

BUILDING INFORMATION MODELING MODELOWANIE DANYCH BUDOWLANYCH

BIM LOD

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BIM - LOD

These terms are frequently encountered in BIM projects:

Level of development [LOD]

Level of definition [LoD]

Level of detail [lod]

Level of information [loi]

The terms have been devised as a means to help communication within a BIM project run more smoothly and

In practice, however terms can, in fact, cause some confusion.

To avoid any misunderstandings on the agreements that are made at the level of detail in the beginning phase of the project, it is important to understand what terms mean.

BIM - LOD

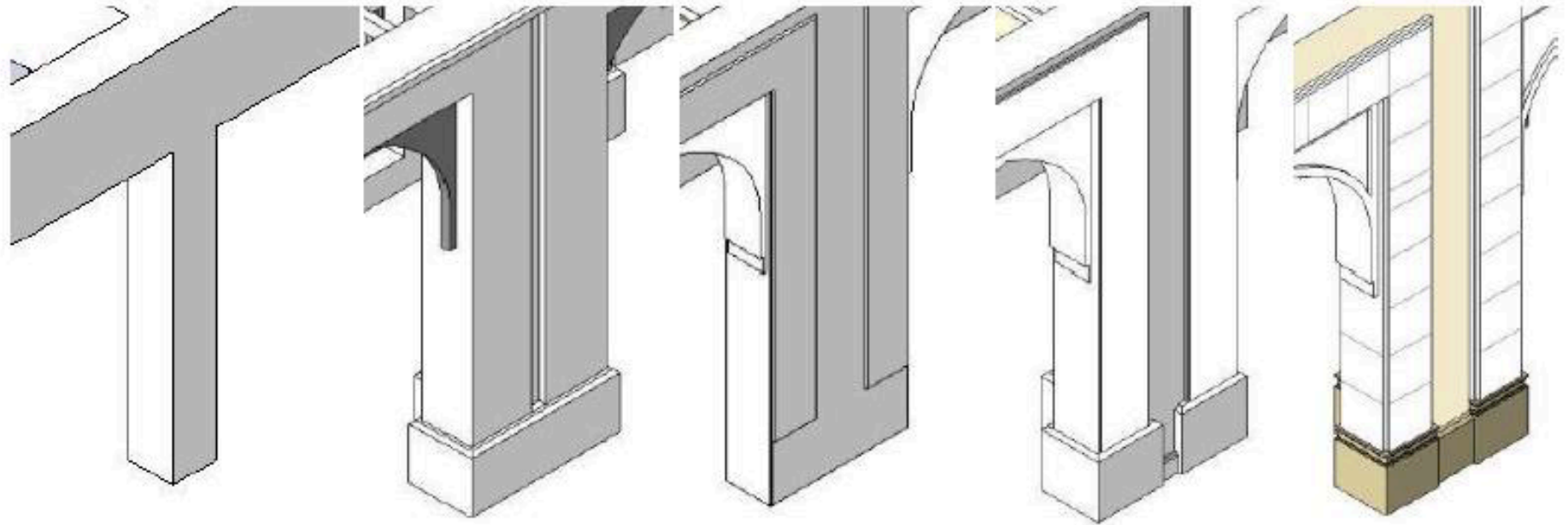
Level of detail [lod]

Level of detail refers to the model graphic representation. Low level of detail has a simple geometric shape such as a cube or a cylinder and will not contain any specified equipment. Unlike the level of development, the level of detail says nothing about the information that is linked to the model.

Level of information [loi]

Information plays a crucial role in an BIM project. The level of information is used to indicate the level of the information that is linked to the model. A model with an high level of information comprises manufacturer-specific data sheets and a maintenance instruction.

BIM - LOD



BIM - LOD

LEVEL of DETAIL

G0



Schematic

DESCRIPTION:

Office Chair

WIDTH:

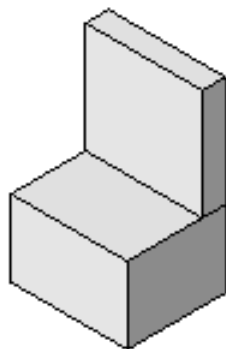
DEPTH:

HEIGHT:

MANUFACTURER:

MODEL:

G1



Concept

DESCRIPTION:

Office Chair

WIDTH:

700

DEPTH:

450

HEIGHT:

1100

MANUFACTURER:

MODEL:

G2



Defined

DESCRIPTION:

Office Chair
Arms, Wheels

WIDTH:

700

DEPTH:

450

HEIGHT:

1100

MANUFACTURER:

Herman Miller, Inc

MODEL:

Mirra

G3



Rendered

DESCRIPTION:

Office Chair
Arms, Wheels

WIDTH:

700

DEPTH:

450

HEIGHT:

1100

MANUFACTURER:

Herman Miller, Inc

MODEL:

Mirra

BIM - LOD

Level of development [LOD]

introduced by AIA the American Institute of Architects

the level of development comprises both

the graphic representation of the model as well as

the level of the information that is linked to the model.

Level of development is often abbreviated to LOD and is often referred to in BIM-related documents such as the BIM protocol.

The level of development is the most general term and less useful for detailed agreements.

Level of definition [LoD]

is defined in PAS 1192-2

as the “collective term used for and including

‘level of model detail’ and the ‘level of information detail’”.

‘Level of model detail’ is the description of graphical content on models at each of the stages

