UNITED BIM

Level of Development

LOD 100, 200, 300, 350, 400, 500

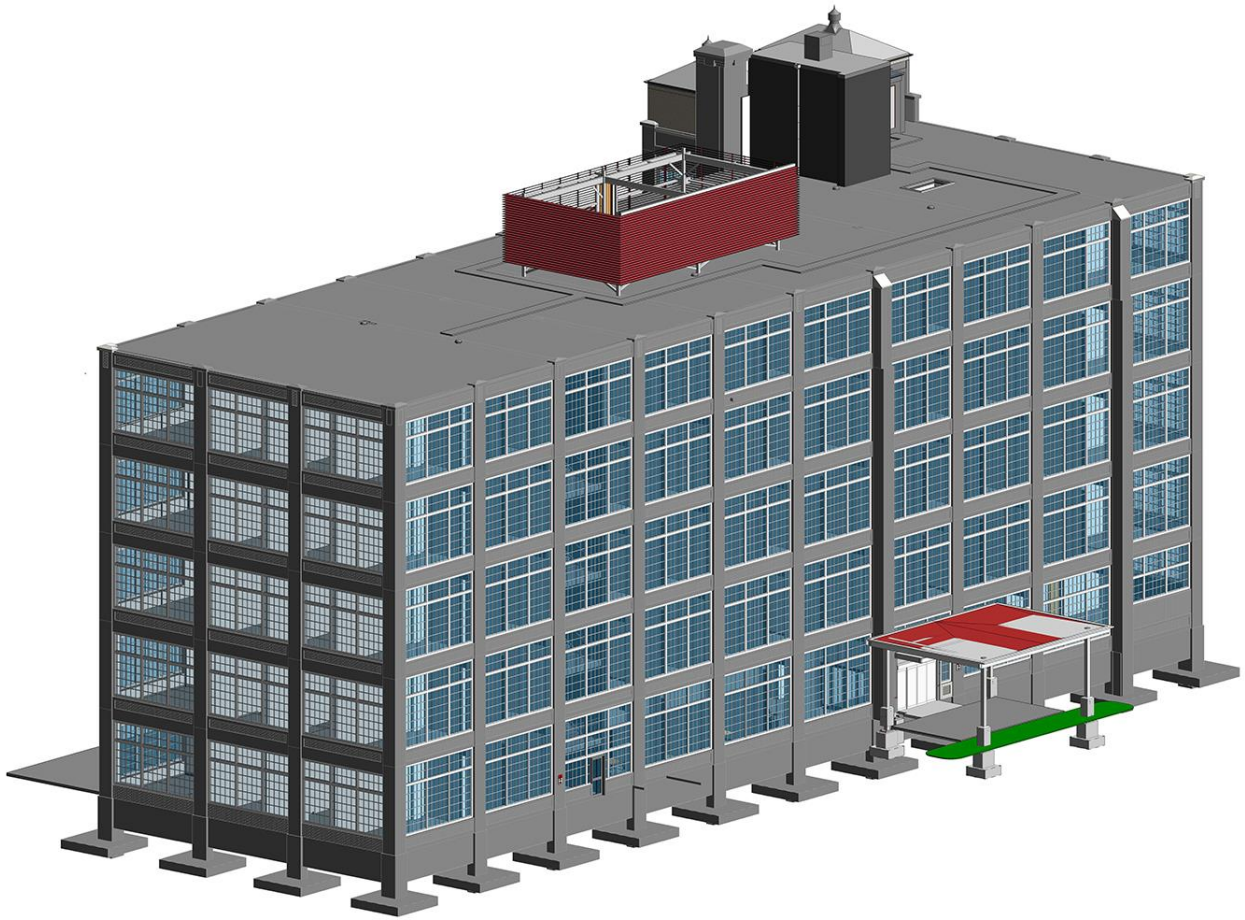
What is Level of Development (LOD)?

Level of Development (LOD) specification allows professionals in the industry to clearly articulate how an element's geometry and associated information has evolved throughout the entire process. It signifies the degree to which different members of the team can rely on information associated with an element.

