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The CAD/BIM Technology Center for Facilities, Infrastructure, and Environment

USACE Advanced Modeling Object Standard

Release 1.0

Andrew Ross, David Johnson, Hai Le, Danny Griffin, Carl Mudd, and David Dawson

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Abstract

The U.S. Army Corps of Engineers (USACE) Advanced Modeling Object Standard (AMOS) has been developed by the CAD/BIM Technology Center for Facilities, Infrastructure, and Environment to establish standards for support of the Advanced Modeling process within the Department of Defense (DoD) and the Federal Government. The critical component of Advanced Modeling is the objects themselves- and either make the modeling process more difficult or more successful.

This manual is part of an initiative to develop a nonproprietary Advanced Modeling standard that incorporates both vertical construction and horizontal construction objects that will address the entire life cycle of facilities within the DoD.

The material addressed in this USACE Advanced Modeling Object Standard includes a classification organization that is needed to identify models for specific use cases. Compliance with this standard will allow users to know whether the object model they are getting is graphically well developed but data poor or if it does have the data needed for creating contract documents. This capability will greatly reduce the designers' efforts to either build an object or search/find/edit an object necessary for the development of their project. Considering that an advanced model may contain hundreds of objects this would represent a huge time savings and improve the modeling process.

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Preface

This study was conducted for the U.S. Army Corps of Engineers (USACE) under Project Number 142397, “USACE Advanced Modeling Object Standard – Release 1.0.” The technical monitor was Mr. David M. Johnson.

The work was performed by the CAD/BIM Technology Center of the Software Engineering and Informatics, U.S. Army Engineer Research and Development Center, Information Technology Laboratory (ERDC-ITL). At the time of publication, Ms. Mariangelica Carrasquillo-Mangual was Chief (CAD/BIM Technology Center); Dr. Jacqueline S. Pettway was Chief (SEID); and Dr. Robert Wallace was the Technical Director for Computational Science. The Deputy Director of ERDC-ITL was Ms. Patti S. Duett and the Director was Dr. David A. Horner.

Special thanks to contributions made by the Mobile, Louisville, Sacramento, Seattle and Fort Worth Districts.

The Commander of ERDC was COL Teresa A. Schlosser and the Director was Dr. David W. Pittman.

1 Introduction

Purpose

This document, referred to as the Advanced Modeling Object Standards (AMOS), defines standards for objects created with Building Information Modeling (BIM) software and Civil Information Modeling (CIM) software. The AMOS – Type Requirements (AMOS-TR) is a supplemental document that defines object type-specific standards. The AMOS-TR standards will define requirements that apply to specific types of objects, whereas the AMOS will define the higher-level standards that apply to all object types.

These object standards have been developed to ensure reusable content is useful, consistent, and increases efficiencies across the organization. The standards are not intended to be a software application manual or a best practices document for using the BIM or CIM software. Best practices and software vendor recommendations should be followed during the creation of content, but specific software processes are not the primary purpose of these standards.

Scope

This initial document is focused on BIM objects but is expandable to allow for engineering design objects. Civil objects to be added will be Autodesk subassemblies and new Bentley OpenRoads Designer objects.

These standards have been developed to ensure that content developed for projects is useful and consistent. Best practices and software vendor recommendations should be followed. This document will assist with creating consistent, accurate, and functional Objects to be used for project design, documentation, and facility management.

This document represents a refinement or control of the model component creation process.

Overview

The U.S. Army Corps of Engineers (USACE) Advanced Modeling process is dependent upon the objects going into the modeling – the software only manipulates the objects available. The typical modeling process frequently involves searching for specific objects and editing these to make them work for the project. This can take a large amount of time, and the results are not usually only different between districts but between individuals. This makes sharing of model objects and their data more difficult and complex. Having an object standard allows for the development of consistent objects that can be shared in a common library. It also allows the ability to expand the data for common objectives such as cost estimating, facilities management, and specifications as well as other areas. This document will create standards to allow for improvement to current and future workflows.

2 General

Object components

Object components are defined as the sets of specific attributes or properties about an object that capture real-world object geometry, information about that object, functions, capabilities, and details such as color, texture, and material properties (e.g., R-values, reflectivity, density and rendering attributes). Details may also describe the inclusion or exclusion of sub-components such as door handles, closers, and kickplates.

