

FALL 2022

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Welcome to the 3D2025 newsletter! With this newsletter, and in the quarterly issues that will follow, PennDOT will share updates on the progress of 3D2025.

PennDOT's Digital Delivery Directive 2025 (3D2025)

The Critical Need for Digital Delivery

As one of the first adopters of electronic bidding and contracting to use geographic information systems (GIS), Pennsylvania is a recognized leader in electronic construction management. Yet, the Department understands the challenges associated with organizing and navigating the sheer volume of data, including spreadsheets and CADD documents.

With 3D2025, PennDOT will realize vast improvements in data storage and the ability to access information fundamental to the success of the construction process and projects.

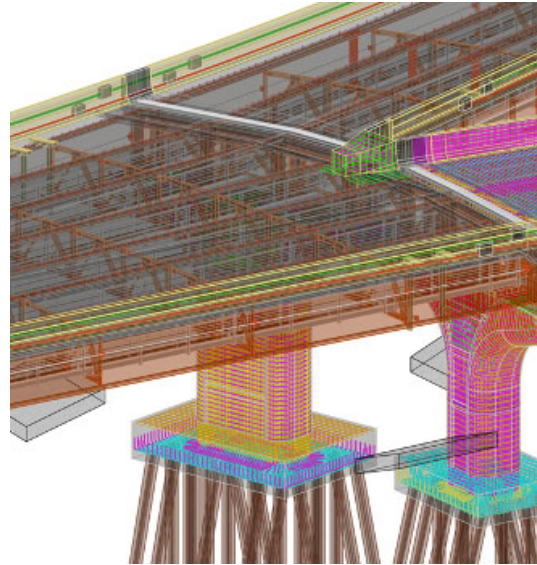


In 2020, PennDOT launched 3D2025, charting the path to replacing traditional paper-based plans with those using 3D digital technology. The ultimate objectives of the digital delivery directive are to improve design quality, reduce risks and project delays, increase construction efficiency, and improve as-built records.

The program's objectives include incorporating 3D digital data to create high-quality, data-rich models of projects. This technology will provide accessible and streamlined processes and tools to enhance construction planning, support construction projects, and improve project inspection. And, through the digital transfer of information, 3D2025 will also support maintenance planning and performance.

While not all project-development activities will be performed in a 3D model, the Department's goal is to introduce digital workflows to transfer information seamlessly through the life cycle of a project. When 3D2025 is fully implemented, PennDOT will design projects using 3D engineered models and deliver the design intent to contractors for bidding, using these models as the primary document of truth.