The LOD specification helps designers define the inherent characteristics of the elements in a model at different stages of development. The clarity in illustration gives depth to a model, signifying how much and at which level someone should rely on a model's element.

Using LOD, designers and engineers can clearly communicate with other professionals who will be using the model further about the usability and limitations of a model. LOD specifications were designed to standardize the use of the LOD framework and use it as an efficient and collaborative communication tool.

Level of development (LOD) is a set of specifications that gives professionals in the AEC industry the power to document, articulate and specify the content of BIM effectively and clearly. Serving as an industry standard, LOD defines the development stages of different systems in BIM. By using LOD specifications, architects, engineers and other professionals can clearly communicate with each other without confusion for faster execution.



The Origin of LOD

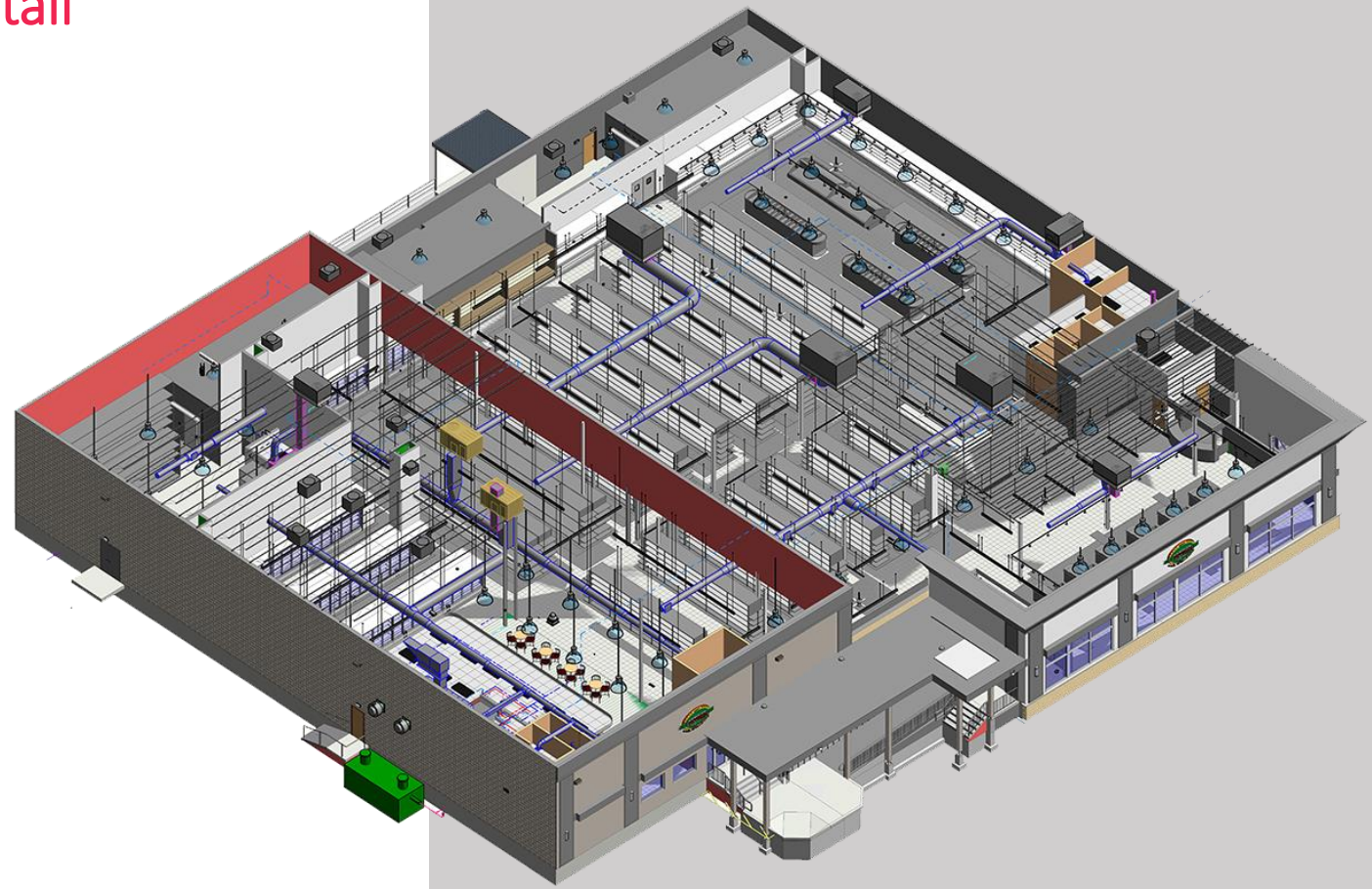
LOD was first introduced by the American Institute of Architects in 2008 when it defined five different levels of development to define the detailing levels in a BIM model. But the concept of LOD is present much before that. The first instance of LOD usage can be traced to a construction analysis software company, Vicosoftware, which made use of LOD-like system to associate digital models with the cost of a project. The company made all the parameters and details associated with a digital model accessible for everyone at various stages of the design process.