Quality indicators

This standard defines four quality indicators with four quality levels each that allow for evaluation of the distinct features of objects.

The four quality indicators are:

- (G) – Geometry
- (F) – Function
- (I) – Information
- (E) – Extensions

These indicators are further discussed later in this report. Evaluation of objects based on these indicators provide a means to rate the quality of objects and a method to catalog objects for the purpose of reusing those objects.

Each quality category is defined by four quality levels with level 0 being the lowest quality level and 3 being the highest. Level designation will be a single letter representing the quality category followed by a hyphen and the single digit level, e.g. geometry level 1 would be G-1.

Development of objects

General requirements for creation of advanced modeling objects:

- Create a single object with multiple object types for common or manufacturers set sizes for objects, e.g.: a single wood door object of multiple types representing sizes. All types within a single object should make use of the same set of type attributes.

- Create objects using the highest precision of units allowed by the software to avoid potential inaccuracies.
- Annotations embedded within objects shall conform to the USACE A/E/C CAD Standard v6 requirements.
- Do not include logos, trademarks, proprietary, or manufacturer-specific information with the objects.
- The target file size is less than 500 kB for simple objects and 500 kB – 1 MB for complex objects.

Annotative objects

Annotative objects, such as Revit tag families, shall conform to the USACE A\E\C CAD Standards or the U.S. National CAD Standards (NCS) graphic standards as required for specific objects. Data in tags should be extracted from the associated object and not manually entered. Annotative objects are not covered by the Quality Indicators in this AMOS.

Naming conventions

Proprietary or vendor names shall not be used in any of the names of objects (e.g. Revit families), types (e.g. Revit family types), attributes (e.g. Revit parameters), and systems.

Object names

Use natural language and the following format to create unique names for each object:

- Functional Type-Subtype(-Descriptor1)(-Descriptor2)(_Author)
    - Functional Type – General Object type/use
    - Subtype – More specific Type
    - Descriptor1 (Optional)
    - Descriptor2 – (Optional)
    - Author – (Optional authoring entity)
        - *Ex: Door_Single-NarrowGlass_90-180Swing_USACE*
- Keep subcategory names as short as possible.
    - Do not complicate the object name with obscure abbreviations.
        - NOT: *xWBCMU – Ext Wall Brick Conc. Masonry Unit*
    - Do not include the object category in the sub-type

    * NOT "*Equip Sofa…*"

Type names

- Should not repeat the object name.
- Should show the differences between types in the name

Ex: Door Object:

Single 36" x 84" x 1-1/4"

Fume Hood Object:

6' Fume Hood

System Names

- Should identify the System type:
    - Mech Supply Air 1,
    - Classroom Exhaust Air
    - OA-18 (Outside Air)
    - RA- 20 (Return Air)
    - EA-13-(Exhaust Air)
    - P-DCW-8 (Plumbing-Domestic Cold Water)

Attribute names

- Use natural or simple language to create unique names for each attribute using the following format.
- Use CamelCase with no spaces between words:
- GeneralCategorySpecificType(-Descriptor1)(Descriptor2)(_Author)
    - Functional Type – General Category
    - Subtype – More specific Type
    - Descriptor1 (Optional)
    - Descriptor2 – (Optional)
    - Author – (Optional authoring entity)
        * *Ex: VentilationAirConnectionDiameter_USACE*
        * *Ex: CoolingNominalInputPower_USACE*
        * *Ex: SupplyFanPower_USACE*
    - Keep attribute names short

Note: The authoring entity suffix _USACE is required for all objects submitted to be included in the USACE content library.

Required attributes

- OmniClass Construction Classification System - Table 21 or Table 23
- Assembly Code

Integration with M3

The USACE Minimum Modeling Matrix (M3) has a Level Of Development (LOD) requirement as well as the quality levels defined here for each line item. Historically, M3 included both LOD and Grade, where LOD related to accuracy and Grade referred to specification of either 2D, 3D, or 3D with data. The Grade specification has been replaced with the AMOS quality categories as it provides a more accurate method to specify object requirements.

Note: M3 "quality indicator" modifications have not yet been implemented and therefore the Advanced Modeling Object Standard needs to be applied utilizing best judgment until these are published. The target object quality levels shall be sufficient to support the Minimum Modeling Matrix (M3) requirements as well as sufficiently convey the design intent.

