LEVEL OF DEVELOPMENT & MODEL ELEMENT BREAKDOWN REPORT

PID No. 122189

VAR-STW CADD 3D Model Development

Submitted to *Office of CADD and Mapping*

June 30, 2025

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Department of Transportation

The environmental review, consultation, and other actions required by applicable Federal environmental laws for this project are being, or have been, carried out by ODOT pursuant to 23 U.S.C. 327 and a Memorandum of Understanding dated December 14, 2020, and executed by FHWA and ODOT.

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Abstract

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ABSTRACT

The Ohio Department of Transportation (ODOT) has advanced its digital project delivery strategy by developing a comprehensive framework for Level of Development (LOD) and Model Element Breakdown (MEB). This initiative supports the broader goals outlined in ODOT's Building Information Modeling (BIM) for Infrastructure Strategic Plan 2024–2026, aiming to enhance collaboration, efficiency, and data-rich design deliverables across the project lifecycle.

The report provides national and international LOD developments, including contributions from AASHTO, ISO 19650, and various state DOTs. ODOT's custom LOD definitions and MEB tools are designed to align with these standards while still addressing state-specific needs.

The report details the structure for ODOT's LOD definitions, which is an organized method to communicate the reliability and detail of 3D model elements at various project stages, ranging from conceptual (LOD 100) to as-built (LOD 500). The emphasis is not solely on geometry or detail but also the usability and confidence in model data for downstream applications, such as estimating, construction, and asset management.

The MEB complements LOD by organizing model elements into standardized categories aligned with ODOT's Construction and Material Specifications (C&MS). A template MEB spreadsheet tool customized for ODOT's policies and procedures has been developed to document model attributes, dimensionality, and measurement methods, ensuring consistency and clarity in digital deliverables.

Recommendations for implementation include expanding task groups, piloting LOD definitions on low-impact projects, developing training and change management strategies, and refining tools based on stakeholder feedback. The ultimate goal of further development is to transition from a plan-centric to a model-centric approach in infrastructure project delivery.

Introduction

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ODOT'S BIM JOURNEY

In 2024, ODOT published the first edition of the BIM for Infrastructure Strategic Plan 2024-2026. This document's goal, building from the earlier Digital Project Delivery Report and Strategic Recommendations, is to create a more robust BIM strategy. Ultimately, ODOT's vision for the BIM for Infrastructure Strategic Plan is to enhance collaboration and efficiency in program delivery through digital processes (ODOT, 2024).

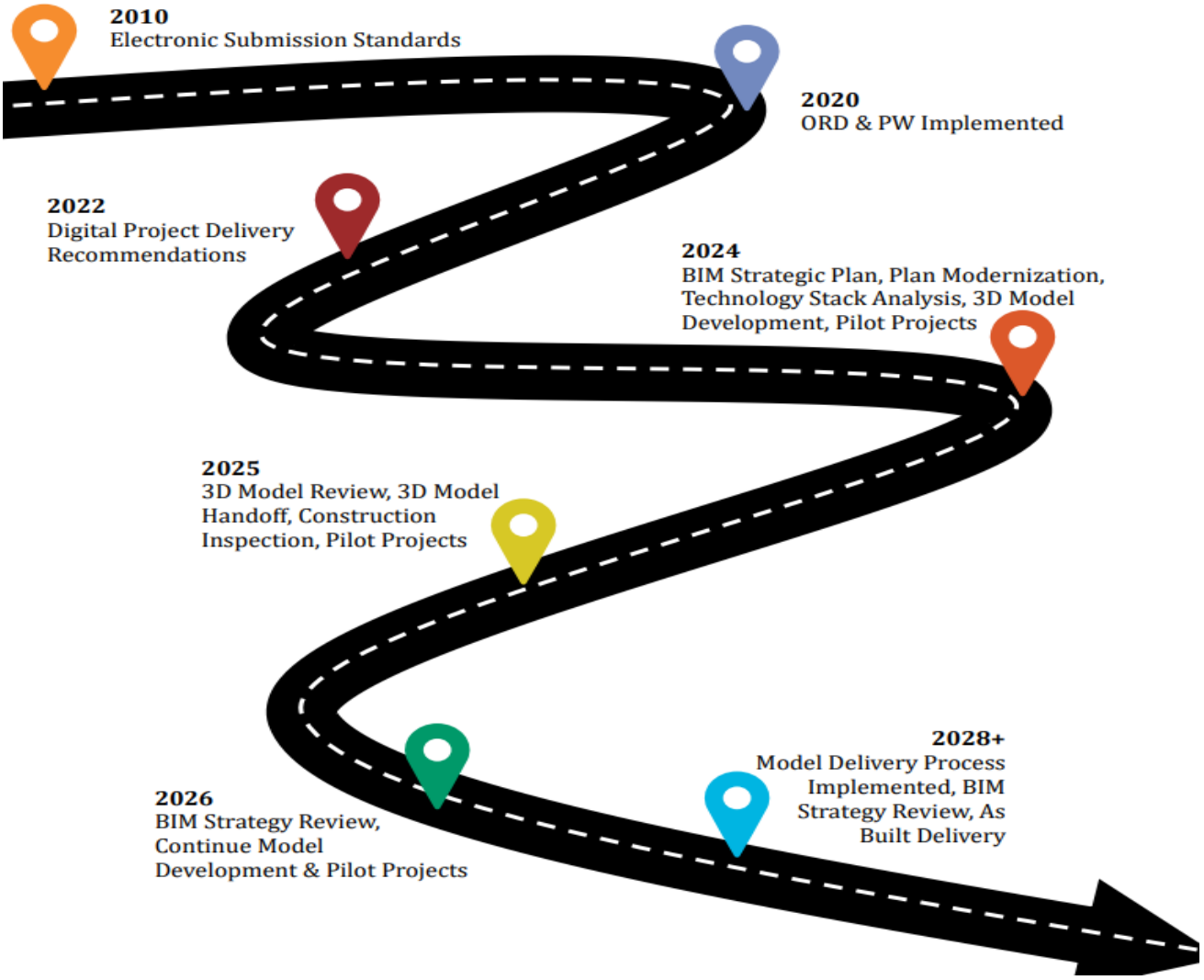

FIGURE 1. ODOT ROADMAP FROM THE BIM STRATEGIC PLAN

In order to achieve this vision, the strategic plan outlined several critical needs:

- A clear understanding of organizational goals and objectives, with a roadmap and within a specified time frame.
- The promotion of teamwork and an integrated perspective that supports OneODOT values.

- The advancement and continual evolvement of the development of BIM 3D modeling authoring tools by inserting metadata required by downstream stakeholders.
- The development of LOD and MEB standards for successful and consistent 3D design model development.
- The advancement and implementation of digital design review, collaboration, and comment resolution tools for all stakeholders to review the 3D design model, significantly reducing or eliminating many plan production efforts.
- Continuous feedback loop through ongoing stakeholder engagements and implementing proper change management practices.

ODOT's BIM for Infrastructure team commissioned this document specifically to develop a structure for LOD and MEB as part of its initiative to standardize advanced 3D modeling. The team also looks to provide data-rich designs through model deliverables for letting, construction, maintenance, and planning.

WHAT IS LEVEL OF DEVELOPMENT?

Clearly communicating design intent, detail, and accuracy within 3D digital models is crucial. BIM-based processes involve sharing design models across disciplines and project phases for coordination; however, assumptions about design intent can pose challenges. To address this, LOD, also known as Level of Information Need (LOIN), is used to communicate the reliability of interpreting model elements at different project stages. It is a method for managing risk by transparently conveying confidence and accuracy during the letting process and standardizing modeling practices during design development.

Generally, LOD is represented on a scale of 100 to 500 (low LOD to high LOD) which provides clarity on the following aspects of model objects:

- Dimensional representation of an object (2D vs. 3D).
- Measurement attributes (size, shape, orientation).
- Reliability of how the model element interfaces with other objects.
- Additional features, such as whether the object has been developed through analysis, provide detail and instructions for fabrication or contain asset information as attributes.

Table 1 provides the American Association of State Highway and Transportation Officials (AASHTO) Joint Technical Committee on Electronic Engineer Standards (JTCEES) Fundamental LOD Definitions which are provided as a starting point for individual DOT development.

TABLE 1. AASHTO JTCEES FUNDAMENTAL LOD DEFINITIONS

LOD	Definition
100	The modeled element is graphically represented in the model with a symbol, derived from a database, or other generic representation. **Size, shape, and orientation cannot** be derived reliably from the model. **Some of the agency's asset information** requirements are included in the element and does not include analysis.
200	The modeled element is graphically represented within the model as a specific system in the **XY plane**. **Size, shape, and orientation can be derived directly** from the modeled element in two dimensions with minimal need for plan sheet notes or dimensions. Some of the agency's asset information requirement are included in the element and may include analysis.
300	The modeled element is graphically represented within the model as a specific system in **the XY and Z plane**. **Size, shape, orientation, and interfaces** with other objects can be derived directly from the modeled element without the need for plan sheet notes or dimensions. The agency's **asset information requirements are included** for the element and includes analysis to the standard of care for that element.
400	The modeled element is graphically represented within the model as a specific system in the XY and Z plane. **Size, shape, orientation, interfaces with other objects, means and methods, and fabrication instructions** can be derived directly from the modeled element which includes sub-elements. The agency's asset **information requirements are included** for the element.
500	The modeled element is graphically represented within the model as a specific system in the XY and Z plane. Size, shape, orientation, interfaces with other objects, and fabrication instructions can be derived directly from the modeled element. This represents the **Digital Twin** of the constructed asset. **Major transportation asset class attributes are linked to the modeled elements**. **Modeled objects or assets are useable** and updatable by all stakeholders.

It is also important to understand that LOD is *not*:

- Only level of detail.
- Only about geometry.
- Only about accuracy.
- A measure of quality.

The MEB is the organization of elements within a 3D digital model and their LOD at different submissions, or stages, within the project lifecycle. It also groups elements into categories and classes which further standardizes BIM implementation. Through MEB tools, LOD can be communicated to downstream users. Table 2 provides an example of a Texas DOT MEB tool providing the grouping, Construction Specification Number, name, LOD, and other required model element attributes for Roadway Illumination Assemblies.

TABLE 2. TEXAS DOT MEB TOOL EXAMPLE

Group 6 - Lighting, Signing, Markings, and Signals						
Specification Number	Model Element Name	Included in Project?	LOD	2D/3D	Required Data Attributes	Required Data Attributes2
610	Roadway Illumination Assemblies	yes	200	2D	Pay item, number, units and quantity information	Alignment, station and offset information

WHY IS LOD IMPORTANT?

LOD is essential for clarity and consistency in BIM workflows. It helps project teams articulate the progression of model elements, ensuring that stakeholders understand the usability and limitations of the data they receive. Without LOD, misinterpretations can lead to costly errors and inefficiencies.

Specifically for DOTs, LOD plays a crucial role in infrastructure projects. DOTs increasingly use BIM to improve project delivery, asset management, and lifecycle planning. LOD ensures that transportation agencies can rely on BIM models for use cases, including 3D digital design review and coordination, model-based estimating and bidding, digital construction inspection, and more.

LOD Background

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NATIONAL AND INTERNATIONAL DEVELOPMENTS

Various national and international initiatives focus on standardizing the LOD framework, providing valuable insights for comparing approaches among DOTs. Below is a list of several key organizations, both domestic and global, that actively engage in and contribute to discussions on LOD-related topics.

- AASHTO
- ISO 19650 LOIN
- National Institute of Building Sciences (NIBS)
- BuildingSMART
- Highway Engineering Exchange Program

AASHTO's JTCEES played a key role in developing an LOD framework designed to help agencies align their efforts around standardized fundamental definitions for transportation projects (AASHTO 2022). This framework provides essential tools to support consistency and collaboration in LOD initiatives as listed below:

- AASHTO JTCEES LOD Status Report provides an explanation of the LOD framework tools.
- MEB and LOD Intended Use explains how the LOD framework is intended to be used.
- JTCEES LOD Fundamental Definitions provides an initial grouping of fundamental definitions as a starting point for states. See Table 1.
- JTCEES-ACEC MEB Template can be used as a starting point to communicate the LOD to a downstream user while also grouping elements into categories and classes.
- BIM for Infrastructure Webinar Series which includes a webinar on the Level of Development Document.

The ISO 19650 LOIN was established in the United Kingdom, leveraging a well-developed BIM standard centered on Organizational Information Requirements (OIR). The following requirements are designed to support OIR in accordance with ISO 19650:

- Asset Information Requirements (AIR) relate to the operation and maintenance of an asset.
- Project Information Requirements (PIR) contribute to project development and delivery.
- Exchange Information Requirements (EIR) relate to the information needs of a particular exchange (i.e., Design to Construction).

The LOIN concept was developed alongside the AASHTO JTCEES LOD framework to integrate information requirements with the geometric and accuracy needs of an element. As states progress through the Federal Highway Administration's (FHWA) Advancing BIM for Infrastructure National Strategic Roadmap levels of BIM Maturity (FHWA, 2021), these Information Requirements are expected to evolve, further refining the AIR for specific exchanges or EIRs.

NIBS has released NBIMS Version 4, which embraces international principles and categorizes LOD into level of accuracy, level of detail, and level of information, aligning with the LOIN concept.

BIMForum has joined the Building Committee of the BuildingSMART USA chapter and continues to refine its LOD Specification. Feedback from AASHTO JTCEES was first incorporated into the LOD-Spec-2023 but still presents challenges in delivering Model as Legal Document outcomes. Ongoing collaboration is expected as states explore the AASHTO JTCEES LOD Fundamental Definitions and apply them to their standards, processes, and priority use cases.

STATE DEVELOPMENTS

State-specific LOD developments center on implementing LOD to enhance digital delivery standards established by the DOT. These efforts offer a practical framework for conveying 3D modeling, digital project delivery, digital construction, and asset management. The following states have contributed to the AASHTO JTCEES LOD initiative:

- Arizona (ADOT)
- Connecticut (CTDOT)
- Florida (FDOT)
- Georgia (GDOT)
- Iowa (Iowa DOT)
- Kansas (KDOT)
- Maine (Maine DOT)
- Michigan (MDOT)
- North Carolina (NCDOT)
- Pennsylvania (PennDOT)
- Tennessee (TDOT)
- Texas (TxDOT)
- Utah (UDOT)
- Vermont (VTrans)

Additionally, many states are developing or have implemented LOD standards which are based on national efforts but customized to their needs. Appendix A provides a list of these DOT-developed standards and links to the content where applicable.

ODOT Base LOD Framework

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BASE LOD DEFINITIONS

Similar to other DOTs, ODOT has started developing their own framework and structure, building on the work from AASHTO JTCEES and others. Below are the working custom LOD definitions which identify the specific content requirements for each Model Element at five levels of confidence: LOD designation 100 through 500. As the LOD increases, the definitions build on the previous level and include all the characteristics of previous levels through LOD 500. For a Model Element to qualify for a target LOD, it must include all items listed in the LOD description and LOD matrix.

LOD 100

The modeled element is graphically represented in the model as a generic line, point, symbol typically derived from a Linear Referencing System (LRS) database or incidental pay item. Size, shape, and orientation cannot be derived reliably from the model. Generally historical agency asset information is included in the element and does not include analysis.

Example: Standard strain pole symbol in a 2D cell in which specific type is not provided.

LOD 200

The modeled element is graphically represented within the model as a specific system in the 2-dimensional plane. Size, shape, and orientation can be derived directly from the modeled element in two dimensions with minimal need for notes or dimensions. Some of the agency's exchange information requirements are included as noted in the element and may include analysis.

Example: Pavement markings accurately provided in 2D with length, width and color.

LOD 300

The modeled element is graphically represented within the model as a specific system in the 3-dimensional plane. Size, shape, orientation, and interfaces with other external objects can be derived directly from the modeled element in 3 dimensions. The agency's exchange information requirements are included as noted for the element and includes typical standard of care analysis for that element.

Example: Asphalt concrete modeled in 3D with accurate pavement limits and depths based on design.

LOD 400

The modeled element is graphically represented within the model as a specific system in the 3-dimensional plane. Size, shape, orientation, interfaces with other internal and external objects, and fabrication instructions can be derived directly from the modeled element which includes sub-elements. The agency's exchange information requirements are included for the element.

Example: Concrete foundation with reinforcement size and spacing modeled interfacing with the connecting elements for a pier column on a bridge.

LOD 500

The modeled element is graphically represented within the model as a specific system in the 3-dimensional plane. Size, shape, orientation, interfaces with other internal and external objects, and digital as-built (DABs) information can be derived directly from the modeled element which includes sub-elements. The agency's asset information requirements are included for the element.

Example: Adding specific supplier/manufacturer luminaire model and metadata in construction.

TABLE 3. LOD DEFINITION MATRIX

LOD	LRS Location	2D Planar Location	3D Location	Size	Shape	Orientation	Interfaces with other objects		Fabrication Information	Digital As-Built Information	Asset Exchange Information	Element Analysis
							External	Internal				
500	•	•	•	•	•	•	•	•	•	•	•	•
400	•	•	•	•	•	•	•	•	•		•	•
300	•	•	•	•	•	•	•				•	•
200	•	•		•	•	•					•	
100	•											

The above definitions and matrix provide general direction and are general descriptions of how the elements are provided in the model environment. There are additional considerations for exceptions and incidental items which are necessary to fully describe the framework. Further direction and detail are provided in the following section and in the appendices for customization by elements.

MEB TOOL DEVELOPMENT

In addition to the LOD definitions and matrix, ODOT has developed a template MEB spreadsheet. The MEB is broken into groups corresponding to ODOT's C&MS:

- CMS 200: Earthwork
- CMS 300: Subgrade Treatments and Base
- CMS 400: Surface Courses and Pavements
- CMS 500: Structures
- CMS 600: Incidentals (Linear Elements, Lighting, Signs, Traffic Signals)
- CMS 640: Pavement Marking

- CMS 650: Roadsides

The intent for this tool is for design teams to refer to the guidance provided and document the model development to ensure model elements meet target LOD thresholds. This tool, either fully or in part, is also provided as project-specific documentation to the contractor when model files are included as part of the construction package.

MEB Information Provided

The MEB spreadsheet tool instructions and template are provided in Appendix B. The information below is provided for each grouping of model elements.

Spec Number

Specification number(s) associated with the given model element. The project team should ensure that the specifications listed match the final letting package and include all applicable specifications.

Model Element

Model elements are design components that are categorized by similar design modeling techniques and/or construction specification requirements. Each model element possesses geometric representation and metadata that define its properties, such as materials, dimensions, and performance characteristics.

Method of Measurement

Lists the units used for measuring the element.

LOD Minimum

The minimum LOD for the model element as defined by ODOT.

2D/3D

Describes the dimensional representation of the element.

Reference Specification Number(s)

The project team should ensure that the specifications listed match the final letting package and include all applicable specifications. See Appendix B for more information and examples.

Attached Model Elements

Refers to design elements that are quantities as part of another model element but not modeled separately.

Comments/Notes

Any additional information needed including detail for how the element is measured to ensure accuracy when modeling and estimating. The project team should refer to the C&MS for additional notes not listed.

Recommendations for Further Development

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The initial versions of the LOD and MEB tables can now be leveraged for further collaboration and project-based communication. This will shift the project design focus from a plan-centric approach to a model-centric approach to prepare ODOT for digital project delivery. This section will cover the recommended next steps that ODOT can take as they implement the LOD and MEB tables.

WORK/TASK GROUPS

The current Work/Task Groups can be expanded to include additional work groups or subgroups for the seven primary sections of the MEB table that correspond to the CMS sections. Outcomes of these groups would include:

1. Development of the structures MEB table for the CMS 500 Structures Group.
2. Review of the LOD for the elements under each section through a series of structured brainstorming sessions to capture any adjustments that may be needed.
3. Validation of the LOD definitions and elements under each section through pilot testing on projects that would have minimal impact on effort (i.e., prior to 30%). The objective would be to have a clear understanding of the LOD for the final for information only deliverables.
4. Repeat steps 2 and 3 when the milestone LOD is developed.
5. Establish an ongoing resource for implementation feedback.

CHANGE MANAGEMENT

Change management will be a critical part of LOD adoption requiring a key message to align users to a consistent understanding of the purpose and expectations. The Work/Task Groups established can serve as the foundation for establishing change. Education and Training can then be delivered to establish clear expectations.

EDUCATION AND TRAINING

An initial effort will be to develop a short video to educate users on how LOD will be used for ODOT projects. National and other state materials can be used to provide structure to a message that specifically relates to ODOT.

Training should be developed for internal and external users on how to use LOD and the MEB table through a BIM Execution Plan template customized for project-specific content and other tools to streamline communication with the downstream user.

ESTABLISH EXPECTATIONS

Clear expectations and the benefits of using LOD and MEB to understand the digital delivery process will be necessary. At minimum, messages and engagement strategies should be developed for the following groups and can build on the Training Deployment Strategy.

- ODOT Design/Reviewers
- ODOT Estimators
- ODOT Construction
- Consultants
- Contractors
  - BIM Managers
  - Estimators
  - Sub-contractors
  - Field Personnel

ADDITIONAL DEVELOPMENT

The following list describes items that should be developed as part of the next steps.

1. Determine LOD at different milestones and then use the work groups to review and validate. This could include general design/construction milestones (30, 60%, 90%, Final Submission, and As-built) and/or specific interim project submissions for permitting, foundations, etc.
2. Develop a template BIM Execution Plan as the communication tool for each project that includes roles and responsibilities, where project information can be found, and how the LOD and MEB will be used for the projects and to manage expectations.
3. Create an LOD/MEB feedback form to help consolidate and track responses and identify common needs.
4. Update Workspace to incorporate LOD/MEB (e.g., Item Type additions). See Appendix C for more information.
5. Develop a training deployment strategy focused on LOD and MEB.
6. Investigate Fee Guidance updates based on LOD/MEB modeling direction.

References

Ohio Department of Transportation

AASHTO Committee on Design – Joint Technical Committee on Electronic Standards. (2022). *Model as Legal Document Maturity Framework (Draft)*. Accessed May 15, 2025. https://transportation.org/design/wp-content/uploads/sites/31/2023/04/AASHTO-JTCEES-MALD-Maturity-Model-3-2023.pdf

Federal Highway Administration (FHWA). (2021). *Advancing BIM for infrastructure: National strategic roadmap* (Report No. FHWA-HRT-21-064). https://doi.org/10.21949/1521637

Ohio Department of Transportation (ODOT). (2024). *BIM for Infrastructure Strategic Plan 2024-2026*. https://www.transportation.ohio.gov/wps/wcm/connect/gov/840b407b-4deb-4b12-b96a-4fd6ffe568b7/BIM+Strategic+Plan+20242026.pdf?MOD=AJPERES&CONVERT_TO=url&CACHEID=ROOTWORKSPACE.Z18_79GCH8013HMOA06A2E16IV2082-840b407b-4deb-4b12-b96a-4fd6ffe568b7-ptpsYKe.

Appendices

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APPENDIX A: DOT LOD REFERENCES

DOT LOD References

Agency	Org. Level	Document Name	Source	Website	Description
CALTRANS	State	Project Delivery (PD) Directives	Website	link	Caltrans webpage on Project Delivery Directives; issued to provide direction and guidance on project delivery policies, standards and best practices.
FDOT	State	FDOT Digital Delivery Training Manual	PDF	link	Digital Delivery Program and Process. Digital Certificate.
IowaDOT	State	Digital Delivery Vision, Plan, Grants, Training, and Resources	Website	link	Transition to 3D based digital delivery, Road & Bridge Design Best Practice Workflows, project implementation.
IowaDOT	State	BIM for Bridges and Structures	Website	link	The purpose of the TPF-5(372) BIM for Bridges and Structures Pooled Fund.
IowaDOT	State	Statewide Strategy for Digital Delivery of Infrastructure	Website	link	Focus on developing consistent digital deliverables, supporting new tools, leveraging existing technology, managing assets, and implementing data management processes.
IowaDOT	State	Creating New Open Standards to Allow for Widespread Use of BIM in the U.S. Bridge Industry	Website	link	Developing a process and standards for designers to export their plans and pass to contractors.
MDOT	State	BIM for Infrastructure – Michigan DOT's Path to Digital Delivery	PDF	link	Webinars on MDOT's DD efforts and pilot project program; includes benefits, model details/information provided to contractor, etc.
NYSDOT	State	NYS DOT Digital Delivery Interim Guidance Document	PDF	link	New York State DOT's interim guidance for Digital Delivery including LOD table, hardware/software recommendations, digital design review, best practices, and pilot project summaries.

Agency	Org. Level	Document Name	Source	Website	Description
PennDOT	State	Digital Delivery Directive 2025	Website	link	Overview of Digital Delivery initiative by 2025; webpage discusses webpage discusses design quality improvements, reduced risks, costs and delays, construction efficiencies and improve as-builts. Additional links on the page provide additional content on pilot projects, ADCMS grant, FAQ and terms, recorded webinars, strategic plan, and additional resources.
PennDOT	State	Digital Delivery Directive 2025 Final Strategic Plan	PDF	link	This strategic plan to implement the processes, technology, and workforce development needed to execute the Digital Delivery Directive 2025 (3D2025).
UDOT	State	UDOT Digital Delivery	Webpage	link	Overview of Digital Delivery education and general resources as well as UDOT specific content such as model guidance, field tools, and digital twin strategic plan.
UDOT	State	UDOT Digital Delivery	PDF	link	Model development and delivery standards for roadway design and other disciplines, including LOD tables and implementation.

