



## WEBINAR SERIES – MODEL DEVELOPMENT STANDARDS (MDS) AND LEVEL OF DEVELOPMENT (LOD) QUESTIONS

Project: TxDOT Digital Delivery Program  
Date: Thursday February 27, 2025 | 9:30 AM – 11:00 AM CST  
Location: Microsoft Teams

QUESTIONS/RESPONSES	
1.	<p>For Conc Paving, will we need to develop the concrete joints as part of the phased construction for the TCP? So, will it need LOD 500? (Philip Barnes)</p> <p>Not at this time. Concrete paving model elements have been classified as LOD 300 because contractors will need additional details for jointing. In general, the Digital Delivery Program (DDP) is still evaluating the LOD classification for phased model elements. The DD pilot projects are testing the requirements and best practices for modeling construction phases. Initially, the emphasis is on modeling earthwork and pavement elements for constructability and quantity take off purposes only.</p> <p>For our first pilot, we modeled the roadway and its two phases, and we are giving the contractor the phased model for reference only. The phased model is a good example of a situation where you might provide a three-dimensional model element, but from a design to construction standpoint, you classify the TCP elements as LOD 200. Construction may have to modify it, but there is value in providing this design information. A lower LOD allows the design team to manage that risk.</p> <p>Regarding LOD classification, think of LOD 500 as the as-built condition or digital twin of what was built. It is the virtual representation of the actual object. From a design perspective, you may never develop an LOD 500 level object. An LOD 400 object is for model elements that they go directly and build it from the model only. General practice is to be cautious of how much information you convey unless it is necessary due to the complexity of the project and staging of your traffic control plan.</p>
2.	<p>Have we tested the new template drop requirements with the various laptops that are in use in the districts? I have a concern that level of fidelity will weigh very heavily on our hardware especially for: (Isaac Stilwell)</p> <p>A. more complex alignments B. non-desktop users and older laptops</p> <p>Most of the TxDOT laptops are the engineering grade Dell laptops and only the engineering laptops have been tested with ORD. We have tried looking at Thinkpads but they did not produce that much more quality or processing power than Dell so this was not a viable option. We have not tested desktops, but the guidance is to reduce the overall corridor model down to a mile or less to help with processing power. Beyond that distance and you run the risk of either crashing the system or corrupting the file. It is undetermined how many desktops are out in engineering use but they would likely be past their warranty date. The goal is for upgrades to occur every two to three years per IT requirements. When TxDOT staff requests a new laptop, then it will have been tested. If there are still a number of desktops, then we need to test those. We are doing our best to make sure that everything in the environment has been tested and works with ORD. For internal TxDOT staff, if you don't know when your warranty date is, it can be found on the asset tag on your computer. If you are past the warranty date, coordinate with ITD to request a new laptop. For other laptop issues, again, reach out to ITD for a new laptop. As far as the template drops, it is the end game. As you develop before a milestone, for example, you can change the setting for less frequency. Once you ready to dive in and finalize, you can move to a more frequent drop.</p>



3. (John Padilla)

- Utilities were shown as being a future effort for MDS, I'm assuming this means that SUE requirements will be changing to include 3D deliverables as standard, correct?

Yes, we are working with our Right of Way/Utility section here at Division to be included as deliverables. We are working through what that looks like for RULIS as well. More conversations are needed because Right of Way division would like to have some of those deliverables included as part of their permitting package in RULIS. We are working on how we convey that information, including GIS features and XML.

- If so, has there been any thought on policy or even legislative changes for UO records requirements--I'm thinking future GIS database(s) for utility information.

We are willing to have more conversations as we move forward with Right of Way division on policy. As of right now, we are not looking to upgrade the TAC rules besides its current language of as-builts and design being required as part of their permit. Within the Digital Delivery Program, each discipline has its own workgroup. The utility workgroup has been helping develop scope for the pilot projects to look at level of development and 3D models.

- While it is important to understand these topics as it will impact the development of project-specific design components, I'm assuming that most of this will be "baked" into delivered WorkSpace so that the resources designers have available will enforce these MDS by default, correct?

That's correct. As the workspace development evolves, the designer's ability to confidently model design elements in 3D increases. The MDS and LOD guidance will be updated to reflect our current capabilities and desired level of development. For example, as 3D cells for traffic elements are developed, the traffic sign supports can move from LOD 200 to LOD 300. TxDOT *may* decide to keep the desired LOD at 200 as a general guidance for a variety of reasons, but project teams have the ability and choice to model to a higher LOD for clash detection (aka interdisciplinary conflicts) or 3D review purposes. Therefore, we want the workspace to support the MDS and LOD, TxDOT to determine the desired LOD, and project teams to have a discussion about when they want to model an element to a higher or lower LOD based on individual circumstances.

