CADD Glossary of Terms

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CADD Glossary of Terms

This is a glossary of terms used in the CADD Manual or related to Digital Delivery. Each term is presented using the following format:

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

3D Model: A 3D model is a digital graphical representation of proposed facility/site data consisting of X, Y, and Z coordinates for producing objects in three dimensions to convey design intent useful for visualization, analysis, animation, simulation, plans, specifications, estimates production, and life-cycle asset management. An accurately designed 3D model will be tied to a defined geographic coordinate system.

Asset Information Model (AIM): See also <u>Project Information Model</u>. A model that contains information to support the management and operation of the asset.

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

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

BIM Manager: See also <u>BIM Execution Plan</u>. The individual, normally identified in a BEP, responsible for overseeing the use of BIM on the project.

Building Information Modeling (BIM): An intelligence-based 3D CADD system used for planning, designing, staged construction, maintenance, and operations of infrastructure facilities.

Calculations Folder: Excel files, Portable Document Format (PDF) files and any associated quantity backup data for the plan summary tables.

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): A service that collects, stores, manages, and shares information through a managed process.

Component: A physical item or feature within a model, often serving as a constituent part of a larger feature or system,

Computer-Aided Design and Drafting (CADD): See also <u>Building Information Modeling</u>. A category of computer software that is used to develop designs for a variety of disciplines. It is used to design and represent objects graphically on the computer. 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.

Constraint: A relationship between two or more elements in a model, which should be maintained in any modifications made to the base element.

Construction-Ready Electronic Files (CREFs): Quality-controlled digital design files packaged for direct use in construction, enabling native design data to support automated machine guidance, model-based workflows, inspection, and field integration.

Data 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.

Data Model: The The organizational structure, outline, and approach to defining and applying data.

Design File: A native electronic CADD file used for the development and production of project plans and models (e.g., .dgn, .dwg).

Digital Twin: 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.

Digital Terrain Model (DTM): See also Surface. A DTM is a digital topographic model of the earth's surface minus objects such as trees, vegetation, and structures that can be manipulated through computer-aided design programs. All elements of the DTM are spatially related to one another in three dimensions.

Digital Delivery (DD): Digital Delivery is the use and transfer of digital data between preconstruction, construction, asset management, and external consumers. Its purpose is to deliver data in a directly consumable format to maximize the benefits of the information for decision making and program delivery.

Discipline Model: See also Federated Model. A model or linked models related to a single discipline.

Drawing Model: A digital model within a DGN file that contains the design geometry, annotations, and associated information for a project or portion of a project. Drawing models serve as the primary source for visualization, analysis, and inclusion in sheet models.

Element Template: A named set of element properties that can be applied to existing elements or can be used to set the active settings that are used for element placement. Their primary purpose is to increase consistency when drawing.

Engineer of Record (EOR): The professional engineer who signs and seals the project documents and assumes professional responsibility for the design.

Engineering Data: Those electronic files that represent the critical geometric and quantitative controls or other data supporting the graphical representation (design) of a project.

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

Feature Definition: A predefined configuration that assigns standardized properties, symbology, behavior, and metadata to a modeled feature to ensure consistency and compliance with digital delivery standards.

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.

Geodatabase (GDB): 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. NCDOT OneMap is a hosted GIS application.

Geographic Information System (GIS): See also 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. *NCDOT OneMap is a hosted GIS application.*

Geoprocessing Tool: A software tool that manipulates spatial data to produce a transformed spatial dataset.

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

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.

Information Exchange: 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.

Item Types: Structured data schemas that define custom properties which can be attached to elements or objects within a design file to store, manage, report, and display project information. They enable consistent data attribution by allowing properties to be embedded in models, cells, or element templates, supporting labeling, reporting, and other data-driven workflows.

LandXML: An open, XML-based file format used to exchange engineering and survey data, including alignments, surfaces, and corridors between design, analysis, and construction software systems. It enables interoperability and the digital transfer of project data across platforms while preserving geometry, attributes, and metadata.

Layer or 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.

Letting: The process of advertising, selection, and awarding of a contract for the construction of a project.

Level of Accuracy (LOA): a measure of how close and correct a stated value is to the actual, real value being described; accuracy may be affected by rounding, the use of significant figures or designated units or ranges in measurement.