APPENDIX B: ODOT LOD/MEB TEMPLATE SPREADSHEET

ODOT Level of Development (LOD)

OVERVIEW

The LOD spreadsheet communicates the design intent behind the level of development for a given model element. See LOD Definitions tab for descriptions of levels of LOD 100, 200, 300, 400, and 500. The LOD Spreadsheet should be provided to the contractor to communicate the dimensional confidence of a given model element as well as the reliance of additional details for construction.

A Model Element Breakdown (MEB) is provided corresponding to the 7 groups outlined in the ODOT Construction and Material Specifications (C&MS).

CMS 200: Earthwork
CMS 300: Subgrade Treatments and Base
CMS 400: Surface Courses and Pavements
CMS 500: Structures
CMS 600: Incidentals (Linear Elements, Lighting, Signs, Traffic Signals)
CMS 640: Pavement Marking
CMS 650: Roadsides

LEVEL OF DEVELOPMENT (LOD) DEFINITIONS

The following LOD definitions identify the specific content requirements for each Model Element at five levels of confidence: LOD designation 500 through 100. LOD 500 is the highest level of development and 100 is the lowest. As the LOD increases, the definitions build on the previous level and includes all the characteristics of previous levels through LOD 500. For a Model Element to qualify for a target LOD, it must include all items listed in the LOD description and LOD matrix. All parties shall agree to utilize the five Levels described below in completing/modifying the Model Element Table, which establishes the required LOD for each element at each phase of the project.

LOD	LRS Location	2D Planar Location	3D Location	Size	Shape	Orientation	Interfaces with other objects		Fabrication Information	Digital As-Built Information	Asset Exchange Information	Element Analysis
							External	Internal				
500	●	●	●	●	●	●	●	●	●	●	●	●
400	●	●	●	●	●	●	●	●	●		●	●
300	●	●	●	●	●	●	●				●	●
200	●	●		●	●	●					●	
100	●											

LOD 100

The modeled element is graphically represented in the model as a generic line, point, symbol typically derived from a Linear Referencing System (LRS) database or incidental pay item. Size, shape, and orientation cannot be derived reliably from the model. Generally historical agency asset information is included in the element and does not include analysis.

LOD 200

The modeled element is graphically represented within the model as a specific system in the 2-dimensional plane. Size, shape, and orientation can be derived directly from the modeled element in two dimensions with minimal need for notes or dimensions. Some of the agency's exchange information requirements are included as noted in the element and may include analysis.

LOD 300

The modeled element is graphically represented within the model as a specific system in the 3-dimensional plane. Size, shape, orientation, and interfaces with other external objects can be derived directly from the modeled element in 3 dimensions. The agency's exchange information requirements are included as noted for the element and includes typical standard of care analysis for that element.

LOD 400

The modeled element is graphically represented within the model as a specific system in the 3-dimensional plane. Size, shape, orientation, interfaces with other internal and external objects, and fabrication instructions can be derived directly from the modeled element which includes sub-elements. The agency's exchange information requirements are included for the element.

LOD 500

The modeled element is graphically represented within the model as a specific system in the 3-dimensional plane. Size, shape, orientation, interfaces with other internal and external objects, and digital as-built (DABs) information can be derived directly from the modeled element which includes sub-elements. The agency's asset information requirements are included for the element.

ODOT Level of Development (LOD)

MODEL ELEMENT BREAKDOWN

Spec Number

Specification number(s) associated with the given model element. The project team should ensure that the specifications listed match the final letting package and include all applicable specifications.

Model Element

Model elements are design components that are categorized by similar design modeling techniques and/or construction specification requirements. Each model element possesses geometric representation and metadata that define its properties such as materials, dimensions, and performance characteristics.

Method of Measurement

Lists the units used for measuring the element.

LOD Minimum

The minimum LOD for the model element as defined by the Department.

2D/3D

Describes the dimensional representation of the element.

Method of Measurement Notes

Provides any additional detail for how the element is measured to ensure accuracy when modeling and estimating. The project team should refer to the C&MS for additional notes not listed.

Reference Specification Number(s)

The project team should ensure that the specifications listed match the final letting package and include all applicable specifications, standard construction drawings, or supplemental specifications.

Attached Model Elements

Refers to design elements that are quantities as part of another model element and but not modeled separately.

Comments/Notes

Any additional information needed.

Elements of Model with No Pay Item										
Specification Number	Model Element Name	Method of Measurement	Included in Project?	LOD Minimum	2D/3D	Reference Specification Number(s)	Comments/Notes	Modeling Criteria		
								60% Submission	90% Submission	Final Federated Model
N/A	Geometry - Horizontal	N/A	Yes	300	3D	441-443, 452	Child of pavement. Could be lower level for concepts.			
N/A	Geometry - Vertical	N/A	Yes	300	3D	441-443, 452	Child of pavement. Could be lower level for concepts.			
N/A	Geometry - Superelevation	N/A	Yes	300	2D	441-443, 452	Child of pavement. Could be lower level for concepts.			
N/A	Construction Limits	N/A	Yes	300	3D					
N/A	Drainage Areas	N/A	Yes	300	2D		Child of inlet of catch basin.			
N/A	Lighting Photometrics	N/A	Yes	200	2D		Child of luminaire.			
N/A	Turning Templates / Fastest Path	N/A	Yes	200	2D		Child of intersection			
N/A	Maps for Utility Coordination	N/A		N/A	N/A		Would use SUE level indications			
N/A	Sign Design Files	N/A	Yes	200	2D		Child of traffic signs			
N/A	Structural Calcs	N/A	Yes							
N/A	Design Exceptions	N/A	Yes	100	N/A					
N/A	ADA Waivers	N/A		100	N/A		Child of curb ramp			
N/A	Guardrail Calcs	N/A	Yes	200	2D		Child of guardrail			
N/A	Airway/Highway Clearance	N/A		100	N/A					
N/A	Temporary Access Fill (TAF) Reports	N/A		100	N/A					

CMS 200 - Earthwork										
Specification Number	Model Element Name	Method of Measurement	Included in Project?	LOD Minimum	2D/3D	Reference Specification Number(s)	Comments/Notes	Modeling Criteria		
								60% Submission	90% Submission	Final Federated Model
201	Clearing and Grubbing	EACH, LS	Yes	NA/100	NA	105, 203, 666	Child of Construction Limits. Perform Clearing and Grubbing within entirety of Construction Limits.	Preliminary construction limits.	Refined construction limits.	Final construction limits.
	Tree Removed, __ Size	*EACH*	*No*	*100*	*2D*	-	*Place X cell on existing tree cells to be removed.*	-	-	-
	Stump Removed, __ Size	*EACH*	*No*	*100*	*2D*	-	*Place X cell on existing stump cells to be removed.*	-	-	-
202	Removal of Structures and Obstructions	FT, SF, SY, CY, LB EACH, LS	Yes	200	2D	105, 109, 203, 204, 501, 611	Place either: X cell, line representing removal limits, or hatched area shape representing removal limits on item to be removed.	-	-	-
-	*Structure Removed*	*LS*	*No*	*200*	-	-	-	-	-	-
-	*Portions of Structure, Removed*	*LS, CY, LB*	*No*	*200*	-	-	-	-	-	-
-	*Pipe Removed for Reuse or Storage*	*FT*	*No*	*100*	-	-	-	-	-	-
-	*Pipe Removed*	*FT*	*Yes*	*100*	-	-	-	-	-	-
-	*Asbestos Pipe Removed*	*FT*	*No*	*100*	-	-	-	-	-	-
-	*Pavement Removed*	*SY*	*Yes*	*200*	-	-	-	-	-	-
-	*Wearing Course Removed*	*SY*	*No*	*200*	-	-	-	-	-	-
-	*Walk Removed*	*SY*	*No*	*200*	-	-	-	-	-	-
-	*Steps Removed*	*LS, FT*	*No*	*200*	-	-	-	-	-	-
-	*Curb Removed*	*FT*	*No*	*200*	-	-	-	-	-	-
-	*Curb and Gutter Removed*	*FT*	*No*	*200*	-	-	-	-	-	-
-	*Gutter Removed*	*FT, SY*	*No*	*200*	-	-	-	-	-	-
-	*Concrete Median Removed*	*SY*	*No*	*200*	-	-	-	-	-	-
-	*Concrete Barrier Removed*	*FT*	*No*	*200*	-	-	-	-	-	-
-	*Concrete Slope Protection Removed*	*SY*	*No*	*200*	-	-	-	-	-	-
-	*Building Demolished*	*LS*	*No*	*100*	-	-	-	-	-	-
-	*Underground Storage Tank Removed*	*EACH*	*No*	*100*	-	-	-	-	-	-
-	*Regulated Underground Storage Tank Removed*	*EACH*	*No*	*100*	-	-	-	-	-	-
-	*Septic Tank Removed*	*EACH*	*No*	*100*	-	-	-	-	-	-
-	*Privy Vault Removed*	*EACH*	*No*	*100*	-	-	-	-	-	-
-	*Guardrail Removed*	*FT*	*No*	*200*	-	-	-	-	-	-
-	*Guardrail Removed for Reuse or Storage*	*FT*	*No*	*200*	-	-	-	-	-	-
-	*Fence Removed for Reuse or Storage*	*FT*	*No*	*200*	-	-	-	-	-	-
-	*Manhole Removed*	*EACH*	*No*	*100*	-	-	-	-	-	-
-	*Manhole Abandoned*	*EACH*	*No*	*100*	-	-	-	-	-	-
-	*Catch Basin or Inlet Removed*	*EACH*	*Yes*	*100*	-	-	-	-	-	-
-	*Catch Basin or Inlet Abandonded*	*EACH*	*No*	*100*	-	-	-	-	-	-
203	Roadway Excavation And Embankment	CY, TON	Yes	300	3D	104, 105, 109, 201, 202, 208, 209, 623, 659	Current volume FDs are on Construction class, so they do not sync to IC.	Volume based on prelminary grading limits.	Volume based on refined grading limits.	Volume based on final grading limits.
-	*Excavation*	*CY*	*Yes*	-	-	-	-	-	-	-
-	*Embankment*	*CY*	*Yes*	-	-	-	-	-	-	-
-	*Granular Embankment*	*CY, TON*	*No*	-	-	-	-	-	-	-

CMS 200 - Earthwork										
Specification Number	Model Element Name	Method of Measurement	Included in Project?	LOD Minimum	2D/3D	Reference Specification Number(s)	Comments/Notes	Modeling Criteria		
								60% Submission	90% Submission	Final Federated Model
-	*Granular Material, Type ____*	*CY, TON*	*No*	-	-	-	-	-	-	-
-	*Borrow*	*CY, TON*	*No*	-	-	-	-	-	-	-
-	*Rock*	*CY, TON*	*No*	-	-	-	-	-	-	-
204	Subgrade Compaction And Proof Rolling	SY, CY, HOUR	Yes	300	3D	203, 703, 712	-	Varies	Varies	Varies
-	*Subgrade Compaction*	*SY*	*Yes*	-	-	-	-	*Area based on preliminary pavement limits.*	*Area based on refined pavement limits.*	*Area based on final pavement limits.*
-	*Proof Rolling*	*HOUR*	*Yes*	-	-	-	-	*Area based on preliminary pavement limits. Attribute for application rate (hours per SY).*	*Area based on refined pavement limits. Attribute for application rate (hours per SY).*	*Area based on final pavement limits. Attribute for application rate (hours per SY).*
-	*Excavation of Subgrade*	*CY*	*Yes*	-	-	-	-	*Assumed depth over entire preliminary pavement limits.*	*Area and depth based on final geotech report.*	*Area and depth based on final geotech report.*
-	*Embankment*	*CY*	*No*	-	-	-	-	*Assumed depth over entire preliminary pavement limits.*	*Area and depth based on final geotech report.*	*Area and depth based on final geotech report.*
-	*Granular Embankment*	*CY*	*No*	-	-	-	-	*Assumed depth over entire preliminary pavement limits.*	*Area and depth based on final geotech report.*	*Area and depth based on final geotech report.*
-	*Granular Material Type ____*	*CY*	*Yes*	-	-	-	-	*Assumed depth over entire preliminary pavement limits.*	*Area and depth based on final geotech report.*	*Area and depth based on final geotech report.*
-	*Geotextile Fabric*	*SY*	*Yes*	-	-	-	-	*Area based on preliminary pavement limits.*	*Area based on final geotech report.*	*Area based on final geotech report.*
-	*Geogrid*	*SY*	*No*	-	-	-	-	*Area based on preliminary pavement limits.*	*Area based on final geotech report.*	*Area based on final geotech report.*
205	Chemically Stabilized Embankment	CY, TON, LS	No	300	3D	203, 499, 701, 703, 712	-	Assumed depth over entire preliminary pavement limits.	Area and depth based on final geotech report.	Area and depth based on final geotech report.
206	Chemically Stabilized Subgrade	SY, TON, HOUR, LS	No	300	3D	203, 204, 499, 701, 702, 712	-	Assumed depth over entire preliminary pavement limits.	Area and depth based on final geotech report.	Area and depth based on final geotech report.
208	Rock Blasting	SY, LS	No	NA	NA	107, 109, 703	Quantity comes from notes and is not included in model.	NA	NA	NA
209	Linear Grading	FT, STA, MILE, CY, TON	No	NA	NA	105, 109, 203, 204, 617	Quantity comes from notes and is not included in model.	NA	NA	NA
-	*Linear Grading*	*STA, MILE*	*No*	-	-	-	-	-	-	-
-	*Ditch Cleanout*	*FT*	*No*	-	-	-	-	-	-	-
-	*Reshaping Under Guardrail*	*STA, MILE*	*No*	-	-	-	-	-	-	-
-	*Preparing Subgrade for Shoulder Paving*	*STA, MILE*	*No*	-	-	-	-	-	-	-
-	*Borrow*	*CY, TON*	*No*	-	-	-	-	-	-	-
251	Partial Depth Pavement Repair	SY, CY	No	NA	NA	202, 407, 449, 702, 705	Quantity comes from notes and is not included in model.	NA	NA	NA
252	Full Depth Rigid Pavement Removal And Flexible Replacement	FT, SY	No	NA	NA	255, 301, 401, 441, 442, 449, 702, 705	Quantity comes from notes and is not included in model.	NA	NA	NA
253	Pavement Repair	SY, CY	No	NA	NA	202, 401, 449, 702, 705	Quantity comes from notes and is not included in model.	NA	NA	NA
254	Pavement Planing	SY	No	300	NA	202, 407, 441, 442	-	Area based on preliminary resurfacing limits. Depth based on preliminary pavement design.	Area based on final resurfacing limits. Depth based on final pavement design.	Area based on final resurfacing limits. Depth based on final pavement design.
255	Full Depth Pavement Removal And Rigid Replacement	FT, SY	No	NA	NA	202, 255, 256, 301, 407, 441, 442, 451, 499	Quantity comes from notes and is not included in model.	NA	NA	NA
256	Bonded Patching Of Portland Cement Concrete Pavement	SF	No	200	NA	451, 701, 703, 705	-	Area based on preliminary patching limits.	Area based on final patching limits.	Area based on final patching limits.
257	Diamond Grinding Portland Cement Concrete Pavement	SY	No	200	NA	-	-	Area based on preliminary diamond grinding limits.	Area based on refined diamond grinding limits.	Area based on final diamond grinding limits.
258	Load Transfer Retrofit	EACH	No	NA	NA	703, 705, 709	Quantity comes from notes and is not included in model.	NA	NA	NA

CMS 300 - Subgrade Treatments and Base										
Specification Number	Model Element Name	Method of Measurement	Included in Project?	LOD Minimum	2D/3D	Reference Specification Number(s)	Comments/Notes	Modeling Criteria		
								60% Submission	90% Submission	Final Federated Model
301	Asphalt Concrete Base	CY	Yes	300	3D	401, 402, 403, 440	-	Area based on preliminary pavement limits. Depth based on preliminary pavement design.	Area based on refined pavement limits. Depth based on final pavement design.	Area based on final pavement limits. Depth based on final pavement design.
302	Asphalt Concrete Base	CY	No	300	3D	401, 402, 403, 440	-	Area based on preliminary pavement limits. Depth based on preliminary pavement design.	Area based on refined pavement limits. Depth based on final pavement design.	Area based on final pavement limits. Depth based on final pavement design.
304	Aggregate Base	CY	Yes	300	3D	-	-	Area based on preliminary pavement limits. Depth based on preliminary pavement design.	Area based on refined pavement limits. Depth based on final pavement design.	Area based on final pavement limits. Depth based on final pavement design.
305	Portland Cement Concrete Base	SY	No	300	3D	-	-	Area based on preliminary pavement limits. Depth based on preliminary pavement design.	Area based on refined pavement limits. Depth based on final pavement design.	Area based on final pavement limits. Depth based on final pavement design.
320	Rubblize And Roll	SY, CY	No	200	2D	-	-	Area based on preliminary pavement limits. Attribute for depth based on preliminary pavement design.	Area based on refined pavement limits. Attribute for depth based on final pavement design.	Area based on final pavement limits. Attribute for depth based on final pavement design.
-	*Rubblize And Roll*	*SY*	*No*	-	-	-	-	-	-	-
-	*Filler Aggregate*	*CY*	*No*	-	-	-	-	-	-	-
321	Cracking And Seating Non-Reinforced Concrete Pavement	SY	No	200	NA	-	-	Area based on preliminary pavement limits. Attribute for depth based on preliminary pavement design.	Area based on refined pavement limits. Attribute for depth based on final pavement design.	Area based on final pavement limits. Attribute for depth based on final pavement design.

CMS 400 - Surface Courses and Pavements										
Specification Number	Model Element Name	Method of Measurement	Included in Project?	LOD Minimum	2D/3D	Reference Specification Number(s)	Comments/Notes	Modeling Criteria		
								60% Submission	90% Submission	Final Federated Model
401	Asphalt Concrete Field Operations	NA	No	NA	NA	440, 702, 705	Not a pay item.	NA	NA	NA
402	Asphalt Concrete Mixing Plants	NA	No	NA	NA	-	Not a pay item.	NA	NA	NA
403	Asphalt Concrete Quality Assurance	NA	No	NA	NA	-	Not a pay item.	NA	NA	NA
407	Tack Coat	GAL	Yes	200	2D	-	Child of an asphalt layer. Quantity is calculated with an application rate (gallons per square yard) over the entire asphalt layer.	Volume based on preliminary pavement limits and assumed application rate.	Volume based on refined pavement limits and assumed application rate.	Volume based on final pavement limits and assumed application rate.
-	*Tack Coat*	*GAL*	*Yes*	*200*	-	-	-	-	-	-
-	*Non-Tracking Tack Coat*	*GAL*	*No*	*200*	-	-	-	-	-	-
-	*Tack Coat, 702.13*	*GAL*	*No*	*200*	-	-	-	-	-	-
408	Prime Coat	GAL	No	300	3D	-	Child of an asphalt layer. Quantity is calculated with an application rate (gallons per square yard) over the entire asphalt layer.	Volume based on preliminary pavement limits and assumed application rate.	Volume based on refined pavement limits and assumed application rate.	Volume based on final pavement limits and assumed application rate.
409	Sawing and Sealing Asphalt Concrete Pavement Joints	FT	No	200	2D	705	-	Linestring for each pavement joint. Length based on preliminary jointing plan.	Linestring for each pavement joint. Length based on refined jointing plan.	Linestring for each pavement joint. Length based on final jointing plan.
410	Traffic Compacted Surface	CY, TON	No	NA	NA	703	Quantity comes from notes and is not included in model.	NA	NA	NA
411	Stabilized Crushed Aggregate	CY	No	300	3D	-	-	Area based on preliminary pavement limits. Depth based on preliminary pavement design.	Area based on refined pavement limits. Depth based on refined pavement design.	Area based on final pavement limits. Depth based on final pavement design.
421	Microsurfacing	SY, TON	No	200	2D	421, 499, 621, 701, 702, 703	-	Area based on preliminary microsurfacing limits.	Area based on refined microsurfacing limits.	Area based on final microsurfacing limits.
422	Chip Seal	SY, GAL	No	200	2D	407, 422, 449, 614, 621, 702, 703	-	Area based on preliminary chip sealing limits.	Area based on refined chip sealing limits.	Area based on final chip sealing limits.
423	Crack Sealing, Hot Applied	LB, SY	No	NA	NA	702	Quantity comes from notes and is not included in model.	NA	NA	NA
424	Fine Graded Polymer Asphalt Concrete	CY	No	300	3D	401, 402, 403, 440, 448, 449, 702, 703	-	Area based on preliminary pavement limits. Depth based on preliminary pavement design.	Area based on refined pavement limits. Depth based on refined pavement design.	Area based on final pavement limits. Depth based on final pavement design.
440	Asphalt Concrete Mix Design - General	-	No	NA	NA	-	Not a pay item.	NA	NA	NA
441	Marshall Asphalt Concrete	CY	Yes	300	3D	401, 402, 403, 440	-	Area based on preliminary pavement limits. Depth based on preliminary pavement design.	Area based on refined pavement limits. Depth based on refined pavement design.	Area based on final pavement limits. Depth based on final pavement design.
-	*Assphalt Concrete Surface Course, Type__,(__), PG64-22*	*CY*	*No*	-	-	-	-	-	-	-
-	*Asphalt Concrete Surface Course, Type__, (__), PG70-22M*	*CY*	*No*	-	-	-	-	-	-	-
-	*Asphalt Concrete Intermediate Course, Type 1, (__)*	*CY*	*No*	-	-	-	-	-	-	-
-	*Asphalt Concrete Intermediate Course, Type 2, (__)*	*CY*	*No*	-	-	-	-	-	-	-
-	*Anti-Segregation Equipment*	*CY*	*No*	-	-	-	-	-	-	-
442	Superpave Asphalt Concrete	CY	No	300	3D	401, 402, 403, 440	-	Area based on preliminary pavement limits. Depth based on preliminary pavement design.	Area based on refined pavement limits. Depth based on refined pavement design.	Area based on final pavement limits. Depth based on final pavement design.
443	Stone Matrix Asphalt Concrete	CY	No	300	3D	401, 402, 403, 440, 446, 447	-	Area based on preliminary pavement limits. Depth based on preliminary pavement design.	Area based on refined pavement limits. Depth based on refined pavement design.	Area based on final pavement limits. Depth based on final pavement design.
446	Asphalt Concrete Core Density Acceptance	-	No	NA	NA	-	Not a pay item.	NA	NA	NA
447	Asphalt Concrete Mat And Joint Core Density Acceptance	-	No	NA	NA	-	Not a pay item.	NA	NA	NA
448	Asphalt Concrete Gauge Density Acceptance	-	No	NA	NA	-	Not a pay item.	NA	NA	NA
449	Asphalt Concrete Non-Density Acceptance	-	No	NA	NA	-	Not a pay item.	NA	NA	NA
451	Reinforced Portland Cement Concrete Pavement	SY	No	300	3D	-	-	Area based on preliminary pavement limits. Depth based on preliminary pavement design.	Area based on refined pavement limits. Depth based on refined pavement design.	Area based on final pavement limits. Depth based on final pavement design.
-	*Reinforced Concrete Pavement Class ___*	*SY*	*No*	-	-	-	-	-	-	-
-	*Reinforced Concrete Pavement Class ___ with QC/QA*	*SY*	*No*	-	-	-	-	-	-	-
452	Non-Reinforced Portland Cement Concrete Pavement	SY	Yes	300	3D	-	-	Area based on preliminary pavement limits. Depth based on preliminary pavement design.	Area based on refined pavement limits. Depth based on refined pavement design.	Area based on final pavement limits. Depth based on final pavement design.
455	Quality Control Plan, Testing And Assurance For QC/QA Concrete	-	No	NA	NA	-	Not a pay item.	NA	NA	NA
499	Concrete - General	-	No	NA	NA	-	Not a pay item.	NA	NA	NA

