

June 2020

Social Distancing Solutions

**FOR PROJECT DEVELOPMENT
AND PUBLIC INVOLVEMENT**



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for Project Development and Public Involvement

Introduction

The Coronavirus pandemic has caused many infrastructure agencies such as state Departments of Transportation and their consultants to transition to a “remote workplace” model, with project team members working from their homes. However, social distancing creates many obstacles to the coordination and collaboration needed to keep projects moving forward. A typical infrastructure project requires a high degree of collaboration within the project development team, within the agency responsible for the project, with other agencies and stakeholders impacted by the project, and with the general public.

This paper describes how real-time Cloud-based 3-D modeling and visualization integrated with remote collaboration technologies provides solutions to these challenges by aiding the design review and approval process with both engineering professionals and the general public.



Internal Design Review

Since 2005 RDV Systems has specialized in providing advanced technology and services in rapid 3-D modeling, simulation, and visualization. RDV has been involved in over 70 projects involving transportation infrastructure in the U.S., working with DOTs, transit authorities, local agencies, and their engineering consultants. RDV takes a unique, “publish - don’t render” approach to visualization, producing accurate, geometrically correct, interactive virtual models of the proposed design rather than simply creating rendered images and videos.

On most projects, RDV was initially engaged to provide visualization assets to support public involvement activities. However, along the way our clients discovered a new benefit – once RDV provided the interactive 3-D project model to the agency-consultant design team, the model quickly became a key tool for the project team to review and evaluate their designs. This nearly always resulted in design modifications ranging from small, but important, adjustments to the project design details to major revisions.

This phenomenon is not so surprising. Engineers have traditionally relied upon reviewing designs using CAD drawings. One problem with this approach is that the design elements are typically stored in different silos such as roadway geometry plans, striping plans, signs and signal plans, and so on. Another issue is that this data is often in the form of 2-D drawings, particularly in the earlier conceptual design stages of the project. Even project designs developed in 3-D CAD do not convey a complete picture.

What our clients have discovered is that the aggregation of that data into a single, three-dimensional, geometrically accurate project model showing the combined design elements in a real-world 3-D environment is a profoundly valuable platform for evaluating and communicating designs effectively.

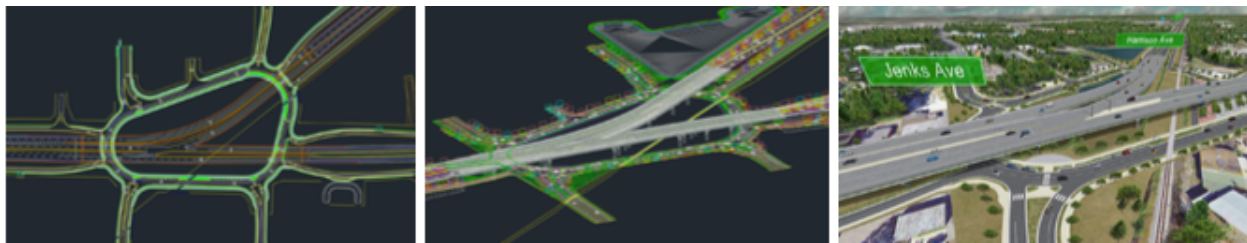


Figure 1 - CAD files vs. 3-D Models



Design Team Collaboration

Project designers have traditionally relied upon a collaborative work environment where the team members are located in the same office, looking over each other's shoulders, and identifying and resolving issues as they arise. The 2020 COVID-19 pandemic created a new "social distancing" work paradigm for project development, making the critical process of ad-hoc review and assessment far more challenging.

RDV's 123BIM technologies have proven to be an ideal solution for collaborative project development in the age of social distancing. The 3-D project visualization models are published and hosted on RDV's 123BIM.com cloud collaboration platform, which does the heavy lifting of on-the-fly rendering and navigation computation. Consequently, project team members can access the 3-D project model from

any computer with an internet connection, explore the project in an interactive gaming-engine environment, move freely around the project site, and turn layers on and off to show project details, design alternatives, and construction staging - all without having to download or install any software.

Publishing 3-D project models in-the-cloud provides several key advantages. 123BIM aggregates the model data and makes dissemination to the project team painless regardless of their location. The model files, which are sometimes quite large, stay in the cloud at the source rather than being generated locally. Changes and updates are published to a single master copy of the 3-D project model, not manually updated and distributed. No software needs to be installed - team members can view and navigate the 3-D project models from any computer using

Project Example

In 2016 RDV provided visualization modeling for a project to re-configure an interchange of an interstate highway and a local arterial. The project was in the early conceptual design phase, and two design alternatives had been developed using 2-D CAD design files. One of the alternatives was a single-point urban interchange (SPUI) configuration with a separate bridge for a light rail line.