BIM - LOD

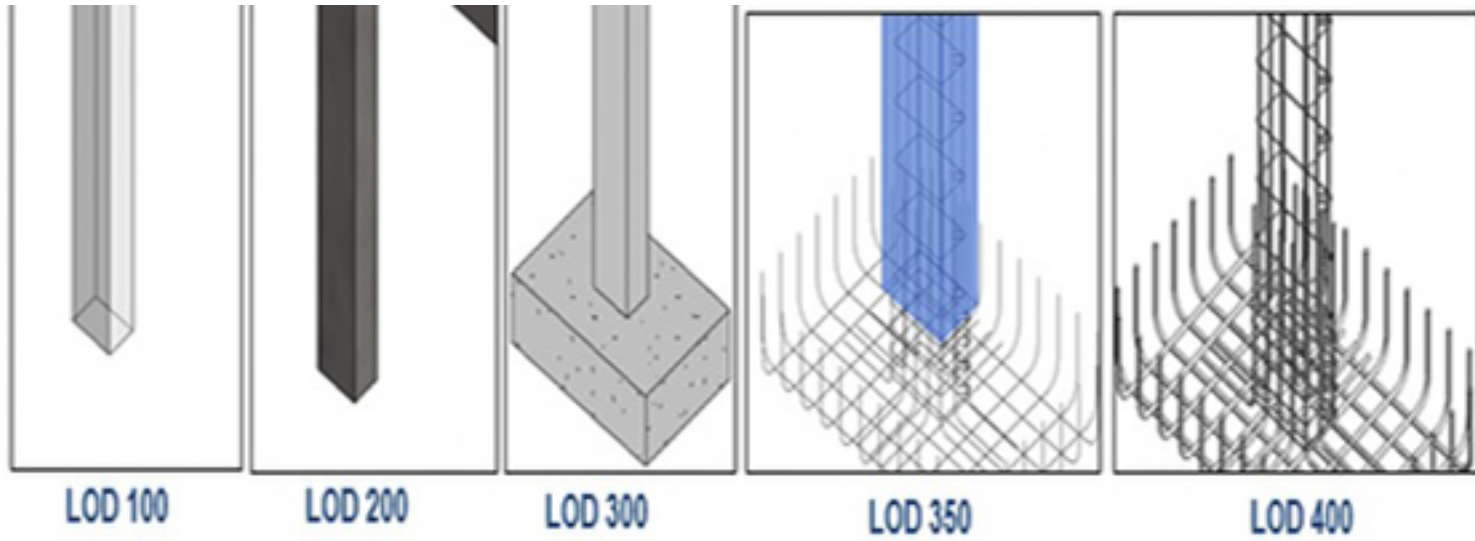
The level of development

for each model component was introduced by AIA
(the American Institute of Architects) Documents E202 in 2008
Thoassen, 2011

The level of development is defined as the level of completeness
to an extent, which a BIM model is developed
Velasco, 2013

The LOD describes the steps through which
a BIM model can logically progress
from the lowest level of conceptual approximation
to the highest level of representational precision
Brewer et al., 2012

BIM - LOD



BIM - LOD

Five levels of development are defined by AIA to indicate the extent to which a BIM model is developed.

LOD 100, LOD 200, LOD 300, LOD 400 and LOD 500.

The codes correspond to project stages such as the conceptual stage, the approximate geometry, precise geometry, fabrication and as-built stages (Jaing, 2011; Velasco, 2013).

These levels require coordination amongst all stakeholders involved in a project to identify who will be responsible for the development of each component and to what extent the BIM model will be detailed (Gaudin, 2013).

The content of each level are described as follows (Brewer et al., 2012):

BIM - LOD

- LOD 100 Conceptual:

The model will consist of overall building massing including orientation, volume, height, location and area

- LOD 200 Approximate geometry:

generalized systems or assemblies with approximate size, shape, location, orientation and quantities

- LOD 300 Precise geometry:

specific assemblies accurate in terms of size, location, orientation, shape and quantities

- LOD 400 Fabrication:

specific assemblies accurate in terms of size, location, shape, orientation and quantities with complete fabrication

- LOD 500 As-built:

constructed assemblies that are accurate and actual in terms of shape, location, size, orientation and quantities.

BIM - LOD

LOD 100 - Concept Design

The building 3D model is developed to represent the information on basic level. Thereby, only conceptual model creation is possible in this stage. Parameters like area, height, volume, location and orientation are defined

LOD 200 - Schematic Design

General model where elements are modeled with approximate quantities, size, shape, location and orientation. We can also attach non-geometric information to the model elements

LOD 300 - Detailed Design

Accurate modeling and shop drawings where elements are defined with specific assemblies, precise quantity, size, shape, location and orientation. Here too we can attach non-geometric information to the model elements

LOD 350 - Construction Documentation

It includes model detail and element that represent how building elements interface with various systems and other building elements with graphics and written definitions

LOD 400 - Fabrication & Assembly

Model elements are modeled as specific assemblies, with complete fabrication, assembly, and detailing information in addition to precise quantity, size, shape, location and orientation. Non-geometric information to the model elements can also be attached

LOD 500 - As-Built

Elements are modeled as constructed assemblies for Maintenance and operations. In addition to actual and accurate in size, shape, location, quantity, and orientation, non-geometric information is attached to modeled elements

Approximate

Specific:

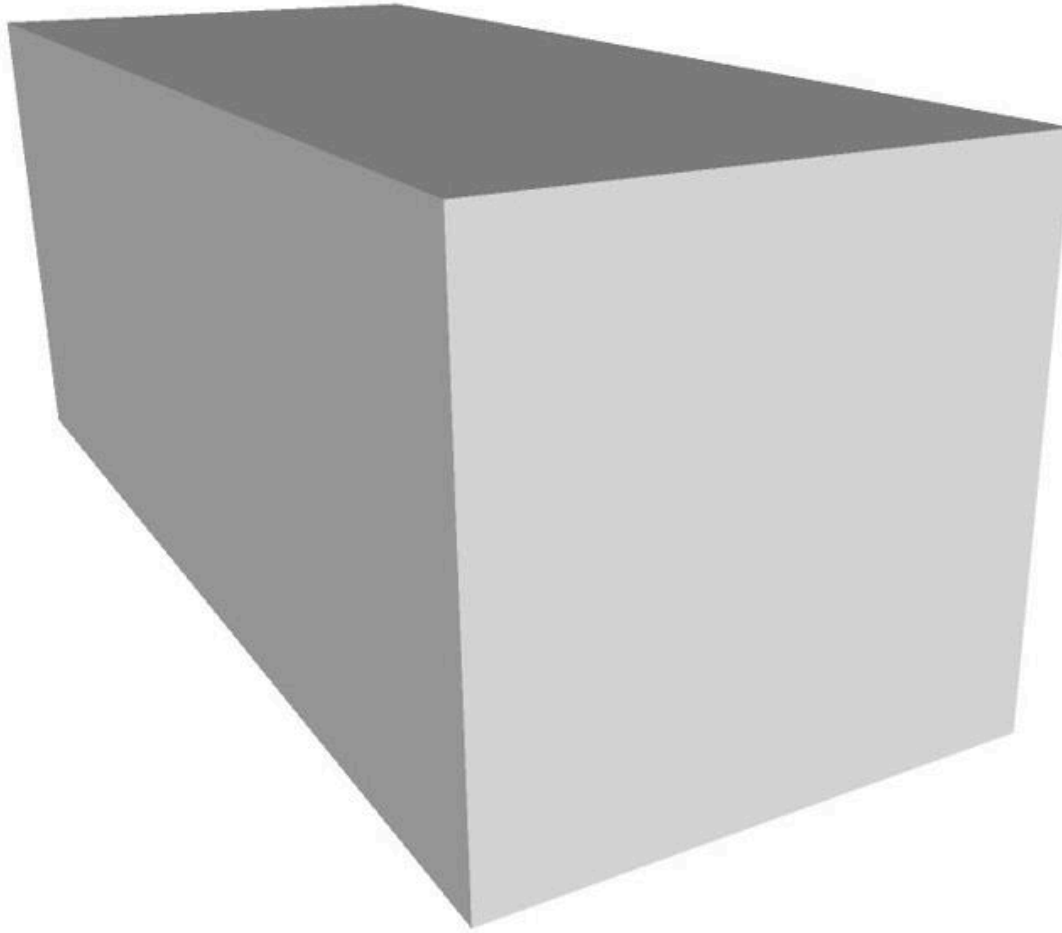
The quantity, size, shape, location, and orientation of the element as designed **can be measured directly from the model**

without referring to non-modeled information such as notes or dimension call-outs.