CMS 600 - Incidentals (Linear Elements, Lighting, Signs, Signals)										
Specification Number	Model Element Name	Method of Measurement	Included in Project?	LOD Minimum	2D/3D	Reference Specification Number(s)	Comments/Notes	Modeling Criteria		
								60% Submission	90% Submission	Final Federated Model
601	Slope And Channel Protection	FT, SY, CY	Yes	200	2D	204, 451, 499, 511, 703, 712	-	Area based on preliminary draiange design.	Area based on refined drainage design.	Area based on final drainage design.
602	Masonry	CY	Yes	300	3D	109, 203, 499, 509, 511	Place true-to-size 3D headwall cell. Quantity comes from table in SCD based on pipe size and pipe shape. Volume in SCD table is rounded and does not match actual mathematical volume. Recommend updating SCD table for accuracy.	Headwall cell to indicate preliminary location. Attribute and quantity for item added.	Headwall cell to indicate refined location. Attribute and quantity for item added.	Headwall cell to indicate final location. Attribute and quantity for specific product added.
605	Underdrains	FT	Yes	300	3D	203, 706, 707, 712	Layout using standard underdrain level and 3D linestring.	Underdrain linework to indicate preliminary location. Attributes for specific size/type added.	Underdrain linework to indicate refined location. Attributes for specific size/type added.	Underdrain linework to indicate final location. Attributes for specific size/type added.
-	__" Unclassified Pipe Underdrains	-	*No*	-	-	*706, 707*	-	-	-	-
-	__" Construction Underdrains	-	*No*	-	-	*707*	-	-	-	-
-	__" Shallow Pipe Underdrains	-	*No*	-	-	*706, 707*	-	-	-	-
-	__" Deep Pipe Underdrains	-	*Yes*	-	-	*706, 707*	-	-	-	-
-	__" Base Pipe Underdrains	-	*Yes*	-	-	*706, 707*	-	-	-	-
-	__" Aggregate Drains	-	*No*	-	-	*203*	-	-	-	-
-	__" Rock Cut Underdrains	-	*No*	-	-	*707*	-	-	-	-
-	__" Prefabricated Edge Underdrains	-	*No*	-	-	*712*	-	-	-	-
606	Guardrail	FT, EACH, SF, LS	No	300	3D	509, 710, 711, 712, 730	Layout using standard guardrail level and 3D linestring.	Guardrail linework to indicate preliminary location. Attributes for specific type added.	Guardrail linework to indicate refined location. Attributes for specific type added.	Guardrail linework to indicate final location. Attributes for specific type added.
607	Fence	FT, EACH	No	Varies	2D	499, 509, 511, 659, 710, 712	-	-	-	-
-	*Fence, Type __*	*FT*	*No*	*200*	*2D*	*499, 509, 511, 710, 712*	*Layout using standard fence level and linestyle.*	*Fence linework to indicate preliminary location. Attributes for specific size/type added.*	*Fence linework to indicate refined location. Attributes for specific size/type added.*	*Fence linework to indicate final location. Attributes for specific size/type added.*
-	*Gate, Type __*	*EACH*	*No*	*200*	*2D*	*499, 509, 511, 710, 712*	*Layout using standard gate level and linestyle.*	*Gate linework to indicate preliminary location. Attributes for specific size/type added.*	*Gate linework to indicate refined location. Attributes for specific size/type added.*	*Gate linework to indicate final location. Attributes for specific size/type added.*
-	*Fenceline Seeding and Mulching*	*FT*	*No*	*100*	*NA*	*659*	*Child of fence. Quantity is calculated by a set area per feet of fence.*	*Fence linework to indicate preliminary location. Attribute and quantity for item added to fence linework.*	*Fence linework to indicate refined location. Attribute and quantity for item added to fence linework.*	*Fence linework to indicate final location. Attribute and quantity for item added to fence linework.*
608	Walks, Curb Ramps, And Steps	FT, SF	No	Varies	2D/3D	451, 499, 511, 609, 705, 712	-	-	-	-
-	*__ Walk*	*SF*	*No*	*300*	*3D*	-	-	*Area based on preliminary walk limits. Depth based on preliminary pavement design.*	*Area based on refined walk limits. Depth based on refined pavement design.*	*Area based on final walk limits. Depth based on final pavement design.*
-	*Curb Ramp*	*SF*	*No*	*200/300*	*2D/3D*	-	*Layout 2D shape for curb ramp using standard level and linestyle, with SCD providing depth. 3D shape recommended for ramps with complex grading or in areas dense with utilities.*	*Area based on preliminary ramp shapes. Depth based on curb ramp SCD.*	*Area based on refined ramp shapes. Depth based on curb ramp SCD.*	*Area based on final ramp shapes. Depth based on curb ramp SCD.*
-	*Concrete Steps*	*FT*	*No*	*100*	*2D*	-	*Layout 2D shape for location of steps using standard step level and linestyle. 3D for steps detailed on SCD for concrete steps.*	*Step shape to indicate preliminary location. Attribute for specific type added.*	*Step shape to indicate refined location. Attribute for specific type added.*	*Step shape to indicate final location. Attribute for specific type added.*
609	Curbing, Concrete Medians, And Traffic Islands	FT, SY, CY	Yes	300	3D	407, 451, 499, 511, 705, 709	-	Location based on preliminary pavement limits in roadway segments with curbing, concrete medians, and/or traffic islands. Section modeled per SCD for proposed curb and gutter type.	Location based on refined pavement limits in roadway segments with curbing, concrete medians, and/or traffic islands. Section modeled per SCD for proposed curb and gutter type.	Location based on final pavement limits in roadway segments with curbing, concrete medians, and/or traffic islands. Section modeled per SCD for proposed curb and gutter type.
611	Pipe Culverts, Sewers, Drains, And Drainage Structures	FT, EACH	Yes	Varies	2D/3D	-	Reconstructed items should generally be 300.	-	-	-
-	*__" Conduit, Type__*	*FT*	*Yes*	*300*	*3D*	*706, 707, 748*	*Layout in 3D using the OpenRoads Drainage and Utility tools.*	-	-	-
-	*__x__ Conduit, Type__*	*FT*	*No*	*300*	*3D*	*706, 707, 748*	*Layout in 3D using the OpenRoads Drainage and Utility tools.*	-	-	-
-	*__" Conduit Reconstructed, Type__*	*FT*	*No*	*300*	*3D*	*706, 707, 748*	*Layout in 3D using the OpenRoads Drainage and Utility tools.*	-	-	-
-	*Type __ Precast Reinforced Concrete Three-sided Flat Topped Culvert, __' Span x __' Rise*	*FT*	*No*	*300*	*3D*	*706, 707, 748*	*Layout in 3D using the OpenRoads Drainage and Utility tools.*	-	-	-
-	*Type __Precast Reinforced Concrete Arch Sections, __' Span x __' Rise*	*FT*	*No*	*300*	*3D*	*706, 707, 748*	*Layout in 3D using the OpenRoads Drainage and Utility tools.*	-	-	-
-	*Type __ Precast Reinforced Concrete Round Sections, __' Span x __' Rise*	*FT*	*No*	*300*	*3D*	*706, 707, 748*	*Layout in 3D using the OpenRoads Drainage and Utility tools.*	-	-	-
-	*__' Rise x __' Span Conduit, Type A Corrugated Steel Box Culvert, __' Minimum*	*FT*	*No*	*300*	*3D*	*706, 707, 748*	*Layout in 3D using the OpenRoads Drainage and Utility tools.*	-	-	-
-	*__' Rise x __' Span Conduit, Type __ Corrugated Aluminum Box Culvert, __'*	*FT*	*No*	*300*	*3D*	*706, 707, 748*	*Layout in 3D using the OpenRoads Drainage and Utility tools.*	-	-	-
-	*__" Conduit, Type__, with Field Paving of Pipe*	*FT*	*No*	*300*	*3D*	*706, 707, 748*	*Layout in 3D using the OpenRoads Drainage and Utility tools.*	-	-	-
-	*__" Conduit, Type__, with Field Paving of Existing Pipe*	*FT*	*No*	*300*	*3D*	*706, 707, 748*	*Layout in 3D using the OpenRoads Drainage and Utility tools.*	-	-	-

CMS 600 - Incidentals (Linear Elements, Lighting, Signs, Signals)										
Specification Number	Model Element Name	Method of Measurement	Included in Project?	LOD Minimum	2D/3D	Reference Specification Number(s)	Comments/Notes	Modeling Criteria		
								60% Submission	90% Submission	Final Federated Model
-	Conduit, Type F for Underdrain Outlets	FT	Yes	300	3D	706, 707, 748	Layout in 3D using the OpenRoads Drainage and Utility tools.	-	-	-
-	Manholes	EACH	No	300	3D	499, 511, 704, 705, 706, 709, 711	Layout in 3D using the OpenRoads Drainage and Utility tools.	-	-	-
-	Inlets	EACH	No	300	3D	499, 511, 704, 705, 706, 709, 711	Layout in 3D using the OpenRoads Drainage and Utility tools.	-	-	-
-	Catch Basins	EACH	Yes	300	3D	499, 511, 704, 705, 706, 709, 711	Layout in 3D using the OpenRoads Drainage and Utility tools.	-	-	-
-	Inspecion Wells	EACH	No	200	2D/3D	499, 511, 704, 705, 706, 709, 711	Place standard inspection well cell. 3D detailing recommended for projects involving urban facilities or facilities serving as a utility corridor (i.e. CCG3A urban interchange project).	Inspection well cell to indicate preliminary location. Attributes for specific size/product added.	Inspection well cell to indicate refined location. Attributes for specific size/product added.	Inspection well cell to indicate final location. Attributes for specific size/product added.
-	Junction Chambers	EACH	No	NA	NA	499, 511, 704, 705, 706, 709, 711	No cell for this object currently available. Recommend ODOT adds a cell for this object to the WorkSpace.	-	-	-
-	Manhole, Catch Basin or Inlet Reconstructed to Grade	EACH	No	200	2D	499, 511, 704, 705, 706, 709, 711	Place standard 2D RTG cell. Could detail in 3D using a proposed structure node from the OpenRoads Drainage and Utility toolkit, but this node may not be an accurate representation of the existing structure. As such, we recommend ODOT develops a 3D node for RTG structures.	RTG cell to indicate preliminary location. Attribute for item added.	RTG cell to indicate final location. Attribute for item added.	RTG cell to indicate final location. Attribute for item added.
-	Manhole, Catch Basin, or Inlet Adjusted Grade	EACH	No	200	2D	499, 511, 704, 705, 706, 709, 711	Place standard 2D ATG cell. Could detail in 3D using a proposed structure node from the OpenRoads Drainage and Utility toolkit, but this node may not be an accurate representation of the existing structure. As such, we recommend ODOT develops a 3D node for ATG structures.	ATG cell to indicate preliminary location. Attribute for item added.	ATG cell to indicate final location. Attribute for item added.	ATG cell to indicate final location. Attribute for item added.
-	Precast Reinforced Concrete Outlet	EACH	Yes	200	2D	499, 511, 704, 705, 706, 709, 711	Place standard precast reinforced concrete outlet cell.	Cell to indicate preliminary location. Attribute for item added.	Cell to indicate refined location. Attribute for item added.	Cell to indicate final location. Attribute for item added.
613	Low Strength Mortar Backfill	CY	No	NA/300	2D/3D	701, 703	When LSM is used to backfill conduit/utility line, LSM is child of the conduit and no graphical representation is included in the model. When LSM is used for structural backfill, LSM may be modeled and is LOD 300.	For LOD 300 applications, area based on preliminary low strength mortar backfill limits. Depth based on structural details.	For LOD 300 applications, area based on refined low strength mortar backfill limits. Depth based on structural details.	For LOD 300 applications, area based on final low strength mortar backfill limits. Depth based on structural details.
614	Maintaining Traffic	FT, MILE, CY, EACH, HOUR, SNMT	Yes	NA	NA	-	Quantity comes from notes and is not included in model.	NA	NA	NA
615	Roads And Pavements For Maintaining Traffic	SY, LS	No	200	2D	-	-	-	-	-
-	Pavement For Maintaining Traffic, Class __	SY	No	200	2D	-	Quantity comes from shape drawn in the phasing plan, area of a modeled crossover, or a total provided in the notes.	Area based on preliminary roads and pavements for maintaining traffic limits.	Area based on refined roads and pavements for maintaining traffic limits.	Area based on final roads and pavements for maintaining traffic limits.
-	Roads for Maintaining Traffic	LS	No	NA	NA	-	Quantity comes from notes and is not included in model.	NA	NA	NA
616	Dust Control	MGAL, TON	Yes	NA	NA	-	Quantity comes from notes and is not included in model.	NA	NA	NA
617	Reconditioning Shoulders	SY, CY, MGAL	Yes	NA	NA	-	Quantity comes from notes and is not included in model.	NA	NA	NA
618	Rumble Strips	FT, MILE, EACH	No	200	2D	-	Layout using standard rumble strip level and linestyle. Placement and 3D detailing of rumble strips included in traffic control and roadway SCDs.	Rumble strip linework to indicate preliminary location. Attribute for specific type added.	Rumble strip linework to indicate refined location. Attribute for specific type added.	Rumble strip linework to indicate final location. Attribute for specific type added.
-	Rumble Stripes, Center line (Asphalt Concrete)	FT	No	-	-	-	-	-	-	-
-	Rumble Stripes, Center line (Asphalt Concrete)	MILE	No	-	-	-	-	-	-	-
-	Rumble Stripes, Center line (Concrete)	FT	No	-	-	-	-	-	-	-
-	Rumble Stripes, Center line (Concrete)	MILE	No	-	-	-	-	-	-	-
-	Rumble Stripes, Transverse (Asphalt Concrete)	EACH	No	-	-	-	-	-	-	-
-	Rumble Stripes, Transverse (Concrete)	EACH	No	-	-	-	-	-	-	-
619	Field Office	MONTH	Yes	100	NA	-	Project incidental quantity, not included in model.	NA	NA	NA
620	Delineators	EACH	Yes	100	2D	720, 730	-	-	-	-

CMS 600 - Incidentals (Linear Elements, Lighting, Signs, Signals)										
Specification Number	Model Element Name	Method of Measurement	Included in Project?	LOD Minimum	2D/3D	Reference Specification Number(s)	Comments/Notes	Modeling Criteria		
								60% Submission	90% Submission	Final Federated Model
-	*Delineator*	-	*Yes*	-	-	*720, 730*	*Place standard pavement delineator cell. Placement and spacing details included in traffic control SCDs.*	*Cell to indicate preliminary location. Attribute for item added.*	*Cell to indicate refined location. Attribute for item added.*	*Cell to indicate final location. Attribute for item added.*
-	*Removal of Delineator*	-	*No*	-	-	*NA*	*Place X cell on existing pavement delineator cells to be removed.*	*X cell to indicate approximate location. Attribute for item added to X cell.*	*X cell to indicate approximate location. Attribute for item added to X cell.*	*X cell to indicate approximate location. Attribute for item added to X cell.*
621	Raised Pavement Markers (Rpm)	EACH	Yes	100	2D	721	-	-	-	-
-	*RPM*	-	*Yes*	*100*	*2D*	*721*	*Place standard raised pavement marker cell. Placement and spacing details included in traffic control SCDs.*	*Cell to indicate preliminary location. Attribute for item added.*	*Cell to indicate refined location. Attribute for item added.*	*Cell to indicate final location. Attribute for item added.*
-	*RPM Reflector*	-	*No*	*NA*	*NA*	*721*	*Child of RPM cell, no graphical representation included.*	*RPM cell to indicate approximate location. Attribute for item added to RPM cell.*	*RPM cell to indicate approximate location. Attribute for item added to RPM cell.*	*RPM cell to indicate approximate location. Attribute for item added to RPM cell.*
-	*Raised Pavement Marker Remover*	-	*Yes*	*NA*	*NA*	*NA*	*Quantity comes from notes and is not included in model.*	*NA*	*NA*	*NA*
622	Concrete Barrier	FT, EACH	No	300	3D	499, 509, 511, 515, 705, 706, 709, 711	-	Location based on preliminary pavement limits in roadway segments with median and/or outside barrier. Section modeled per SCD for proposed barrier type.	Location based on refined pavement limits in roadway segments with median and/or outside barrier. Section modeled per SCD for proposed barrier type.	Location based on final pavement limits in roadway segments with median and/or outside barrier. Section modeled per SCD for proposed barrier type.
623	Construction Layout Stakes And Survey Monuments	LS, EACH	Yes	NA	NA	-	Quantity comes from notes and is not included in model.	NA	NA	NA

CMS 600 - Incidentals (Linear Elements, Lighting, Signs, Signals)										
Specification Number	Model Element Name	Method of Measurement	Included in Project?	LOD Minimum	2D/3D	Reference Specification Number(s)	Comments/Notes	Modeling Criteria		
								60% Submission	90% Submission	Final Federated Model
624	Mobilization	LS	Yes	NA	NA	-	Project incidental quantity, not included in model.	NA	NA	NA
625	Highway Lighting	FT, EACH	Yes	Varies	2D/3D	499, 509, 511, 725	Reconstructed items should generally be 200.	-	-	-
-	*Luminaire, (Functional Type), (Housing Size if Conventional), (Light Distribution), (Lamp Wattage), (Light Source), (Voltage)*	*EACH*	*Yes*	*100*	*2D*	*725*	*Child of pole/tower cell. Quantity is calculated by a set number of luminaires per pol/tower.*	*Pole/tower cell to indicate preliminary location. Attributes for specific product added to pole/tower cell.*	*Pole/tower cell to indicate refined location. Attributes for specific product added to pole/tower cell.*	*Pole/tower cell to indicate final location. Attributes for specific product added to pole/tower cell.*
-	*Glare Shield*	*EACH*	*No*	*NA*	*NA*	*725*	*Child of luminaire, no graphical representation included.*	*Pole/tower cell to indicate approximate location. Attribute for item added to pole/tower cell.*	*Pole/tower cell to indicate approximate location. Attribute for item added to pole/tower cell.*	*Pole/tower cell to indicate approximate location. Attribute for item added to pole/tower cell.*
-	*Light Pole, (Pole Style), (Design Number)*	*EACH*	*Yes*	*100*	*2D/3D*	*725*	*Place standard pole cell. Cell does not need modified to match true dimensions of the pole.*	*Pole cell to indicate preliminary location. Attributes for specific product added.*	*Pole cell to indicate refined location. Attributes for specific product added.*	*Pole cell to indicate final location. Attributes for specific product added.*
-	*Light Tower, (Design Number)*	*EACH*	*No*	*100*	*2D/3D*	*725*	*Place standard tower cell. Cell does not need modified to match true dimensions of the tower.*	*Tower cell to indicate preliminary location. Attributes for specific product added.*	*Tower cell to indicate refined location. Attributes for specific product added.*	*Tower cell to indicate final location. Attributes for specific product added.*
-	*Light Pole Anchor Bolts*	*EACH*	*No*	*NA*	*NA*	*725*	*Child of pole/tower cell. Bolt placement detailed on SCDs for poles/towers.*	*Pole/tower cell to indicate preliminary location. Attribute for item added to pole/tower cell.*	*Pole/tower cell to indicate refined location. Attribute for item added to pole/tower cell.*	*Pole/tower cell to indicate final location. Attribute for item added to pole/tower cell.*
-	*Light Pole Foundation*	*EACH*	*Yes*	*200*	*2D*	*499, 509, 511*	*Child of the light pole cell. Could elevate to LOD 300 by developing a unique 3D cell for each ODOT foundation type.*	*Pole cell to indicate preliminary location. Attribute for item added to pole cell.*	*Pole cell to indicate refined location. Attribute for item added to pole cell.*	*Pole cell to indicate final location. Attribute for item added to pole cell.*
-	*Light Tower Foundation*	*EACH*	*No*	*200*	*2D*	*499, 509, 511*	*Child of the light tower cell. Could elevate to LOD 300 by developing a unique 3D cell for each ODOT foundation type.*	*Tower cell to indicate preliminary location. Attribute for item added to tower cell.*	*Tower cell to indicate refined location. Attribute for item added to tower cell.*	*Tower cell to indicate final location. Attribute for item added to tower cell.*
-	*Junction Box, (Length x Height x Depth)*	*EACH*	*No*	*100*	*2D*	*725*	*Place standard junction box cell. Cell does not need modified to match true dimensions of junction box embedded in concrete barrier/parapet, as placement detailed on SCDs. 3D detailing recommended for structure mounted junction boxes*	*Junction box cell to indicate preliminary location. Attributes for specific size/product added.*	*Junction box cell to indicate refined location. Attributes for specific size/product added.*	*Junction box cell to indicate final location. Attributes for specific size/product added.*
-	*Pull Box, (Material Type), (Length x Height x Depth)*	*EACH*	*Yes*	*100*	*2D*	*725*	*Place standard 2D pullbox cell. Cell does not need modified to match true dimensions of pullbox in rural locations. 3D detailing recommended for projects involving urban facilities or facilities serving as a utility corridor (i.e. CCG3A urban interchange project).*	*Pull box cell to indicate preliminary location. Attributes for specific size/product added.*	*Pull box cell to indicate refined location. Attributes for specific size/product added.*	*Pull box cell to indicate final location. Attributes for specific size/product added.*
-	*Conduit, (Material Type), (Nominal Diameter)*	*FT*	*No*	*200*	*2D*	*725*	*Layout using standard conduit level and linestyle. 3D profile recommended for projects involving urban facilities or facilities serving as a utility corridor (i.e. CCG3A urban interchange project).*	*Conduit linework to indicate preliminary location. Attributes for specific size/type added.*	*Conduit linework to indicate refined location. Attributes for specific size/type added.*	*Conduit linework to indicate final location. Attributes for specific size/type added.*
-	*Trench*	*FT*	*Yes*	*NA*	*2D*	*NA*	*Child of conduit linework. Quantity is equivalent to length of conduit linework.*	*Conduit linework to indicate preliminary location. Attribute for trench type added to conduit linework.*	*Conduit linework to indicate refined location. Attribute for trench type added to conduit linework.*	*Conduit linework to indicate final location. Attribute for trench type added to conduit linework.*
-	*Trench in Paved Area*	*FT*	*No*	*NA*	*2D*	*NA*	*Child of conduit linework. Quantity is equivalent to length of conduit linework.*	*Conduit linework to indicate preliminary location. Attribute for trench type added to conduit linework.*	*Conduit linework to indicate refined location. Attribute for trench type added to conduit linework.*	*Conduit linework to indicate final location. Attribute for trench type added to conduit linework.*
-	*Conduit Jacked or Drilled, (Material Type), (Nominal Diameter)*	*FT*	*Yes*	*200*	*2D*	*725*	*Layout using standard conduit level and linestyle. 3D profile recommended for projects involving urban facilities or facilities serving as a utility corridor (i.e. CCG3A urban interchange project).*	*Conduit linework to indicate preliminary location. Attributes for specific size/type added.*	*Conduit linework to indicate refined location. Attributes for specific size/type added.*	*Conduit linework to indicate final location. Attributes for specific size/type added.*
-	*Power Service*	*EACH*	*Yes*	*100*	*2D*	*725*	*Place standard power service cell. Cell does not need modified to match true dimensions of power service.*	*Power service cell to indicate preliminary location. Attribute for item added to power service cell.*	*Power service cell to indicate refined location. Attribute for item added to power service cell.*	*Power service cell to indicate final location. Attribute for item added to power service cell.*
-	*Ground Rod*	*EACH*	*Yes*	*NA*	*NA*	*725*	*Child of pole/tower cell, no graphical representation included.*	*Pole/tower cell to indicate approximate location. Attribute for item added to pole/tower cell.*	*Pole/tower cell to indicate approximate location. Attribute for item added to pole/tower cell.*	*Pole/tower cell to indicate approximate location. Attribute for item added to pole/tower cell.*
-	*Ground Grid*	*EACH*	*No*	*NA*	*NA*	*NA*	*Child of object being grounded, no graphical representation included. Grounding detailed on SCDs for grounding details.*	*Structure/object being grounded to indicate approximate location. Attribute for item added to structure/object being grounded.*	*Structure/object being grounded to indicate approximate location. Attribute for item added to structure/object being grounded.*	*Structure/object being grounded to indicate approximate location. Attribute for item added to structure/object being grounded.*
-	*Structure Grounding System*	*EACH*	*No*	*NA*	*NA*	*NA*	*Child of object being grounded, no graphical representation included. Grounding detailed on SCDs for structure grounding.*	*Structure/object being grounded to indicate approximate location. Attribute for item added to structure/object being grounded.*	*Structure/object being grounded to indicate approximate location. Attribute for item added to structure/object being grounded.*	*Structure/object being grounded to indicate approximate location. Attribute for item added to structure/object being grounded.*
-	*Pole and Bracket Cable, (Size of Conductors in AWG), (Voltage Rating)*	*FT*	*Yes*	*NA*	*NA*	*725*	*Child of pole cell, no graphical representation included.*	*Pole/tower cell to indicate approximate location. Attribute for item added to pole/tower cell.*	*Pole/tower cell to indicate approximate location. Attribute for item added to pole/tower cell.*	*Pole/tower cell to indicate approximate location. Attribute for item added to pole/tower cell.*
-	*Distribution Cable, (Size of Conductors in AWG), Voltage Rating)*	*FT*	*Yes*	*NA*	*NA*	*725*	*Child of conduit linework. Quantity is multiple of length of conduit linework with contingency added for slack.*	*Conduit linework to indicate preliminary location. Attribute for cable/wire type added to conduit linework.*	*Conduit linework to indicate refined location. Attribute for cable/wire type added to conduit linework.*	*Conduit linework to indicate final location. Attribute for cable/wire type added to conduit linework.*
-	*Duct Cable, (Duct Diameter) with (Number of Conductors), (Size of Conductors in AWG), (Voltage Rating) Conductors*	*FT*	*Yes*	*200*	*2D*	*725*	*Layout using standard duct cable level and linestyle. 3D profile recommended for projects involving urban facilities or facilities serving as a utility corridor (i.e. CCG3A urban interchange project).*	*Duct cable linework to indicate preliminary location. Attributes for specific size/type added.*	*Duct cable linework to indicate refined location. Attributes for specific size/type added.*	*Duct cable linework to indicate final location. Attributes for specific size/type added.*