Upon reviewing the initial version of the 3-D project model, the designers realized that the rail bridge on the SPUI alternative did not have adequate structural support. Additional columns, including three straddle bents, were quickly designed and incorporated into the 3-D project model. The design team was then able to evaluate the impact of placing large support columns in the parking lot of an adjacent car dealership, and this turned out to be a major factor in evaluating the alternatives.



Figure 2 - Project Example



common web browsers such as Chrome, Edge, and Firefox. 123BIM also provides a managed environment where the project administrator can set the appropriate level of access for each team member, e.g., Viewer, Collaborator, or Modeler.



Figure 3 - 123bim Collaboration Session with Multiple Participants

Furthermore, a team member viewing the 3-D project model in 123BIM can invite any number of remote team members to join a Live Meeting where every participant can see and interact with the model simultaneously. Many organizations are familiar with web-based collaboration tools such as Google Hangouts, Microsoft Teams, or Zoom. 123BIM Live Meeting goes above and beyond the basic screen sharing features offered by these tools and allows for more dynamic interaction: First, every participant can use their cursor as a pointing device that everyone can see. Second, control of the viewing and navigation can be transferred to any participant, not just the meeting host. This has proven to be an extremely effective tool for ad hoc reviews in a social distancing environment.

Another important weapon in the 123BIM arsenal is the Virtual Tour. The Virtual Tour allows the viewer to explore the 3-D project model in a highly simplified cloud-based interactive environment. This facilitates individual review of the project design by separated team members. It can be accessed on phones and tablets as well as computers, and allows easy comparison of existing and proposed conditions, design alternatives, and construction staging. The Virtual Tour is widely used for design review by the extended project team, i.e., not the designers directly involved in the project but the supervisors, managers, and senior agency officials who are indirectly involved.



For example, Figure 4 shows a virtual tour of the maintenance-of-traffic plan for the North Washington Street bridge replacement project in Boston, MA. Using a simple web link (<https://vtour.123bim.com/AAGV>) team members are able to see 360-degree views from over twenty viewpoints for six traffic configuration stages.



Figure 4 – Virtual Tour Showing Maintenance-of-Traffic Details for Multiple Construction Stages

Stakeholder and Inter-Agency Collaboration

Before a project is presented to the public, it typically needs to be reviewed by a variety of other stakeholders such as the FHWA, other government agencies, transit authorities, elected officials, and impacted business owners. This is often an iterative process where issues and concerns are identified, and solutions are designed and then reviewed again. FHWA guidelines define the roles of a project's "lead agency" and "cooperating agencies, and state that "Effective interagency coordination is the key to achieving environmentally responsible transportation decisions."



Communication with these external parties is often much more difficult than internal collaboration for several reasons. They operate on different networks and do not have access to the design plans, and often need IT assistance or permission to use other collaboration platforms. Many of these stakeholders may not have a background in engineering and transportation design, and thus need to have the relevant information presented in a way they can understand. 3-D project modeling in a visual environment plays an important role in this process, giving the project team the tools and assets needed to ensure clear communication and understanding with a diverse audience.

In the social distancing environment, the ability to host live collaboration sessions and interactively move to different viewpoints showing different conditions has become even more advantageous to the stakeholder engagement process. Virtual Tours that can be conveniently shared with the stakeholders are also an important tool for collaboration beyond the project design team.

The advantages of RDV's system are much the same for external collaboration as they are for internal design and review. The key difference is that when going outside the organic framework the challenges of social distancing are compounded. 123BIM allows for clear and effective communication with stakeholders, which is more important than ever in the remote work environment.

Project Example

For the project shown in Figure 4 RDV was engaged by the construction contractor and the Massachusetts DOT to develop a 3-D project model for replacement of the North Washington Street over the Charles River in Boston, MA. The original purpose was to develop a "storyboard" video to be used at a series of public meetings showing how traffic on this critical arterial would be impacted and maintained over the five-year construction period.

Once the 3-D project model was delivered, the project team realized that it provided the most effective way to review the details of the proposed maintenance-of-traffic plan with the city engineers and with the Metro Transit Authority prior to the public meetings. These reviews resulted in several significant changes to the traffic flow layout at the signalized intersections on both sides of the bridge. The changes were incorporated into the model and the updated plan was shared with the two agencies using a Virtual Tour for final review and approval.



North Washington Street Bridge Replacement



Virtual Public Involvement

Public engagement during project development is a statutory requirement of the National Environmental Policy Act of 1970. As per NEPA, public involvement/public hearing procedures must provide for coordination of public involvement activities and public hearings with the entire NEPA process, and provide early and continuing opportunities for the public to be involved during project development.

