



Digital Delivery Directive 2025

Glossary of Terms

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Format

Term (ACRONYM) See also: Related Term. Definition in a sentence. *Optional example of usage.*

PennDOT-Specific Definitions

Digital Delivery A modernized approach to project delivery processes and contract media that incorporates digital data. Simply stated, construction projects have the ability to be bid using 3D technology and no longer only be delivered in a traditional construction plan format.

Engineering and Construction Management System (ECMS) PennDOT's business system for managing engineering and construction projects. ECMS provides up-to-date information on PennDOT's construction projects, construction contracts and consultant agreements. PennDOT's business partners use ECMS to conduct business with PennDOT, e.g. to submit bids and invoices.

Enterprise Content Services (ECS) See also: [Common Data Environment](#). PennDOT's business system for managing documents. ECS replaced Electronic Document Management System (EDMS). Previously, documents were loaded into ECMS from EDMS; now, documents are loaded into ECMS from ECS.

Building Information Modeling (BIM) Terms

Asset Information Model (AIM) See also: [Project Information Model](#). A model that contains information to support the management and operation of the asset.

BIM Execution Plan (BEP) See also: [Project Execution Plan](#). A plan to manage the use of BIM, especially collaboration and information delivery, to accomplish the project goals.

BIM Manager See also [BIM Execution Plan](#). The individual, normally identified in a BEP, responsible for overseeing the use of BIM on the project.

Building Information Modeling (BIM) See also: [Clash Detection Use of 3D Models](#) to coordinate different disciplines (e.g. structural and utilities) and to identify/resolve possible clashes between virtual elements prior to actual construction or fabrication.

Common Data Environment (CDE) See also: [ECS](#). A service that collects, stores, manages, and shares information through a managed process.

Computer-Aided Design and Drafting. The use of a digital model of a built asset to facilitate design, construction, and operation processes to form a reliable basis for decisions. BIM may also be used as a noun to describe the digital model.

Clash Detection Use of 3D Models to coordinate different disciplines (e.g. structural and utilities) and to identify/resolve possible clashes between virtual elements prior to actual construction or fabrication.

Common Data Environment (CDE) See also: [ECS](#). A service that collects, stores, manages, and shares information through a managed process.

Computer-Aided Design and Drafting (CAD/CADD) See also: [Building Information Modeling](#). A category of computer software that is used to develop designs for a variety of disciplines. CADD software typically uses an object-oriented approach to apply mathematical rules that automate the process of drafting designs. 3D digital design data is a common output of the application of CADD software.

Discipline Model See also: [Federated Model](#). A model or linked models related to a single discipline. *The superstructure model, substructure model, and detailing models are linked together into a federated Structural Discipline Model.*

Engineer of Record (EOR) See also: [Model Element Author](#). The professional engineer who signs and seals the project documents and assumes professional responsibility for the design. The EOR may supervise the work of subordinate Model Element Authors who create the model under the EOR's direction.

Federated Model See also: [Discipline Model](#). A model that is compiled by integrating different discipline models together into one model through either linking and/or importing.

Industry Foundation Classes (IFC) See also: [Open Data](#). A non-proprietary data schema and format to describe, exchange and share the physical and functional information for the assets within a facility. IFC is the International Organization for Standardization standard for BIM and is being extended to roadway and bridge asset classes.

Level of Detail See also: [Level of Development](#). Often confused with Level of Development, Level of Detail describes only the amount of geometric detail in a model element, not the amount of engineering intent. Highly-detailed model elements may be placed in a model as place-holders with no engineering intent. Though detail often increases in parallel with development, observing the detail of a model element is not an effective way to determine its development or the appropriate uses.

Level of Development (LOD) See also: [Level of Information](#), [Level of Visualization](#), [Model Progression Specification](#). A qualitative designation that communicates the degree of engineering intent behind a 3D model element (or group of model elements) and defines the authorized uses for which the model element is sufficiently developed. Normally the LOD will increase through the design development process as defined in the MPS.

Level of Information (LOI) See also: [Level of Development](#). A description of the quality of the non-graphical information attached to the model elements.

Level of Visualization (LOV) See also: [Level of Development](#). A qualitative designation that communicates the degree of visual enhancement given to the 3D model elements, to suit the needs of different target audiences. Generally, non-technical audiences need color-realistic geometry or even photo-realistic materials to be able to understand bridge models.