CMS 600 - Incidentals (Linear Elements, Lighting, Signs, Signals)										
Specification Number	Model Element Name	Method of Measurement	Included in Project?	LOD Minimum	2D/3D	Reference Specification Number(s)	Comments/Notes	Modeling Criteria		
								60% Submission	90% Submission	Final Federated Model
-	*Connection*	*EACH*	*Yes*	*NA*	*NA*	*725*	*Child of pole/tower/pull box/junction box cell, no graphical representation included.*	*Pole/tower/pull box/junction box cell to indicate approximate location. Attribute for item added to cell.*	*Pole/tower/pull box/junction box cell to indicate approximate location. Attribute for item added to cell.*	*Pole/tower/pull box/junction box cell to indicate approximate location. Attribute for item added to cell.*
-	*Service to Underpass Lighting*	*EACH*	*No*	*NA*	*NA*	*NA*	*Child of underpass light cell, no graphical representation included.*	*Underpass light cell to indicate approximate location. Attribute for item added to cell.*	*Underpass light cell to indicate approximate location. Attribute for item added to cell.*	*Underpass light cell to indicate approximate location. Attribute for item added to cell.*
-	*Portable Winch Drive Power Unit*	*EACH*	*No*	*NA*	*NA*	*725*	*Child of tower cell, no graphical representation included.*	*Tower cell to indicate approximate location. Attribute for item added to tower cell.*	*Tower cell to indicate approximate location. Attribute for item added to tower cell.*	*Tower cell to indicate approximate location. Attribute for item added to tower cell.*
-	*Luminaire Removed*	*EACH*	*No*	*NA*	*NA*	*NA*	*Child of existing light pole/tower cell or proposed replacement luminaire cell.*	*Attribute for item added to X cell over luminaire support being removed or the proposed replacement luminaire cell.*	*Attribute for item added to X cell over luminaire support being removed or the proposed replacement luminaire cell.*	*Attribute for item added to X cell over luminaire support being removed or the proposed replacement luminaire cell.*
-	*Luminaire Support Removed*	*EACH*	*No*	*100*	*2D*	*NA*	*Place X cell on existing light pole/tower cells to be removed.*	*X cell to indicate approximate location. Attribute for item added to X cell.*	*X cell to indicate approximate location. Attribute for item added to X cell.*	*X cell to indicate approximate location. Attribute for item added to X cell.*
-	*Luminaire Support Foundation Removed*	*EACH*	*No*	*NA*	*NA*	*NA*	*Child of existing light pole/tower cell to be removed.*	*Attribute for item added to X cell over luminaire support being removed.*	*Attribute for item added to X cell over luminaire support being removed.*	*Attribute for item added to X cell over luminaire support being removed.*
-	*Pull Box Removed*	*EACH*	*No*	*100*	*2D*	*NA*	*Place X cell on existing pull box cells to be removed.*	*X cell to indicate approximate location. Attribute for item added to X cell.*	*X cell to indicate approximate location. Attribute for item added to X cell.*	*X cell to indicate approximate location. Attribute for item added to X cell.*
-	*Disconnect Circuit*	*EACH*	*No*	*NA*	*NA*	*NA*	*Child of pole/tower/pull box/junction box/power service cell, no graphical representation included.*	*Pole/tower/pull box/junction box/power service cell to indicate approximate location. Attribute for item added to cell.*	*Pole/tower/pull box/junction box/power service cell to indicate approximate location. Attribute for item added to cell.*	*Pole/tower/pull box/junction box/power service cell to indicate approximate location. Attribute for item added to cell.*
-	*Power Service Removed*	*EACH*	*No*	*100*	*2D*	*NA*	*Place X cell on existing power service cells to be removed.*	*X cell to indicate approximate location. Attribute for item added to X cell.*	*X cell to indicate approximate location. Attribute for item added to X cell.*	*X cell to indicate approximate location. Attribute for item added to X cell.*
-	*Underground Warning/Marking Tape*	*FT*	*Yes*	*100*	*2D*	*725*	*Child of conduit linework. Quantity is equivalent to length of conduit linework.*	*Conduit linework to indicate preliminary location. Attribute for item added to conduit linework.*	*Conduit linework to indicate refined location. Attribute for item added to conduit linework.*	*Conduit linework to indicate final location. Attribute for item added to conduit linework.*
626	Barrier Reflectors	EACH	No	100	NA	726	Child of concrete barrier linework, no graphical representation included. Placement and spacing details included in design standards.	Concrete barrier linework to indicate approximate location. Attribute for item added to barrier linework.	Concrete barrier linework to indicate approximate location. Attribute for item added to barrier linework.	Concrete barrier linework to indicate approximate location. Attribute for item added to barrier linework.
-	*Barrier Reflector, Type ___, (One-Way or Bi-Directional)*	-	*No*	-	-	-	-	-	-	-
630	Traffic Signs And Sign Supports	FT, SF, EACH	Yes	Varies	2D	499, 501, 509, 511, 513, 625, 711, 730	-	-	-	-
-	*Ground Mounted Structural Beam Support Foundation*	*EACH*	*No*	*200*	*2D*	*499, 509, 511, 625*	*Child of the support cell. Could elevate to LOD 300 by developing a unique 3D cell for each ODOT foundation type.*	*Support cell to indicate preliminary location. Attribute for item added to support cell.*	*Support cell to indicate refined location. Attribute for item added to support cell.*	*Support cell to indicate final location. Attribute for item added to support cell.*
-	*Ground Mounted Pipe Support Foundation*	*EACH*	*No*	*200*	*2D*	*499, 509, 511, 625*	*Child of the support cell. Could elevate to LOD 300 by developing a unique 3D cell for each ODOT foundation type.*	*Support cell to indicate preliminary location. Attribute for item added to support cell.*	*Support cell to indicate refined location. Attribute for item added to support cell.*	*Support cell to indicate final location. Attribute for item added to support cell.*
-	*Rigid Overhead Sign Support Foundation*	*EACH*	*No*	*200*	*2D*	*499, 509, 511, 625*	*Child of the support cell. Could elevate to LOD 300 by developing a unique 3D cell for each ODOT foundation type.*	*Support cell to indicate preliminary location. Attribute for item added to support cell.*	*Support cell to indicate refined location. Attribute for item added to support cell.*	*Support cell to indicate final location. Attribute for item added to support cell.*
-	*Span Wire Sign Support Foundation*	*EACH*	*No*	*200*	*2D*	*499, 509, 511, 625*	*Child of the support cell. Could elevate to LOD 300 by developing a unique 3D cell for each ODOT foundation type.*	*Support cell to indicate preliminary location. Attribute for item added to support cell.*	*Support cell to indicate refined location. Attribute for item added to support cell.*	*Support cell to indicate final location. Attribute for item added to support cell.*
-	*Ground Mounted Support, __ Post*	*FT*	*Yes*	*100*	*2D*	*501, 513, 711, 730*	*Place standard support cell. Could elevate to LOD 300 by developing a unique 3D cell for each ODOT sign support type.*	*Support cell to indicate preliminary location. Attributes for specific product added.*	*Support cell to indicate refined location. Attributes for specific product added.*	*Support cell to indicate final location. Attributes for specific product added.*
-	*Ground Mounted Structural Beam Support, __ Beam*	*FT*	*No*	*100*	*2D*	*501, 513, 711, 730*	*Place standard support cell. Could elevate to LOD 300 by developing a unique 3D cell for each ODOT sign support type.*	*Support cell to indicate preliminary location. Attributes for specific product added.*	*Support cell to indicate refined location. Attributes for specific product added.*	*Support cell to indicate final location. Attributes for specific product added.*
-	*Ground Mounted Support, Pipe*	*FT*	*No*	*100*	*2D*	*501, 513, 711, 730*	*Place standard support cell. Could elevate to LOD 300 by developing a unique 3D cell for each ODOT sign support type.*	*Support cell to indicate preliminary location. Attributes for specific product added.*	*Support cell to indicate refined location. Attributes for specific product added.*	*Support cell to indicate final location. Attributes for specific product added.*
-	*Ground Mounted WoodenBox Beam Support, __ Beam*	*FT*	*No*	*100*	*2D*	*501, 513, 711, 730*	*Place standard support cell. Could elevate to LOD 300 by developing a unique 3D cell for each ODOT sign support type.*	*Support cell to indicate preliminary location. Attributes for specific product added.*	*Support cell to indicate refined location. Attributes for specific product added.*	*Support cell to indicate final location. Attributes for specific product added.*
-	*One-Way Support, __ Post*	*FT*	*No*	*100*	*2D*	*501, 513, 711, 730*	*Place standard support cell. Could elevate to LOD 300 by developing a unique 3D cell for each ODOT sign support type.*	*Support cell to indicate preliminary location. Attributes for specific product added.*	*Support cell to indicate refined location. Attributes for specific product added.*	*Support cell to indicate final location. Attributes for specific product added.*
-	*Street Name Sign Support, __ Post*	*FT*	*No*	*100*	*2D*	*501, 513, 711, 730*	*Place standard support cell. Could elevate to LOD 300 by developing a unique 3D cell for each ODOT sign support type.*	*Support cell to indicate preliminary location. Attributes for specific product added.*	*Support cell to indicate refined location. Attributes for specific product added.*	*Support cell to indicate final location. Attributes for specific product added.*
-	*Temporary Sign Support, __ Post*	*FT, EACH*	*No*	*100*	*2D*	*501, 513, 711, 730*	*Place standard support cell. Could elevate to LOD 300 by developing a unique 3D cell for each ODOT sign support type.*	*Support cell to indicate preliminary location. Attributes for specific product added.*	*Support cell to indicate refined location. Attributes for specific product added.*	*Support cell to indicate final location. Attributes for specific product added.*
-	*Breakway Structural Beam Connection*	*EACH*	*No*	*NA*	*NA*	*NA*	*Child of support cell, no graphical representation included. Breakaway connection detailed on SCDs for structural beam supports.*	*Structural beam support cell to indicate approximate location. Attribute for item added to support cell.*	*Structural beam support cell to indicate approximate location. Attribute for item added to support cell.*	*Structural beam support cell to indicate approximate location. Attribute for item added to support cell.*
-	*Triangular Slip Base Connection*	*EACH*	*No*	*NA*	*NA*	*NA*	*Child of support cell, no graphical representation included. Slip base connection detailed on SCDs for pipe supports.*	*Pipe support cell to indicate approximate location. Attribute for item added to support cell.*	*Pipe support cell to indicate approximate location. Attribute for item added to support cell.*	*Pipe support cell to indicate approximate location. Attribute for item added to support cell.*

CMS 600 - Incidentals (Linear Elements, Lighting, Signs, Signals)										
Specification Number	Model Element Name	Method of Measurement	Included in Project?	LOD Minimum	2D/3D	Reference Specification Number(s)	Comments/Notes	Modeling Criteria		
								60% Submission	90% Submission	Final Federated Model
-	*Overhead Sign Support, Type TC-___, Design __*	*EACH*	*No*	*100*	*2D*	*501, 513, 711, 730*	*Place standard support cell. Could elevate to LOD 300 by developing a unique 3D cell for each ODOT sign support type.*	*Support cell to indicate preliminary location. Attributes for specific product added.*	*Support cell to indicate refined location. Attributes for specific product added.*	*Support cell to indicate final location. Attributes for specific product added.*
-	*Combination Overhead Sign Support, Type TC-__, Design __*	*EACH*	*No*	*100*	*2D*	*501, 513, 711, 730*	*Place standard support cell. Could elevate to LOD 300 by developing a unique 3D cell for each ODOT sign support type.*	*Support cell to indicate preliminary location. Attributes for specific product added.*	*Support cell to indicate refined location. Attributes for specific product added.*	*Support cell to indicate final location. Attributes for specific product added.*
-	*Sign Attachment Assembly*	*EACH*	*No*	*NA*	*NA*	*NA*	*Child of support cell, no graphical representation included. Attachment assembly detailed on SCDs.*	*Support cell to indicate approximate location. Attribute for item added to support cell.*	*Support cell to indicate approximate location. Attribute for item added to support cell.*	*Support cell to indicate approximate location. Attribute for item added to support cell.*
-	*Luminaire Support Assembly*	*EACH*	*No*	*NA*	*NA*	*NA*	*Child of support cell, no graphical representation included. Luminaire support assembly detailed on Plan Insert Sheet 203121.*	*Support cell to indicate approximate location. Attribute for item added to support cell.*	*Support cell to indicate approximate location. Attribute for item added to support cell.*	*Support cell to indicate approximate location. Attribute for item added to support cell.*
-	*Span Wire Sign Support, Type TC-17.11, Design __*	*EACH*	*No*	*100*	*2D*	*501, 513, 711, 730*	*Place standard support cell. Could elevate to LOD 300 by developing a unique 3D cell for each ODOT sign support type.*	*Support cell to indicate preliminary location. Attributes for specific product added.*	*Support cell to indicate refined location. Attributes for specific product added.*	*Support cell to indicate final location. Attributes for specific product added.*
-	*Overpass Structure Mounted Sign Support,Type TC-__, Design __*	*EACH*	*No*	*100*	*2D*	*501, 513, 711, 730*	*Place standard support cell. Could elevate to LOD 300 by developing a unique 3D cell for each ODOT sign support type.*	*Support cell to indicate preliminary location. Attributes for specific product added.*	*Support cell to indicate refined location. Attributes for specific product added.*	*Support cell to indicate final location. Attributes for specific product added.*
-	*Sign Hanger Assembly, (Span Wire, Mast Arm)*	*EACH*	*No*	*100*	*2D*	*NA*	*There is no graphical representation of a mast arm sign hanger in the current ODOT cell library. We currently represent this by using the SGN1PP cell placed along span wire/mast arm. Recommend creating separate cell to represent this item. Hanger assembly detailed on SCDs.*	*Support cell to indicate preliminary location. Attribute for item added to support cell.*	*Support cell to indicate refined location. Attribute for item added to support cell.*	*Support cell to indicate final location. Attribute for item added to support cell.*
-	*Sign Support Assembly, (Pole or Bridge Mounted)*	*EACH*	*No*	*100*	*2D*	*NA*	*There is no graphical representation of a sign support assembly in the current ODOT cell library. We currently represent this by using the SGN1PP cell placed along the pole or structure. Recommend creating separate cell to represent this item. Support assembly detailed on Plan Insert Sheets 201824, 201826, and 202030.*	*Support cell or pole cell to indicate preliminary location. Attribute for item added to support cell.*	*Support cell or pole cell to indicate refined location. Attribute for item added to support cell.*	*Support cell or pole cell to indicate final location. Attribute for item added to support cell.*
-	*Sign, (Flat Sheet, Ground Mounted Extrusheet, Overhead Extrusheet, Temporary Overlay)*	*SF*	*Yes*	*100*	*2D*	*730*	*Child of support cell. Basic graphical representation included as part of support cell. Signs detailed on SCDs and SDMM. There is no current way to graphically represent signs being installed with a sign support/hanger assembly.*	*Support cell to indicate approximate location. Attribute for item added to support cell.*	*Support cell to indicate approximate location. Attribute for item added to support cell.*	*Support cell to indicate approximate location. Attribute for item added to support cell.*
-	*Sign, Double-Faced, (Street Name, Mile Marker)*	*EACH*	*No*	*100*	*2D*	*730*	*Child of support cell. Basic graphical representation included as part of support cell. Signs detailed on SCDs and SDMM. There is no current way to graphically represent signs being installed with a sign support/hanger assembly.*	*Support cell to indicate approximate location. Attribute for item added to support cell.*	*Support cell to indicate approximate location. Attribute for item added to support cell.*	*Support cell to indicate approximate location. Attribute for item added to support cell.*
-	*Sign Erected, (Flat Sheet, Extrusheet, Temporary Overlay)*	*SF*	*No*	*100*	*2D*	*730*	*Child of support cell. Basic graphical representation included as part of support cell. Signs detailed on SCDs and SDMM. There is no current way to graphically represent signs being installed with a sign support/hanger assembly.*	*Support cell to indicate approximate location. Attribute for item added to support cell.*	*Support cell to indicate approximate location. Attribute for item added to support cell.*	*Support cell to indicate approximate location. Attribute for item added to support cell.*
-	*Sign Backing Assembly*	*EACH*	*No*	*NA*	*NA*	*NA*	*Child of support cell, no graphical representation included. Backing assembly detailed on SCDs.*	*Support cell to indicate approximate location. Attribute for item added to support cell.*	*Support cell to indicate approximate location. Attribute for item added to support cell.*	*Support cell to indicate approximate location. Attribute for item added to support cell.*
-	*Sign Post Reflector*	*EACH*	*Yes*	*NA*	*NA*	*NA*	*Child of support cell, no graphical representation included. Sign post reflector detailed on SCDs.*	*Support cell to indicate approximate location. Attribute for item added to support cell.*	*Support cell to indicate approximate location. Attribute for item added to support cell.*	*Support cell to indicate approximate location. Attribute for item added to support cell.*
-	*Covering of Sign*	*SF*	*No*	*NA*	*NA*	*NA*	*Child of support cell.*	*Support cell to indicate approximate location. Attribute for item added to support cell.*	*Support cell to indicate approximate location. Attribute for item added to support cell.*	*Support cell to indicate approximate location. Attribute for item added to support cell.*
-	*Removal of Ground Mounted (Major) Sign and (Delivery, Storage, Reerection, or Disposal)*	*EACH*	*Yes*	*NA*	*NA*	*NA*	*Child of X cell on existing sign support to be removed. There is no current way to graphically represent removal of signs mounted with a sign support/hanger assembly.*	*X cell to indicate approximate location. Attribute for item added to X cell.*	*X cell to indicate approximate location. Attribute for item added to X cell.*	*X cell to indicate approximate location. Attribute for item added to X cell.*
-	Removal of Ground Mounted (Structureal Beam, Post, Pipe, Wooden Box Beam) Support and (Delivery, Storage or Disposal)	*EACH*	*Yes*	*100*	*2D*	*NA*	*Place X cell on existing sign support cells to be removed.*	*X cell to indicate approximate location. Attribute for item added to X cell.*	*X cell to indicate approximate location. Attribute for item added to X cell.*	*X cell to indicate approximate location. Attribute for item added to X cell.*
-	*Removal of Overhead Mounted Sign and (Delivery, Storage, Reerection, or Disposal)*	*EACH*	*No*	*NA*	*NA*	*NA*	*Child of X cell on existing sign support to be removed. There is no current way to graphically represent removal of signs mounted with a sign support/hanger assembly.*	*X cell to indicate approximate location. Attribute for item added to X cell.*	*X cell to indicate approximate location. Attribute for item added to X cell.*	*X cell to indicate approximate location. Attribute for item added to X cell.*
-	*Removal of Overhead Sign Support and (Delivery, Storage, Reerection, or Disposal),*	*EACH*	*No*	*100*	*2D*	*NA*	*Place X cell on existing sign support cells to be removed.*	*X cell to indicate approximate location. Attribute for item added to X cell.*	*X cell to indicate approximate location. Attribute for item added to X cell.*	*X cell to indicate approximate location. Attribute for item added to X cell.*
-	*Removal of Overlay Sign*	*EACH*	*No*	*NA*	*NA*	*NA*	*Child of X cell on existing sign support to be removed. There is no current way to graphically represent removal of signs mounted with a sign support/hanger assembly.*	*X cell to indicate approximate location. Attribute for item added to X cell.*	*X cell to indicate approximate location. Attribute for item added to X cell.*	*X cell to indicate approximate location. Attribute for item added to X cell.*

CMS 600 - Incidentals (Linear Elements, Lighting, Signs, Signals)										
Specification Number	Model Element Name	Method of Measurement	Included in Project?	LOD Minimum	2D/3D	Reference Specification Number(s)	Comments/Notes	Modeling Criteria		
								60% Submission	90% Submission	Final Federated Model
631	Sign Lighting And Electrical Signs	EACH	No	NA	NA	625, 725, 711, 731	Child of sign support cell. There is no current way to graphically represent sign lighting and electrical signs being installed with a sign support/hanger assembly.	Support cell to indicate approximate location. Attribute for item added to support cell.	Support cell to indicate approximate location. Attribute for item added to support cell.	Support cell to indicate approximate location. Attribute for item added to support cell.
-	*Sign Service*	-	*No*	-	-	-	-	-	-	-
-	*Sign Wired*	-	*No*	-	-	-	-	-	-	-
-	*Sign Wired, Overpass Structure*	-	*No*	-	-	-	-	-	-	-
-	*Disconnect Switch with Enclosure, Type __*	-	*No*	-	-	-	-	-	-	-
-	*Switch Enclosure Mounting Bracket Assembly*	-	*No*	-	-	-	-	-	-	-
-	*Ballast, Type __*	-	*No*	-	-	-	-	-	-	-
-	*Photoelectric Control*	-	*No*	-	-	-	-	-	-	-
-	*Luminaire, Type __, With __-watt Lamp*	-	*No*	-	-	-	-	-	-	-
-	*Changeable Message Sign, (Limited, Unlimited) Message*	-	*No*	-	-	-	-	-	-	-
-	*Internally Illuminated Fixed Message Sign, Type __*	-	*No*	-	-	-	-	-	-	-
-	*Sign Flasher Assembly*	-	*No*	-	-	-	-	-	-	-
-	School Speed Limit Sign Assembly, __ inches x __ inches	-	*No*	-	-	-	-	-	-	-
-	*Timer with Enclosure*	-	*No*	-	-	-	-	-	-	-
-	*Removal of Luminaire, Disconnect Switch, Ballast, etc.)*	-	*No*	-	-	-	-	-	-	-
632	Traffic Signal Equipment	FT, EACH	No	Varies	2D	499, 511, 524, 725, 730, 732	-	-	-	-
-	*Vehicular Signal Head, (Yellow or Black), (Aluminum or Polycarbonate), __ Section __ inch Lens (with Backplate)*	*EACH*	*No*	*100*	*2D*	*732*	*Place standard signal head cell. Cell does not need modified to match true dimensions of the signal head.*	*Signal head cell to indicate preliminary location. Attributes for specific product added.*	*Signal head cell to indicate refined location. Attributes for specific product added.*	*Signal head cell to indicate final location. Attributes for specific product added.*
-	*Vehicular Signal Head, Optically Programmed, (Yellow or Black), (Aluminum or Polycarbonate), __-Section, __inch Lens, (with Backplate)*	*EACH*	*No*	*100*	*2D*	*732*	*Place standard signal head cell. Cell does not need modified to match true dimensions of the signal head.*	*Signal head cell to indicate preliminary location. Attributes for specific product added.*	*Signal head cell to indicate refined location. Attributes for specific product added.*	*Signal head cell to indicate final location. Attributes for specific product added.*
-	*Pedestrian Signal Head, (Aluminum or Polycarbonate) (Countdown), Type __*	*EACH*	*No*	*100*	*2D*	*732*	*Place standard signal head cell. Cell does not need modified to match true dimensions of the signal head.*	*Signal head cell to indicate preliminary location. Attributes for specific product added.*	*Signal head cell to indicate refined location. Attributes for specific product added.*	*Signal head cell to indicate final location. Attributes for specific product added.*
-	*Pedestrian Pushbutton*	*EACH*	*No*	*100*	*2D*	*732*	*Place standard pedestrian push button cell. Cell does not need modified to match true dimensions of the signal head.*	*Push button cell to indicate preliminary location. Attributes for specific product added.*	*Push button cell to indicate refined location. Attributes for specific product added.*	*Push button cell to indicate final location. Attributes for specific product added.*
-	*Accessible Pedestrian Pushbutton*	*EACH*	*No*	*100*	*2D*	*732*	*Place standard pedestrian push button cell. Cell does not need modified to match true dimensions of the signal head.*	*Push button cell to indicate preliminary location. Attributes for specific product added.*	*Push button cell to indicate refined location. Attributes for specific product added.*	*Push button cell to indicate final location. Attributes for specific product added.*
-	*Loop Detector Unit*	*EACH*	*No*	*100*	*2D*	*732*	*Limits of loop detection bounded by linework using standard detection level and linestyle. Layout detailed on SCDs.*	*Detection linework to indicate approximate location. Attribute for item added.*	*Detection linework to indicate approximate location. Attribute for item added.*	*Detection linework to indicate approximate location. Attribute for item added.*
-	*Dectector Loop*	*EACH*	*No*	*200*	*2D*	*732*	*Limits of loop detection bounded by linework using standard detection level and linestyle. Layout detailed on SCDs.*	*Detection linework to indicate approximate location. Attribute for item added.*	*Detection linework to indicate approximate location. Attribute for item added.*	*Detection linework to indicate approximate location. Attribute for item added.*
-	*Strain Pole Foundation*	*EACH*	*No*	*200*	*2D*	*499, 511, 524*	*Child of the pole cell. Could elevate to LOD 300 by developing a unique 3D cell for each ODOT foundation type.*	*Pole cell to indicate preliminary location. Attribute for item added to support cell.*	*Pole cell to indicate refined location. Attribute for item added to support cell.*	*Pole cell to indicate final location. Attribute for item added to support cell.*
-	*Signal Support Foundation*	*EACH*	*No*	*200*	*2D*	*499, 511, 524*	*Child of the support cell. Could elevate to LOD 300 by developing a unique 3D cell for each ODOT foundation type.*	*Support cell to indicate preliminary location. Attribute for item added to support cell.*	*Support cell to indicate refined location. Attribute for item added to support cell.*	*Support cell to indicate final location. Attribute for item added to support cell.*
-	*Pedestal Foundation*	*EACH*	*No*	*200*	*2D*	*499, 511, 524*	*Child of the pedestal cell. Could elevate to LOD 300 by developing a unique 3D cell for each ODOT foundation type.*	*Pedestal cell to indicate preliminary location. Attribute for item added to support cell.*	*Pedestal cell to indicate refined location. Attribute for item added to support cell.*	*Pedestal cell to indicate final location. Attribute for item added to support cell.*
-	*Signal Support, Type TC-__, Design _*	*EACH*	*No*	*100*	*2D*	*730*	*Place standard support cell. Could elevate to LOD 300 by developing a unique 3D cell for each ODOT signal support type.*	*Support cell to indicate preliminary location. Attributes for specific product added.*	*Support cell to indicate refined location. Attributes for specific product added.*	*Support cell to indicate final location. Attributes for specific product added.*
-	*Combination Signal Support, Type TC-__, Design__*	*EACH*	*No*	*100*	*2D*	*730*	*Place standard support cell. Could elevate to LOD 300 by developing a unique 3D cell for each ODOT signal support type.*	*Support cell to indicate preliminary location. Attributes for specific product added.*	*Support cell to indicate refined location. Attributes for specific product added.*	*Support cell to indicate final location. Attributes for specific product added.*
-	*Strain Pole, Type TC-__, Design__*	*EACH*	*No*	*100*	*2D*	*730*	*Place standard strain pole cell. Could elevate to LOD 300 by developing a unique 3D cell for each ODOT strain pole type.*	*Strain pole cell to indicate preliminary location. Attributes for specific product added.*	*Strain pole cell to indicate refined location. Attributes for specific product added.*	*Strain pole cell to indicate final location. Attributes for specific product added.*