Level of Development vs. Level of Detail

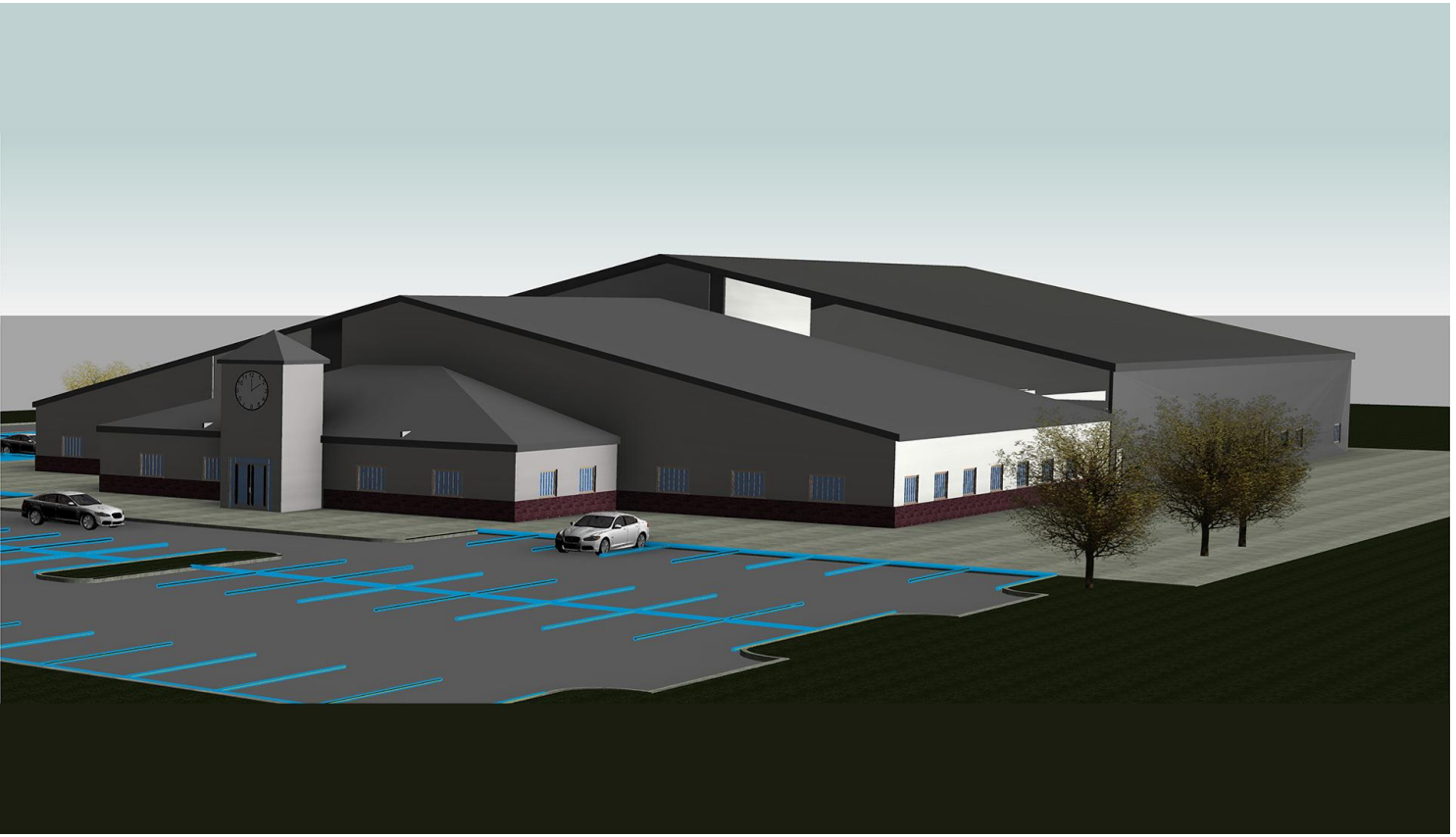
LOD is usually interpreted as Level of Detail instead of Level of Development. This Specification uses the concept of Level of Development. There are important differences.

