SCSI CPD
BIM First Steps for Quantity Surveyors

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April 29th 2021

Introduction

Learning Outcomes?

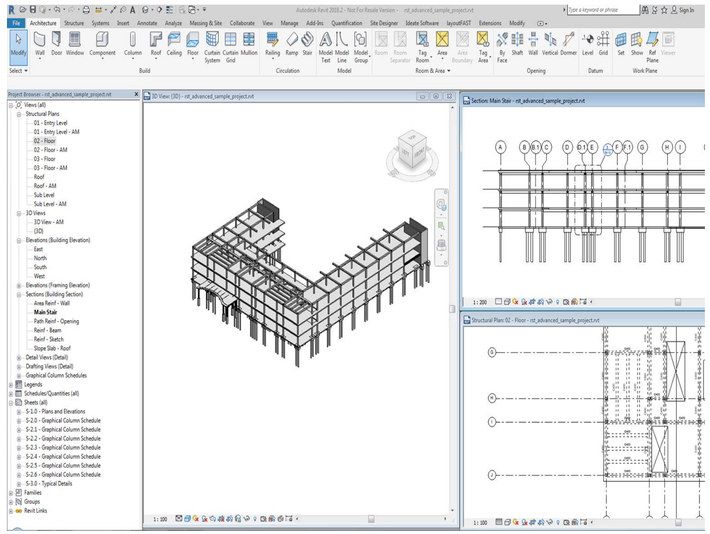
- Key BIM concepts & documents
- Software & file formats
- Basic model checking & processes
- Design information and model validation

Key BIM concepts & documents

BIM DIMENSIONS

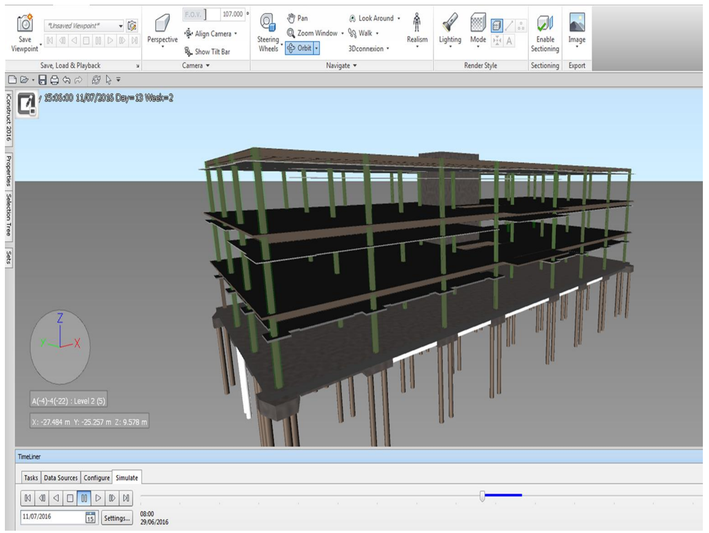
3D

Model authoring & documentation



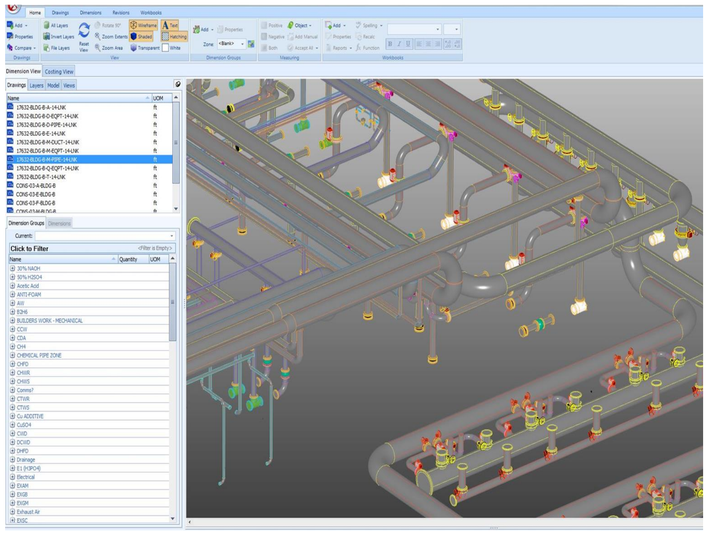
4D

Link model to schedule for simulations & sched validation, dynamic clash detection