CMS 600 - Incidentals (Linear Elements, Lighting, Signs, Signals)										
Specification Number	Model Element Name	Method of Measurement	Included in Project?	LOD Minimum	2D/3D	Reference Specification Number(s)	Comments/Notes	Modeling Criteria		
								60% Submission	90% Submission	Final Federated Model
-	*Combination Strain Pole, Type TC-__, Design__*	*EACH*	*No*	*100*	*2D*	*730*	*Place standard strain pole cell. Could elevate to LOD 300 by developing a unique 3D cell for each ODOT strain pole type.*	*Strain pole cell to indicate preliminary location. Attributes for specific product added.*	*Strain pole cell to indicate refined location. Attributes for specific product added.*	*Strain pole cell to indicate final location. Attributes for specific product added.*
-	*Wood Pole, Class __, (Length)__feet (__ m)*	*EACH*	*No*	*100*	*2D*	*732*	*Place standard wood pole cell. Could elevate to LOD 300 by developing a unique 3D cell for each ODOT wood pole type.*	*Pole cell to indicate preliminary location. Attributes for specific product added.*	*Pole cell to indicate refined location. Attributes for specific product added.*	*Pole cell to indicate final location. Attributes for specific product added.*
-	*Down Guy*	*EACH*	*No*	*100*	*2D*	*732*	*Place standard guy cell.*	*Guy cell to indicate preliminary location. Attributes for specific product added.*	*Guy cell to indicate refined location. Attributes for specific product added.*	*Guy cell to indicate final location. Attributes for specific product added.*
-	*Pedestal, (Length) __feet (__m)*	*EACH*	*No*	*100*	*2D*	*732*	*Place standard pedestal cell. Cell does not need modified to match true dimensions of the pedestal.*	*Pedestal cell to indicate preliminary location. Attributes for specific product added.*	*Pedestal cell to indicate refined location. Attributes for specific product added.*	*Pedestal cell to indicate final location. Attributes for specific product added.*
-	*Pedestal, (Length) __feet (__m), Transformer Base*	*EACH*	*No*	*100*	*2D*	*732*	*Place standard pedestal cell. Cell does not need modified to match true dimensions of the pedestal.*	*Pedestal cell to indicate preliminary location. Attributes for specific product added.*	*Pedestal cell to indicate refined location. Attributes for specific product added.*	*Pedestal cell to indicate final location. Attributes for specific product added.*
-	*Conduit Riser, __inch Dia.*	*EACH*	*No*	*NA*	*NA*	*732*	*Child of pole providing raceway for signal cable, no graphical representation included.*	*Pole cell to indicate approximate location. Attribute for item added to pole cell.*	*Pole cell to indicate approximate location. Attribute for item added to pole cell.*	*Pole cell to indicate approximate location. Attribute for item added to pole cell.*
-	*Messenger Wire, (No.) Strand __inch Dia., with Accessories*	*FT*	*No*	*NA*	*NA*	*725, 732*	*Child of signal conduit, hand hole, and/or poles, no graphical representation included.*	*Signal conduit/hand hole/pole to indicate preliminary location. Attribute for cable/wire type added to signal conduit/hand hole/pole.*	*Signal conduit/hand hole/pole to indicate refined location. Attribute for cable/wire type added to signal conduit/hand hole/pole.*	*Signal conduit/hand hole/pole to indicate final location. Attribute for cable/wire type added to signal conduit/hand hole/pole.*
-	*Signal Cable, __- Conductor, __AWG*	*FT*	*No*	*NA*	*NA*	*725, 732*	*Child of signal conduit, hand hole, and/or poles, no graphical representation included.*	*Signal conduit/hand hole/pole to indicate preliminary location. Attribute for cable/wire type added to signal conduit/hand hole/pole.*	*Signal conduit/hand hole/pole to indicate refined location. Attribute for cable/wire type added to signal conduit/hand hole/pole.*	*Signal conduit/hand hole/pole to indicate final location. Attribute for cable/wire type added to signal conduit/hand hole/pole.*
-	*Interconnect Cable, __- Conductor, __AWG*	*FT*	*No*	*NA*	*NA*	*725, 732*	*Child of signal conduit, hand hole, and/or poles, no graphical representation included.*	*Signal conduit/hand hole/pole to indicate preliminary location. Attribute for cable/wire type added to signal conduit/hand hole/pole.*	*Signal conduit/hand hole/pole to indicate refined location. Attribute for cable/wire type added to signal conduit/hand hole/pole.*	*Signal conduit/hand hole/pole to indicate final location. Attribute for cable/wire type added to signal conduit/hand hole/pole.*
-	*Interconnect Cable, Integral Messenger Wire Type, __-Conductor,__AWG*	*FT*	*No*	*NA*	*NA*	*725, 732*	*Child of signal conduit, hand hole, and/or poles, no graphical representation included.*	*Signal conduit/hand hole/pole to indicate preliminary location. Attribute for cable/wire type added to signal conduit/hand hole/pole.*	*Signal conduit/hand hole/pole to indicate refined location. Attribute for cable/wire type added to signal conduit/hand hole/pole.*	*Signal conduit/hand hole/pole to indicate final location. Attribute for cable/wire type added to signal conduit/hand hole/pole.*
-	*Loop Detector Lead-In Cable*	*FT*	*No*	*NA*	*NA*	*725, 732*	*Child of signal conduit, hand hole, and/or poles, no graphical representation included.*	*Signal conduit/hand hole/pole to indicate preliminary location. Attribute for cable/wire type added to signal conduit/hand hole/pole.*	*Signal conduit/hand hole/pole to indicate refined location. Attribute for cable/wire type added to signal conduit/hand hole/pole.*	*Signal conduit/hand hole/pole to indicate final location. Attribute for cable/wire type added to signal conduit/hand hole/pole.*
-	*Power Cable,__- Conductor, __ AWG*	*FT*	*No*	*NA*	*NA*	*725, 732*	*Child of signal conduit, hand hole, and/or poles, no graphical representation included.*	*Signal conduit/hand hole/pole to indicate preliminary location. Attribute for cable/wire type added to signal conduit/hand hole/pole.*	*Signal conduit/hand hole/pole to indicate refined location. Attribute for cable/wire type added to signal conduit/hand hole/pole.*	*Signal conduit/hand hole/pole to indicate final location. Attribute for cable/wire type added to signal conduit/hand hole/pole.*
-	*Service Cable, __- Conductor, __AWG*	*FT*	*No*	*NA*	*NA*	*725, 732*	*Child of signal conduit, hand hole, and/or poles, no graphical representation included.*	*Signal conduit/hand hole/pole to indicate preliminary location. Attribute for cable/wire type added to signal conduit/hand hole/pole.*	*Signal conduit/hand hole/pole to indicate refined location. Attribute for cable/wire type added to signal conduit/hand hole/pole.*	*Signal conduit/hand hole/pole to indicate final location. Attribute for cable/wire type added to signal conduit/hand hole/pole.*
-	*Power Service*	*EACH*	*No*	*NA*	*NA*	*725, 732*	*Child of signal controller cabinet cell.*	*Signal controller cabinet cell to indicate approximate location. Attribute for item added to signal controller cabinet cell.*	*Signal controller cabinet cell to indicate approximate location. Attribute for item added to signal controller cabinet cell.*	*Signal controller cabinet cell to indicate approximate location. Attribute for item added to signal controller cabinet cell.*
-	*Covering of Vehicular Signal Head*	*EACH*	*No*	*NA*	*NA*	*NA*	*Child of signal head cell.*	*Signal head cell to indicate approximate location. Attribute for item added to signal head cell.*	*Signal head cell to indicate approximate location. Attribute for item added to signal head cell.*	*Signal head cell to indicate approximate location. Attribute for item added to signal head cell.*
-	*Covering of Pedestrian Signal Head*	*EACH*	*No*	*NA*	*NA*	*NA*	*Child of signal head cell.*	*Signal head cell to indicate approximate location. Attribute for item added to signal head cell.*	*Signal head cell to indicate approximate location. Attribute for item added to signal head cell.*	*Signal head cell to indicate approximate location. Attribute for item added to signal head cell.*
-	*Removal of Traffic Signal Installation*	*EACH*	*No*	*NA*	*NA*	*NA*	*Quantity comes from notes and is not included in model.*	*NA*	*NA*	*NA*
-	*Removal of (Item) and (Storage Or Reerection)*	*EACH*	*No*	*NA*	*NA*	*NA*	*Quantity comes from notes and is not included in model.*	*NA*	*NA*	*NA*
-	*Reuse of (Item)*	*EACH*	*No*	*NA*	*NA*	*NA*	*Quantity comes from notes and is not included in model.*	*NA*	*NA*	*NA*
-	Tether Wire, with Accessories	*FT*	*No*	*NA*	*NA*	*NA*	*Child of signal head cell.*	*Signal head cell to indicate approximate location. Attribute for item added to signal head cell.*	*Signal head cell to indicate approximate location. Attribute for item added to signal head cell.*	*Signal head cell to indicate approximate location. Attribute for item added to signal head cell.*
633	Traffic Signal Controllers	EACH, LS	No	Varies	2D	499, 511, 608, 632, 725, 733	-	-	-	-
-	*Cabinet, Type__*	*EACH*	*No*	*100*	*2D*	*632, 725, 733*	*Place standard signal controller cabinet cell. Cell does not need modified to match true dimensions of the signal controller cabinet.*	*Signal controller cabinet cell to indicate preliminary location. Attributes for specific product added.*	*Signal controller cabinet cell to indicate refined location. Attributes for specific product added.*	*Signal controller cabinet cell to indicate final location. Attributes for specific product added.*
-	*Cabinet, Type__, Furnish Only*	*EACH*	*No*	*100*	*2D*	*632, 725, 733*	*Place standard signal controller cabinet cell. Cell does not need modified to match true dimensions of the signal controller cabinet.*	*Signal controller cabinet cell to indicate preliminary location. Attributes for specific product added.*	*Signal controller cabinet cell to indicate refined location. Attributes for specific product added.*	*Signal controller cabinet cell to indicate final location. Attributes for specific product added.*
-	*Cabinet Foundation*	*EACH*	*No*	*200*	*2D*	*499, 511*	*Child of the signal controller cabinet cell. Could elevate to LOD 300 by developing a unique 3D cell for each ODOT foundation type.*	*Signal controller cabinet cell to indicate preliminary location. Attribute for item added to signal controller cabinet cell.*	*Signal controller cabinet cell to indicate refined location. Attribute for item added to signal controller cabinet cell.*	*Signal controller cabinet cell to indicate final location. Attribute for item added to signal controller cabinet cell.*
-	*Controller Work Pad*	*EACH*	*No*	*200*	*2D*	*499, 511, 608*	*Child of the signal controller cabinet cell. Recommend updating cell to have parametric constraints work pad dimensions.*	*Signal controller cabinet cell to indicate preliminary location. Attribute for item added to signal controller cabinet cell.*	*Signal controller cabinet cell to indicate refined location. Attribute for item added to signal controller cabinet cell.*	*Signal controller cabinet cell to indicate final location. Attribute for item added to signal controller cabinet cell.*
-	*Flasher Controller*	*EACH*	*No*	*100*	*2D*	*632, 725, 733*	*Place standard signal controller cabinet cell. Cell does not need modified to match true dimensions of the signal controller cabinet.*	*Signal controller cabinet cell to indicate preliminary location. Attributes for specific product added.*	*Signal controller cabinet cell to indicate refined location. Attributes for specific product added.*	*Signal controller cabinet cell to indicate final location. Attributes for specific product added.*

CMS 600 - Incidentals (Linear Elements, Lighting, Signs, Signals)										
Specification Number	Model Element Name	Method of Measurement	Included in Project?	LOD Minimum	2D/3D	Reference Specification Number(s)	Comments/Notes	Modeling Criteria		
								60% Submission	90% Submission	Final Federated Model
-	*Communications*	*EACH*	*No*	*NA*	*NA*	*NA*	*Child of signal controller cabinet cell.*	*Signal controller cabinet cell to indicate approximate location. Attribute for item added to signal controller cabinet cell.*	*Signal controller cabinet cell to indicate approximate location. Attribute for item added to signal controller cabinet cell.*	*Signal controller cabinet cell to indicate approximate location. Attribute for item added to signal controller cabinet cell.*
-	*Training*	*LS*	*No*	*NA*	*NA*	*NA*	*Child of signal controller cabinet cell.*	*Signal controller cabinet cell to indicate approximate location. Attribute for item added to signal controller cabinet cell.*	*Signal controller cabinet cell to indicate approximate location. Attribute for item added to signal controller cabinet cell.*	*Signal controller cabinet cell to indicate approximate location. Attribute for item added to signal controller cabinet cell.*
-	*Uninterruptible Power Supply*	*EACH*	*No*	*NA*	*NA*	*NA*	*Child of signal controller cabinet cell.*	*Signal controller cabinet cell to indicate approximate location. Attribute for item added to signal controller cabinet cell.*	*Signal controller cabinet cell to indicate approximate location. Attribute for item added to signal controller cabinet cell.*	*Signal controller cabinet cell to indicate approximate location. Attribute for item added to signal controller cabinet cell.*
638	Water Mains And Service Branches	FT, MBF, EACH	No	300	3D	748	Layout in 3D using the OpenRoads Drainage and Utility tools.	-	-	-

CMS 640 - Pavement Marking										
Specification Number	Model Element Name	Method of Measurement	Included in Project?	LOD Minimum	2D/3D	Reference Specification Number(s)	Comments/Notes	Modeling Criteria		
								60% Submission	90% Submission	Final Federated Model
641	Pavement Marking - General	-	Yes	200	2D	614, 642, 643, 644, 645, 646, 647, 648	Not a pay item.	Linework representing proposed pavement markings.	Linework representing proposed pavement markings. Attributes for pavement markings width and color.	Linework representing proposed pavement markings. Attributes for pavement markings width and color.
642	Traffic Paint	FT, MILE, SF, EACH, LS	No	200	2D	641, 740	-	-	-	-
-	*Edge Line, __inch, Type __*	*MILE*	*No*	-	-	-	-	-	-	-
-	*Lane Line, __inch, Type __*	*MILE*	*No*	-	-	-	-	-	-	-
-	*Center Line, Type __*	*MILE*	*No*	-	-	-	-	-	-	-
-	*Channelizing Line, __inch, Type __*	*FT*	*No*	-	-	-	-	-	-	-
-	*Stop Line, Type __*	*FT*	*No*	-	-	-	-	-	-	-
-	*Yield Line, Type __*	*FT*	*No*	-	-	-	-	-	-	-
-	*Crosswalk Line, Type __*	*FT*	*No*	-	-	-	-	-	-	-
-	*Transverse/Diagonal Line, Type __*	*FT*	*No*	-	-	-	-	-	-	-
-	*Curb Marking, Type __*	*FT*	*No*	-	-	-	-	-	-	-
-	*Island Marking, Type __*	*SF*	*No*	-	-	-	-	-	-	-
-	*Handicap Symbol Marking, Type __*	*EACH*	*No*	-	-	-	-	-	-	-
-	*Railroad Symbol Marking, Type __*	*EACH*	*No*	-	-	-	-	-	-	-
-	*School Symbol Marking, __ inch, Type __*	*EACH*	*No*	-	-	-	-	-	-	-
-	*Bicycle Lane Symbol Marking, Type __*	*EACH*	*No*	-	-	-	-	-	-	-
-	*Shared Lane Marking, Type __*	*EACH*	*No*	-	-	-	-	-	-	-
-	*Parking Lot Stall Marking, Type __*	*FT*	*No*	-	-	-	-	-	-	-
-	*Lane Arrow, Type __*	*EACH*	*No*	-	-	-	-	-	-	-
-	*Two Way Left Turn Arrow*	*EACH*	*No*	-	-	-	-	-	-	-
-	*Word on Pavement, __inch, Type __*	*EACH*	*No*	-	-	-	-	-	-	-
-	*Dotted Line, __inch, Type __*	*FT*	*No*	-	-	-	-	-	-	-
-	*Removal of pavement marking*	*EACH, FT, SF*	*No*	-	-	-	-	-	-	-
-	*Two-Way Radio Equipment*	*LS*	*No*	-	-	-	-	-	-	-
643	Polyester Pavement Marking	FT, MILE, SF, EACH, LS	No	200	2D	641, 642, 740	-	-	-	-
-	*Word on Pavement, __inch*	*EACH*	*No*	-	-	-	-	-	-	-
-	*Dotted Line, __inch*	*FT*	*No*	-	-	-	-	-	-	-
-	*Removal of pavement marking*	*FT OR SQ. FT. (M OR SQ. M), OR EACH*	*No*	-	-	-	-	-	-	-
-	*Two-Way Radio Equipment*	*LS*	*No*	-	-	-	-	-	-	-
644	Thermoplastic Pavement Marking	FT, MILE, SF, EACH, LS	Yes	200	2D	641, 647, 740	-	-	-	-
-	*Edge Line, __inch*	*MILE*	*Yes*	-	-	-	-	-	-	-
-	*Lane Line, __inch*	*MILE*	*Yes*	-	-	-	-	-	-	-
-	*Center Line*	*MILE*	*Yes*	-	-	-	-	-	-	-
-	*Channelizing Line, __inch*	*MILE*	*Yes*	-	-	-	-	-	-	-
-	*Stop Line*	*FT*	*Yes*	-	-	-	-	-	-	-

CMS 640 - Pavement Marking										
Specification Number	Model Element Name	Method of Measurement	Included in Project?	LOD Minimum	2D/3D	Reference Specification Number(s)	Comments/Notes	Modeling Criteria		
								60% Submission	90% Submission	Final Federated Model
-	*Yield Line*	*FT*	*Yes*	-	-	-	-	-	-	-
-	*Crosswalk Line*	*FT*	*Yes*	-	-	-	-	-	-	-
-	*Transverse/Diagonal Line*	*FT*	*Yes*	-	-	-	-	-	-	-
-	*Handicap Symbol Marking*	*EACH*	*Yes*	-	-	-	-	-	-	-
-	*Railroad Symbol Marking, __ inch*	*EACH*	*Yes*	-	-	-	-	-	-	-
-	*School Symbol Marking, __ inch*	*EACH*	*Yes*	-	-	-	-	-	-	-
-	*Bicycle Lane Marking Symbol*	*EACH*	*Yes*	-	-	-	-	-	-	-
-	*Shared Lane Marking*	*EACH*	*Yes*	-	-	-	-	-	-	-
-	*Parking Lot Stall Marking*	*FT*	*Yes*	-	-	-	-	-	-	-
-	*Lane Arrow*	*EACH*	*Yes*	-	-	-	-	-	-	-
-	*Two Way Left Turn Arrow*	*EACH*	*Yes*	-	-	-	-	-	-	-
-	*Word on Pavement, __inch*	*EACH*	*Yes*	-	-	-	-	-	-	-
-	*Dotted Line, __ inch*	*FT*	*Yes*	-	-	-	-	-	-	-
-	*Removal of pavement marking*	*EACH, FT, SF*	*Yes*	-	-	-	-	-	-	-
-	*Two-Way Radio Equipment*	*LS*	*Yes*	-	-	-	-	-	-	-
645	Preformed Pavement Marking	FT, MILE, SF, EACH, LS	No	200	2D	641, 740	-	-	-	-
-	*Edge Line, __inch*	*MILE*	*No*	-	-	-	-	-	-	-
-	*Lane Line, __inch*	*MILE*	*No*	-	-	-	-	-	-	-
-	*Center Line*	*MILE*	*No*	-	-	-	-	-	-	-
-	*Channelizing Line, __inch*	*FT*	*No*	-	-	-	-	-	-	-
-	*Stop Line, Type __*	*FT*	*No*	-	-	-	-	-	-	-
-	*Yield Line, Type __*	*FT*	*No*	-	-	-	-	-	-	-
-	*Crosswalk Line, Type __*	*FT*	*No*	-	-	-	-	-	-	-
-	*Transverse/Diagonal Line, Type __*	*FT*	*No*	-	-	-	-	-	-	-
-	*Handicap Symbol Marking, Type __*	*EACH*	*No*	-	-	-	-	-	-	-
-	*Railroad Symbol Marking, Type __*	*EACH*	*No*	-	-	-	-	-	-	-
-	*School Symbol Marking, __ inch, Type __*	*EACH*	*No*	-	-	-	-	-	-	-
-	*Bicycle Lane Symbol Marking, Type __*	*EACH*	*No*	-	-	-	-	-	-	-
-	*Shared Lane Marking*	*EACH*	*No*	-	-	-	-	-	-	-
-	*Parking Lot Stall Marking, Type __*	*FT*	*No*	-	-	-	-	-	-	-
-	*Lane Arrow, Type __*	*EACH*	*No*	-	-	-	-	-	-	-
-	*Two Way Left Turn Arrow*	*EACH*	*No*	-	-	-	-	-	-	-
-	*Word on Pavement, __inch, Type __*	*EACH*	*No*	-	-	-	-	-	-	-
-	*Dotted Line, __ inch, Type __*	*FT*	*No*	-	-	-	-	-	-	-
-	*Removal of pavement marking*	*EACH, FT, SF*	*No*	-	-	-	-	-	-	-
-	*Two-Way Radio Equipment*	*LS*	*No*	-	-	-	-	-	-	-

CMS 640 - Pavement Marking										
Specification Number	Model Element Name	Method of Measurement	Included in Project?	LOD Minimum	2D/3D	Reference Specification Number(s)	Comments/Notes	Modeling Criteria		
								60% Submission	90% Submission	Final Federated Model
646	Epoxy Pavement Marking	FT, MILE, SF, EACH, LS	No	200	2D	641, 740	-	-	-	-
-	*Edge Line, __inch*	*MILE*	*No*	-	-	*641, 740*	-	-	-	-
-	*Lane Line, __inch*	*MILE*	*No*	-	-	*641, 740*	-	-	-	-
-	*Center Line*	*MILE*	*No*	-	-	*641, 740*	-	-	-	-
-	*Channelizing Line, __inch*	*FT*	*No*	-	-	*641, 740*	-	-	-	-
-	*Stop Line*	*FT*	*No*	-	-	*641, 740*	-	-	-	-
-	*Yield Line*	*FT*	*No*	-	-	*641, 740*	-	-	-	-
-	*Crosswalk Line*	*FT*	*No*	-	-	*641, 740*	-	-	-	-
-	*Transverse/Diagonal Line*	*FT*	*No*	-	-	*641, 740*	-	-	-	-
-	*Curb Marking*	*FT*	*No*	-	-	*641, 740*	-	-	-	-
-	*Island Marking*	*SF*	*No*	-	-	*641, 740*	-	-	-	-
-	*Handicap Symbol Marking*	*EACH*	*No*	-	-	*641, 740*	-	-	-	-
-	*Railroad Symbol Marking*	*EACH*	*No*	-	-	*641, 740*	-	-	-	-
-	*School Symbol Marking, __ inch, Type __*	*EACH*	*No*	-	-	*641, 740*	-	-	-	-
-	*Bicycle Lane Symbol Marking*	*EACH*	*No*	-	-	*641, 740*	-	-	-	-
-	*Shared Lane Marking*	*EACH*	*No*	-	-	*641, 740*	-	-	-	-
-	*Parking Lot Stall Marking*	*FT*	*No*	-	-	*641, 740*	-	-	-	-
-	*Lane Arrow*	*EACH*	*No*	-	-	*641, 740*	-	-	-	-
-	*Two Way Left Turn Arrow*	*EACH*	*No*	-	-	*641, 740*	-	-	-	-
-	*Word on Pavement, __inch*	*EACH*	*No*	-	-	*641, 740*	-	-	-	-
-	*Dotted Line, __inch*	*FT*	*No*	-	-	*641, 740*	-	-	-	-
-	*Removal of pavement marking*	*EACH, FT, SF*	*No*	-	-	*641, 740*	-	-	-	-
-	*Two-Way Radio Equipment*	*LS*	*No*	-	-	*641, 740*	-	-	-	-
647	Heat-Fused Preformed Thermoplastic Pavement Marking	FT, MILE, SF, EACH	No	200	2D	641, 740	-	-	-	-
-	*Channelizing Line, __inch*	*FT*	*No*	-	-	*641, 740*	-	-	-	-
-	*Stop Line, Type __*	*FT*	*No*	-	-	*641, 740*	-	-	-	-
-	*Yield Line, Type __*	*FT*	*No*	-	-	*641, 740*	-	-	-	-
-	*Crosswalk Line, Type __*	*FT*	*No*	-	-	*641, 740*	-	-	-	-
-	*Transverse/Diagonal Line, Type __*	*FT*	*No*	-	-	*641, 740*	-	-	-	-
-	*Handicap Symbol Marking, Type __*	*EACH*	*No*	-	-	*641, 740*	-	-	-	-
-	*Railroad Symbol Marking, Type __*	*EACH*	*No*	-	-	*641, 740*	-	-	-	-
-	*School Symbol Marking, __ inch, Type __*	*EACH*	*No*	-	-	*641, 740*	-	-	-	-
-	*Bicycle Lane Symbol Marking, Type __*	*EACH*	*No*	-	-	*641, 740*	-	-	-	-
-	*Shared Lane Marking*	*EACH*	*No*	-	-	*641, 740*	-	-	-	-
-	*Speed Measurement Marking*	*EACH*	*No*	-	-	*641, 740*	-	-	-	-
-	*Parking Lot Stall Marking, Type __*	*FT*	*No*	-	-	*641, 740*	-	-	-	-