Social distancing has put the brakes on large public gatherings, creating a potential bottleneck to moving projects forward. As a result, infrastructure agencies are now putting more attention on the concept of Virtual Public Involvement where the public is engaged via the Internet rather than traditional “live” meetings.

Virtual public involvement, or VPI, is not a new concept. A quick Google search on the term shows many papers, guidelines, and discussions that pre-date the COVID-19 pandemic, as well as numerous guidelines that have been published more recently due to social distancing restrictions. Prior to 2020 the emphasis was on the use of VPI to supplement traditional open house meetings, but social distancing has brought renewed attention to the concept as a replacement for traditional open house meetings, at least in the short term. The FHWA describes the [benefits of VPI](#) as including efficiency and low cost, accelerated project delivery, improved communication and collaboration, and expanded engagement. In one [newsletter article published in 2019](#) the FHWA cited the example of North Carolina DOT using online VPI tools that generated 19 times the usual response rate from the public.

Online visualization assets are a critical component of successful VPI, once again facilitating clear communication and understanding to non-technical audiences. RDV's 123BIM technologies provide many advantages over more traditional methods of visualization for the creation of assets needed for a successful VPI program. These tools include quick and easy creation of high quality images, videos, and virtual tours that can be incorporated into the VPI website and used in online presentations. Furthermore, the cloud collaboration environment makes the tools for creating these assets easily accessible to the IT specialists, graphic designers, and PR professionals who need to be involved.

For example, still images are often needed for slide presentations, website graphics, and poster boards. With 123BIM, a VPI website builder can access the 3-D project model remotely, quickly navigate to any vantage point, and export images of existing conditions, proposed conditions, and design alternatives at any desired resolution in a matter of seconds. They can also use environmental



controls to instantly change the sky background, time-of-day, and lighting and shadow settings to their liking. Figure 5 shows exported JPEG files of two interchange design alternatives with different environment settings, a process that took less than one minute to complete.



Figure 5 - Exported Image Files of Two Interchange Alternatives

The role of Virtual Tours of RDV models for design team collaboration and stakeholder outreach has already been described. However, the primary use of the Virtual Tour is to share information with the public. Virtual tours make it easy to share the 3-D project model in a simplified web-hosted interface that is accessible on computers, phones, and tablets. RDV clients often post links to 3-D virtual tours on project websites, include links and scannable QR codes on brochures and hand-outs, and provide touch-screen virtual tours at open house meetings. In addition, Virtual Tours include single-click instant posting to social media platforms, making it easy for viewers to share with their social networks.



Figure 6 - Touch Screen Virtual Tours Used at a NCDOT Public Meeting



One of the most critical elements of VPI is the “storyboard” video, i.e., a pre-recorded video that graphically tells a story about the project. In traditional live public meetings, storyboards are often used as a presentation tool, giving the presenter a visual story that he or she can speak to. An example of this can be seen on Massachusetts DOT’s website for the North Washington Street Bridge Replacement project, where the video used at three public meetings was posted on the project website ([click here](#)). This example is a “silent” movie which relies on titles and captions to tell the story. A more elaborate storyboard video could include a recorded narration in addition to titles and captions.

Creation of a storyboard video is a two-step process. The first step is creating the raw video clips of the project, and the second is using a video editing application like Camtasia or Adobe Premier to assemble the final product. In the traditional visualization process, creating raw video clips of drive-throughs, fly-overs, and orbiting paths is a laborious, computationally intensive process that often takes hours and requires high-end computer equipment. Furthermore, if even a minor change or correction to the video is needed then the whole process has to be repeated.

RDV’s interactive model and 123BIM application allows users to quickly modify existing animation paths or create custom paths, and then export a video file for any duration and at any resolution in mere minutes. Video generation is done in-the-cloud on the 123BIM servers, eliminating the need for dedicated high end hardware on sight.

Project Example

RDV was engaged by the Florida DOT and Dewberry Engineers to create a 3-D project model for the first continuous flow intersection (CFI) in the state to facilitate public education efforts on the operation of this unfamiliar intersection configuration. The model included VISSIM-generated traffic simulation to show how the CFI would operate. It took a Dewberry engineer less than two hours to develop a custom camera path and export a four minute video file. This video was turned over to Dewberry’s internal visualization and video editing team to add a narration track, music background, and highlighting graphics.

The resulting storyboard video was used in FDOT’s public education meetings and posted on the project website for expanded outreach ([click here](#)).