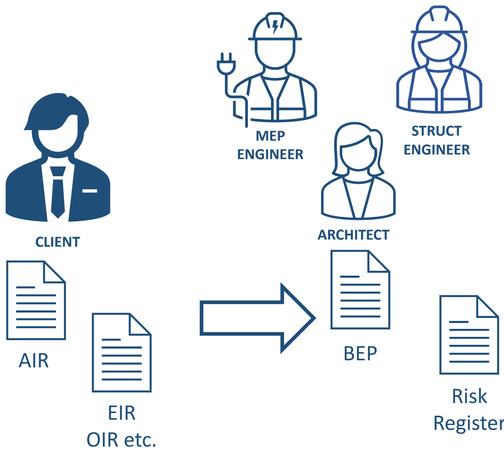


5D

Extract quantities from models & link to costs

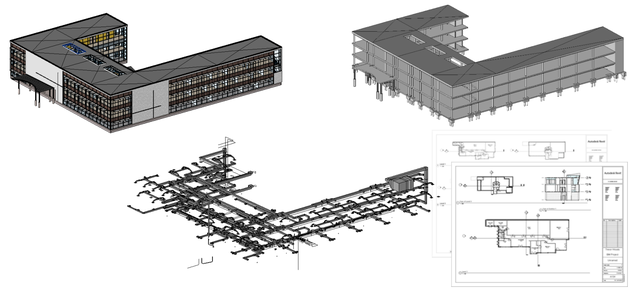


BIM Process (ISO 19650 client mandated)



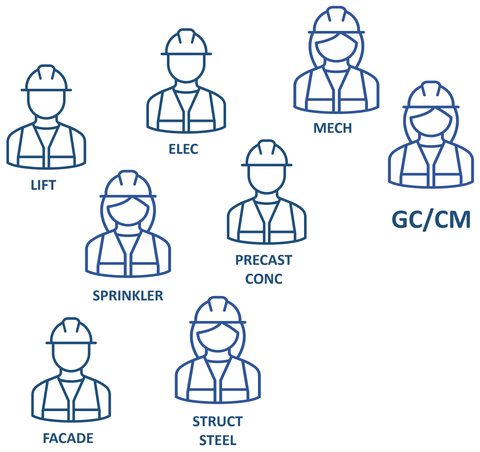
BIM Design tools

REVIT
ALLPLAN
DDS-CAD
VECTORWORKS
GRAPHISOFT Archicad
BRICSCAD
AUTODESK CIVIL 3D
CADWorx Plant Design Suite
Bentley MicroStation
AECOsim Building Designer
OpenRoads CONNECT Edition



Common Data Environments (CDE)

e-Builder A TRIMBLE COMPANY
AUTODESK BIM 360
PROCORE
AUTODESK BIM 360 DOCS
VIEWPOINT A TRIMBLE COMPANY
ORACLE aconex
3D REPO
ASITE Get to it
PlanGrid AN AUTODESK COMPANY



CADWorx Plant Design Suite
AUTOCAD PLANT 3D
REVIT
Tekla Structures
AUTODESK AUTOCAD MEP
AUTODESK FABRICATION CADMEP

BIM Design/Detailing tools

SketchUp
StruCad
SOLIDWORKS
AUTODESK INVENTOR

3D modelling tools

Coordination & clash detection

AUTODESK NAVISWORKS

What's wrong with this process?

Where's the QS?