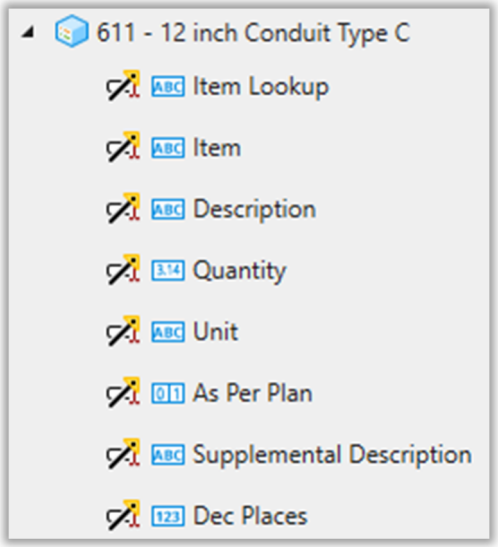
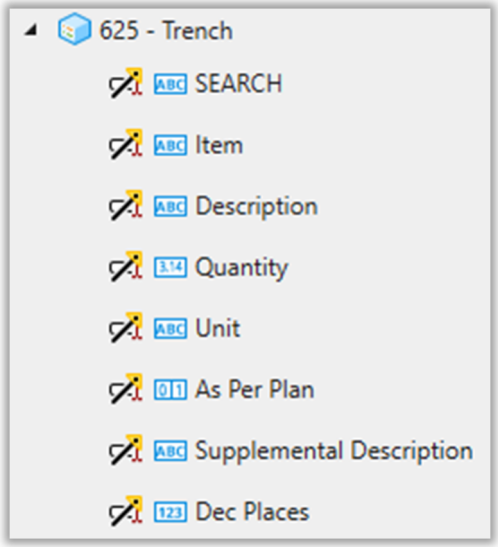
CMS 640 - Pavement Marking										
Specification Number	Model Element Name	Method of Measurement	Included in Project?	LOD Minimum	2D/3D	Reference Specification Number(s)	Comments/Notes	Modeling Criteria		
								60% Submission	90% Submission	Final Federated Model
-	*Lane Arrow, Type __*	*EACH*	*No*	-	-	*641, 740*	-	-	-	-
-	*Word on a Pavement, __inch, Type __*	*EACH*	*No*	-	-	*641, 740*	-	-	-	-
-	*Dotted Line, __inch, Type __*	*FT*	*No*	-	-	*641, 740*	-	-	-	-
-	*Removal of pavement marking*	*EACH, FT, SF*	*No*	-	-	*641, 740*	-	-	-	-
648	Spray Thermoplastic Pavement Marking	FT, MILE, SF, EACH, LS	No	200	2D	641, 740	-	-	-	-
-	*Edge Line, __inch*	*MILE*	*No*	-	-	-	-	-	-	-
-	*Lane Line, __inch*	*MILE*	*No*	-	-	-	-	-	-	-
-	*Center Line*	*MILE*	*No*	-	-	-	-	-	-	-
-	*Channelizing Line, __inch*	*FT*	*No*	-	-	-	-	-	-	-
-	*Dotted Line, __inch*	*FT*	*No*	-	-	-	-	-	-	-
-	*Removal of pavement marking*	*FT, SF, EACH*	*No*	-	-	-	-	-	-	-
-	*Two-Way Radio Equipment*	*LS*	*No*	-	-	-	-	-	-	-

CMS 650 - Roadsides										
Specification Number	Model Element Name	Method of Measurement	Included in Project?	LOD Minimum	2D/3D	Reference Specification Number(s)	Comments/Notes	Modeling Criteria		
								60% Submission	90% Submission	Final Federated Model
651	Topsoil Stockpiled	CY	No	NA	NA	-	Quantity comes from notes and is not included in model.	NA	NA	NA
652	Placing Stockpiled Topsoil	CY	No	NA	NA	653	Quantity comes from notes and is not included in model.	NA	NA	NA
653	Topsoil Furnished And Placed	CY	No	NA	NA	659	Quantity comes from notes and is not included in model.	NA	NA	NA
654	Renovating Existing Soil	MSF, TON	No	NA	NA	105, 659	Quantity comes from notes and is not included in model.	NA	NA	NA
656	Roadside Cleanup	MSF	No	NA	NA	105, 666	Quantity comes from notes and is not included in model.	NA	NA	NA
657	Riprap For Tree Protection	SY	No	100	2D	203, 611, 658	Child of Tree cell. Quantity is calculated by a set area per tree by species.	Preliminary planting plan. Attribute for assumed rip rap application rate.	Final planting plan. Attribute for assumed rip rap application rate.	Final planting plan and final rip rap application rate.
658	Tree Root Aeration	CY	No	200	NA	105, 203, 611	Child of Tree cell. Quantity is calculated by a set volume per tree by species.	Preliminary planting plan. Attribute for assumed aeration rate.	Final planting plan. Attribute for assumed aeration rate.	Final planting plan and final aeration rate.
659	Seeding And Mulching	SY, MSF, ACRES, CY, MGAL, TON, EACH	Yes	Varies	Varies	105, 203	-	Varies	Varies	Varies
-	*Soil Analysis Test*	*EACH*	*Yes*	*NA*	*NA*	-	*Quantity comes from notes and is not included in model. Child of Seeding and Mulching. Quantity is calculated based on Seeding and Mulching area.*	*NA*	*NA*	*NA*
-	*Topsoil*	*CY*	*Yes*	*300*	*3D*	*203*	-	*All grading within construction limits. Based on preliminary grading limits.*	*All grading within construction limits. Based on refined grading limits.*	*All grading within construction limits. Based on final grading limits.*
-	*Commercial Fertilizer*	*TON*	*Yes*	*NA*	*NA*	-	*Quantity comes from notes and is not included in model. Child of Seeding and Mulching. Quantity is calculated based on Seeding and Mulching area.*	*NA*	*NA*	*NA*
-	*Lime*	*ACRE*	*Yes*	*NA*	*NA*	-	*Quantity comes from notes and is not included in model. Child of Seeding and Mulching. Quantity is calculated based on Seeding and Mulching area.*	*NA*	*NA*	*NA*
-	*Seeding and Mulching*	*SY*	*Yes*	*300*	*3D*	-	-	*All grading within construction limits. Based on preliminary grading limits.*	*All grading within construction limits. Based on refined grading limits.*	*All grading within construction limits. Based on final grading limits.*
-	*Seeding and Mulching for Wildlife*	*SY*	*No*	*300*	*3D*	-	-	*All grading within construction limits. Based on preliminary grading limits.*	*All grading within construction limits. Based on refined grading limits.*	*All grading within construction limits. Based on final grading limits.*
-	*Seeding and Mulching, Class ___*	*SY*	*No*	*300*	*3D*	-	-	*All grading within construction limits. Based on preliminary grading limits.*	*All grading within construction limits. Based on refined grading limits.*	*All grading within construction limits. Based on final grading limits.*
-	*Repair Seeding and Mulching*	*SY*	*No*	*NA*	*NA*	-	*Quantity comes from notes and is not included in model. Child of Seeding and Mulching. Quantity is calculated based on Seeding and Mulching area.*	*NA*	*NA*	*NA*
-	*Water*	*MGAL*	*Yes*	*NA*	*NA*	-	*Quantity comes from notes and is not included in model. Child of Seeding and Mulching. Quantity is calculated based on Seeding and Mulching area.*	*NA*	*NA*	*NA*
-	*Inter-Seeding*	*SY*	*No*	*NA*	*NA*	-	*Quantity comes from notes and is not included in model. Child of Seeding and Mulching. Quantity is calculated based on Seeding and Mulching area.*	*NA*	*NA*	*NA*
-	*Mowing*	*MSF*	*No*	*NA*	*NA*	-	*Quantity comes from notes and is not included in model. Child of Seeding and Mulching. Quantity is calculated based on Seeding and Mulching area.*	*NA*	*NA*	*NA*
660	Sodding	SY	No	200	2D	659	-	Area based on preliminary sodding limits.	Area based on refined sodding limits.	Area based on final sodding limits.
661	Planting Trees, Shrubs, Perennials And Vines	EACH	No	100	2D	662	Only 2 tree cells in WorkSpace. Could elevate to LOD 200 by creating unique cell for each tree/shrub on the project.	Preliminary planting plan.	Final planting plan.	Final planting plan.
662	Landscape Watering	GALLON	No	100	2D	-	Child of Tree cell. Quantity is calculated by a set number of gallons per tree by species.	Preliminary planting plan. Attribute for assumed watering rate.	Final planting plan. Attribute for assumed watering rate.	Final planting plan and final watering rate.
666	Pruning Existing Trees	EACH	No	NA	2D	105	Quantity comes from note. Could elevate to LOD 100 by creating cell for tree pruning. Could elevate to LOD 200 by making a unique cell for each size tier in CMS.	NA	NA	NA
670	Erosion Protection	SY	Yes	200	2D	659, 660, 571, 712	-	Area based on preliminary draiange design.	Area based on refined drainage design.	Area based on final drainage design.
671	Erosion Control Mats	SY	No	200	2D	109, 659, 712	-	Area based on preliminary drainage design.	Area based on refined drainage design.	Area based on final drainage design.

APPENDIX C: ITEM TYPE DEVELOPMENT

Item Type Styles / Classes

During Item Type development for the WOO-23 Progress Design Build roundabout project (PID 117545), it became clear that 2 distinct classes of Item Types would be useful.

"Fixed Item" Item Type	"Enter Item" Item Type
Recommended when there is only one version of an item in the Item Master. Associates a pay item with a modeled element in a single step – attaching the Item Type, which could ultimately be done as part of the Feature Definition.	Recommended when there are many varieties of an item in the Item Master and it would be impractical to create an Item Type for every variety. Requires 2 steps to associate a pay item with a modeled element: attaching the Item Type and entering the specific pay item using the SEARCH function. Examples: Light Pole (many different varieties), Asphalt Concrete Surface Course (Type 1/Type 2 & 446/448/449 & PG64-22/PG70-22M), Removal of Sign Post (Ground Mounted/Ground Mounted Major/Ground Mounted Post & Disposal/Storage/ Reerection/Delivery)
	

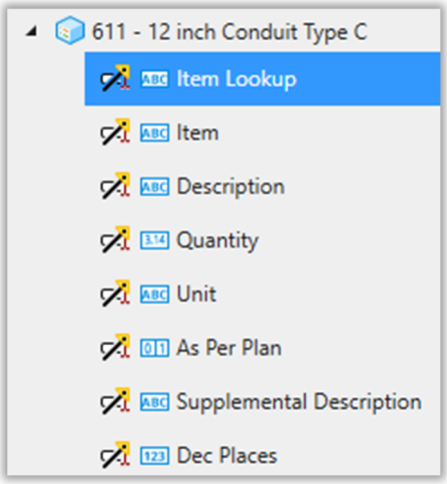
Common Item Type Properties

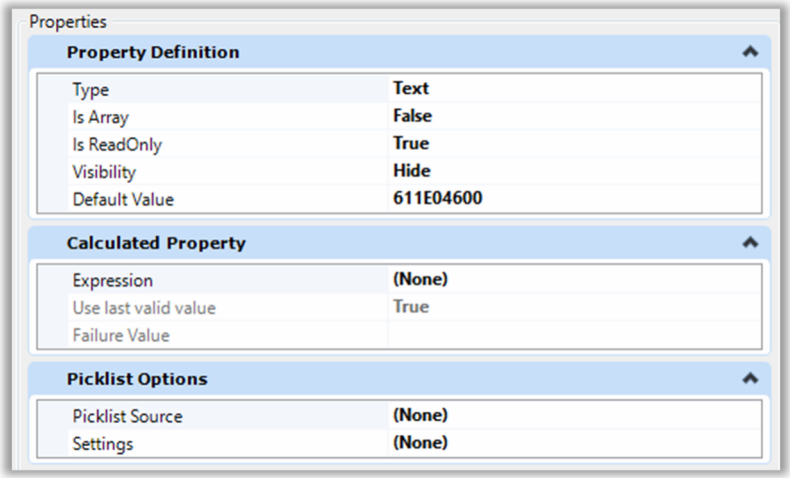
Each Item Type has 7 Item Type Properties that are included across all Item Types: **Item**, **Description**, **Quantity**, **Unit**, **As Per Plan**, **Supplemental Description**, and **Dec Places** (omitted for EACH items).

Additionally, each Item Type has either the **Item Lookup** or **SEARCH** Item Type Property, depending on if the Item Type is a "Fixed Item" style or a "Enter Item" style.

1A. Item Lookup

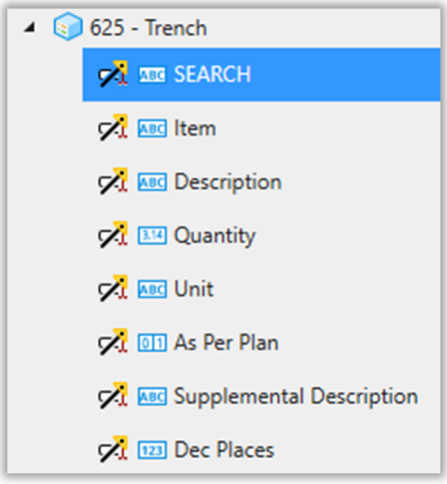
- This property is set in the Item Type library for "Fixed Item" Item Types. The value should be hidden and set to read only. Keeping this field separate from **Item** enables the use of the **As Per Plan** toggle to increment the **Item Lookup** value and display it in **Item**.

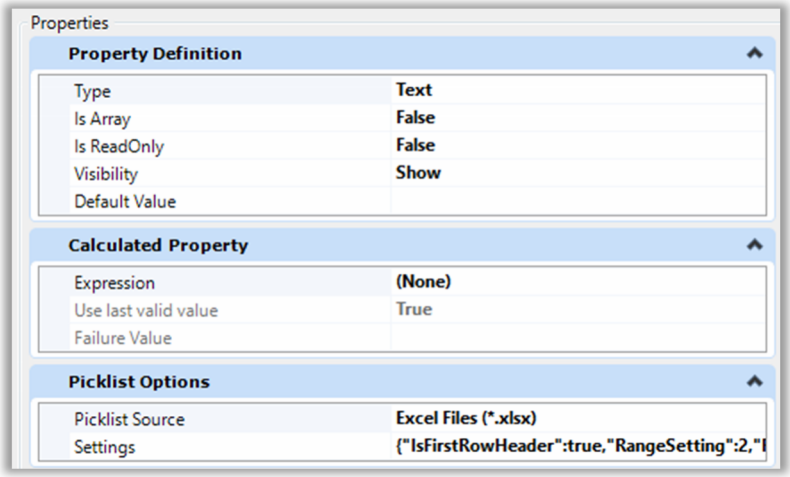




1B. SEARCH

- Users can search in the dropdown to find the desired **Item** in the Item Master spreadsheet.





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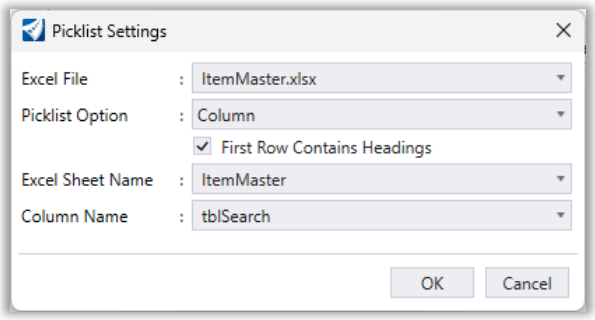
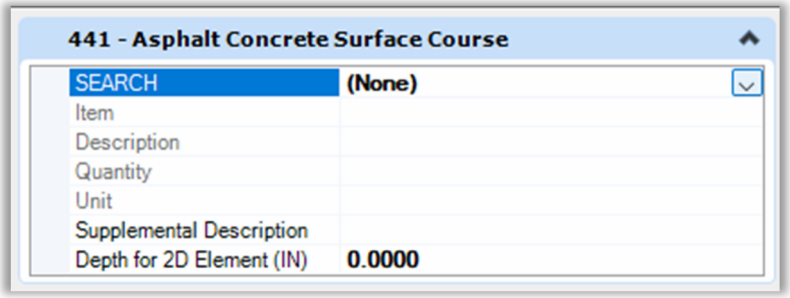
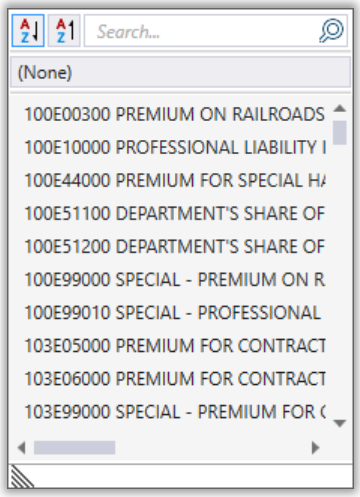
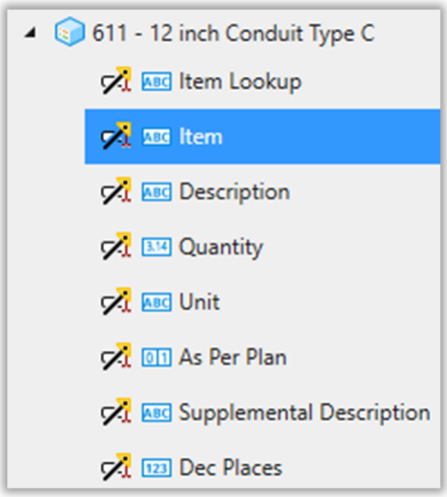


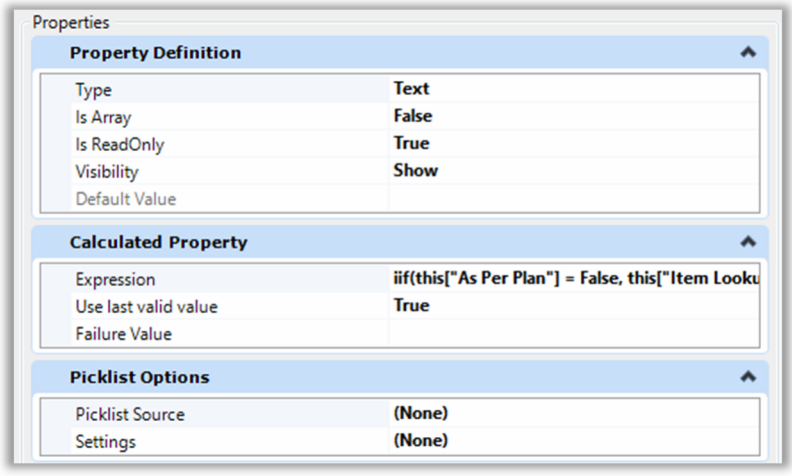




2A. Item (Used with "Fixed Item" Item Types)

- Takes the entry from **Item Lookup** and increments the value by 1 if **As Per Plan** is set to True.

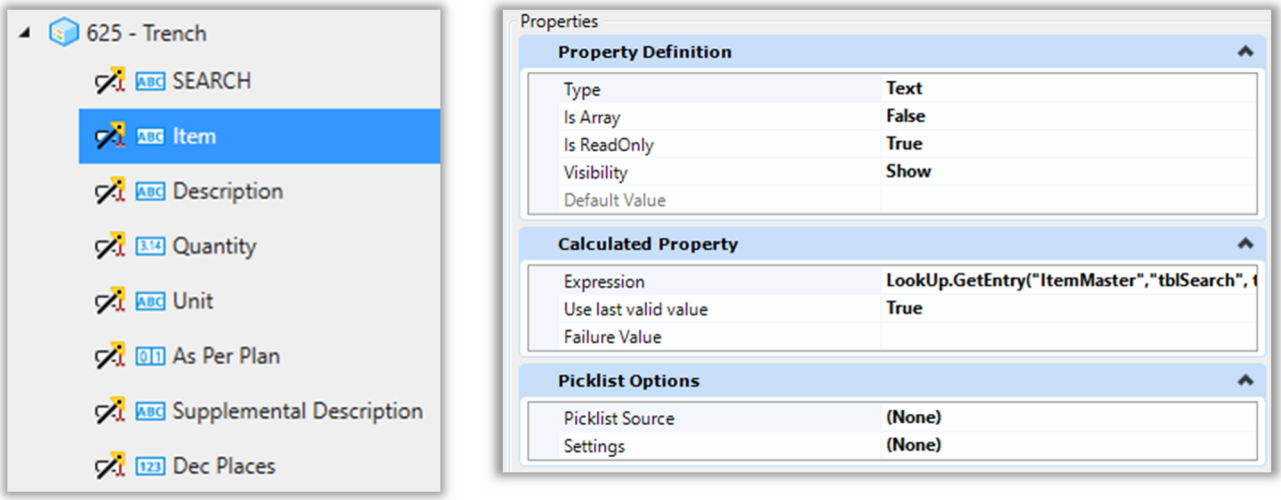




- iif(this["As Per Plan"] = False, this["Item Lookup"], (System.String.Substring(this["Item Lookup"],0,8)) & (System.String.Substring(this["Item Lookup"],8,-1) + 1))

2B. Item (Used with "Enter Item" Item Types)

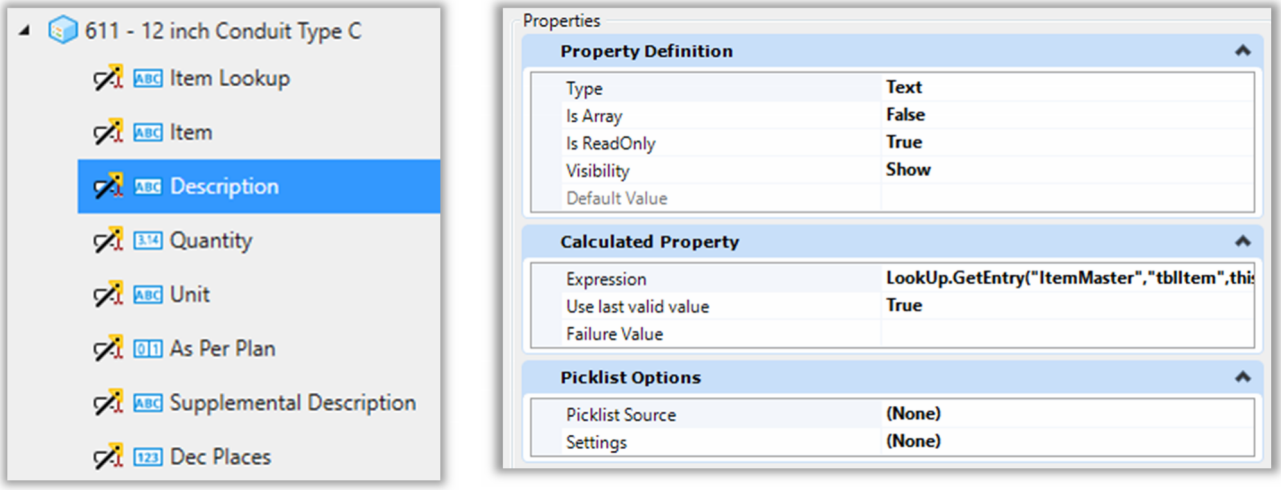
- Uses the entry from **SEARCH** to look up the associated **Item** in the Item Master spreadsheet.



- LookUp.GetEntry("ItemMaster","tblSearch", this["SEARCH"])["tblItem"]

3. Description

- Uses the value in **Item** to look up the associated **Description** in the Item Master spreadsheet. Appends any text from **Supplemental Description**.

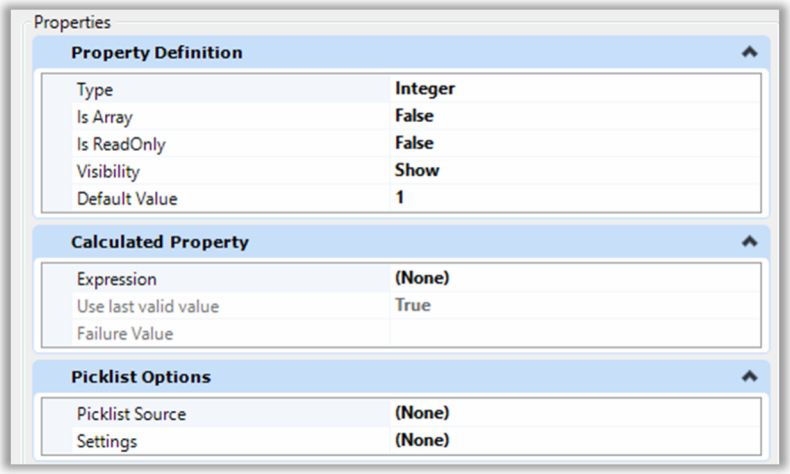


- LookUp.GetEntry("ItemMaster","tblItem",this["Item"])["tblDescription"] & iif(this["Supplemental Description"] = "", "", (" " & this["Supplemental Description"]))

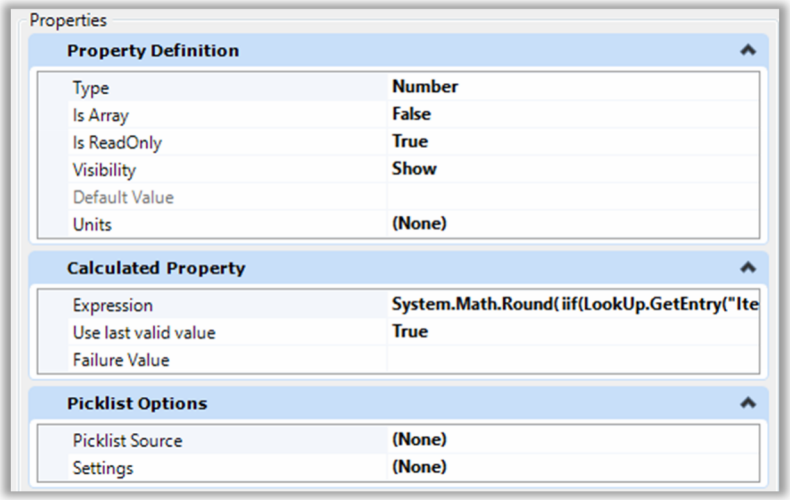
4. **Quantity**

The **Quantity** Item Type Property has several possible formulas, depending on the **Item**.