3 Geometry

The **Geometry** is defined as the spatial, geometrical construction, and quality (physical accuracy) of the object compared to the real-world object. Primarily, it deals with the physical dimensions of an object and includes shape, size, clearances, and location. Table 1 identifies the classifications and descriptions.

Table 1. Geometry classifications and descriptions.

Quality Level	Definition
G-0	Object does not include 3-dimensional shapes
G-1	Object composed of basic shape(s) indicative of area, height, volume, orientation, and clearances. (e.g. a pump would be a cube)
G-2	Object is modeled with approximate, size, shape, orientation, and clearances
G-3	Object is modeled to specific size, shape, orientation, and clearances based on real world objects and use. This may also include objects that are over-modeled to accurately depict fine details not required for typical design projects but serve specific use purpose

Purpose

There are many uses of geometric components of the Advanced Modeling objects. At the lower quality levels (G-0 and G-1), objects have very limited geometry and are typically only used for planning purposes, although use of G-0 and G-1 objects are not required.

As the design progresses, objects used in the model are expected to be at the G-2 and G-3 levels and the primary use of the geometric components shifts to facilitating the creation of construction contract documents and must be taken into consideration in the development of the objects. An object must be developed such that it will appear correctly in plan, elevation, and section views. The object will also be used for design review and construction coordination and should to be able to accurately represent itself in three dimensions as to allow for interference detection against other objects and features including required clearances (e.g. maintenance clearance space for servicing of air filters or equipment access).

Depending on the object type, there is a target geometry quality level suitable for most USACE construction design project with G-2 and G-3 being the more applicable quality levels. The AMOS-TR will define the type specific geometry requirements.

Efficiency

To create more efficient projects, objects should be lean and not have excessive geometry. Graphically represent all essential shape information using the least complex geometry necessary to adequately represent the object to reduce family size and complexity. For example, a door object would typically not need to have the hinges, latches, trims, and sweeps modeled.

Where non-native geometry is required, complex curves or shapes (common for CAD or Manufacturing quality design files) should be simplified prior to importing. Limit the use of non-native geometry to special objects that may be necessary to support the design (helicopters, trucks, human figures, etc.).

Use symbolic lines to represent geometric components in 2D views that do not require a three-dimensional representation such as plan, elevation, or section views (e.g.: door swings). Symbolic lines are required for devices that depict required geometric information at symbolic sizes such electrical devices. Where applicable, apply visibility settings to the object geometry to ensure that only what is necessary for the view is visible.

Consider creating all the geometry necessary for the family inside the family without nesting. When nesting is necessary, limit the nesting to two levels in order to manage the file size.

Categories and subcategories may also be used to help control the visibility of the geometric representation.

Ease of use

Create objects in the correct orientation using an insertion point relevant to the deployment or use of the object in a design model.

4 Function

The **Function** indicator describes an object's parametric behavior and connectivity; the method for allowing an object to become part of a system (e.g. a variable air volume (VAV) unit connecting to the ductwork for air supply; a light switch connecting to an electrical circuit, a pump connecting to an electrical circuit). This includes the object's relationships to the environment, hosts, systems, processes, and other objects. Table 2 identifies the classifications and descriptions.

Table 2. Function classifications and descriptions.

Quality Level	Definition
F-0	Object contains no parametric behavior or connectivity.
F-1	Object contains limited parametric behavior or connectivity.
F-2	Object contains parametric behavior or connectivity, but not both. For example, a door with parametrically driven width and height or a plumbing fixture with connections properly configured with the correct utility system(s). Also, a light fixture with electrical connections but no light distribution data.
F-3	Object contains both parametric behavior and connectivity. These generally should be limited in number due to the complexity of the object, the file size, and the impact on the building design with overly complex objects.

Purpose

Not all objects require built-in functions. At the lowest quality level, F-0, objects do not include parametric behaviors or connectivity. They are unaware of their environment, model, or system in which they are used. Many furnishing objects are typically of the F-0 level, whereas an F-1 furnishing object may have limited parametric functions that allow them to change based on certain settings (e.g. – a table object with different object types defined for different sizes).

At the F-2 level, connectivity functions may be present. System connectivity is a critical component in the MEP design process and must be considered in building such objects. Similarly, an F-3 furnishing may have parametric features beyond simple driven dimension sizes (e.g. – a table and chairs group object with varying numbers of chairs that are parametrically set by object type).