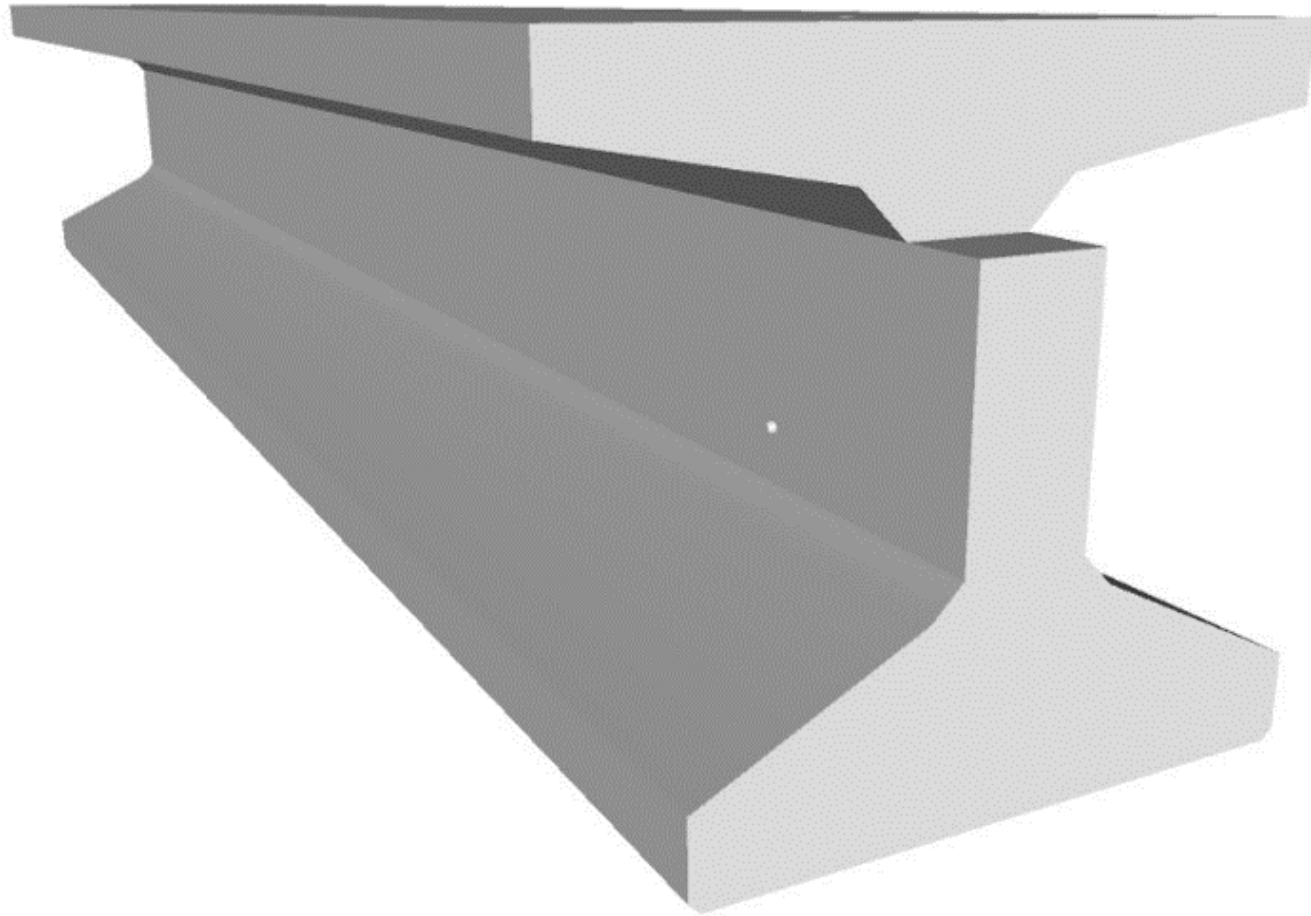
Actual:

The model element **includes all the qualities** of a element and is representative of the manufacturer's model **to be installed** or the construction intent of an assembly.