KEY BIM DOCUMENTS & TERMS

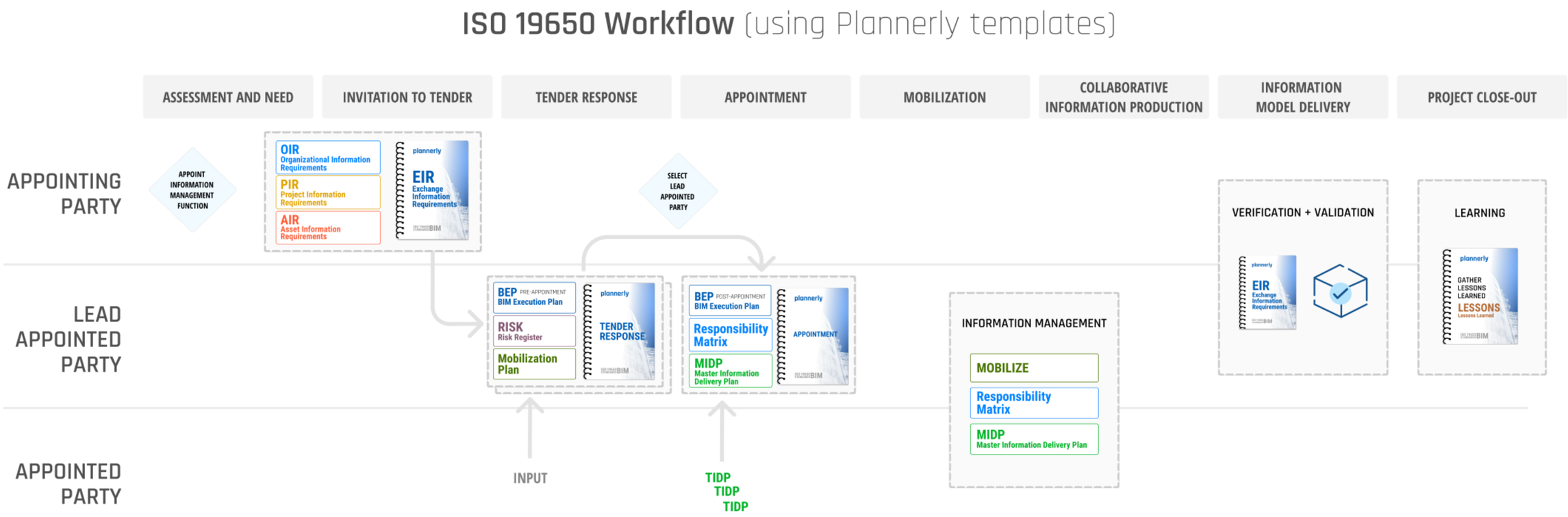
DOCUMENTS

- OIR/PIR/AIR – Organisation/Project/Asset Information Requirments
- EIR – Exchange Information Requirements (was Employers Information Requirements)
- BEP – BIM Execution Plan
- MIDP/TIDP – Master/Task Information Delivery Plan
- MPDT – Model Production Delivery Table
- Risk Register

BIM TERMS

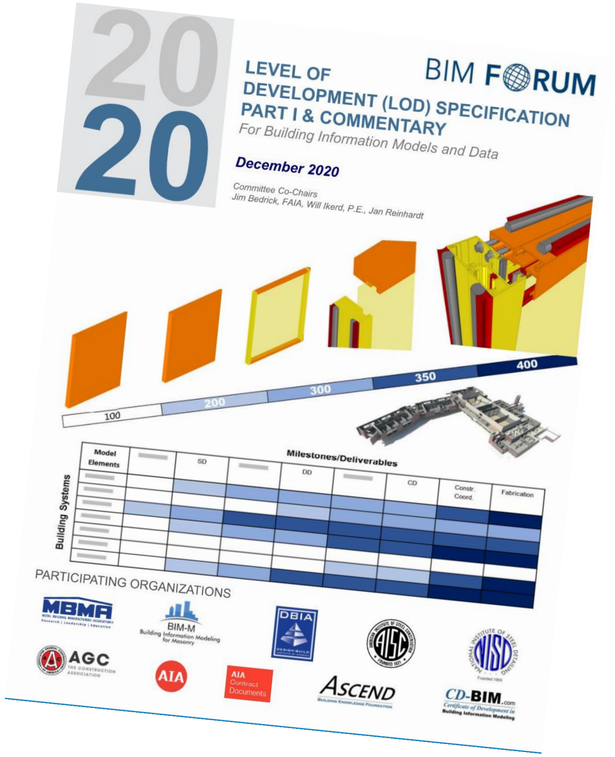
- BIM PROTOCOL
- COBIE – Construction Operation Building Information Exchange – data exchange schema
- LOD - Level of Development/Detail
- LOI - Level of Information