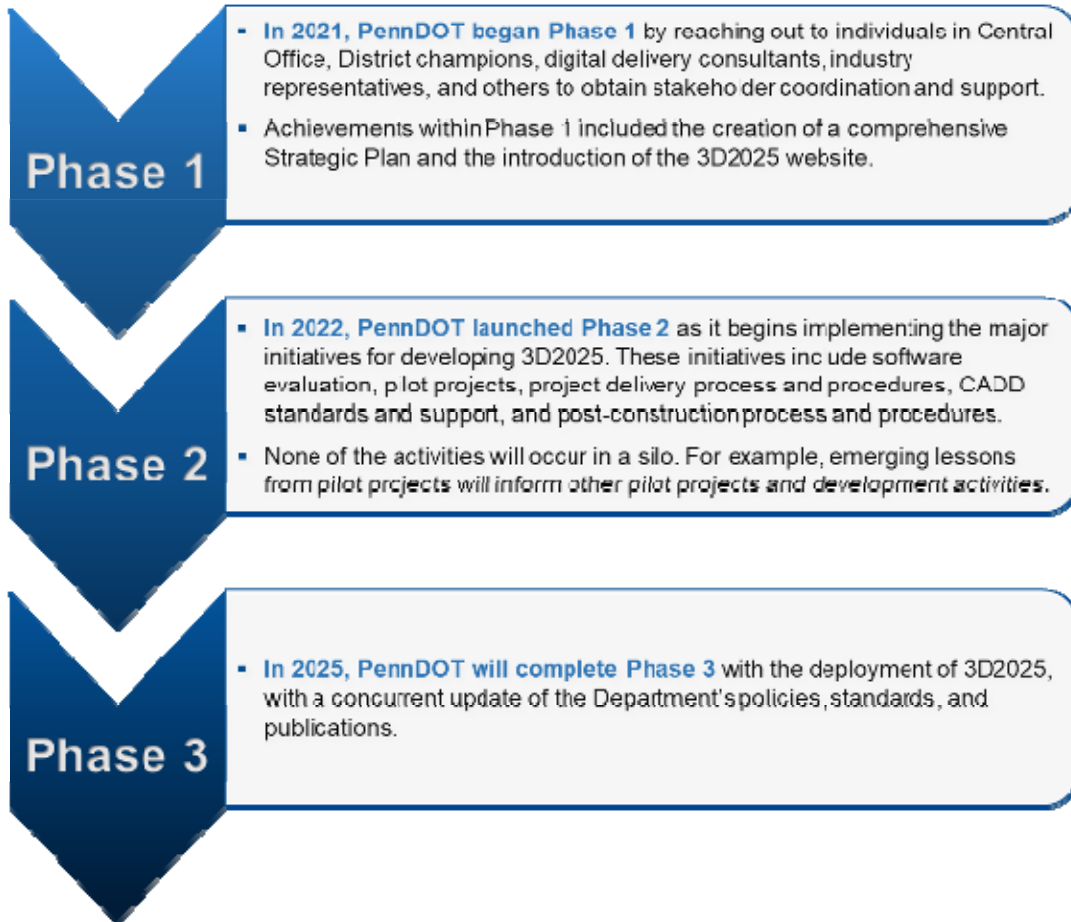
All project elements, including those that would typically be shown on "also plans," will be contained in a digital model with 2D and 3D elements (with attached attributes and references). By selecting these elements, users will easily be able to access 2D representations of traditional details and call-outs, along with relevant calculation data. Additionally, users will have the ability to attach photos, videos, documents, hyperlinks, and other components to model elements.



3D2025 also offers a new way to view, understand, and use project designs in the field. Contractors and construction inspectors will use the digital models on site, collecting digital as-built records to provide an accurate representation of the constructed project. Further, the use of structured, object-oriented data will provide the capability to define the environment in which the structure is situated, aligning contextual data throughout the life cycle of the infrastructure.

How Will 3D2025 Be Implemented?

3D2025 comprises three phases:



Small-Scale Pilot Projects

PennDOT has begun piloting low risk/low complexity projects in its incremental approach to developing and deploying digital delivery. These projects allow the Department to test, monitor, receive feedback, refine, and retest digital solutions. Piloting will continue—and expand in scale—to allow best practices to be incorporated into the implementation guidelines formalized in PennDOT's policy and guidance documents. The overarching objectives of the pilots are to engage the contracting community as partners in defining effective practices for digital delivery and to ensure the viability of 3D2025.

Single Project PDF

The goal of these pilots is to encourage the use of mobile viewing devices and eliminate traditional cut plan sheets. This allows the entire project to be viewed on a single pdf, where layers can be toggled on or off to help the reader better understand the information presented on the plan. The single-project PDF includes items found in traditional plan, specification and estimate (PS&E) submittals.

These projects do not include any requirements for delivering 3D models but will evaluate how contractors use the project PDF and how the PDF can

"I've had the privilege to be traveling about the country for AASHTO events and speaking engagements. No matter where I go, people want to talk to me about our Digital Delivery Directive and their amazement at what we are able to do.

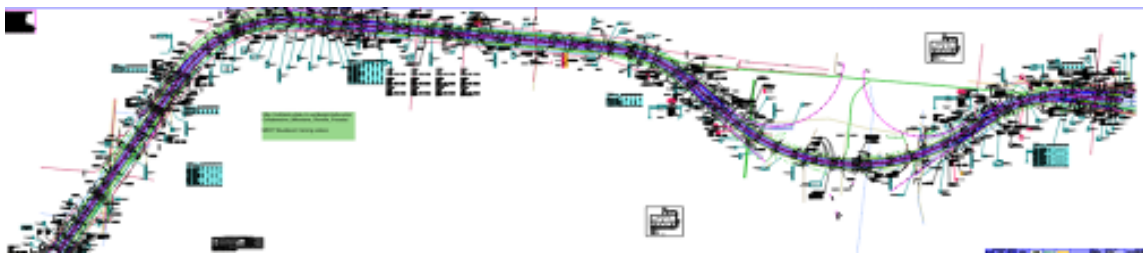
I've been told that we are right there with Utah in being leaders in this space. So I have swelled with pride to tell them of the work that the entire agency, as well as our partners, have put into moving us into this new space.