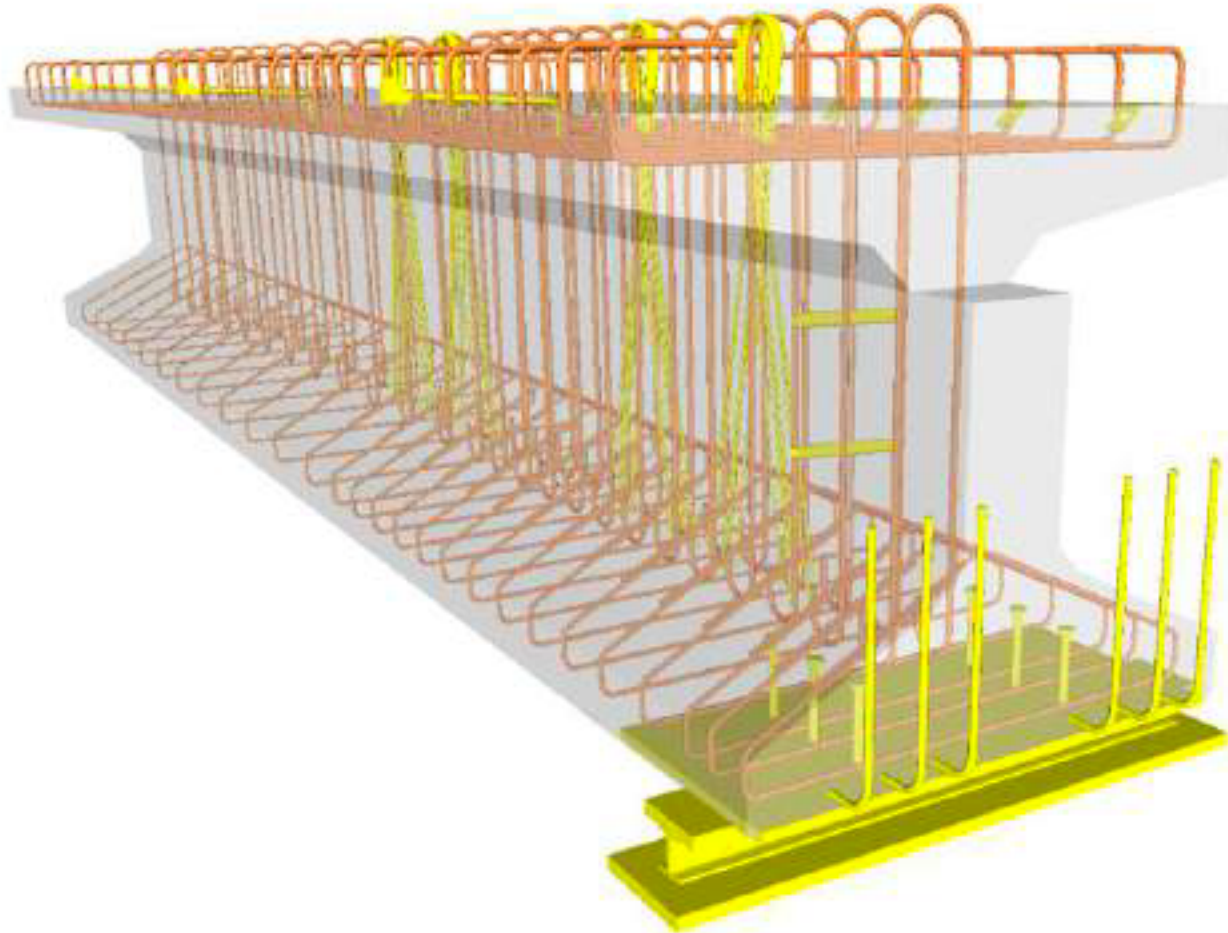
BIM - LOD



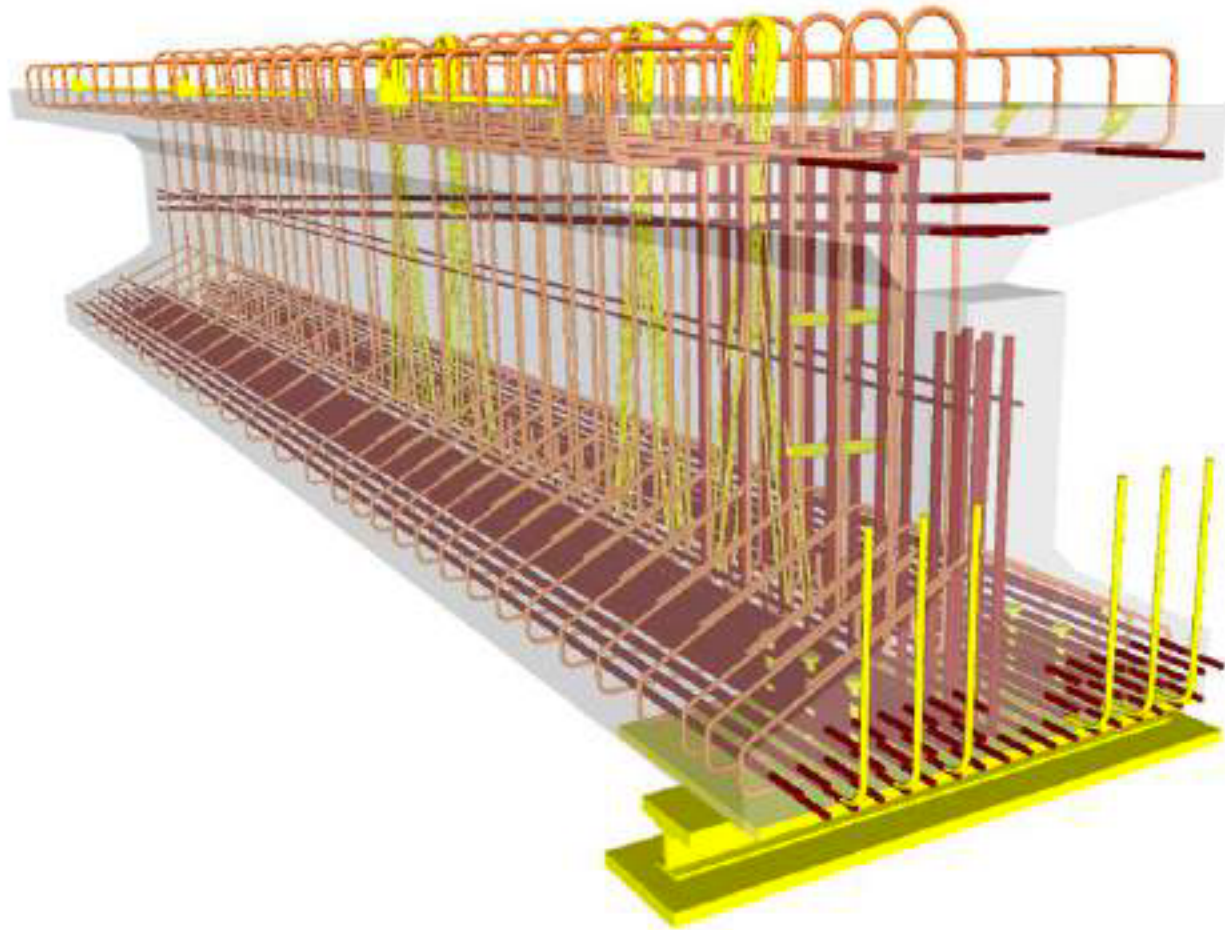
BIM - LOD



BIM - LOD



BIM - LOD



BIM - LOD

LOD 100

Overall building massing indicative of area, height, volume, location and orientation is modelled in 3D dimensions

Analysis

The model is analysed based on volume, area and orientation by application of generalised performance criteria assigned to the representative BIM model

Cost Estimating

The model is used to develop a cost estimate based on current area, volume or similar estimating techniques

Schedule

The model is used for project phasing and construction

BIM - LOD

LOD 200

Model elements are modelled as generalised systems or assemblies with approximate quantities, size, shape, location and orientation.

Non-geometric information can also be attached to the BIM model

Analysis

The model is analysed for performance of selected systems by application of generalised performance criteria assigned to the representative BIM model

Cost Estimating

The model is used to develop a cost estimate based on approximate data provided and conceptual estimating techniques

Schedule

The model is used to show ordered, time scaled appearance of major elements and systems

BIM - LOD

LOD 300

Model elements are modelled as specific assemblies accurate in terms of quantity, size, shape, location and orientation.

Non geometric information is also attached to the BIM model

Analysis

The model is analysed for the performance of selected systems by application of specific performance criteria assigned to the representative BIM model

Cost Estimating

The model is used to develop a cost estimate based on specific data provided and conceptual estimating techniques

Schedule

The model is used to show an ordered, time scaled appearance of detailed elements and systems

Construction

Suitable for the generation of traditional construction documents and shop drawings

BIM - LOD

LOD 400

BIM model components are modelled as specific assemblies accurate in terms of quantity, size, shape, location and orientation with complete fabrication, assembly and detailing information. Nongeometric information is also attached to the BIM model.

Analysis

The model is analysed for performance of approved systems based on specific BIM model

Cost Estimating

Costs are based on the actual cost of specific elements at buyout

Schedule

The model is used to show an ordered, time scaled appearance of detailed specific elements and systems including construction means and methods

Construction

BIM model is the virtual representation of the proposed element and are suitable for construction.