F-3 objects may also include those that can cut their host, e.g. a door cutting the host wall.

Depending on the object type, there is a target **Function** quality level suitable for most USACE construction design projects, with most with F-2 and F-3 being the more applicable quality levels. The AMOS-TR will define the type specific function requirements.

Efficiency

Limit the use of functions to extend an object's behavior and connectivity.

Ease of use

Implement parametric behaviors such that flexing the object (e.g. changing object type) will not break the existing hosting and orientation. Likewise, a change in the connected system should not generally cause the object to lose or break connection or lose its orientation.

5 Information

The **Information** indicator encompasses the key aspect of BIM/CIM objects and may overlap the geometry and function indicators in some areas. For example, **Information** can include data that is used to define the **Geometry's** dimension-driven sizes or the **Function's** connecting component size or system type.

Information also includes standard data required for any construction contract document schedules as well as information needed for design, specifications, and management – (e.g. weight, power/utility data, fire/smoke rating, identification numbers). Table 3 identifies the classifications and descriptions.

Table 3. Information classifications and descriptions.

Quality Level	Definition
I-0	Object contains no information. This may include objects with no information attributes defined, or information attributes defined with no data inserted
I-1	Object contains only information depicting data associated with dimension-driven geometry
I-2	Object contains some data required to populate required schedules on contract documents and may contain information depicting data associated with dimension-driven geometry.
I-3	Object contains all data required for dimension-driven geometry and all data required to populate required schedules on contract documents. There should be sufficient information to identify a specific real-world object from a manufacturer that would be represented by this object.

Purpose

The primary use of the **Information** component is delivering relevant data about the Advanced Modeling BIM/CIM objects. At the lowest quality level, an I-0 object does not include any information. Although this is not ideal, there are valid reasons why an object may not have any associated information.

At the I-1 level, objects may include some basic information such as data that is indicative of the geometric sizes or functional sizes, e.g. a door object that has width and height, which is often also used to drive the door's geometry.

At the I-2 level, objects may include specific information that are not captured by the Geometry or Function, but are internal attributes of the object such as a door's fire rating, or a pump's connection type that are used to populate design schedules.

At the I-3 level, objects may include information typically external to the object such as warranty information, make and model numbers, and installation date. I-3 includes all data required to populate design schedules.

Depending on the object type, there is a target Information quality level suitable for most USACE construction design projects. The AMOS-TR will define the type specific information requirements.

Efficiency

Use system or built-in parameters to the greatest extent possible when creating object to capture information.

Include only those information parameters relevant to the object category; do not include irrelevant placeholders. For example, do not include horsepower rating for a window object.

Ease of use

Where supported by the software application, organize information by logical grouping of discipline and then function.

6 Extensions

The **Extensions** indicator focuses on the extended information attached to the object. Some extensions are available as default with out-of-the-box software, but often will require the extended resources to be delivered with the object when resources are either proprietary or customized. These can include material, color, texture, IES lighting, or rendering attributes.

Where possible, materials will be assigned to the geometry of the object. Categories or subcategories may be used to apply materials to the geometry of the object. Table 4 identifies the classifications and descriptions.

Table 4. Extensions classifications and descriptions.

Quality Level	Definition
E-0	Object contains no additional content or extensions
E-1	Object contains or is linked to one generic extended data such as generic .IES lighting information file, photometric data, images or general type catalogs, material, textures, or mapped attributes
E-2	Object contains or is linked to multiple generic extended data such as generic lighting, .IES lighting information file, photometric data, images or general type catalogs, material, textures
E-3	Object contains or is linked to one or more real-world extended data. E.g. specific .IES lighting information file derived from industry or field tests, or structural steel sizes from type catalogs with AISC sizes

Purpose

The **Extensions** indicator is used to identify any extended information that the object creator defined with the intent to enhance the object. Extensions are generally those attributes or features that are not or cannot be embedded within the native object. For the majority of projects, most objects will be E-0 with no need for Extensions.

E-1 level introduces basic extended information such as Revit external type catalogs for equipment or structural components, lighting fixtures with IES lighting information file, or an object surface texture bump map defined.

An E-2 object would be similar to an E-1, but with more than one generic extension, e.g. a lighting fixture with an IES defined and a surface texture bump map for the material finish.

An E-3 object contains one or more real-world extended data.