ISO 19650 BIM PROCESS



Plannerly.com

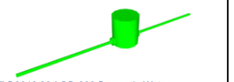
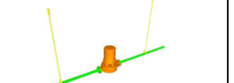
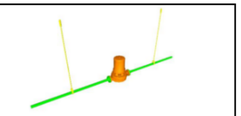
LOD/LOI - USA

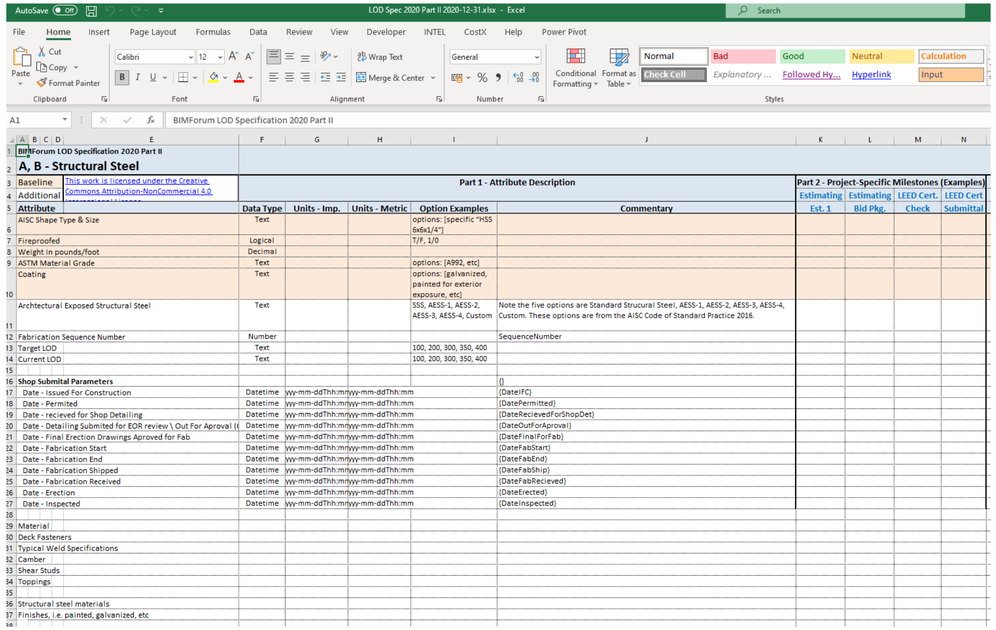


D2010.20 21-04 20 10 20 Domestic Water Equipment

Includes: Equipment for domestic water distribution system. Includes: Equipment for the softening of domestic water. Includes: Equipment for the filtering of domestic water. Includes: Equipment to heat domestic water. Includes electric and fuel-fired equipment. Includes: Equipment to heat domestic water by means of heat exchange.