We've been leaders for quite some time in how we contract electronically (ECMS) and for everything we are doing with eConstruction, so it's natural for us to once again be leaders in how we are changing project delivery to go digital.

Looking forward to

be manipulated. Three Districts are involved with this set of pilots. Projects in Districts 9-0 and 11-0 have been let; the District 5-0 project will be let in early 2023.

More information, including an instructional video, can be found on the [3D2025 page](#) of PennDOT's website.



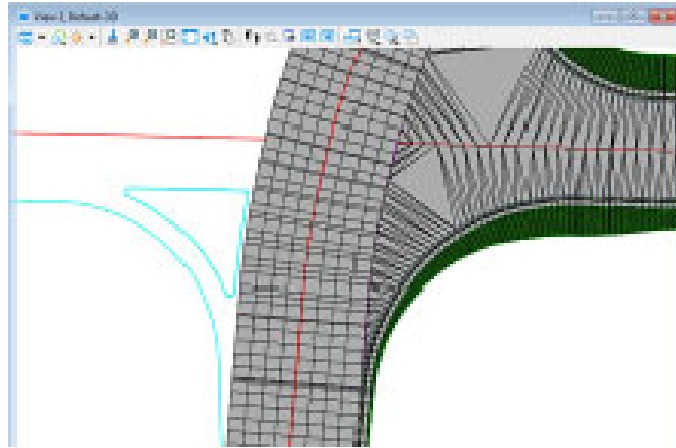
Digital As-Builts

PennDOT is evaluating the best methods for receiving digital as-builts for guideways from contractors. The focus is on collecting information about location (using global positioning system [GPS] coordinates) and geographic information system (GIS) attributes that can easily be imported into the Department's Guideway Maintenance Database. Instead of creating a red-lined plan mark-up, the contractor provides asset information using a PennDOT-designed spreadsheet.

These projects do not include any requirements for delivering 3D models. Rather, the deliverable is the spreadsheet that contains easily importable information about locations and other pertinent data tracked by PennDOT's Central Office. As of June 2021, six pilot projects have been let (one each in Districts 1-0, 4-0, 5-0, 9-0, 10-0, and 12-0).

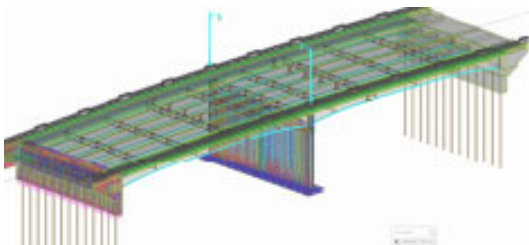
Existing Ground Confidence Level (EGCL) and Roadway Authoring

These projects will evaluate the process of collecting existing survey data, along with developing proposed earthwork models (exported as digital terrain models) that will be delivered to contractors.



The three pilots will provide the earthwork 3D models in place of cross sections. Utilizing OpenRoads Designer® software, project teams will implement new 3D design processes to prepare the digital deliverables. Districts 1-0, 3-0, and 10-0 are participating in this effort, with anticipated let dates in spring of 2023.

Bridge Authoring



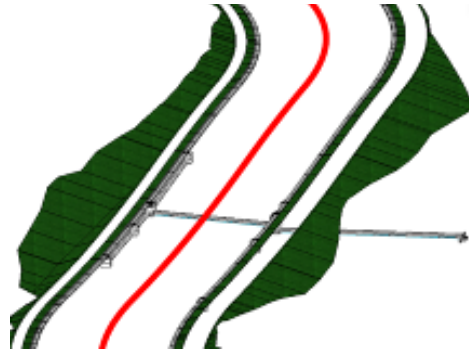
This work focuses on the use of digital means for developing 3D bridge models. PennDOT will pilot this process using OpenBridge Designer® software, which includes analysis, 3D modeling, and detailing tools.