BIM - LOD

LOD 500

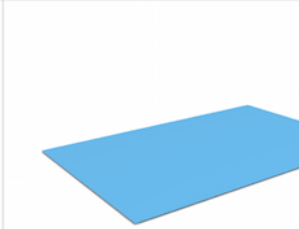
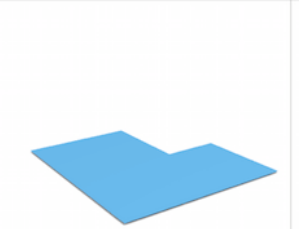
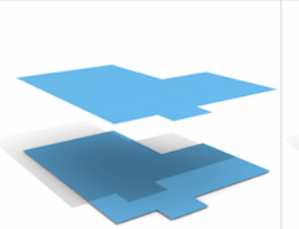
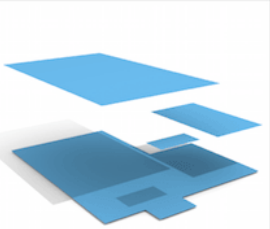
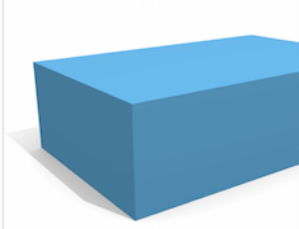
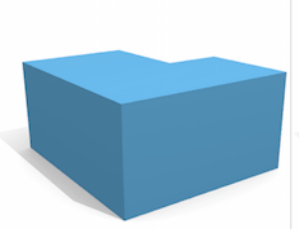
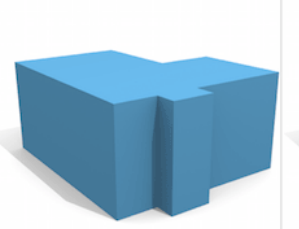
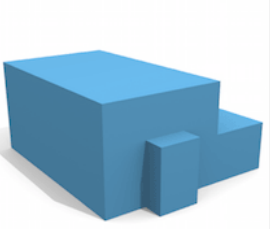




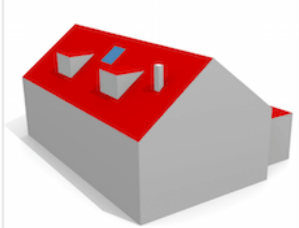



BIM Model is modelled as constructed assemblies, actual and accurate in terms of size, shape, location, quantity and orientation.

Non-geometric information may also be attached to the modelled elements

General Usage

The model is utilised for maintaining, altering and adding to a project but only to the extent that is consistent with any licences granted in the agreement or in a separate licensing agreement

BIM - LOD

	LOD x.0	LOD x.1	LOD x.2	LOD x.3
LOD0	 LOD0.0	 LOD0.1	 LOD0.2	 LOD0.3
LOD1	 LOD1.0	 LOD1.1	 LOD1.2	 LOD1.3
LOD2	 LOD2.0	 LOD2.1	 LOD2.2	 LOD2.3
LOD3	 LOD3.0	 LOD3.1	 LOD3.2	 LOD3.3

BIM - LOD

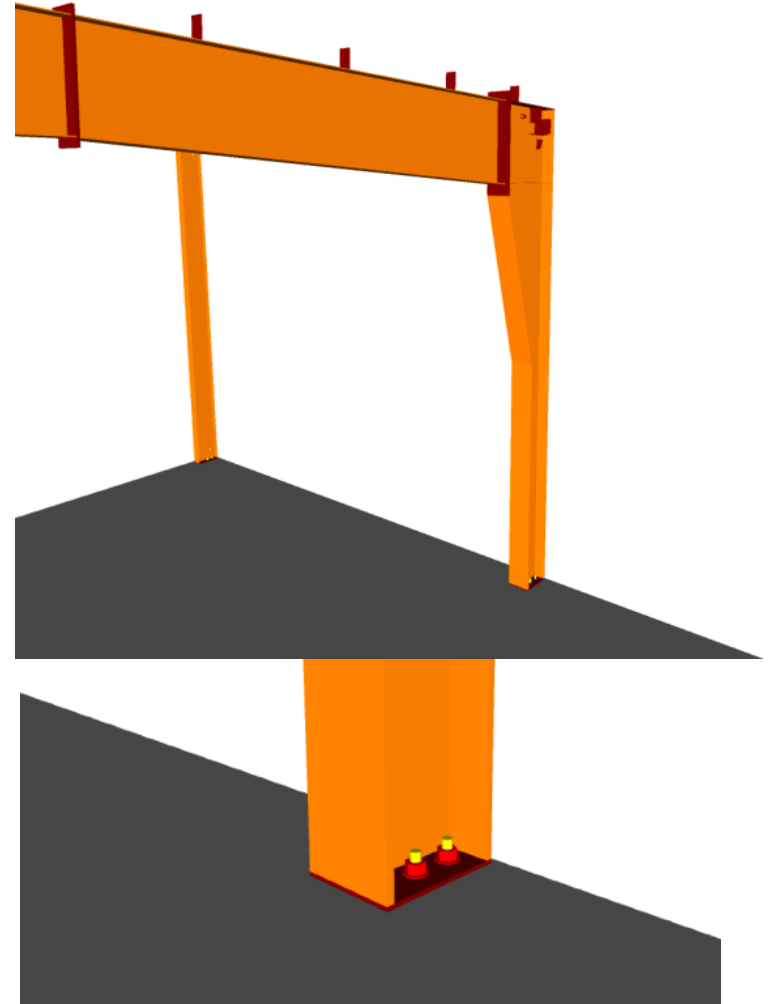
Metal Building Systems

Prefabricated buildings and structures assembled on temporary and permanent foundations.

LOD 400

Element modeling to include fabrication level information:

- Welds
- Reinforcement plates
- Coping of members
- Bolts, nuts, washers, etc.
- Holes, slots, etc., including holes for future element attachments
- All assembly elements