Level of Detail is actually what proportion detail is enclosed within the model element. Level of Development is the degree to which the components' specification, geometry, and attached information have been thought through – the degree to which project team members may depend on the information when using the model.

In essence, the Level of Detail can be thought of as input to the element, while the Level of Development is a reliable output.



LOD and Design Phase



The LODs don’t seem to be outlined deliberately by design phases. Rather, design phases completion, as well as any other milestone or deliverable, can be described through the LOD language. There are several important reasons for this approach:

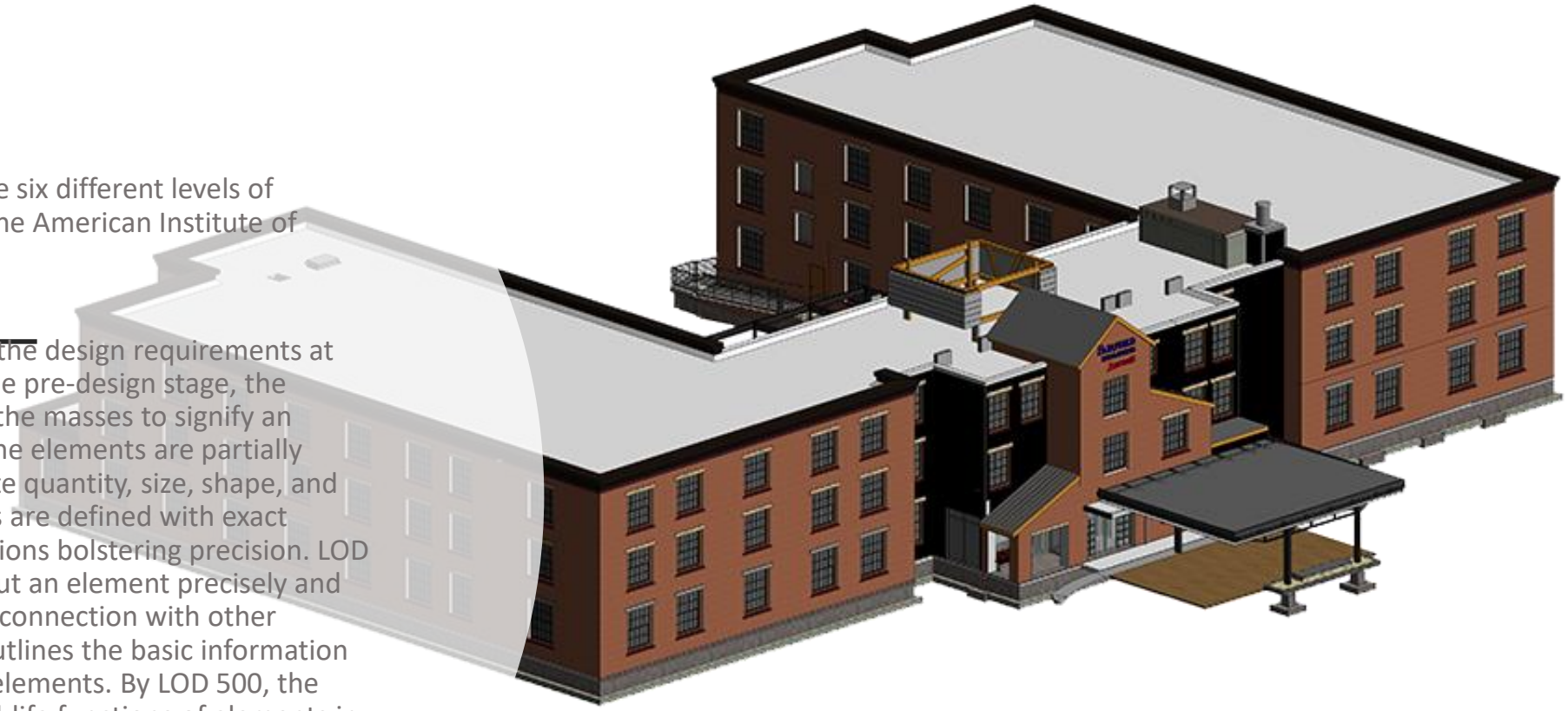
1) The first reason is that there is no detailed standard available for the design phase. Earlier architects have created standards but existing within an organization. The standards differ from one organization to another, and it can even differ within a single organization according to the requirements of a project.