Model Element See also: [Level of Development](#), [Model Element Author](#), [Model Progression Specification](#). An entity within a model that represents a physical object or an abstract concept (e.g. alignment, north arrow).

Model Element Author (MEA) See also [BIM Execution Plan](#), [Engineer of Record](#), [Model Element](#). The individual, normally identified in a BEP and/or MPS, responsible for creating a specific model element or group of model elements. The MEA may work under the direct supervision of an EOR who assumes professional responsibility for the design represented in the model.

Model Breakdown Structure (MBS) See also: [Model Progression Specification](#). A classified list of model elements. A MBS is the basis for a Model Progression Specification.

Model Manager See also [BIM Execution Plan](#), [BIM Manager](#), [Model Element](#). The individual, normally identified in a BEP, responsible for a specific discipline model.

Model Progression Specification (MPS) See also: [Model Breakdown Structure](#). A specification that defines how the LOD for individual model elements increases over the project milestones. The MPS will assign a specific, minimum LOD to each model element for each milestone. The LOD typically increases from milestone to milestone.

Project Execution Plan (PxP) See also [BIM Execution Plan](#). A plan to manage the use of BIM, especially collaboration and information delivery, to accomplish the project goals.

Project Information Model (PIM) See also: [Asset Information Model](#). A model that contains information to support the design and construction of the asset.

Data-related Terms

Attribute Non-graphical data that is part of a model element definition.

Component A physical item or feature within a model.

Constraint See also: [Parametric](#). A relationship between two or more elements in a model, which should be maintained in any modifications made to the base element. *The slab geometry is a constraint for the rebar layout.*

Digital Twin Initially conceived of for smart manufacturing, a digital twin is a digital representation of a physical asset that contains a 3D digital model of the physical asset, as well as non-graphical information about the asset such as its properties, functions, evaluative properties, and other analytical context.

Extract Transform Load (ETL) See also: [Data Exchange](#), [Information Exchange](#). Extract, Transform, and Load are three discrete database processes that can be combined in one action to copy data from one database into another database that presents the information differently (i.e. transformed).

Feature See also: [Model Element](#). Anything that can be seen or located and is a physical part of your project.

Graphical Data See also: [Non-graphical Data](#), [Spatial Data](#). Data conveyed using shape and arrangement and/or location in space.

Layer See also: [Level](#). A container within software for model elements or features. Some CADD, GIS, and PDF software products use the term “Layer” to describe the container while other software products use the term “Level.” Common software features include styling elements and controlling the visibility of elements using layer settings.

Level See also: [Layer](#). A container within software for model elements or features. Some CADD, GIS, and PDF software products use the term “Layer” to describe the container while other software products use the term “Level.” Common software features include styling elements and controlling the visibility of elements using level settings.

Links Hyperlinks that can be applied to geometry to allow a user to connect to and access a wide range of external files and formats. These links can be used to link to web addresses, networked folder locations, files and/or folders located in a CDE, or bookmarks within the file.

Metadata See also: [Model Progression Specification](#). Data used for the description and management of documents and other containers of information. Metadata is usually structured data embedded within the file. However, it could include an external document that describes pertinent information to others on the assumptions and basis for the 3D models, such as the geospatial metadata (grid/ground coordinate system definitions), intended uses of the 3D models, approximations and simplifications (e.g., removing minor curvature from analysis models). A MPS is important metadata that accompanies a Federated Model.

Model A representation of a system that allows for investigation of the properties of the system. (EN ISO 29481-1:2016). *The roadway and bridge models were delivered in CADD files.*

Naming Convention A set of rules for naming components and features within a model. A naming convention may provide instructions for choosing the character sequence to be identifiers that denote variables, types, functions and other entities in source code and documentation.

Non-graphical Data See also: [Attribute](#), [Feature](#) See also: [Model Element](#). Anything that can be seen or located and is a physical part of your project.

Graphical Data, Property. Data that describes attributes and properties of a model element that do not relate to its physical dimensions or location.

Parametric See also: [Component](#) A physical item or feature within a model.

Constraint. An approach to creating a model whether the physical dimensions are constrained by mathematical rules such that the model can be manipulated by changing individual property definitions.

Property See also: [Attribute](#). Non-graphical information that describes a model element. *The Modulus of Elasticity is a property of a girder.*

Schema See also: [Industry Foundation Classes](#). A formalized model for structuring information.