BIM - LOD

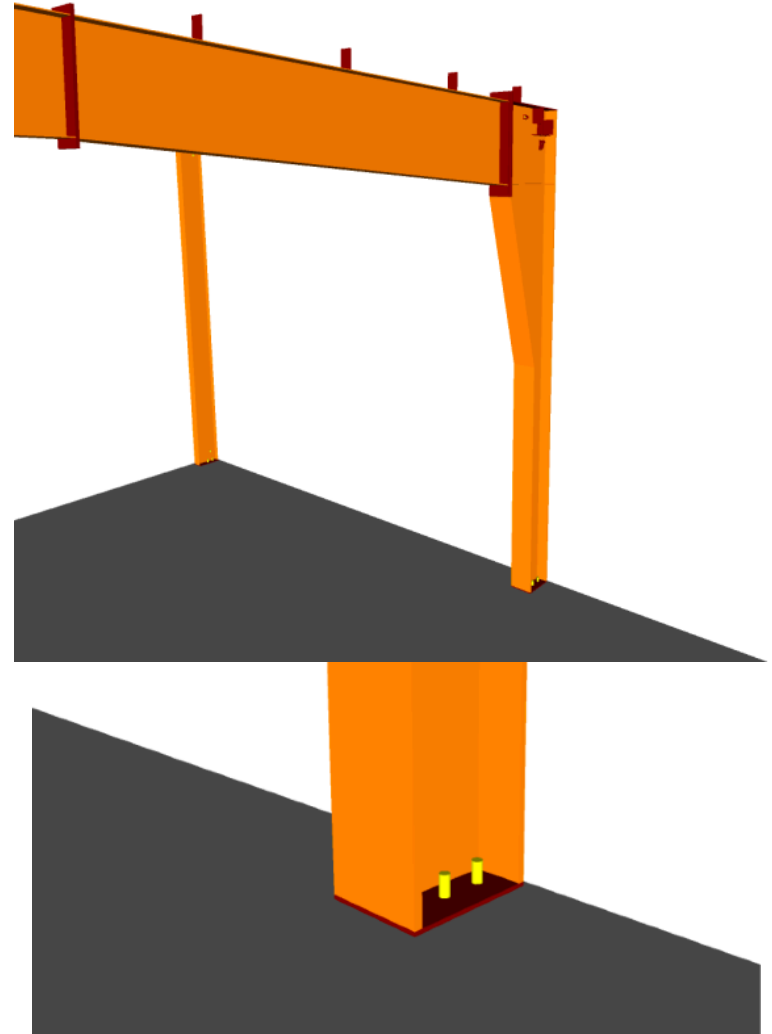
Metal Building Systems

Prefabricated buildings and structures assembled on temporary and permanent foundations.

LOD 350

Element modeling to include:

- Base plate locations
- Bracing components (i.e. gussets)
- Critical or large elements of connections applied to all structural steel connections such as base plates, gusset plates, anchor rods, etc.
- Clips required for connection to secondary framing
- Any miscellaneous steel members with correct size, shape, orientation and material required for the frame structure. (i.e., roof beams, spandrels)
- Any steel structure reinforcement such as web stiffeners, connection plate stiffeners, sleeve penetrations, etc. required for coordination.



BIM - LOD

Metal Building Systems

Prefabricated buildings and structures assembled on temporary and permanent foundations.

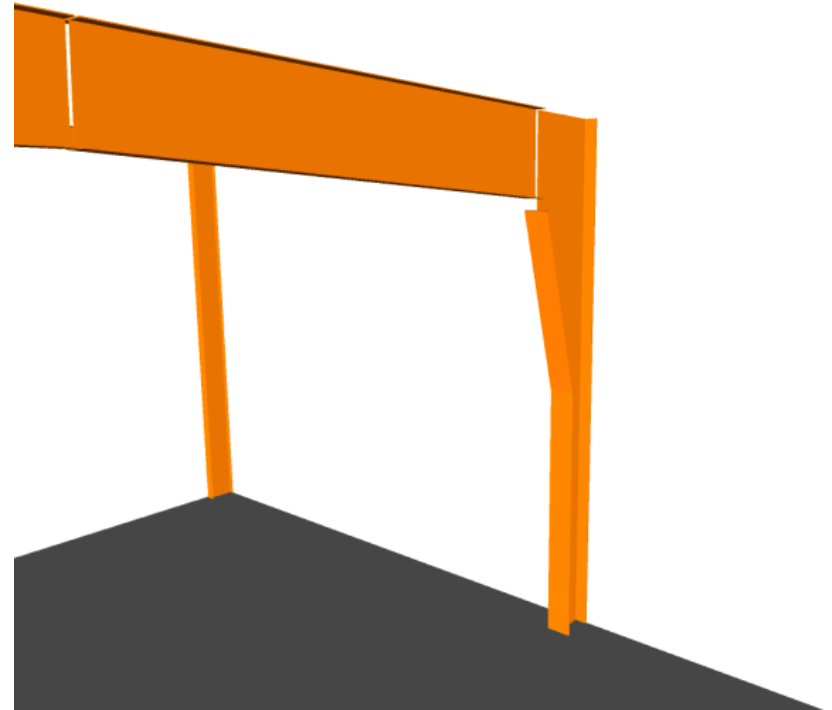
LOD 300

Metal Building System components including:

- 1) Endwall or wind column
- 2) End frame main members
- 3) Module or interior columns
- 4) Frames and main members
 - a. Columns
 - b. Rafters
- 5) Roof and wall diagonal bracing
- 6) Crane beams

Element modeling to include:

- Specific sizes of frame structural members, all with correct orientation
- Web tapers
- Frame connection type (Extended/Flush)
- Any lateral bracing components connecting to frame or foundation (i.e., portal frames, fixed base columns, diagonal bracing - rods or cables, struts) all with specific sizes and orientation.



BIM - LOD

Metal Building Systems

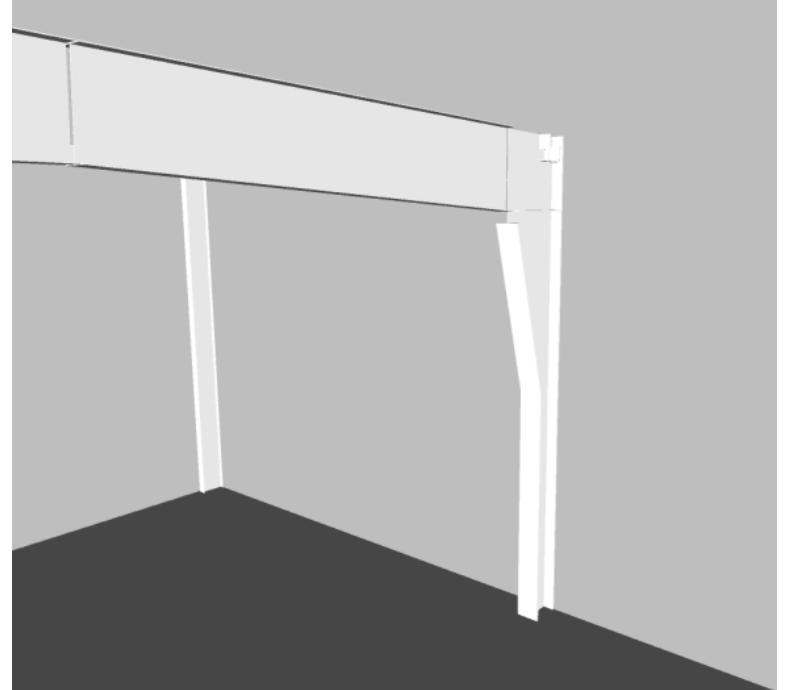
Prefabricated buildings and structures assembled on temporary and permanent foundations.

LOD 200

Generic mass of frame shown in an approximate location, and a general span/direction with a design narrative for conceptual pricing.

