grading, and cross sections while ContextCapture helped develop a reality mesh model of the surrounding area.

“This real-world application of enhanced digital technology showcases the benefits of projects within the engineering industry. These tools provide a cost-effective means to help eliminate errors prior to construction, mitigate risks, and set up to successfully transition to the operation and maintenance phase.”

*– Samuel Worthy,
Project Manager,
AECOM*

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Another way that AECOM improved project visualization was by implementing civil infrastructure information modeling (CIIM). This practice allowed the team to visualize the potential designs and measure performance features, such as sight lines and vehicular clearances. Performing these analyses during the design phase was crucial to keep the project on schedule and meet client demands. CIIM is also leading the organization-wide effort of going digital, implementing more digital technologies into its workflows.



OpenRoads helped with modeling and design, creating an innovative design for better project visualization and engaging marketing material.

Improving Collaboration, Internally and Externally

Along with improving visualization, AECOM needed to ensure that collaboration between the organization and its supply chain was cohesive. Therefore, AECOM used ProjectWise to establish an open, connected data environment so that each team member could access the latest data. This practice helped save a total of 480 resource hours by eliminating the need to email files back and forth or provide external access to internal local servers. In addition, ProjectWise helped team members directly upload final deliverables into submittal folders, reducing back-end effort and saving about 130 resource hours.

With any transportation project, it is important to communicate with the public throughout the entire project lifecycle. To make it easier for AECOM—and, therefore, the client—to communicate with participants outside of the organization, the team created 5D iModels, interactive 3D LiveCube models in LumenRT, and daytime and nighttime

renderings. The organization also used videos to better communicate the project design, including 4D constructability, drive-through, and project overview videos.

Also, AECOM made sure to use applications that provided geolocation for proposed 3D models, which were shared using iModelHub. The team created representations of existing buildings around the project and overlaid 3D reality meshes of the design to more readily and easily understand the design solutions to the project's complex infrastructure challenges. This content was used to convey the project design to FDOT, the general public, and technical designers, proving to be more effective than traditional methods.

Providing High-quality Deliverables while Streamlining Workflows

AECOM delivered over 700 plan sheets, 10 horizontal alignments, eight profiles, 215 cross-sections, 14 corridors, and 1,900 linear feet of bridges (including bridge widening) to FDOT. This significant number of deliverables would not have been possible to present to the client without AECOM's use of Bentley applications. By using OpenRoads, AECOM had an environment that let them efficiently design the roadway in an easy-to-understand way while also saving time. By developing a 3D model of the proposed roadways and ramps, AECOM saved an estimated one hour per cross-section, four hours per horizontal alignment, four hours per profile, and 10 hours per corridor for quantities. In total, the team saved about 430 hours of design time.

Improved communication also helped AECOM save significant time on the project. By using ProjectWise as the connected data environment, interdisciplinary reviews were more efficient and transparent. All disciplines could review the proposed design plans and the federated model in real time, whenever and wherever. This practice streamlined the review process while also providing a design that was easier to visualize and understand than traditional workflows. These electronic reviews and plan sets did not need to be printed for verification and review, reducing the number of printed sheets by 1,400 pages and helping lessen AECOM's environmental impact.

Despite the streamlined workflows, AECOM still delivered a high-quality design to its client. With enhanced engineering analysis and design, as well as 3D deliverable reviews, the project team was able to detect numerous utility conflicts before construction, enhance pedestrian safety, and improve driver visibility on the roadway. These benefits would not have been realized without the ability to visualize the project throughout all its phases.