Efficiency

Extensions requiring additional software to access or use (beyond the native software) are not permissible. Extensions can be created by third-party propriety software, but will not require third-party propriety software to function.

Depending on the object type, there is a target Extensions quality level suitable for most USACE construction design project, with E-0 and E-1 being the more applicable quality levels. The AMOS-TR will define the type specific extensions requirements.

Ease of use

Ensure all necessary extension files(s) are included with the object to properly use the object. Files for materials, IES files for lighting, type catalog, or lookup tables will be included and accessible to model without additional path setting changes.

For complex objects (over six different object types), the use of type catalog is highly recommended.

Extensions will remain intact when the object is upgraded to newer versions without requiring third-party software, manual re-work, or re-mapping.

Glossary

Advanced Modeling: A subset of geospatial technologies to include BIM, CIM, GIS, and CAD. Advanced Modeling is comprised of models and drawings that form a digital representation of the project, or part thereof, that are comprised of model elements with facility data.

M3: *Minimum Modeling Matrix*: USACE Standard contract requirement for establishing the specific Level of Development (LoD) for BIM objects that are part of the model produced for the contract. The requirements are for record modeling as well as design.

A/E/C: refers to the A/E/C CAD Standard or A/E/C Graphics Standard documents that have been developed by the USACE CAD/BIM Technology Center for computer design documentation standards.

Facility Data Exchange (FDE): The process and the set of specific data requirements for use in managing a facility.

UniFormat: Publication of Construction Specifications Institute – hierarchical numbered classification system of construction data as assemblies based on functional use in a facility: Substructure, Foundations, Shell, Floors, Interiors, and Services. Generally, these are the objects that are represented in the model.

MasterFormat: Publication of Construction Specifications Institute – numbered classification system of construction data as individual building components – sometimes as subcomponents for the UniFormat assemblies: Concrete, Concrete finishing, post tensioned concrete, Masonry, and Finishes.

OmniClass: A national uniform construction classification system built to incorporate existing separate classification systems for construction materials and processes. There are multiple tables to include various aspects of the construction process. Tables are built from a consistent structure.

AMOS-TR: The "*Advanced Modeling Object Standards-Technical Requirements*" – the detailed requirements for specific object types such as values, doors, and light fixtures.

Appendix A: Revit Best Practices

Family templates and categories

New objects should be created using the most relevant out-of-the-box (OOTB) family template suitable for the family, or templates created from the relevant OOTB template. (Since families created in one version cannot be saved back to a previous version, verify the required version of the final project models before developing a new family Object). Additionally, ensure that the appropriate family category is set to ensure that parameters and parametric functions work correctly and allow for proper scheduling. For example, it would be incorrect to create a countertop based on a wall family even though it is technically possible. For objects that have difficult matches between the real world type of object and the generic object, OmniClass Table 21 may be used as a guide for determining the appropriate Revit family category with OmniClass Table 23 as the second level reference. Most generic family objects will have parameters already assigned for OmniClass (either Table 21 or Table 23).

Exceptions: Since there are a limited number of templates available, there may be some products classified in multiple categories. For these, use the closest category. Reference the Uniformat or MasterSpec classification system for additional guidance. (e.g.- a locker would be classified as 'Specialties' (C1030) and would be based on a 'Specialty Equipment' family template).

Object origin

The family orientation shall be created to match the real world object – front of the object built with the front of the Family View cube.

Reference elements and constraints

Use named reference elements (planes and lines) for the creation of object geometry. Limit constraint of dimensions to those reference elements to only those necessary for the proper flexing of the family. Similarly, limit the locking of geometry to reference elements to those necessary to support parametric changes such as parametrically dimensioned reference elements representing the physical properties for design- e.g. : window width, height and sill height. Where applicable, geometry can be fixed (dimensionally locked) if the real-world intent dictates.

Object materials

Materials shall use the standard software materials. Check the materials browser to verify that no proprietary or imported materials are in the families.

If other file types are used to assist the development of the objects that are part of the construction (e.g.: CAD, .skp, .sat…), all imported geometry, materials, linestyles, layers, and data will be removed for completion of the final object.

Objects not part of the construction, but are used for design, planning, or illustration do not have to meet this requirement.

Tags and materials

Tags and symbols shall be built from annotation templates.

Shared parameters

Utilize system and existing USACE shared parameters to the greatest extent possible. New shared parameters should use the OpenDefinery.com parameter and GUID if available.