2) Building systems progress from concept to precise definition at different rates, so at any given time different elements will be at different points along with this progression. At the completion of the Schematic Design phase, for example, the model will include many elements at LOD 200, but will also include many at LOD 100, as well as some at LOD 300, and possibly even LOD 400.

Fundamental Definitions Associated with LOD

- In the current context, there are six different levels of development that are defined by the American Institute of Architects (AIA).

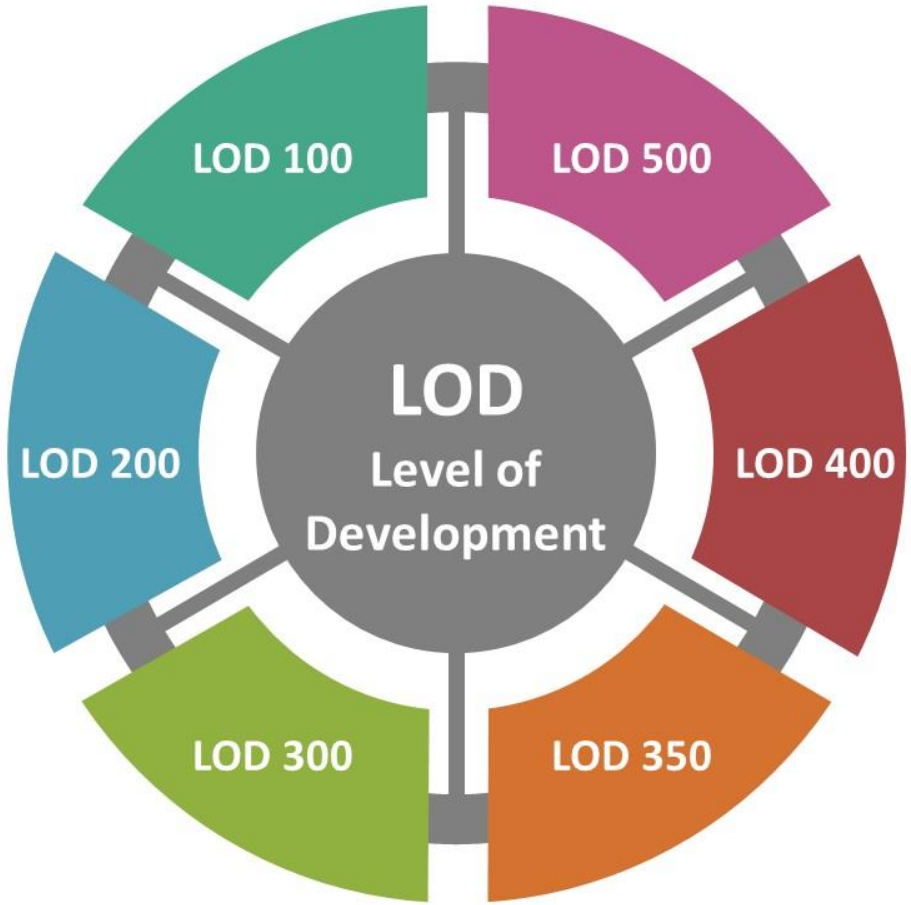
- According to AIA, LOD outlines the design requirements at each stage. At LOD 100, which is the pre-design stage, the model consists of 2D symbols and the masses to signify an element's existence. At LOD 200, the elements are partially defined by outlining its approximate quantity, size, shape, and location. By LOD 300, the elements are defined with exact dimensions and their relative positions bolstering precision. LOD 350 describes the information about an element precisely and outlines an element's relation and connection with other components. The LOD 400 level outlines the basic information about the construction of various elements. By LOD 500, the model begins representing the real-life functions of elements in a real building. Here are all the levels of development with their definition in detail.