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Two pilot projects in District 1-0 and one in District 4-0 are underway, with anticipated let dates in early 2023.

Drainage Authoring

These projects pilot the development of model-based deliverables, using the OpenRoads Designer® software for the construction of drainage systems and utilities, roadways, and structures. Six pilot projects are underway, with one each in Districts 2-0, 4-0, 5-0, 8-0, 9-0, and 11-0.



The anticipated let dates of these projects are in late 2023 and early 2024.

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Open Data Standards for Better Interoperability

There is no secret that exchanging model-based information between proprietary modeling software platforms is a challenge today. The ability to exchange files between systems is what we call interoperability. Today, we have great interoperability within the same brand of software we use for infrastructure modeling. However, sharing files between different proprietary systems is so cumbersome that in 2019 AASHTO issued a resolution to adopt the Industry Foundation Classes or IFC as the standard data schema for the exchange of electronic engineering data for AASHTO states.

What does this mean in practical terms? To put it simply, IFC is an open, non-proprietary solution that will enable us to exchange files across systems with full data fidelity, which will enhance interoperability. This open-data standard has existed for decades but only to support data exchange for vertical infrastructure (i.e., buildings). The good news is that IFC is being improved to include infrastructure data types (e.g., bridges, roadways). The bad news is that current modeling software has not been certified to ensure full fidelity when exporting/importing IFC files. In the meantime, PennDOT progresses toward fully enacting 3D2025 while considering the future AASHTO IFC standards.

As a supporter of open-data standards and a sponsor of the BIM for Bridges and Structures pooled fund—an effort of 24 state DOTs to develop IFC modeling standard for bridges—PennDOT has started to set requirements for delivering model-based data. The 3D2025 new modeling standard requirements are being incorporated into the software platform the Department uses today to ensure repeatability and long-term sustainability. If a consultant or contractor chooses a different software platform, they will need to meet the required deliverables set by the new standards. It is important to note that files produced by different software platforms are not interchangeable. PennDOT modeling standards will work for today’s projects and will still be relevant in the future when IFC is implemented in all software packages.

Major Changes Coming to *Publication 122M*

With the implementation of 3D2025, mapping of existing ground conditions became an even more critical part of digital delivery design processes. Therefore, in January 2022, the Photogrammetry and Surveys Section teamed with the Bureau of Innovations to accelerate the rewrite of Publication 122M. The goal is to ensure that both project managers and surveyors know how to collect surveying and mapping data, and then enable them to evaluate the confidence levels of the resulting manuals.

The Photogrammetry and Surveys Section expects to issue the updated publication before the end of this year.



Upcoming Events

Monthly PennDOT Digital Delivery Workspace Open Discussion and Update: September 27, 2022, 11 to noon (Recurring monthly on 4th Tuesday)
IHEEP: September 25-29, 2022
APC Fall Seminar: November 16-18, 2022

Resources

Allen S. Melley, P.E.
Chief Digital Delivery Section
Email: amelley@pa.gov
Phone: 717.787.0185

Digital Delivery Email:
RA-PDDigitalDelivery@pa.gov

[Digital Delivery Website](#)



Digital Delivery Workspace Update

PennDOT continues to update CADD and modeling to standardize the digital deliverable. These standards are released quarterly to our internal users and to contractors and other business partners through PennDOT's CADD Resources SharePoint site. Workspace updates are also released quarterly, using "readme" files describing the changes the Department has made. This allows all PennDOT collaborators to evaluate the impact of these changes on their projects.

The most notable changes to the workspace standards were made by PennDOT when migrating from OpenRoads Designer 2020 R3® to OpenRoads Designer 2021 R1®. In particular, OpenRoads Designer 2021 R1® workspace renamed several feature definitions, feature symbology, element templates, and levels.

Because of these changes, PennDOT recommends against migrating OpenRoads® files designed in prior workspaces to future workspaces. However, all future workspaces will be built using these standards to ensure compatibility.