Spatial Data See also: [Geodatabase](#), [Feature](#) See also: [Model Element](#). Anything that can be seen or located and is a physical part of your project.

Graphical Data. Data that is associated with a spatial reference system, such as State Plane coordinates. Spatial data may be raster (e.g. aerial photography) or vector (e.g. point, line, or polygon).

Data Management Terms

Data Exchange See also: [Extract Transform Load](#), [Information Exchange](#). The process of taking data structured under a source schema to transform and restructure into a target schema, so the target data are an accurate representation of the source data within specified requirements and minimal loss of content.

Geodatabase (GDB) See also: [Geographic Information System \(GIS\)](#) See also: [Geodatabase](#), **Error! Not a valid bookmark self-reference.**, [Spatial Data](#). A software application that is designed to display, manage, analyze, create, connect, and manipulate spatial data. GIS software includes many Geoprocessing Tools that manipulate Geodatabases, as well as Graphical and Non-Graphical datasets in order to perform complex analyses. *PennDOT OneMap is a hosted GIS application.*

Geoprocessing Tool, [GIS](#), [Spatial Data](#). A database that is designed to store, query, and manipulate spatial data. A geodatabase may hold multiple datasets of different types.

Geographic Information System (GIS) See also: [Geodatabase](#), **Error! Not a valid bookmark self-reference.**, [Spatial Data](#). A software application that is designed to display, manage, analyze, create, connect, and manipulate spatial data. GIS software includes many Geoprocessing Tools that manipulate Geodatabases, as well as Graphical and Non-Graphical datasets in order to perform complex analyses. *PennDOT OneMap is a hosted GIS application.*

Geoprocessing Tool See also: [Geodatabase](#), [GIS](#), [Spatial Data](#) A software tool that manipulates spatial data to produce a transformed spatial dataset. *A buffer is a geoprocessing tool that creates a new polygon dataset defined by a specified offset from an existing point, line, or polygon dataset.*

Information Exchange See also: [Data Exchange](#), [Information Requirements](#). Packages of information passed from one party to another in a BIM process, or the act of passing such information, possibly as a contractual deliverable. Parties involved agree upon and understand what information content and format will be exchanged.

Information Requirements See also: [Asset Inventory](#), [Information Exchange](#). A specification for what, when, how and for whom information is to be produced. Information requirements could be documented in a PennDOT Publication, in a project Scope of Work, or in a BIM Execution Plan.

Open Data See also: [Open Specification](#). Data that is publicly available and free to use or reuse without restrictions. *PennDOT's Open Data Portal provides access to all published GIS data that members of the public can map, style, chart, download or share.*

Open Specification See also: [Industry Foundation Classes](#), [Proprietary Specification](#). A specification for data that is structured according to an open schema that is freely available and not controlled by any one particular vendor. Open specifications are intended to facilitate data exchange.

Proprietary Specification See also: [Open Specification](#). A specification for data that is structured according to a proprietary schema. Proprietary data can usually only be read and written by one vendor's software products.

Use Cases

3D Coordination The process in which information models are used to determine field conflicts via Clash Detection software or visual inspection. 3D coordination is accomplished by comparing proposed 3D geometry from discipline models aggregated into a federated model. 3D elements for all objects are required to perform 3D coordination.

Analytical Design The process of capturing the existing and proposed alternatives in analytical models to design the proposed facility.

As-built Record See also: [Asset Information Model](#). Traditionally, “marked up” plan sets that denote any changes to the project that occurred during construction. Increasingly, there is interest in collecting digital asset information in construction to support maintenance and operation of the asset.

Asset Inventory See also: [Asset Information Model](#), [Asset Management](#), [Information Requirements](#). The process of creating an inventory of the assets removed, modified, and constructed to hand over to the maintenance, operations, and asset management departments’ business systems. The asset information is defined within the organizational asset information requirements.

Asset Management See also: [Asset Information Model](#), [Asset Inventory](#). A strategic and systematic process for managing assets and programming maintenance and replacement activities. Asset Management Systems are often GIS databases that track the current condition of the assets. The information is updated routinely, when assets are inspected, or when maintenance or construction actions occur.

Automated Machine Guidance (AMG) The use of real-time positioning equipment with 3D digital data to guide or control the blade on construction equipment, resulting in real-time construction layout without the need for physical markers such as stakes or hubs.