- **EACH** items have a default value of 1. The value can be edited, but the Property is set as an Integer.

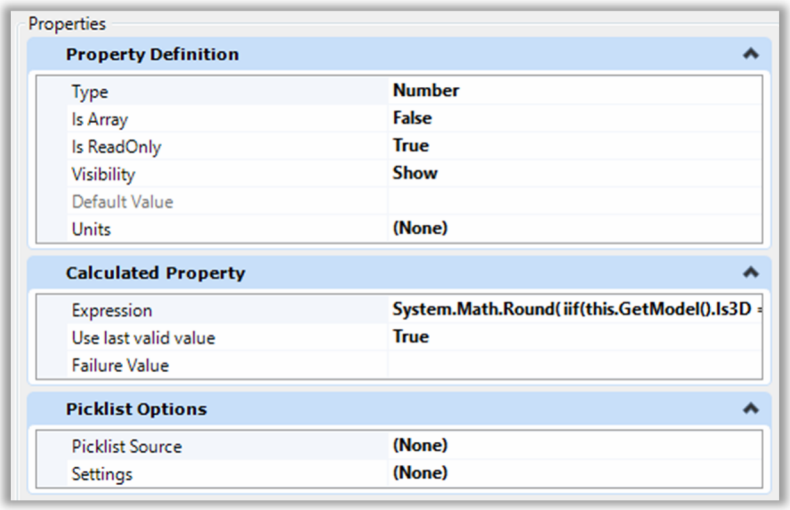


- **LINEAR** items calculate the quantity by determining if the modeled element is a Drainage & Utilities (DU) link or not, then by determining if the modeled element is an arc or not. This is because the MicroStation property field that contains the applicable length measurement differs between those 3 cases. Depending on the **Unit** of the **Item**, the measured length may be converted to MILE or STA.




```
System.Math.Round(

iif(LookUp.GetEntry("ItemMaster","tblItem",this["Item"])["tblUnit"] = "FT",

  iif(System.String.Contains(this.GetElement().ElementDescription, "Link"),
      "Civil Element Properties"."Drainage and Utilities"."Link"."Utility Link"."Length (Unified)"(),
      iif(this.GetElement().ElementType = "Arc",
          this.GetElement().Length,
          this.GetElement().TotalLength)),

iif(LookUp.GetEntry("ItemMaster","tblItem",this["Item"])["tblUnit"] = "MILE",

  iif(System.String.Contains(this.GetElement().ElementDescription, "Link"),
      "Civil Element Properties"."Drainage and Utilities"."Link"."Utility Link"."Length (Unified)"() / 5280,
      iif(this.GetElement().ElementType = "Arc",
          this.GetElement().Length / 5280,
          this.GetElement().TotalLength / 5280)),

iif(LookUp.GetEntry("ItemMaster","tblItem",this["Item"])["tblUnit"] = "STA",

  iif(System.String.Contains(this.GetElement().ElementDescription, "Link"),
      "Civil Element Properties"."Drainage and Utilities"."Link"."Utility Link"."Length (Unified)"() / 1000,
      iif(this.GetElement().ElementType = "Arc",
          this.GetElement().Length / 1000,
          this.GetElement().TotalLength / 1000)),

iif(LookUp.GetEntry("ItemMaster","tblItem",this["Item"])["tblUnit"] = "LF",

  iif(System.String.Contains(this.GetElement().ElementDescription, "Link"),
      "Civil Element Properties"."Drainage and Utilities"."Link"."Utility Link"."Length (Unified)"(),
      iif(this.GetElement().ElementType = "Arc",
          this.GetElement().Length,
          this.GetElement().TotalLength)),

0)))),

this["Dec Places"])
```

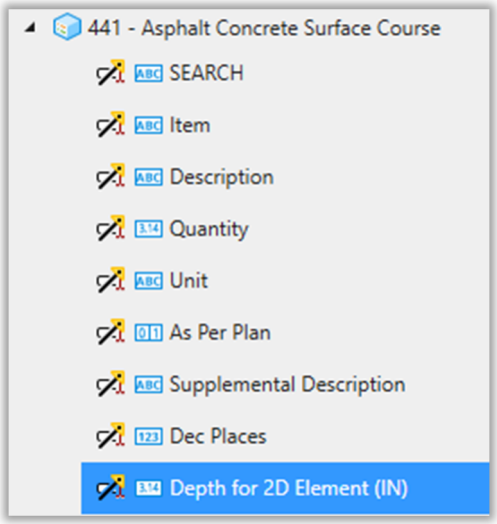
- **AREA** items calculate the quantity by determining if the modeled element is in a 3D model or not. This is because the MicroStation property field that contains the relevant area measurement differs between these cases. Depending on the **Unit** of the **Item**, the measured area may be converted to SY, ACRE, or MSF.




```
System.Math.Round(

iif(this.GetModel().Is3D = "3D",
     "Civil Element Properties"."Surface"."Mesh"."Mesh Surface"."Planar Area"(),
     this.GetElement().EnclosedArea) *

iif(LookUp.GetEntry("ItemMaster","tblItem",this["Item"])["tblUnit"] = "SF",     1,

iif(LookUp.GetEntry("ItemMaster","tblItem",this["Item"])["tblUnit"] = "SY",     (1 / 9),

iif(LookUp.GetEntry("ItemMaster","tblItem",this["Item"])["tblUnit"] = "ACRE",   (1 / 43560),

iif(LookUp.GetEntry("ItemMaster","tblItem",this["Item"])["tblUnit"] = "MSF",    (1 / 1000),

    0)))),

this["Dec Places"])
```

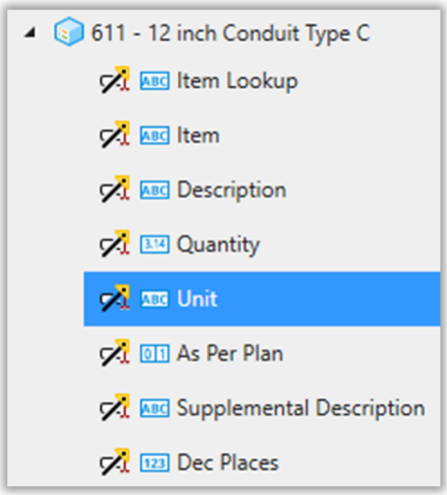
- **VOLUME** items calculate the quantity by determining if the modeled element is in a 3D model or not. Elements in a 3D model can have their volume measured directly. Since elements in a 2D model do not have a volume, users can manually enter a depth for any 2D element to calculate a volume. Depending on the **Unit** of the **Item**, the volume may be converted to CY.

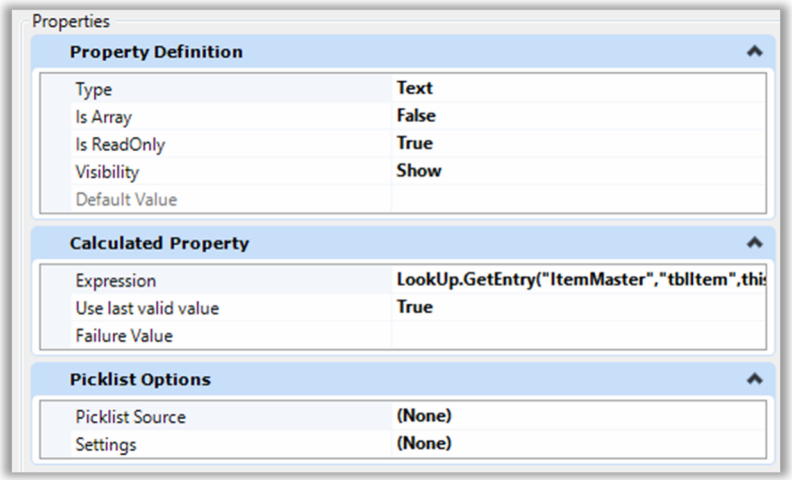
```
System.Math.Round(

iif(this.GetModel().Is3D = "3D",
     "Civil Element Properties"."Surface"."Mesh"."Mesh Surface"."Volume"(),
     this.GetElement().Area * this["Depth for 2D Element (IN)"] / 12) *

iif(LookUp.GetEntry("ItemMaster","tblItem",this["Item"])["tblUnit"] = "CF",     1,

iif(LookUp.GetEntry("ItemMaster","tblItem",this["Item"])["tblUnit"] = "CY",     (1 / 27),

     0)),

this["Dec Places"])
```



5. **Unit**

- Uses the value in **Item** to look up the associated **Unit** in the Item Master spreadsheet.

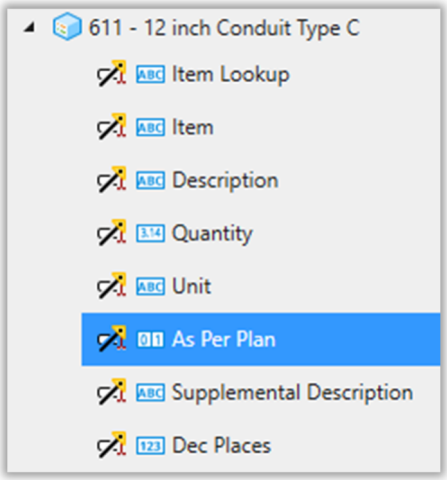


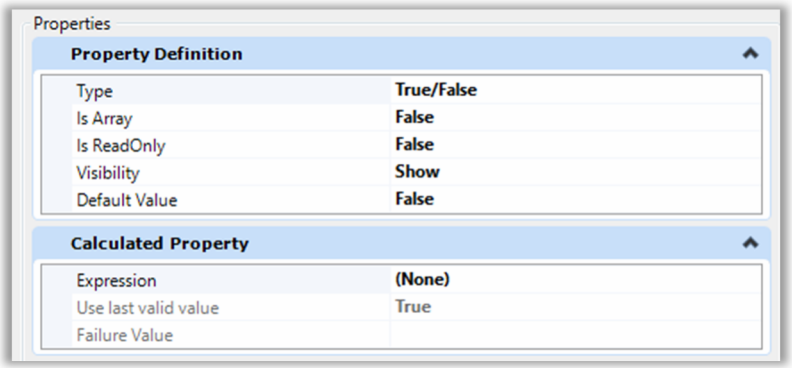


- LookUp.GetEntry("ItemMaster","tblItem",this["Item"])["tblUnit"]

6. **As Per Plan**

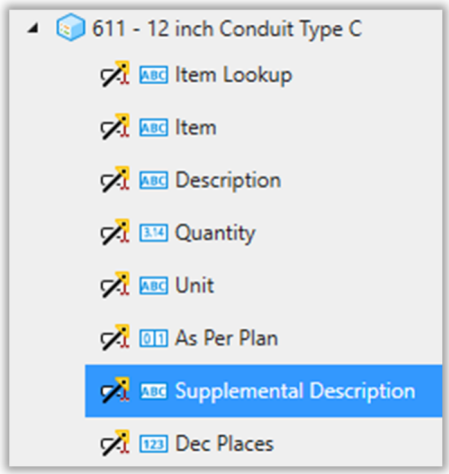
- True/False toggle. After assigning the Item Type, the user has the option to switch to the As Per Plan version of the item by changing the toggle to True.

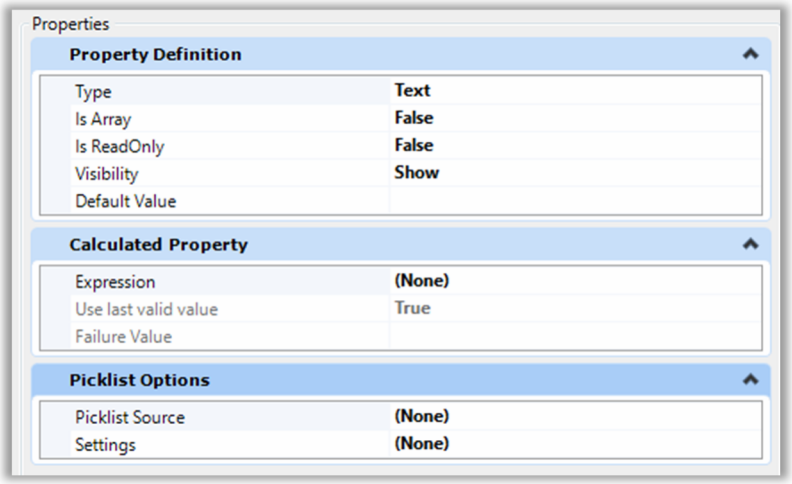




7. **Supplemental Description**

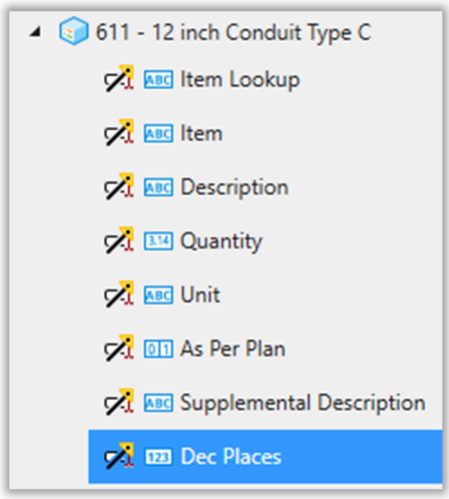
- Some items require a **Supplemental Description**. Text entered in this field is appended to the base Item Master **Description**.

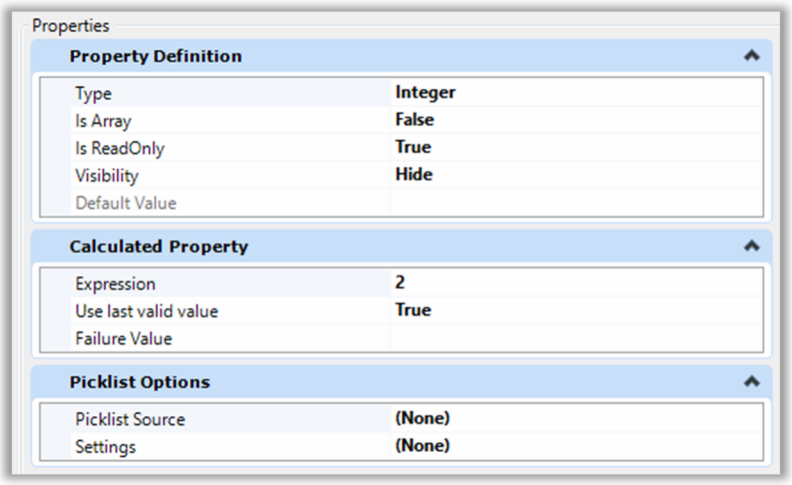




8. **Dec Places**

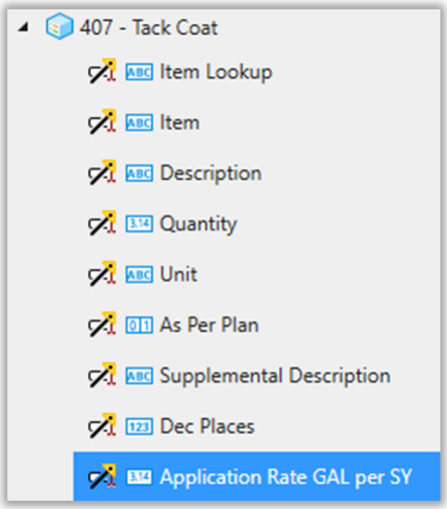
- Number of **Decimal Places** to which the quantity field should be rounded. Every item is rounded to 2 places for now.
- ODOT could consider incorporating a **Dec Places** column into the Item Master based on the requirements of L&D Vol. 3 section 1307.4.3. This would enable the use of a lookup function to control rounding based on **Item**.

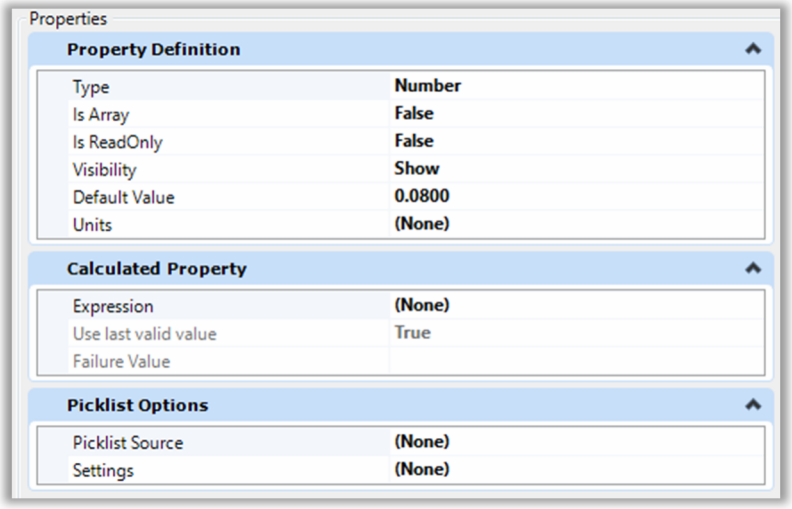




Item Type Properties for Special Cases

1. Tack Coat quantities are calculated from a given pavement area and an application rate from C&MS section 407. To ensure the designer does not have to edit the **Quantity** field, an additional **Application Rate** field is needed.



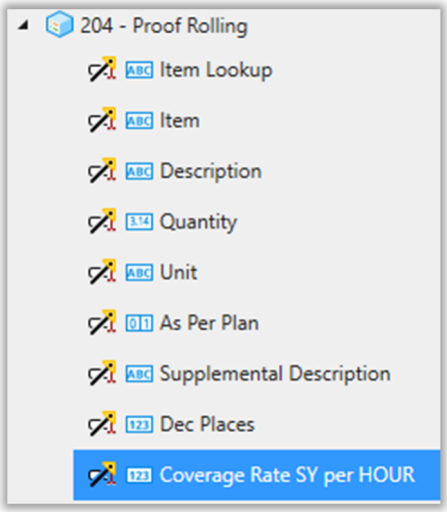


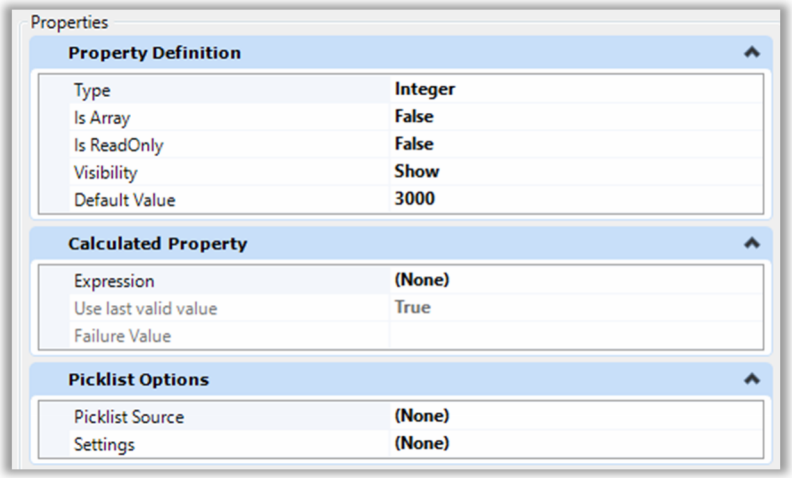

```
System.Math.Round(

(this["Application Rate GAL per SY"]) *

System.Math.Round(

iif(this.GetModel().Is3D = "3D",
     "Civil Element Properties"."Surface"."Mesh"."Mesh Surface"."Planar Area"(),
     this.GetElement().EnclosedArea) *


iif(LookUp.GetEntry("ItemMaster","tblItem",this["Item"])["tblUnit"] = "GAL",    (1 / 9),

    0),

this["Dec Places"]),

this["Dec Places"])
```

TABLE 407.06-1, TYPICAL TACK COAT APPLICATION RATES

Existing Pavement	Application Rate gal/yd² (L/m²)
New Asphalt	0.05 to 0.06 (0.23 to 0.27)
Oxidized Asphalt	0.08 to 0.09 (0.36 to 0.41)
Milled Asphalt Surface	0.08 to 0.09 (0.36 to 0.41)
Milled PCC Surface	0.06 to 0.08 (0.27 to 0.36)
PCC Surface	0.06 to 0.08 (0.27 to 0.36)

2. Proof Rolling quantities are calculated from a given pavement area and a coverage rate from L&D Volume 3, plan note G111. To ensure the designer does not have to edit the **Quantity** field, an additional **Coverage Rate** field is needed.






```
System.Math.Round(

(1 / this["Coverage Rate SY per HOUR"]) *

System.Math.Round(

iif(this.GetModel().Is3D = "3D",
     "Civil Element Properties"."Surface"."Mesh"."Mesh Surface"."Planar Area"(),
     this.GetElement().EnclosedArea) *


iif(LookUp.GetEntry("ItemMaster","tblItem",this["Item"])["tblUnit"] = "HOUR",   (1 / 9),

    0),

this["Dec Places"]),

this["Dec Places"])
```

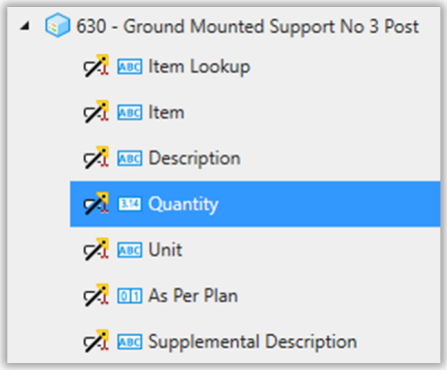
G111 - ITEM 204 - PROOF ROLLING

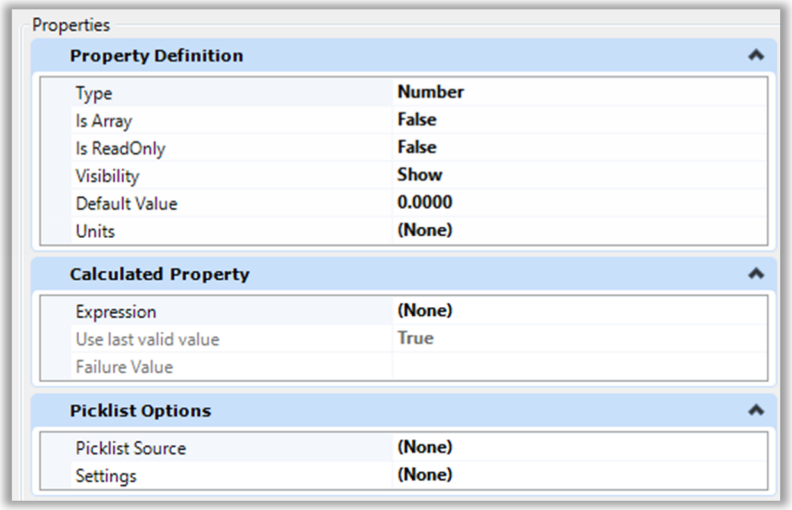
THE FOLLOWING QUANTITY IS PROVIDED IN THE GENERAL SUMMARY TO ADDRESS LOCATIONS REQUIRING PROOF ROLLING. SEE PLAN SHEET NO_____FOR ADDITIONAL INFORMATION.

ITEM 204 – PROOF ROLLING_____HOUR.

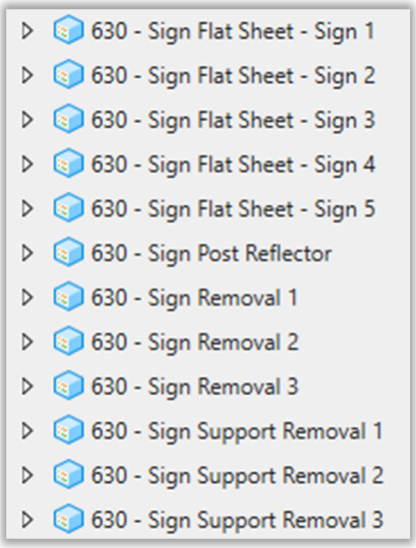
Designer Note: The estimate should be based on one hour of roller time for each 2000 Sq. Yd. of Item 204, Subgrade Compaction for reconstruction projects and 3000 Sq. Yd. of Item 204, Subgrade Compaction for new construction. Proof Rolling is recommended on all projects where subgrade compaction is required, except very short projects such as bridge approaches.

3. Sign Posts are represented by a cell but the relevant quantity is a length. There is no physical representation of the length in the model, so the quantity field is editable and a number (rather than integer) to allow for non-whole-number values.