LOD 100 The Model Element may be graphically represented in the Model with a symbol or other generic representation. Information related to the Model Element can be derived from other Model Elements. Any information derived from LOD 100 elements must be considered approximate.

LOD 200 The Model Element is graphically represented within the Model as a generic system, object, or assembly with approximate quantities, size, shape, location, and orientation. Non-graphic information may also be attached to the Model Element. Any information derived from LOD 200 elements must be considered approximate.

LOD 300 The Model Element is graphically represented within the Model as a specific system, object or assembly in terms of quantity, size, shape, location, and orientation. Non-graphic information may also be attached to the Model Element. The project origin is defined and the element is located accurately with respect to the project origin.



LOD 500 The Model Element is a field verified representation in terms of size, shape, location, quantity, and orientation. Non-graphic information may also be attached to the Model Elements.

LOD 400 The Model Element is graphically represented within the Model as a specific system, object or assembly in terms of size, shape, location, quantity, and orientation with detailing, fabrication, assembly, and installation information. Non-graphic information may also be attached to the Model Element.

LOD 350 The Model Element is graphically represented within the Model as a specific system, object, or assembly in terms of quantity, size, shape, location, orientation, and interfaces with other building systems. Non-graphic information may also be attached to the Model Element.

Capability of BIM Model According to LOD level

Model Content	LOD 100	LOD 200	LOD 300	LOD 400	LOD 500
3D Model Based Coordination	Site level coordination	Major large object coordination	General object level coordination	Design certainty coordination	N/A
4D Scheduling	Total project construction duration. Phasing of major elements	Time-scaled, ordered appearance of major activities	Time-scaled, ordered appearance of detailed assemblies	Fabrication and assembly detail including construction means and methods (cranes, man-lifts, shoring, etc.)	N/A
Cost Estimation	Conceptual cost allowance Example $/sf of floor area, $/hospital bed, $/parking stall, etc. assumptions on future content	Estimated cost based on measurement of the generic element (i.e. generic interior wall)	Estimated cost based on measurement of specific assembly (i.e. specific wall type)	Committed purchase price of specific assembly at buyout	Record cost
Program Compliance	Gross departmental areas	Specific room requirements	FF&ampE, casework, utility connections		
Sustainable Materials	LEED strategies	Approximate quantities of materials by LEED categories	Precise quantities of materials with percentages of recycled and/or locally purchased materials	Specific manufacturer selections	Purchase documentation
Analysis/Simulation	Strategy and performance criteria based on volumes and areas	Conceptual design based on geometry and assumed system types	Approximate simulation based on specific building assemblies and engineered systems	Precise simulation based on the specific manufacturer and detailed system components	Commissioning and recording of measured performance

Source: Approved Use Metrix by U.S. General Services Administration- Real Estate Services

Advantages of LOD in Design

• Better collaboration and communication between different teams

With the help of standardized specification and detailed information about all the elements, designers can provide guidelines and data for people working downstream to ensure zero lapses in execution and maintenance. LOD makes it easier to define a standard for contractors who must take care of BIM execution. At the same time, design managers can explain the requirements at various levels of the design process to the teams in a better way.