Associated Masterformat Sections: 22 11 23 / 22 31 00 / 22 32 00 / 22 33 00 / 22 34 00
22 35 00

100	See D20	 *106 D2010.20-LOD-100 Domestic Water Equipment, From Ikerd.com*
200	Schematic layout with approximate size, shape, and location of equipment; approximate access/code clearance requirements modeled;	 *107 D2010.20-LOD-200 Domestic Water Equipment, From Ikerd.com*
300	Modeled as design-specified size, shape, spacing, and location of equipment; approximate allowances for spacing and clearances required for all specified anchors, supports, vibration and seismic control that are utilized in the layout of equipment; access/code clearance requirements modeled.	 *108 D2010.20-LOD-300 Domestic Water Equipment, From Ikerd.com*
350	Modeled as actual construction elements size, shape, spacing, and location/connections of equipment; Actual size, shape, spacing, and clearances required for all specified anchors, supports, vibration and seismic control that are utilized in the layout of equipment. actual access/code clearance requirements modeled.	 *109 D2010.20-LOD-350 Domestic Water Equipment, From Ikerd.com*
400	See D2010.10	 *110 D2010.20-LOD-400 Domestic Water Equipment, From Ikerd.com*



BIMForum LOD Specification 2020 Part II

A, B - Structural Steel

Baseline / Additional — This work is licensed under the Creative Commons Attribution-NonCommercial 4.0

Attribute	Data Type	Units - Imp.	Units - Metric	Option Examples	Commentary	Part 2 - Project-Specific Milestones (Examples) Estimating Est. 1	Estimating Bid Pkg.	LEED Cert. Check	LEED Cert Submittal
AISC Shape Type & Size	Text			options: [specific "HSS 6x6x1/4"]					
Fireproofed	Logical			T/F, 1/0					
Weight in pounds/foot	Decimal								
ASTM Material Grade	Text			options: [A992, etc]					
Coating	Text			options: [galvanized, painted for exterior exposure, etc]					
Architectural Exposed Structural Steel	Text			SSS, AESS-1, AESS-2, AESS-3, AESS-4, Custom	Note the five options are Standard Strucural Steel, AESS-1, AESS-2, AESS-3, AESS-4, Custom. These options are from the AISC Code of Standard Practice 2016.				
Fabrication Sequence Number	Number				SequenceNumber				
Target LOD	Text			100, 200, 300, 350, 400					
Current LOD	Text			100, 200, 300, 350, 400					
Shop Submittal Parameters					{}				
Date - Issued For Construction	Datetime	yyy-mm-ddThh:mm	yyyy-mm-ddThh:mm		{DateIFC}				
Date - Permited	Datetime	yyy-mm-ddThh:mm	yyyy-mm-ddThh:mm		{DatePermitted}				
Date - recieved for Shop Detailing	Datetime	yyy-mm-ddThh:mm	yyyy-mm-ddThh:mm		{DateRecievedForShopDet}				
Date - Detailing Submited for EOR review \ Out For Aproval (	Datetime	yyy-mm-ddThh:mm	yyyy-mm-ddThh:mm		{DateOutForAproval}				
Date - Final Erection Drawings Aproved for Fab	Datetime	yyy-mm-ddThh:mm	yyyy-mm-ddThh:mm		{DateFinalForFab}				
Date - Fabrication Start	Datetime	yyy-mm-ddThh:mm	yyyy-mm-ddThh:mm		{DateFabStart}				
Date - Fabrication End	Datetime	yyy-mm-ddThh:mm	yyyy-mm-ddThh:mm		{DateFabEnd}				
Date - Fabrication Shipped	Datetime	yyy-mm-ddThh:mm	yyyy-mm-ddThh:mm		{DateFabShip}				
Date - Fabrication Received	Datetime	yyy-mm-ddThh:mm	yyyy-mm-ddThh:mm		{DateFabRecieved}				
Date - Erection	Datetime	yyy-mm-ddThh:mm	yyyy-mm-ddThh:mm		{DateErected}				
Date - Inspected	Datetime	yyy-mm-ddThh:mm	yyyy-mm-ddThh:mm		{DateInspected}				
Material									
Deck Fasteners									
Typical Weld Specifications									
Camber									
Shear Studs									
Toppings									
Structural steel materials									
Finishes, i.e. painted, galvanized, etc									

LOD/LOI - UK

Uniclass2015 - Pr_65_52_63_23 Cross-linked polyethylene (PE-X) pipes and fittings Show classification mappings

Level of detail | Level of information

Manufacturer Product Data template
Complete this electronic spreadsheet to ensure that your Cross-linked polyethylene (PE-X) pipes and fittings product information meets the requirements of Level 2 BIM. This is important as it will enable your customers to select, specify and use your products within the BIM environment. Once you have completed this template you can host it on your own website or distribute it to your customers. Please note that we do not host completed product data templates within the BIM Toolkit.