S.R. 82 Continuous Flow Intersection



Project Example

In 2017, Oregon DOT was engaged in the conceptual design phase of a project to widen a seven-mile stretch of highway U.S. 97 near the town of Bend from a two-lane undivided road to a four-lane highway with a vegetated median. Multiple design alternatives had been developed for three aspects of the project. The first was for different alignment layouts to address a large knoll in the path of the widened roadway, the second had to do with different styles and locations of wildlife crossings, and the third looked at different configurations for a critical at-grade intersection.

ODOT contracted with RDV to develop a 3-D project model showing all the different alternatives, and used that model to develop a separate storyboard video for each area of concern. These were used in the live presentations given at open house meetings held with the public. They then went a step further and added recorded narrations to the videos. The Virtual Tour and narrated videos were used to set up a “online open house” web page, making the information available to a wider audience and generating additional public feedback ([click here](#) to see the U.S. 97 online open house website).

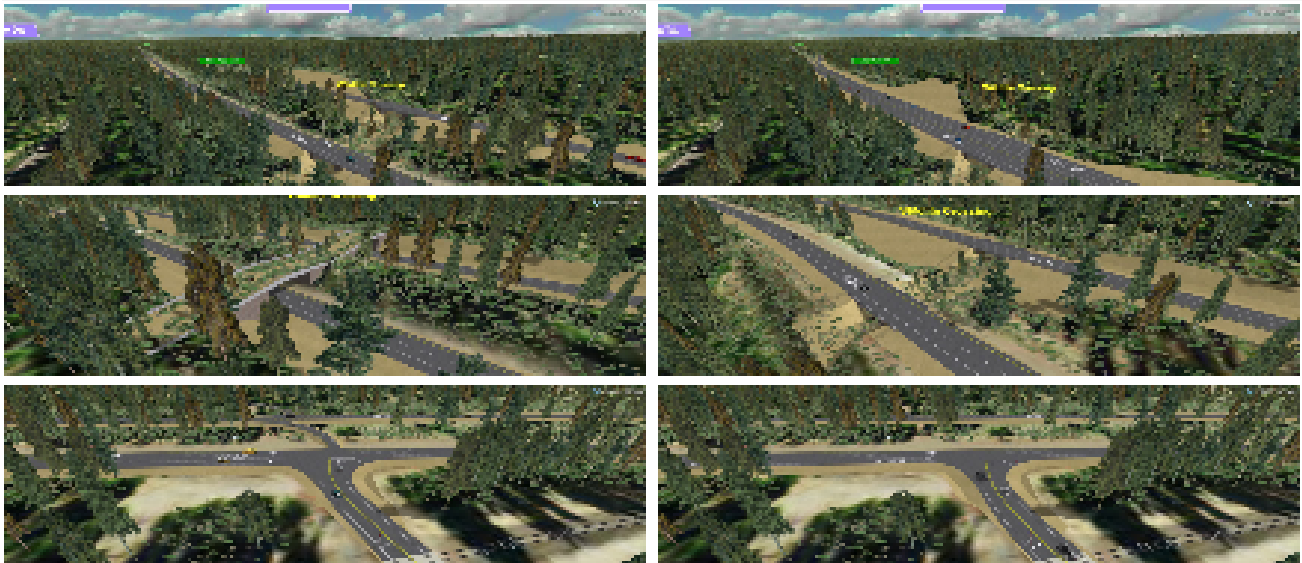


Figure 7 - U.S. 97 Widening Design Alternatives for Alignment, Wildlife Crossings, and Intersection



Summary

Although most DOTs and other infrastructure agencies remain committed to keeping projects moving forward and on schedule, the COVID-19 pandemic has created unprecedented challenges for engineering professionals. Social distancing hampers internal design development and review within the project team, collaboration with stakeholders, coordination between lead agencies and cooperating agencies, and the public involvement necessary to keep projects moving forward.

RDV Systems provides field-tested solutions to many of these challenges with an integrated suite of 3-D modeling and collaboration technologies. The cloud-based 123BIM system provides tools for:

- Aggregation of siloed engineering data into a single, geometrically correct visual representation of the proposed designs.
- Interactive exploration of the 3-D project model in a gaming engine environment.
- Hosting of the 3-D project model in-the-cloud for access for easy access by team members from remote locations.
- “Live” web-hosted collaboration sessions with multiple remote participants.
- Web-hosted virtual tours for sharing the 3-D project model with cooperating agencies, stakeholders, and the public in an easy-to-use interactive environment.
- Quick and easy “on-demand” creation of images, videos, and other visualization assets to support virtual public involvement.

Design firms can rest assured that RDV provides solutions for the challenges they face in today’s uncertain times. These solutions will continue to provide great value to infrastructure professionals across America.

For more information on RDV products and services please visit:
www.rdvsystems.com.