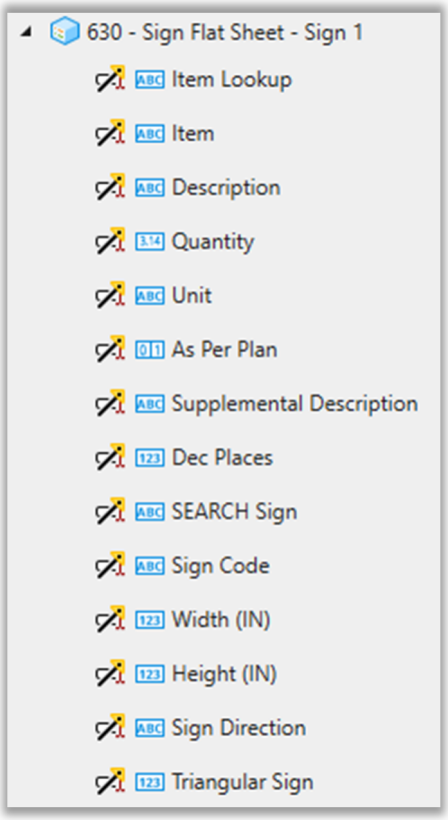




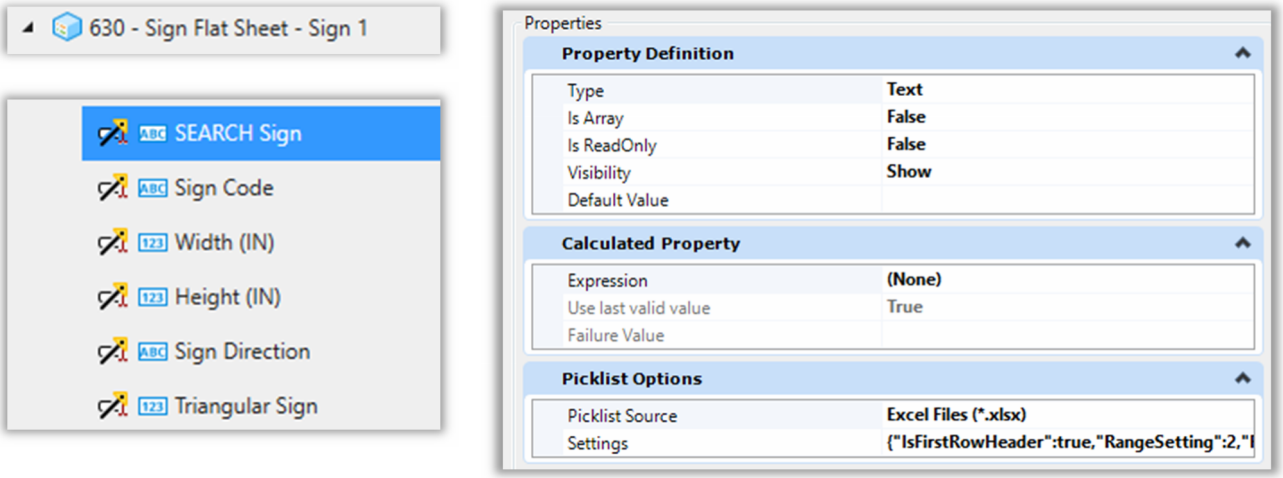
4. During design / CAD production work, a single cell is often used to represent multiple objects -- a single sign post cell can represent multiple signs on that post OR a removal X symbol can represent the removal of several objects at the same location. This can become a challenge when assigning Item Types to those elements because ORD / MicroStation does not allow multiple instances of the same Item Type to be attached to a single element. The solution is to create multiple versions of those Item Types and add a numerical identifier to the end. In the example below, the designer could attach 5 sign Item Types to a single sign post element. Or in the case of two sign removals on the same existing post, the designer could attach two Item Types to a single removal X cell to represent that one sign is removed & disposed and the second is removed & reerected.

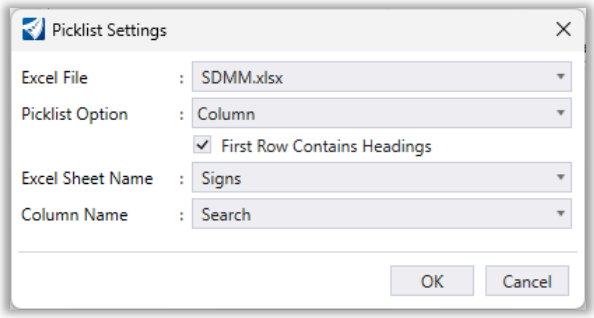


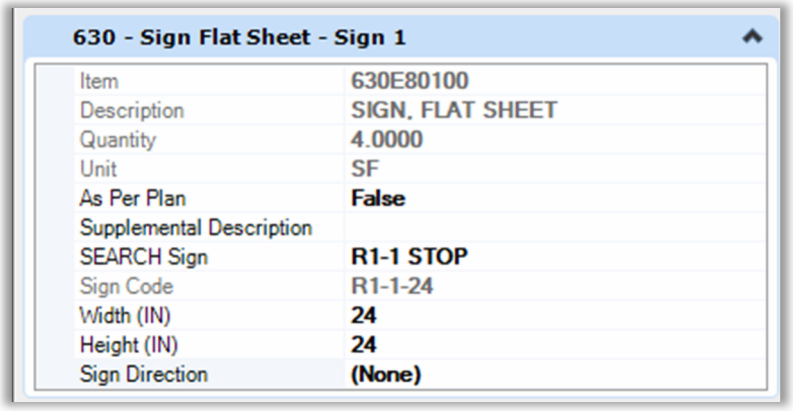
5. In addition to the standard Item Type Properties, the Sign Flat Sheet Item Type has several additional properties that allow for automatic sign area calculations based on user-entered **Width (IN)**, **Height (IN)**, and **Sign Code**.

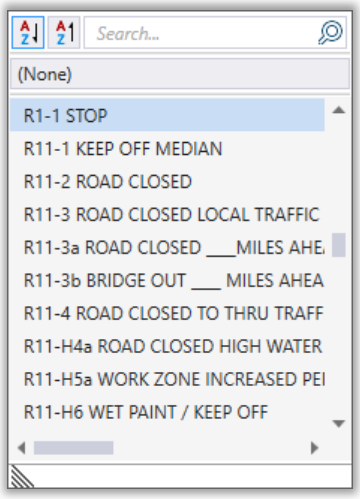


- **SEARCH Sign** allows the designer to search the SDMM lookup spreadsheet using either a sign code like "R1-1" or a description like "STOP".

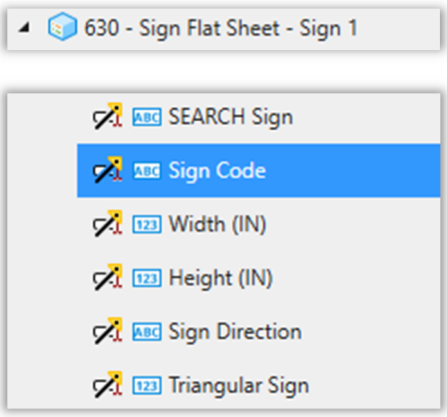


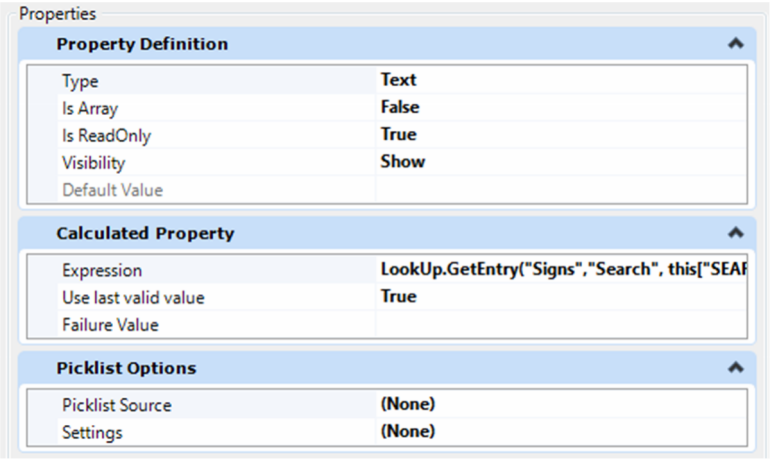






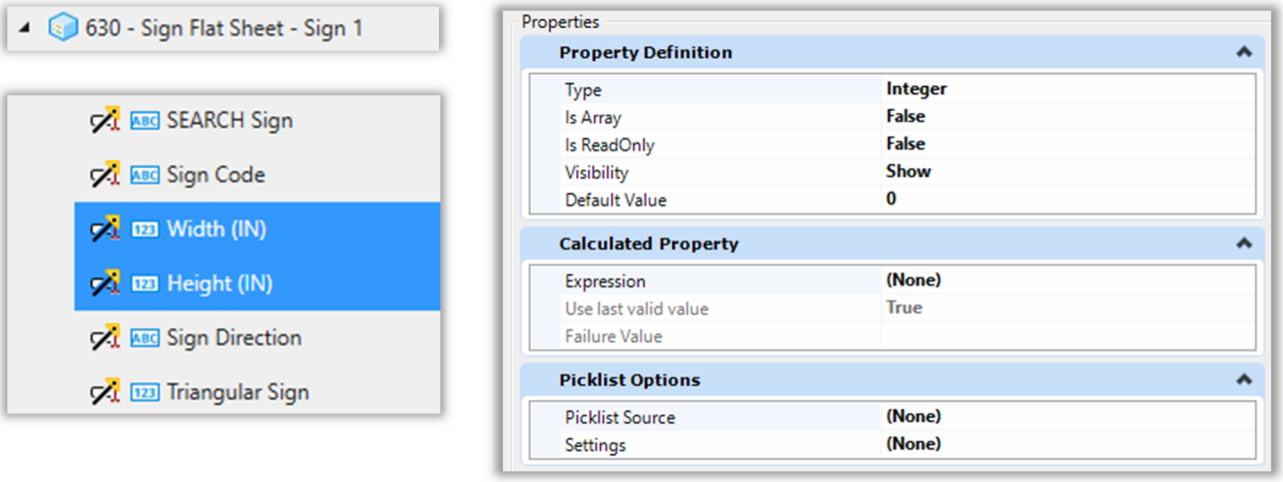
- **Sign Code** takes the entry from **SEARCH Sign**, looks up the corresponding sign code in an SDMM lookup database, appends an “L” or “R” based on the designer’s entry in **Sign Direction**, and also appends the **Width (IN)** entered by the designer. Example output is “R1-1-24” or “R6-1L-54” which matches the standard format in the TEM / OMUTCD.



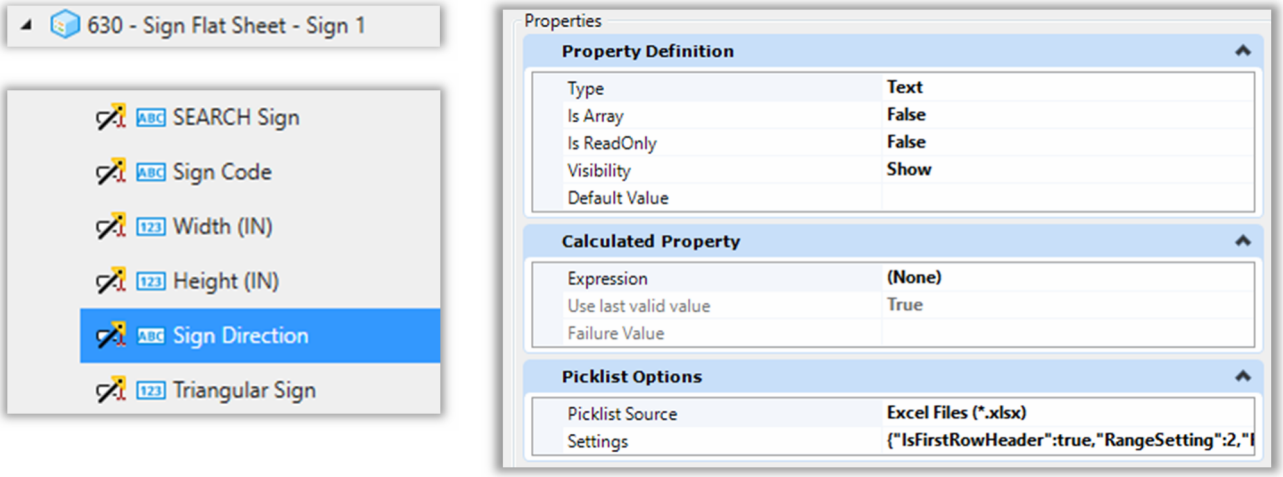


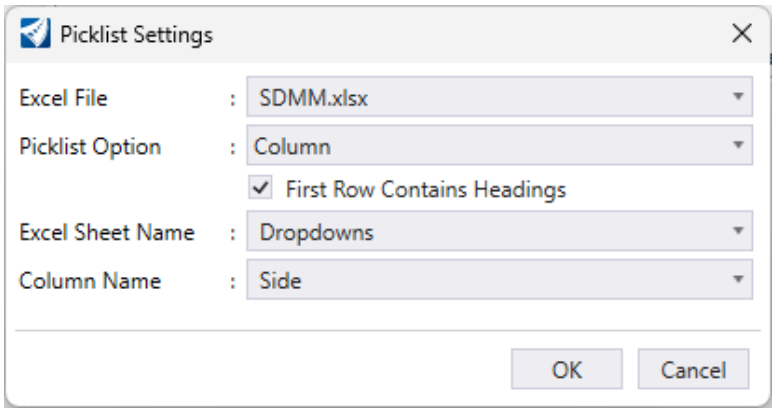
  - LookUp.GetEntry("Signs","Search", this["SEARCH Sign"])."Code"& iif(this["Sign Direction"] = "LT", "L", iif(this["Sign Direction"] = "RT", "R", ""))& iif(this["Width (IN)"] = 0, "", ("-" & this["Width (IN)"]))

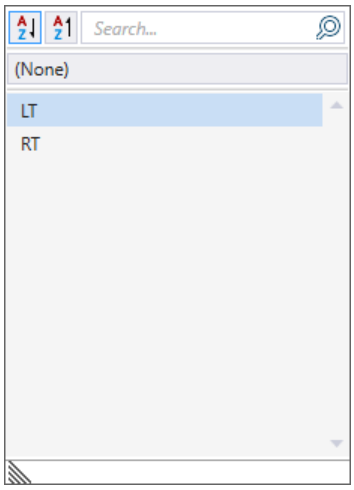
- **Width (IN)** and **Height (IN)** are editable fields that will only accept an Integer value.



- **Sign Direction** is controlled with a dropdown list and can be either “LT” or “RT”.

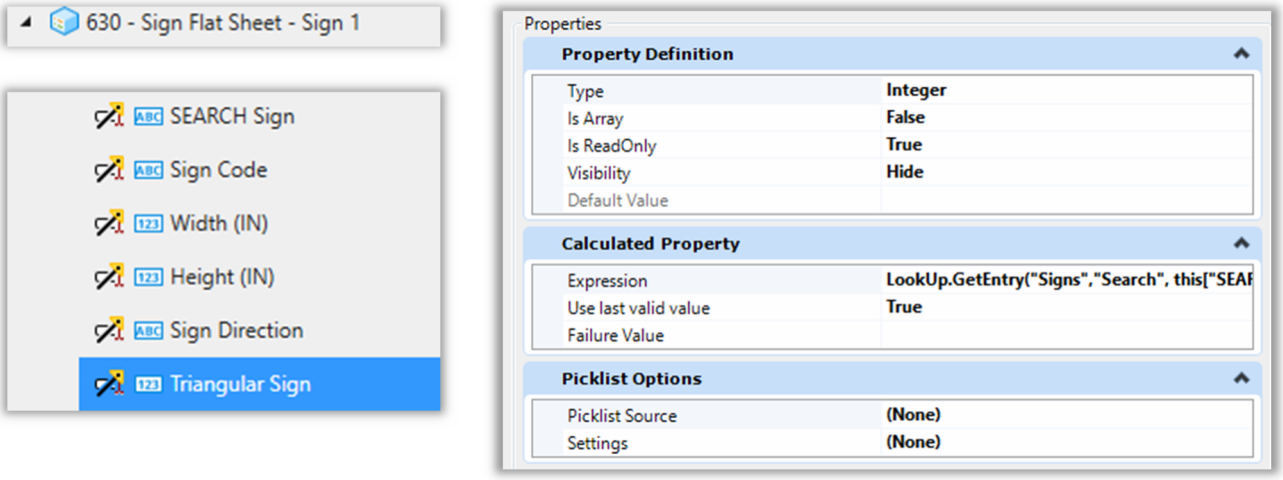






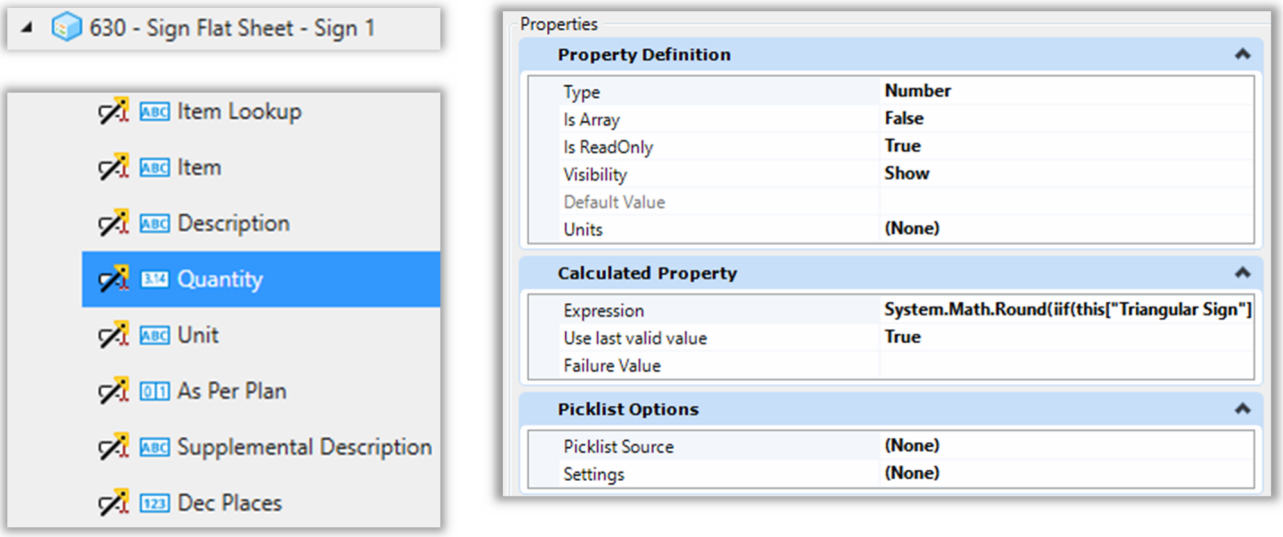
Department of Transportation

- **Triangular Sign** uses the entry from **SEARCH Sign** to look up if the sign is triangular or not in the SDMM spreadsheet. This will affect the sign area **Quantity** calculation.



  - LookUp.GetEntry("Signs","Search", this["SEARCH Sign"])."Triangular"

- **Quantity** uses the **Width** and **Height** entries and the **Triangular Sign** check to calculate the sign area.



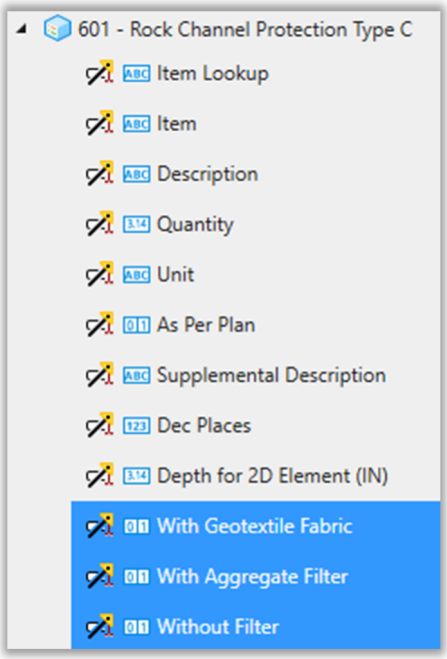

```
System.Math.Round(
iif(this["Triangular Sign"] = 1,

(1/4) * this["Height (IN)"] *
System.Math.Sqrt( (4 * ((this["Width (IN)"] ^ 2)) - (this["Height (IN)"] ^ 2) ) )
/ 144,

this["Width (IN)"] * this["Height (IN)"] / 144),

this["Dec Places"])
```

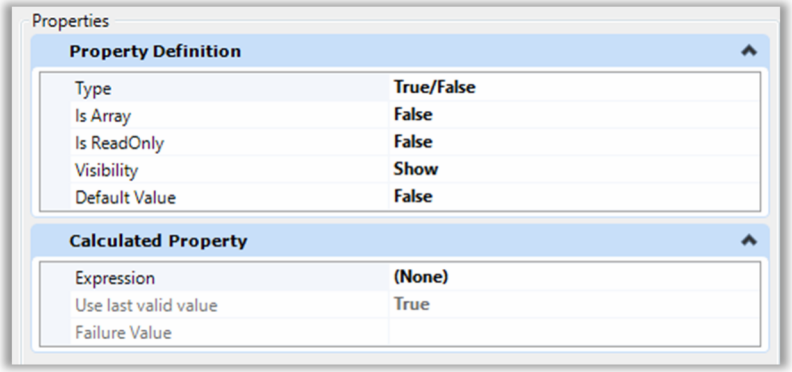
6. The Item Type for **Rock Channel Protection, Type X** is a hybrid between a "Fixed Item Item Type" and an "Enter Item Item Type". There are 4 styles of RCP -- With Filter, With Geotextile Fabric, With Aggregate Filter, and Without Filter. We can cover all 4 cases with True/False toggles instead of creating a unique Item Type for each.

601E32200	ROCK CHANNEL PROTECTION, TYPE C WITH FILTER	CY
601E32201	ROCK CHANNEL PROTECTION, TYPE C WITH FILTER, AS PER PLAN	CY
601E32204	ROCK CHANNEL PROTECTION, TYPE C WITH GEOTEXTILE FABRIC	CY
601E32205	ROCK CHANNEL PROTECTION, TYPE C WITH GEOTEXTILE FABRIC, AS PER PLAN	CY
601E32210	ROCK CHANNEL PROTECTION, TYPE C WITH AGGREGATE FILTER	CY
601E32211	ROCK CHANNEL PROTECTION, TYPE C WITH AGGREGATE FILTER, AS PER PLAN	CY

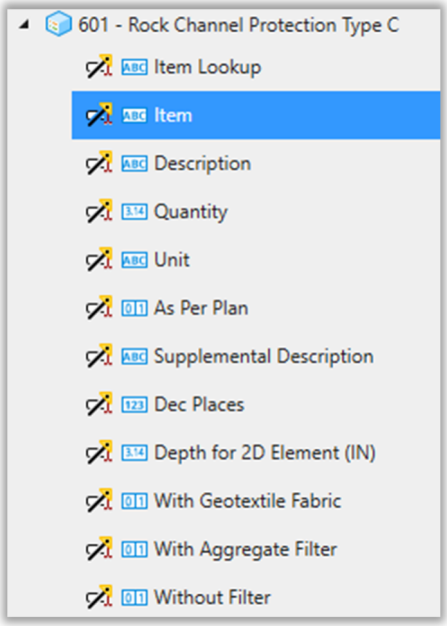
601E34200	ROCK CHANNEL PROTECTION, TYPE C WITHOUT FILTER	CY
601E34201	ROCK CHANNEL PROTECTION, TYPE C WITHOUT FILTER, AS PER PLAN	CY

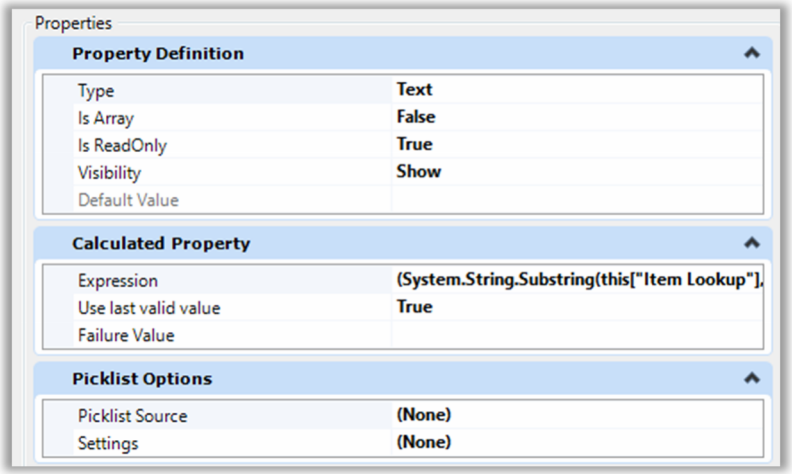
- **With Geotextile Fabric**, **With Aggregate Filter**, and **Without Filter** are additional fields for the RCP Item Type. Each field is a True/False toggle set to False by default.





- The **Item** field takes the entry from **Item Lookup** and increments the value by 1 if **As Per Plan** is set to True. Then, it either adds 4, 10, or 2000 to the value depending on the status of the True/False toggles. This functionality is possible because the mathematical difference between the **Item** number for Type A/B/C/D versions of each of the 4 RCP styles is the same.






```
(System.String.Substring(this["Item Lookup"],0,4)) &

(  System.String.Substring(this["Item Lookup"],4,-1) +
   iif(this["As Per Plan"] = False, 0, 1) +

   iif(this["With Geotextile Fabric"] = True,
   iif(this["With Aggregate Filter"] = False,
   iif(this["Without Filter"] = False,
   4,0),0),0) +

   iif(this["With Aggregate Filter"] = True,
   iif(this["With Geotextile Fabric"] = False,
   iif(this["Without Filter"] = False,
   10,0),0),0) +

   iif(this["Without Filter"] = True,
   iif(this["With Geotextile Fabric"] = False,
   iif(this["With Aggregate Filter"] = False,
   2000,0),0),0)

)
```