2

Requirement

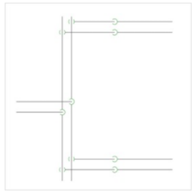
Visual information to provide general principles of the design. Showing arrangement of system with their relationship to internal and external context, and key project criteria to suit a clients brief.

General descriptions would be expected to communicate principles of materiality, scope, colour and context. Expect strategic coordination with other professions to show general principles of the design.

Purpose of information

To provide a visual representation of proposals at a Concept stage and support general spatial coordination.

Plan



The above illustration is for *Copper pipelines* from the NBS section *Pipelines*. This is indicative of the LOD requirements for *Cross-linked polyethylene (PE-X) pipes and fittings*.

3

Requirement

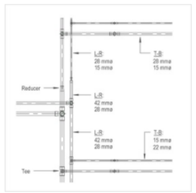
Visual information to provide developed principles of the design to a greater level of detail. Developed coordination between all professions. Visual development showing coordination for general size and primary relationships between different elements of the construction.

Can form a brief for a specialist sub-contractor or fabricator to progress with their technical design, fabrication and installation. This would be expected to include critical dimensional coordination, performance requirements and qualities of finish.

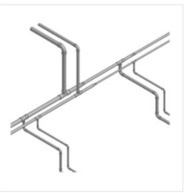
Purpose of information

To provide a visual representation of proposals, confirming brief for technical Design stage supporting full spatial coordination.

Plan



Model



The above illustrations are for *Copper pipelines* from the NBS section *Pipelines*. This is indicative of the LOD requirements for *Cross-linked polyethylene (PE-X) pipes and fittings*.

4

Requirement

Visual information to provide fixed principles of the design supporting procurement. Developed coordination between all professions. Visual representations showing coordination for general size and relationships between different elements of the construction.

Graphical representation of system, dimensionally accurate indicating primary performance characteristics.

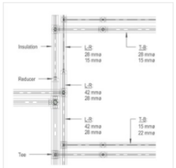
Graphical information represented may alter dependant on visual information to be produced, eg: Scope of work drawings, setting out, floor loading etc

Typical / Installation details separately produced linked to model element and adjacent constructions.

Purpose of information

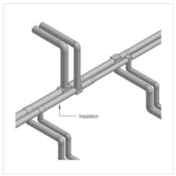
To provide a visual representation of proposals at a Technical Design stage supporting full spatial coordination.

Plan



Elevation

Model



The above illustrations are for *Copper pipelines* from the NBS section *Pipelines*. This is indicative of the LOD requirements for *Cross-linked polyethylene (PE-X) pipes and fittings*.

5

Requirement

Visual information to provide full information to support construction / installation. Developed coordination between all professions.

Visual representations showing final coordination for size and relationships between different elements of the construction.

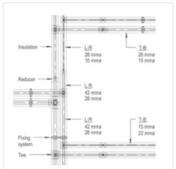
Graphical representation of system, dimensionally accurate indicating primary performance characteristics and sufficient information to support installation.

Typical / Installation details separately produced linked to model element and adjacent constructions.

Purpose of information

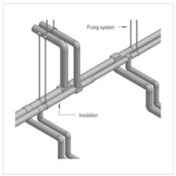
To be updated during the construction process to reflect the final design, and to provide a future reference to sit alongside the O&M Manuals.