• Articulated Scope associated with a BIM deliverable

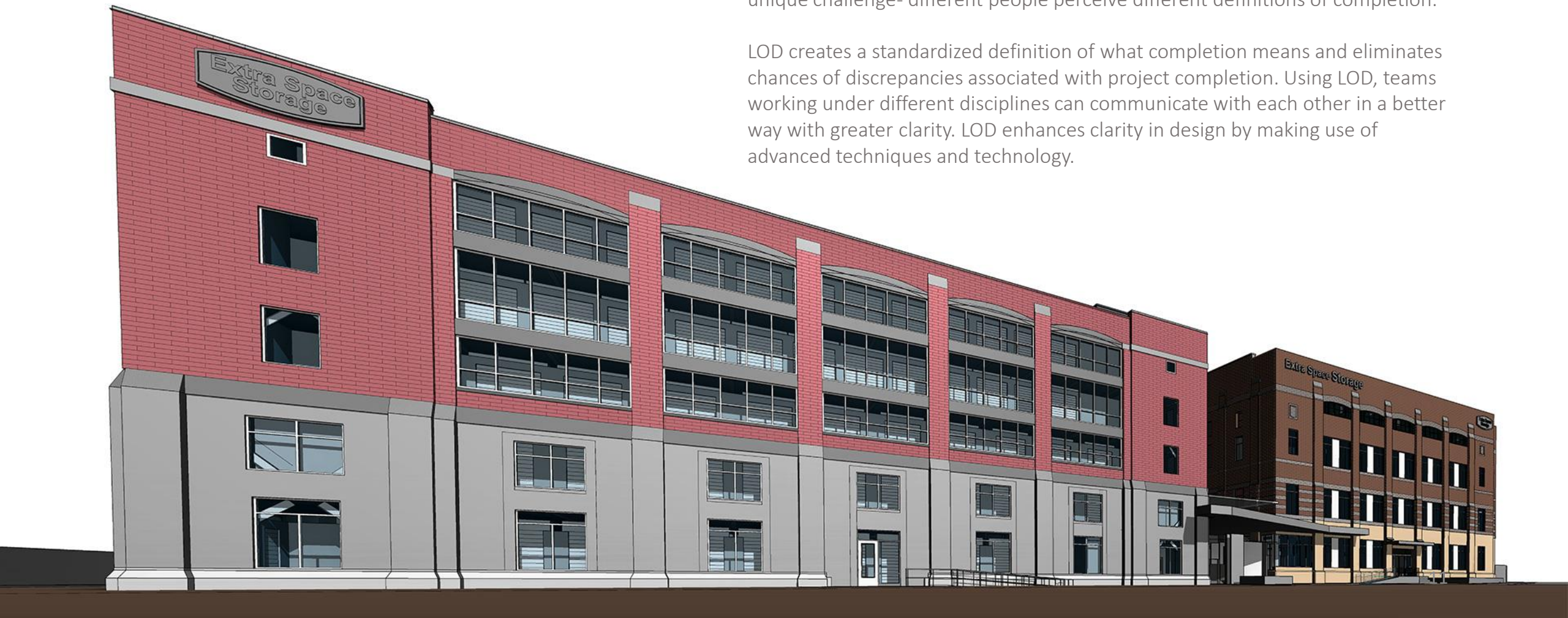
With the help of LOD, BIM models become more accurate. At the same time, all the teams including the owners can precisely specify the level of detail they want from a BIM model and get clarity on the scope of the final BIM deliverable.

Level of development is an extremely important element of the entire BIM process. Without LOD, it can become hard for everyone to work on the same page, creating inconsistencies that can hamper a project's prospects. With the help of LOD specifications, communication and collaboration can become easier and faster, making room for efficient deployment of resources at all levels of design and construction. Here are some of the benefits of the level of development specifications in the design process:

The Benefit of Clarity Due to LOD for an AEC Project

In an era where everything is handled digitally and all critical projects make use of 3D model, it becomes hard for designers to make other teams understand the project expectations. Most often, handling a BIM model comes with a unique challenge- different people perceive different definitions of completion.