Use the proper Group setting for the parameter to make it easier to find.

'Parameter type' is the data type and will create restrictions - a number type will not allow letters and therefore should not be used for "room number" or "door number" – these frequently have characters or dash symbols. Unless the data type will always use a number and not have any options such as "NA" it is better to use a character or text data type.

It is easy to create a parameter for an Object, but that parameter increases file size and will multiply the file size, which impacts the performance of a model. Therefore, do not use excessive parameters. There may be some use in knowing what person created what parameter for what project and based on what building code but that is too much information that is of questionable benefit and is generally unnecessary.

Because of the restrictions of GUIDs for scheduling formulas and other model uses, it is critical that the same parameters be used with the same

GUID. Parameters with the same name, but different GUIDs would not be able to be shown in the same schedule. Shared parameters are critical for Objects that depend on exchanging, scheduling information since these have the GUID embedded. Since these projects are to be part of the Department of Defense facilities, it is imperative that all projects use the shared parameters use the same GUIDs.

Tags for Objects will also be dependent on the GUID, not the parameter name and will not populate if not coordinated.

1. Use of parameters
    a. Parameters should be used for only the information being captured or for parametric necessary for object use.
    b. Use the software parameter groups to simplify or organize the data:
        (1) Dimensions, graphics, identity, Green Building Properties…
    c. Parameters are to use “Parameter Type” that corresponds to actual usage for all projects
        (1) A Door “Number” or Room “Number” may be called a number but many door “numbers” use text types of data : “ – e.g. 1002A. A ‘Text’ parameter type should be used for this type of parameter.
        (2) Using an Area parameter allows calculations to be made using other “Length” parameters

Visibility

Apply visibility settings to geometry for “medium” and “coarse” views.

Function

1. Hosting requirements
    a. Creating an Object that is hosted by another element can assist with the placement of the Object but may create problems when the Object being created by one discipline (e.g.: Lights- Electrical) are hosted in objects of another discipline (e.g.: Ceilings – Architectural).
        (1) It is recommended that “face-based” Objects be created to avoid this problem.
        (2) Example -an electrical lighting fixture hosted by a ceiling managed by the architect will be deleted if the architect deletes the ceiling or replaces it).

   b. Create "face based hosted" objects for objects that are interdisciplinary to avoid connection problems.

2. Connectivity
   a. For Adding Connectors Families - Place connector on face of object that is in the family
   b. Connector orientation correctly for the proper use of connecting Objects
   c. Rectangular connectors – these will be oriented so that width and height axes will correspond to placement vertical and horizontal directions

3. Provide all BIM connections necessary for analysis – piping, HVAC ducting, electrical wiring
   a. Provide connectors based on the disciple for the connection
      (1) Coordinate objects that require connectors from different disciplines to verify that each discipline connector is located accurately and has the correct parameter data associated with that connection.

Appendix B: Resources

Construction Operations Building Information exchange – COBIe– The national standard for Building Information Modeling data referencing specifically data that is needed for facility operations and maintenance.

United States National CAD Standard (NCS) - classifying electronic building design data consistently allowing streamlined communication among owners and design and construction project teams.

USACE QTO Requirements – USACE Quantity Take Off

USACE FDE – USACE Facility Data Exchange Requirements

NBIMS-US National BIM Standards (buildingSMART alliance)

USACE A/E/C CAD Standard

- Data contained in Revit Content will be able to produce required schedule information

USACE A/E/C Graphic Standard

- Data contained in Revit Content will be able to produce required schedule information

BIMForum Level of Development Specification 2018 –http://bimforum.org/

OmniClass: OmniClass Construction Classification System http://www.omniclass.org/

OpenDefinery.com - National standard for Revit family shared parameters that is being adopted for USACE BIM standards.

UNIFORMAT: Construction Estimating and Construction Project Management classification system - managed by the Construction Specifications Institute (CSI)

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14. ABSTRACT

The U.S. Army Corps of Engineers (USACE) Advanced Modeling Object Standard (AMOS) has been developed by the CAD/BIM Technology Center for Facilities, Infrastructure, and Environment to establish standards for support of the Advanced Modeling process within the Department of Defense (DoD) and the Federal Government. The critical component of Advanced Modeling is the objects themselves- and either make the modeling process more difficult or more successful.

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