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 placeholders 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, 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 Information Need (LOIN): An framework defining the exact quality, quantity, and granularity of information required for projects. It ensures only necessary data is delivered—covering geometry, alphanumerics, and documentation—to match specific project milestones, preventing inefficiency.

Level Symbology: The definition of the symbology an element inherits when placed on a level using the "ByLevel" setting. The level definition contains symbology such as Color, Line Style, and Line Weight.

Line Style: Part of the symbology of an element: for example, whether a line is represented a solid, composed of dashes, dots and dashes, and so on. Each element has its own line style.

Line Weight: An index that designates the thickness of the lines used to draw or print a graphic element. Each element has its own line weight.

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: Data is 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).

Model: A digital representation of a project or a portion of a project, consisting of one or more Model Portions, each containing Model Elements. A model can include 2D or 3D data and represents the design, layout, and associated information of the project.

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 Element: A digital representation of a component, system, object, or assembly within a Model.

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Model Manager: See also <u>BIM Execution Plan, BIM Manager, Model Element</u>. The individual, normally identified in a BEP, responsible for a specific discipline model.

Model Portion: A subset of a Model often times designated by discipline, area, location, or phase.

Model Progression Specification (MPS): See also <u>Model Breakdown Structure</u>. 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.

Model Submittal Guidelines: Guidelines that define the expected content, detail, and quality of models at each preconstruction submittal stage. They establish the standards for model completeness, accuracy, and usability to support review, coordination, and downstream design workflows.

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 <u>Attribute, Feature, Model Element</u>. Anything that can be seen or located and is a physical part of your project.

Open Data: Data that is publicly available and free to use or reuse without restrictions.

OpenX Version: A Version refers to a new release of the OpenX platform by Bentley that introduces updated functionality, improvements, or fixes. Each Version serves as the baseline platform to which the NCDOT Unified Workspace is applied.

OpenX Version Conversion: This process refers to moving design files that were previously developed in Microstation into the latest version of OpenX software.

OpenX Version Upgrade: This process refers to moving design files that were previously developed in an older version of the OpenX software into the latest version of OpenX software.

Parametric: A characteristic of a model element or object that allows its geometry, dimensions, or properties to be defined and controlled by parameters, rules, or constraints, enabling automatic updates when those parameters change.

Project Information Model (PIM): See also <u>Asset Information Model</u>. A model that contains information to support the design and construction of the asset.

Reference File: A Bentley design file or other file type that is attached to and viewed simultaneously with the active design file.

Sheet Model: A designated area within a DGN file used to produce plots or construction sheets from one or more Drawing Models. Sheet models allow placement of viewports that display different areas or scales of the underlying design data, enabling organized and publication-ready sheet layouts.

Spatial Data: See also <u>Geodatabase, Feature, Model Element</u>. Anything that can be seen or located and is a physical part of your project.

Surface: See also <u>Digital Terrain Model</u>. A surface, in the context of 3D engineered models, represents an element of design such as existing ground, final grading, or pavement in a three-dimensional workspace. All elements of the surface are spatially oriented to one another.

WorkSet: See also <u>WorkSpace</u>. A WorkSet is a logical grouping of files and associated data used in the development of a specific project. Every WorkSet is owned by one WorkSpace. Each WorkSet has one or more Configuration Files that specify locations for the various files that comprise the WorkSet resources and designs, including the project files. In some cases, it is desirable to override or augment the standards supplied at the Organization and WorkSpace level with resources that are appropriate for a particular project. These may include special or custom CADD resources used for that project, such as special details that are beyond or in addition to the normal standards. This can be accomplished through WorkSet Configuration Files.

WorkSpace: See also <u>WorkSet</u>. A WorkSpace is a container grouping WorkSets, standards files, and associated Configuration Files that are used in a particular broad context. WorkSpaces include the CADD resources that prescribe an organization's or company's CADD standards. Different user organizations have different uses for the WorkSpace grouping mechanism. Private engineering firms might use a separate WorkSpace for each of their clients, while asset owners may use a separate WorkSpace for each asset or department. Each WorkSpace has one or more Configuration File(s) that specify locations for WorkSpace standards and the WorkSets contained within the WorkSpace.

WorkSpace Version: A configuration of an OpenX WorkSpace; formerly split by discipline roles, the current version provides a unified environment for all users.