Model elements to include:

- Framing grids defined.
- Sections shapes shown but profiles, tapers and plate thicknesses and flange widths still flexible.
- Primary braced bay locations
- End wall framing type (i.e., main frame versus post and beam)
- Crane runways



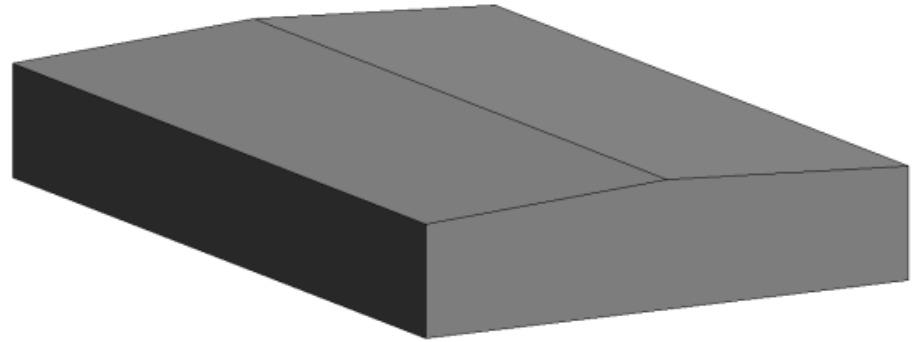
BIM - LOD

Metal Building Systems

Prefabricated buildings and structures assembled on temporary and permanent foundations.

LOD 100

Generic mass of special structure
with system typically noted
with a design narrative
for conceptual pricing.



BIM - LOD

Metal Building Systems Secondary Framing

LOD 300

Metal Building System components, including:

- Purlins and bridging
- Eave strut
- Sidewall girts
- Endwall girts
- Sag braces
- Framed openings (jamb, headers, etc.)
- Window sub-frames
- Walk door sub-frames
- Wall member connection type

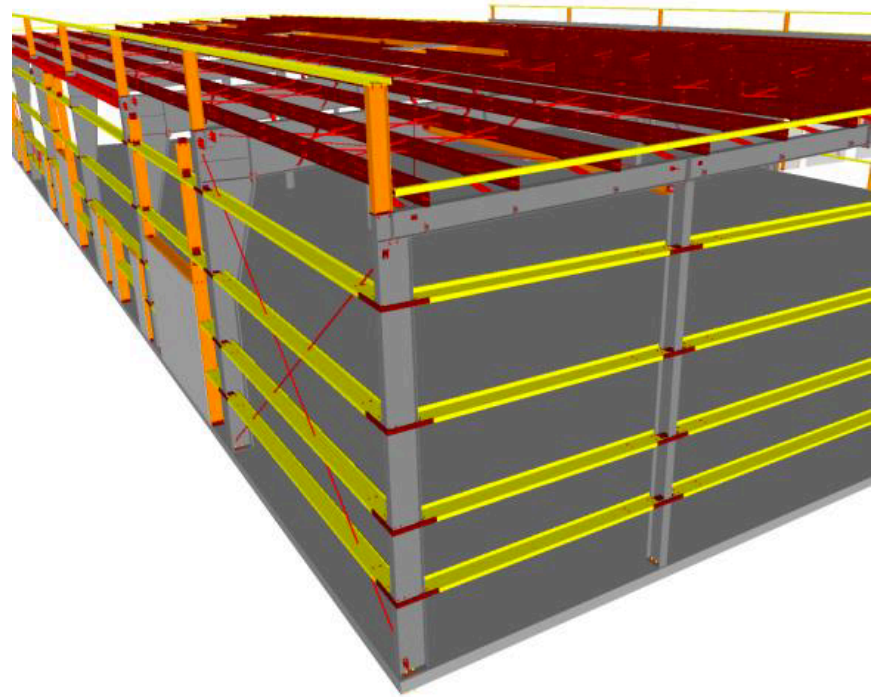
Element modeling to include:

- Specific sizes of main structural members, all with correct orientation

LOD 400

Element modeling to include fabrication level information:

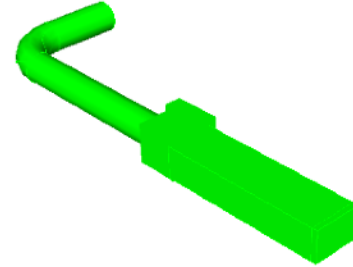
- Welds
- Bolts, nuts, washers, screws, and fasteners
- Coping of members
- Holes cut for bracing
- Nested member attachments
- All assembly elements
- Continuous web vs. open web



BIM - LOD

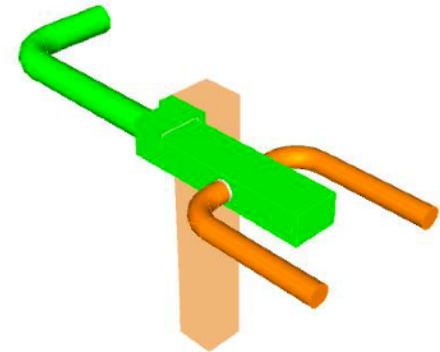
MEP installation Supply air elements

LOD 200



LOD 300

Modeled as design-specified size, shape, spacing, and location of duct, dampers, fittings, and insulation for risers, mains, and branches; approximate specified allowances for spacing and clearances required for all hangers, supports, vibration and seismic control that are to be utilized in the layout of all risers, mains, and branches; access/code clearance requirements modeled.



BIM - LOD

MEP installation Supply air elements

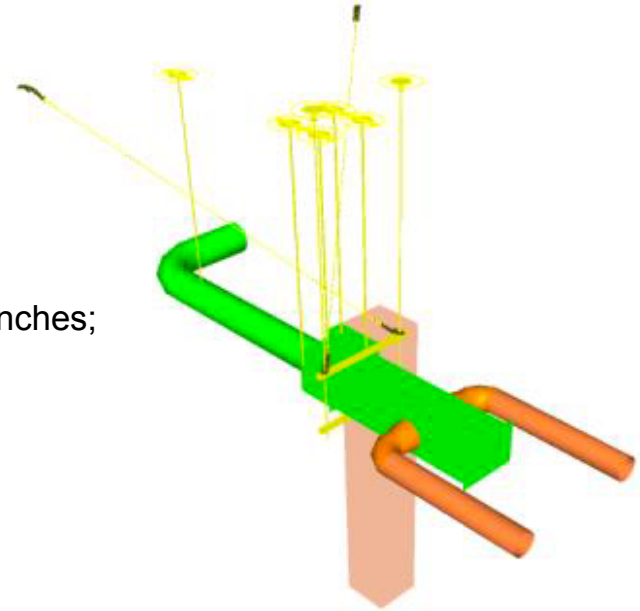
LOD 350

Modeled as actual size, shape, spacing, and location/connections of duct, dampers, fittings, and insulation for risers, mains, and branches;

actual size, shape, spacing, and clearances required for all hangers, supports, vibration and seismic control that are utilized in the layout of all risers, mains, and branches;

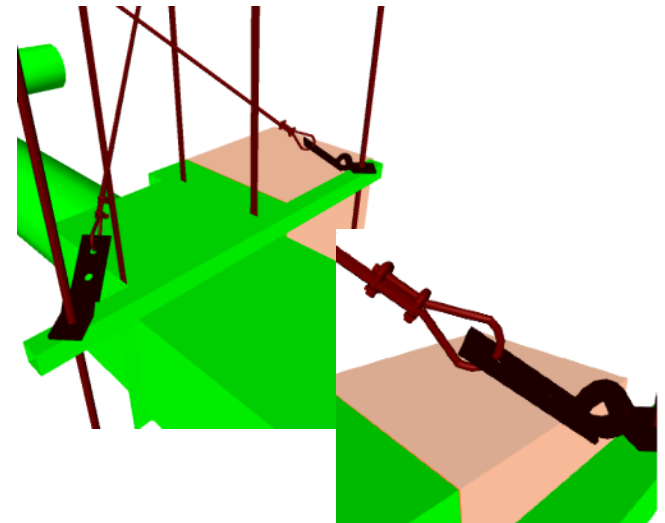
actual floor and wall penetration elements modeled.

actual access/code clearance requirements modeled.