Construction Documentation See also: [Construction Inspection](#), [Verification and Acceptance](#). The process whereby a construction inspector documents the construction process. This includes but not limited to daily diary records, materials testing results, pile driving reports, monthly payments, routine erosion prevention and sediment control inspections, NEPA compliance, and the process of seeking remedies to work that was not in conformance with plans, quantities, and/or specification.

Construction Inspection See also: [Construction Documentation](#), [Verification and Acceptance](#). The process in which the owner’s representative monitors and documents construction quality assurance and measures and verifies pay item quantities for completed work.

Construction Simulation The process in which a 3D model is connected to a construction schedule to simulate the sequence of construction activities. 3D models need to be organized with elements (usually in 3D) segmented and grouped according to the work breakdown structure in the schedule.

Contractor Estimating See also: [Department Estimate](#), [Prepare Contract](#) Prepare the written agreement between the Department and the Contractor for the construction of the project. The contract includes the following: Proposal; Plans; Specifications; Agreement; Performance Bond; Payment Bond; Insurance Certificates; Notice to Proceed; and all work orders and supplemental agreements that are required to complete the construction of the project. Section 105.04 of the standard specifications (Pub 408)

defines how to coordinate the contract establishing an order of precedence for special provisions, plans (excluding standard drawings), specifications, standard drawings, and electronic files.

Quantity Take-off. Part of the bid process in which the contractor takes off quantities from the contract to prepare a price for each bid item.

Design Authoring See also: Existing Conditions Modeling. The process in which 3D design software is used to develop information models based on specific roadway and structural criteria to convey design intent for construction. The core functions of design authoring include development and analysis of the design elements.

Design Review The process in which an information model is used to review and provide feedback related to multiple design aspects. These aspects include evaluation of design alternatives and environmental constraints, review and validation of geometric design criteria, and completeness or quality of overall design.

Department Estimate See also: Contractor Estimating, Prepare Contract Prepare the written agreement between the Department and the Contractor for the construction of the project. The contract includes the following: Proposal; Plans; Specifications; Agreement; Performance Bond; Payment Bond; Insurance Certificates; Notice to Proceed; and all work orders and supplemental agreements that are required to complete the construction of the project. Section 105.04 of the standard specifications (Pub 408) defines how to coordinate the contract establishing an order of precedence for special provisions, plans (excluding standard drawings), specifications, standard drawings, and electronic files.

Quantity Take-off. Preparing the estimated construction cost as determined by the Designer. Designers use QTO to determine Contract Item (Pay Item) quantities and multiply those quantities by reasonable rates (usually from historical bids) to produce an aggregate cost.

Environmental Compliance See also: Permitting. Conduct the environmental analysis in accordance with the National Environmental Protection Act (NEPA) and state environmental protection laws to establish environmental commitments and mitigations. Also monitor compliance environmental commitments and mitigations during construction.

Existing Conditions Modeling See also: Design Authoring. The process to create a 3D model of existing conditions for a roadway and/or bridge project, including an existing ground surface and the demarcation of features such as above and underground and utilities, structures, fences, and trees. It may also include the modeling of existing pavement structures.

For Information Only (FIO) See also: Prepare Contract, Record Model See also: As-built Record. The process of documenting any changes to the design plans, specifications, and quantities in a comprehensive record of the as-built condition. Currently, the process involves manual mark-ups on 2D plans in either PDF document or raster format. With digital delivery, the design models and shop models could be updated to reflect the as-built condition.

Reference Information. Supplemental information provided to the contractor that is not contractually-binding and used at the contractor's risk. *The soils report was provided with the bid package For Information Only.*

Initial Bridge Inspection See also: [Asset Inventory](#), [Record Model](#). Per 23 CFR 650.315, agencies must maintain a structure inventory and appraisal for all bridges in accordance with the National Bridge Inspection Standards. The FHWA recommends that agencies conduct an initial inspection on all bridges that are constructed or rehabilitated bridges before they are opened to traffic. The process involves creating or modifying the structure inventory and appraisal data in the bridge management system. With digital delivery, the structure inventory and appraisal fields could be incorporated into the Record Model so that a suitably-qualified inspector can populate that data during Verification and Acceptance and the information be delivered with the asset inventory information in a format compatible with the bridge management system.