- Also, the capability to deliver on some of these LOD requirements will be contingent on the existing conditions models delivered in survey--I'm assuming these are being examined as well?

This goes back to the three-legged stool concept and the accuracy. It is an important element of both the existing condition and the other objects related to the object you are considering. If the existing conditions are lower than an LOD 200, then you cannot create a proposed object greater than LOD 200, even if modeled. If it was modeled, the reliability of how it's going to interact with the existing conditions needs to be verified before it's constructed. This is the accuracy component and the need for consistent survey requirements. There is a National Research project on standardizing survey standards right now, especially with NSRS coming out. This varies from agency to agency.

For digital delivery, it is paramount that the existing terrain received is accurate. The DDP is working with our survey groups, mobile mapping groups, and our remote sensing group on requirements, methods, and verification techniques. Just as engineers sign and seal information, we are working to ground truth our existing surfaces, verifying they were received as intended. An example is verifying initial survey of a project that had been shelved is still accurate to existing conditions. We're building on this. If we do not have great data, we are not going to have a great model to fit on top of the data. It is one of the most important things that we are doing. Ronnie Lackey is the state surveyor. He's working with COGS on developing what those level of standards are because, as an industry, they need to understand to what level accuracy is achievable out in the field. This will correspond to what our LOD when we are in design. It is a tedious process going item by item, bit code by bit code to really understand what level of accuracy meets our needs.



	<p>In addition, the LOD classification may We have talked about a future guidance item that we want to do is project type. Considering, for example, an ADA only project which are often not surveyed. For our summer goal of having model deliverables, this is going to apply to projects that have roadway, paving, grading, and survey.</p>
4.	<p>Can you develop a table that associates alignment curvature (Curve Radius, K-value) to the recommended maximum template drop interval? Is 10' for ALL conditions reasonable? Is it really necessary for a straight Super-2 in flat terrain? (Mort TaShoor)</p> <p>It can be challenging, the more complicated and descriptive that we get. The MDS has a note underneath the stroking tolerances that could be modified at the discretion of the engineer for this type of scope. Super 2 in a fill section would have more dirt work. We might want more frequent interval drops to get a more accurate quantity being pulled from the model. One of the biggest benefits is the ability for us to pull quantities from the models. We see over and under runs on earthwork in construction phase.</p>
5.	<p>Our favorite topic: Utilities. How do we represent 3D underground facilities when we only have Quality Level (QL) C, 2D data? (Philip Barnes)</p> <p>We are working with our Right of Way and Utilities teams to get underground facilities in a better digital format. Currently, we obtain XYs though level C and B data and then assume depths based on the Texas Administrative Code (TAC) rules or through using toned depths. With the assumed depth and horizontal locations, we can then do a conflict analysis.. From the conflict analysis then we can determine locations to get QL A, and get true field verified depths to assign to the utility lines in the model. If we pull the TAC up, it will show the depth representations. In the model the utilities should be notated as a QL C or QL B so that everyone understands this is an assumption of depth, not 100% verified and consider there is some variability.</p> <p>We know to use caution in this situation versus a situation with a relocate and survey at a QLA showing we know everything about it. We can design this and dig relatively close to level A. The way we see SUE and utility coordination is as a living document. If you receive level C, this is your initial step towards completing SUE and following TAC rules to identify it. Going into level B, you might get an assumed depth that would allow you to complete some conflict analysis and identify locations for your level A test holes. Updating at each milestone, your model continues improving through the progress of your PS&amp;E. Our hope is for a more robust system, where we can scan in and complete a LIDAR scan with either an iPhone or using a Trimble system that identifies true level A when the utility is going into the ground. For now, what we are left with is level C is not your final and you should be going towards level B and level A. For the first pilot that let this past January with the San Antonio District, we were able to acquire level A SUE to facilitate the utility modeling. Just because we are delivering utilities in a 3D model, you can still have annotations, call outs, and notes. If your specific project only allows a level C or level B, you can still deliver a 3D model with a note/annotation specifying the level of SUE for that project. SUE quality levels based off of ASCE standard 3822 define whether there is horizontal confidence or horizontal and vertical confidence. Quality level D utilities based off records is an evident challenge that utility engineers will have in terms of depicting something in 3D when quality level D, by definition, is strictly horizontal. Judgments will need to be made in terms of how that line is depicted. Item types and properties for each linear element should have a SUE quality level defined. If you have a line that is quality level D, the attribute or item type noted as quality level D, will help trigger the need to annotate why you're depicting something at a certain depth when it is not based off of the 3822 definition.</p>
6.	<p>On the LOD spreadsheet for Group 3 (Pavement), there is LOD 2 and 3 provided for various specifications. What was used to define these levels? For example, Limestone Rock Asphalt Pavement is 3D but Thin Bonded Friction Course is 2D. The measurements for these mixtures are both the same in the field, so just curious how the LODs were developed. (Greg Cleveland)</p>