LOD 400

Supplementary components added to the model required for fabrication and field installation.



BIM FORUM

<http://bimforum.org/lo/>

LEVEL OF DEVELOPMENT SPECIFICATION

Level of definition [LoD]

Level of information [loi]

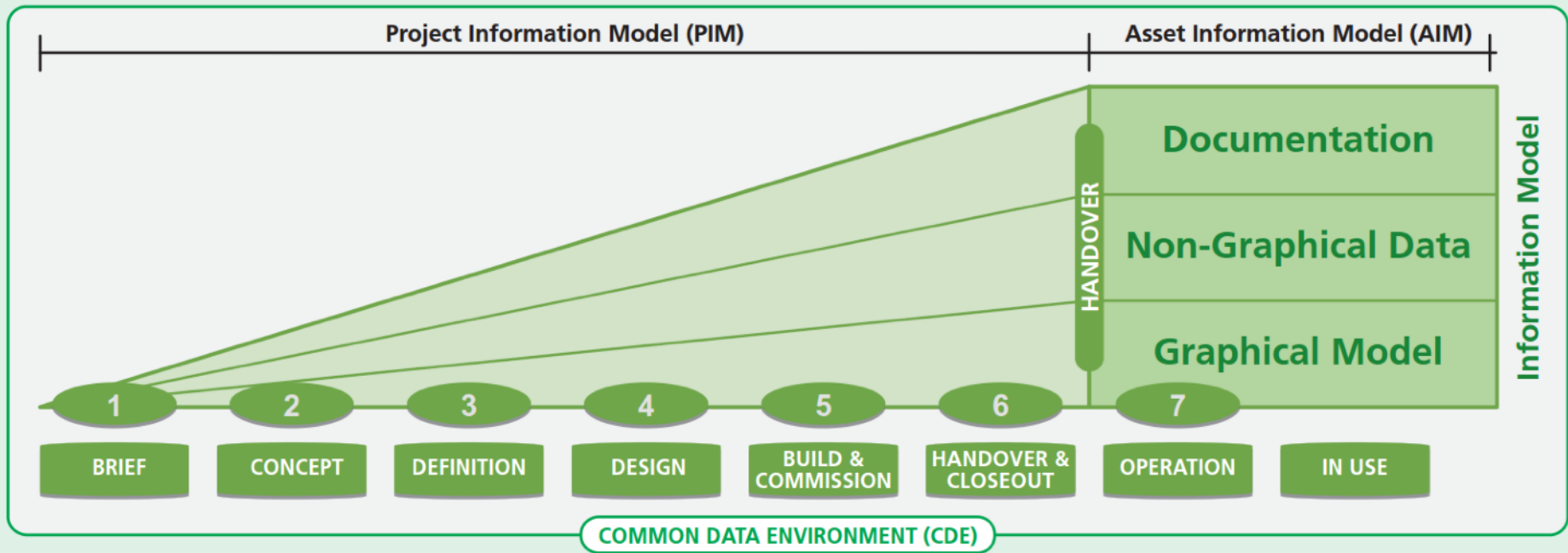
PAS 1192-2:2013

Incorporating Corrigendum No. 1

Specification for information management for the capital/delivery phase of construction projects using building information modelling

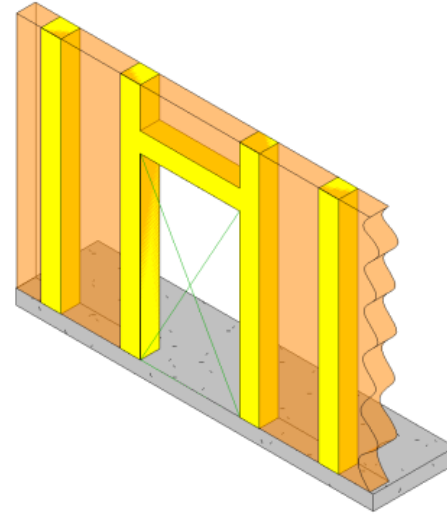


BIM - LOD

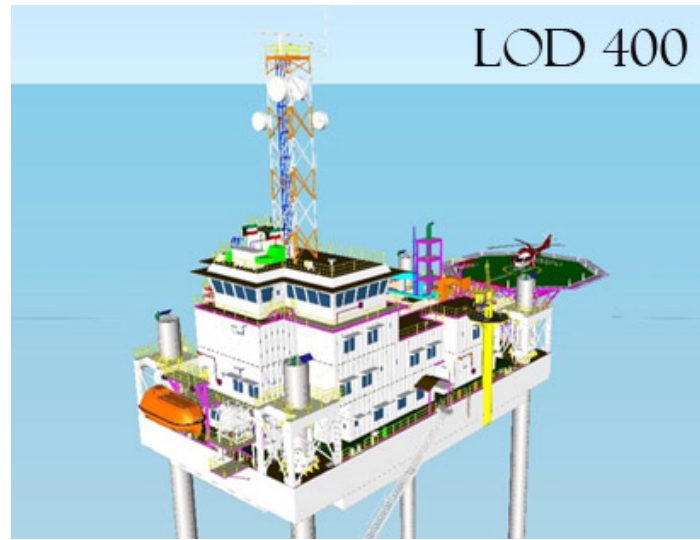


BIM - LOD

MODEL COMPONENT



BUILDING MODEL



ADAGIO APART HOTEL JEDDAH, SAUDI ARABIA



HVAC MODEL



BUILDING DESIGN VIZ BY RMC OFFICE

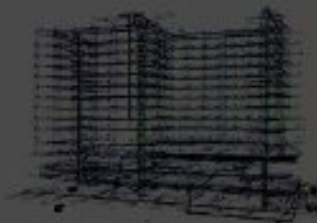


PART OF THE BIM ARCH MODEL

SAMPLE OF SCHEDULING & GTOs



ROOF & UPPER ROOF HVAC LAYOUT



PLUMBING & FIRE PROTECTION MODEL



PART OF THE BIM STRUCTURAL MODEL

BIM - LOD

Client BIM requirements

BIM EXECUTION PLAN

BEP

BIM PROJECT EXECUTION PLAN

BIM PXP

LOD ?

BIM - LOD

WHAT IS IN YOUR MODEL

LOD ?