LOD creates a standardized definition of what completion means and eliminates chances of discrepancies associated with project completion. Using LOD, teams working under different disciplines can communicate with each other in a better way with greater clarity. LOD enhances clarity in design by making use of advanced techniques and technology.

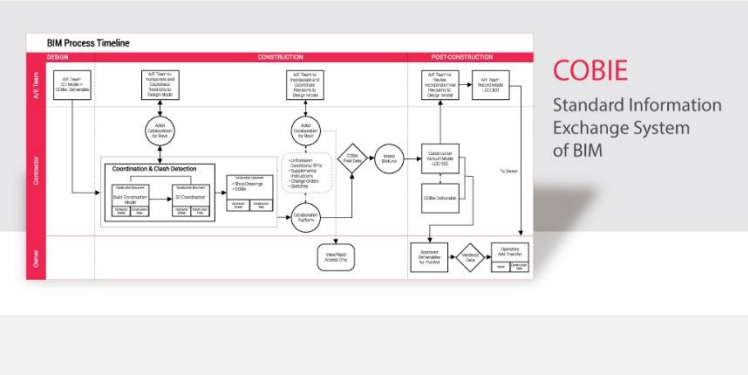


Overcoming the LOD Lexicon

If used without standardization, 3D BIM models can cause massive blunders owing to the difference in precision and accuracy definitions between two teams. LOD is structured to minimize errors with the help of a numerical lexicon which the designers and the end-users of a BIM model share for common understanding.

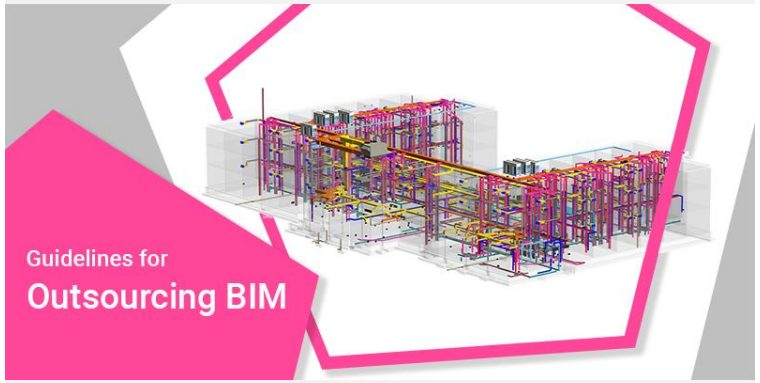
LOD is just like a key to a lock which can open the right gate for project completion. In other words, it's a way to accurately execute various elements in a model. With LOD, design, and execution teams can come at the same page and see that a model's elements with clarity and understand when an element reaches desired level of maturity that can be called as completion.

FEATURED BLOGS



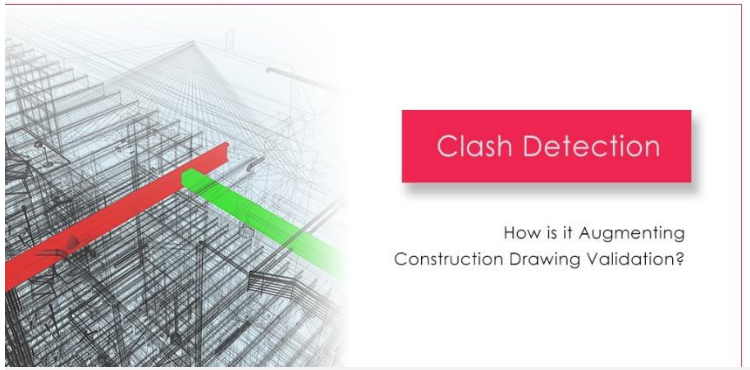
What is COBie?

How it is streamlining data collaboration between AEC professionals



Guidelines for Outsourcing BIM

Key Takeaways for AEC Professionals



What is Clash Detection in BIM?

Process, Benefits and Future Scope in Modern Day AEC industry

REVIEW CHECKLIST
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