	<p>Thin Bonded Friction Course has been proposed as an element that does not need to model in 3D because according to the specification, thickness is negligible, and quantities are measured in plan-view area. This is an example of an element that may be better suited for an attribute to the related pavement material. The reason most are shown are shown as 2D 200 is because they are associated with overlay, micro surfacing, mill and fill type of situation where it might be more beneficial to show as 2D representation. During the development of the LOD spreadsheet, we had a small technical group from various backgrounds ranging from national expertise on LOD and local TxDOT designers. These can classifications are being piloted and can be revised based on input on value for modeling in 3D.</p>
7.	<p>The discussion on accuracy made me curious about changes to the models and how it effects the electronic delivery processes. How will addendums and revisions be handled? (Melandy Smith)</p> <p>We are in the stage of determining how addendums and change orders look like for the models. Our first pilot is underway. SAT FM 1977 did not have any addendums during letting but we did have discussions about how we would approach this. Because of the hashing mechanism, which is the process of essentially assigning a digital fingerprint, like a serial number, we were anticipating that if an addendum was necessary, a bundle of DGNs would require reissue.</p> <p>In the legacy method, a single plan sheet gets clouded and issued. In the case of digital files, you have to grab the entire umbrella of DGNs that are impacted and rehash them, which is analogous to signing and sealing. It's a way to ensure that the responsible engineer can protect that DGN. Although no addendums were issued, we do anticipate change orders once the project breaks ground. As mentioned on a previous webinar, the current expectation is for the design team, in this case design division, to take lead on change orders as a construction phase service.</p> <p>The next focus is looking at as-builts which tie into the accuracy question as well. We are in the early stages of investigating the as-builts. There is an intent that each utility linear element will have attributes, and those attributes are basically defined horizontally and vertically, if possible. They won't be vertical each time. The attributes for material type, owner, size, the way the utility was constructed, etc. will ultimately get vectorized or coded as RULIS will be accepting vectorized information to allow data to be attributed to a GIS platform. There is an extra step, in terms of the workflow model, to get a utility from a CAD model to a GIS platform. The digital delivery program is coordinating through the utility work group which has representatives from the division and districts.</p>
8.	<p>Can the final digital deliverables for the digital delivery pilot project be shared with consultants? A copy of contractor pre bid questions would be helpful to include. (Majed Agha)</p> <p>Yes, final deliverables were posted publicly before letting and should currently be found on PlansOnline. The contractor pre-bid questions should still be posted also.</p>
9.	<p>Circling back to earthwork, ORD currently creates the 3d mesh that we use for end area volumes only vertically, so when we have an extended base material with a vertical section of pavement above (like CRCP) it does not calculate that area between the extended base and the finished grade. Are there plans to address this? (John Harvey)</p>  <p>Our new templates will address vertical faces. We may need to look at it in the workspace. There is a problem with those to create surfaces and it is something we are pushing to remove.</p> <p>If I was going to use this, I would typically do a slight offset if I wanted to eliminate a vertical face. But what I have here is line treatment, cement treatment and flex base beneath a concrete pavement section. We are showing that extended 1 foot beyond the base and 1 foot beyond the concrete pavement. Inside and just above that base material, it does not calculate that small area. There is a tiny area above the</p>



base, below the finish grade, and behind the back of curb that should be embankment but is not calculated and is left out. I spoke to Bentley and they referred to this situation as a cave and said no, they would not calculate earthwork in a cave.

See the webinar series from Tuesday Feb. 25<sup>th</sup>, on the 3D model breakline curation process and the updated roadway ITL and workspace that is being developed to support this work. As the program we continue to get feedback on the new ITL and modeling requirements, we can add guidance in the MDS on how to handle situations like this. This new ITL and workspace are anticipated for release prior to the summer 2025 model deliverable requirements as defined in previous webinars.