Pay Item Quantities See also: [Contractor Estimating](#), [Department Estimate](#), [Prepare Contract](#) Prepare the written agreement between the Department and the Contractor for the construction of the project. The contract includes the following: Proposal; Plans; Specifications; Agreement; Performance Bond; Payment Bond; Insurance Certificates; Notice to Proceed; and all work orders and supplemental agreements that are required to complete the construction of the project. Section 105.04 of the standard specifications (Pub 408) defines how to coordinate the contract establishing an order of precedence for special provisions, plans (excluding standard drawings), specifications, standard drawings, and electronic files.

Quantity Take-off. A schedule of work items for which the contractor will be paid and an estimated number for each item.

Permitting See also: [Environmental Compliance](#). The process of coordinating with other agencies to secure permits to conduct the construction activities. Many permitting agencies are not prepared for digital delivery and require 2D plans.

Planning and Programming The process in which Asset Management Systems and GIS are used to evaluate properties and conditions of existing assets in a particular area to determine scope of work, high level cost estimation, and prioritization of projects to be added to the construction program.

Prepare Contract Prepare the written agreement between the Department and the Contractor for the construction of the project. The contract includes the following: Proposal; Plans; Specifications; Agreement; Performance Bond; Payment Bond; Insurance Certificates; Notice to Proceed; and all work orders and supplemental agreements that are required to complete the construction of the project. Section 105.04 of the standard specifications (Pub 408) defines how to coordinate the contract establishing an order of precedence for special provisions, plans (excluding standard drawings), specifications, standard drawings, and electronic files.

Quantity Take-off (QTO) See also: [Contractor Estimating](#), [Department Estimate](#). The process of estimating the quantities. The designer performs QTO to determine the Contract Item (Pay Item) quantities to prepare the Department Estimate. QTO is also part of the Contractor Estimating process to bid the job, as well as to plan and schedule ordering materials and executing the work.

Record Model See also: [As-built Record](#). The process of documenting any changes to the design plans, specifications, and quantities in a comprehensive record of the as-built condition. Currently, the process involves manual mark-ups on 2D plans in either PDF document or raster format. With digital delivery, the design models and shop models could be updated to reflect the as-built condition.

Reference Information See also: [Prepare Error! Reference source not found.](#), [For Information Only](#). Supplemental information provided to the contractor that is not contractually-binding and used at the contractor's risk. *The soils report was Reference Information provided with the bid package.*

Right-of-Way (ROW) The process of developing legal right-of-way widths, research of property owner records in County Deed Recorder's office, preparing individual property plats, creating a plan to acquire and/or vacate certain properties within a projects overall required right-of-way corridor, determine property value appraisal for involved parcel takings and claim offers.

Scoping Capture digital information about the asset inventory, condition and other performance information (e.g. traffic, safety) and evaluate alternatives to determine the scope and estimated cost of the project. For bridge projects, conducting a "type, size, and location" study that includes preliminary structural design.

Stakeholder Engagement See also: [Visualization](#). A process that uses digital information to communicate the project to technical and non-technical stakeholders and document their input throughout project delivery.

Verification and Acceptance See also: [Construction Inspection](#), [Construction Documentation](#). The process whereby a construction inspector accesses the design information in the contract to verify that the project is constructed per plan and in accordance with the pay item quantities and specifications. Acceptance includes accessing material testing results and comparing them to the specifications. If there are deviations to plan, quantities, and/or specification, then the inspector initiates the appropriate remedy, which may include creating a record of the as-built condition.

Visualization See also: [Stakeholder Engagement](#). The process of creating visual representations of the project to communicate with technical and non-technical stakeholders throughout the project lifecycle.

Working Drawing Authoring See also: [Prepare Contract](#), [Working Drawing Review](#). The process in which the Contractor prepares all required shop drawings, erection plans, falsework plans, stress sheets, framework plans, cofferdam plans, bending diagrams for reinforcing steel, and any other supplementary plans or similar data, all prepared by the. With digital delivery, the shop "drawings" may be 3D models.

Working Drawing Review See also: [Prepare Contract](#), [Working Drawing Authoring](#). The process of reviewing the Contractor's proposed shop drawings, erection plans, falsework plans, and other working drawings. Currently, shop drawings comprise 2D plans. With digital delivery, the shop "drawings" may be 3D models.

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