Plan



Elevation

Model



Software & file formats

File formats

BIM/3D modelling tools

REVIT

OpenRoads CONNECT Edition

AECOsim Building Designer

BRICSCAD

AUTODESK CIVIL 3D

CADWorx Plant Design Suite

ALLPLAN

GRAPHISOFT Archicad

VECTORWORKS

DDS-CAD

AUTOCAD PLANT 3D

Tekla Structures

AUTODESK FABRICATION CADMEP

AUTODESK AUTOCAD MEP

SketchUp

StruCad

SOLIDWORKS

AUTODESK INVENTOR

Model exchange formats

AUTODESK NAVISWORKS

NWC/NWD

REV

DWFx

IFC 2x3

IFC 4

CPIxml

3D PDF

Model review tools

AUTODESK NAVISWORKS

Manage

Simulate

Freedom

DALUX

SOLIBRI Model Checker

BIMcollab ZOOM

BIMvision

AUTODESK VIEWER

e-Builder A TRIMBLE COMPANY

AUTODESK BIM 360

PROCORE

AUTODESK BIM 360 DOCS

VIEWPOINT A TRIMBLE COMPANY

ORACLE aconex

3D REPO

ASITE Get to it

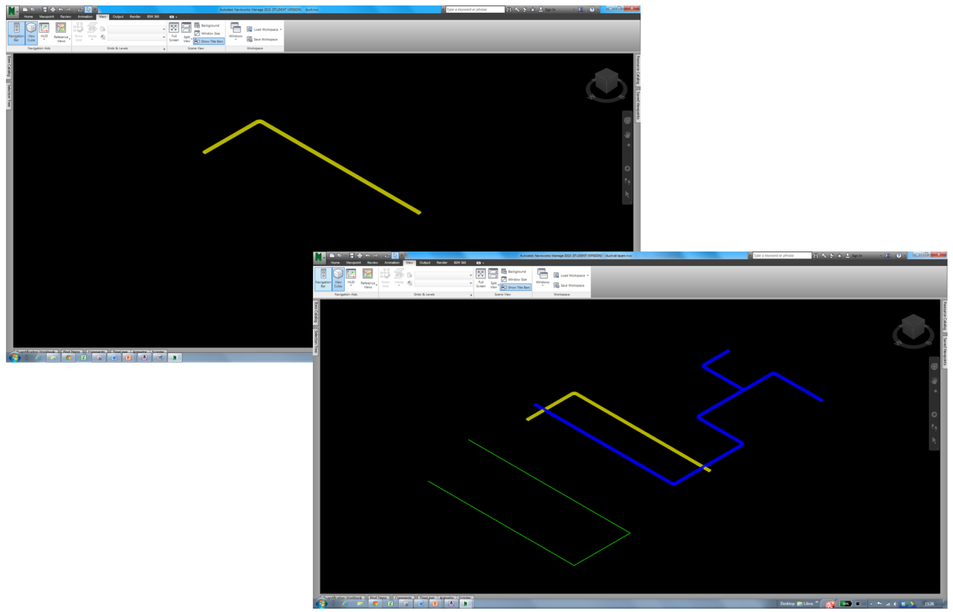
PlanGrid AN AUTODESK COMPANY

Most of the CDE platforms have model viewing capabilities

Basic model checking & processes

What are you looking at….?

- Have you the correct model version?
- What view are you looking at?
- What view should you be looking at?
- Is the model complete?
- Have all objects been exported?
- Are all layers & worksets switched on?



Layers switched off….

Ask Model Author for a specific export or a named QS view in the native file that you can import, get a Navis version as well

Get a shipping list/manifest e.g. a list of object categories & object counts from Revit

How do we validate?

What type of model is it?

What format is the model?

What software do you have?

How do you communicate issues to the Design Team? Screenshots? BCF?

What do we need to validate?

Validate within a model – e.g. an architectural model

Validate between models – e.g. between an architectural & structural model

We are checking for;

- model & element completeness – **gaps or overlaps**
- Identification & classification of elements
- dimensional accuracy – objects modelled as they will be constructed e.g. columns floor to floor, not full building height
- Information quality & consistency
- Information deficiencies
- Conflicting information between 2D, 3D & specs

Design information and model validation

Modelling Principles

Appendix B discusses 6 Key Modelling principles QS's should be aware of & make the industry aware of

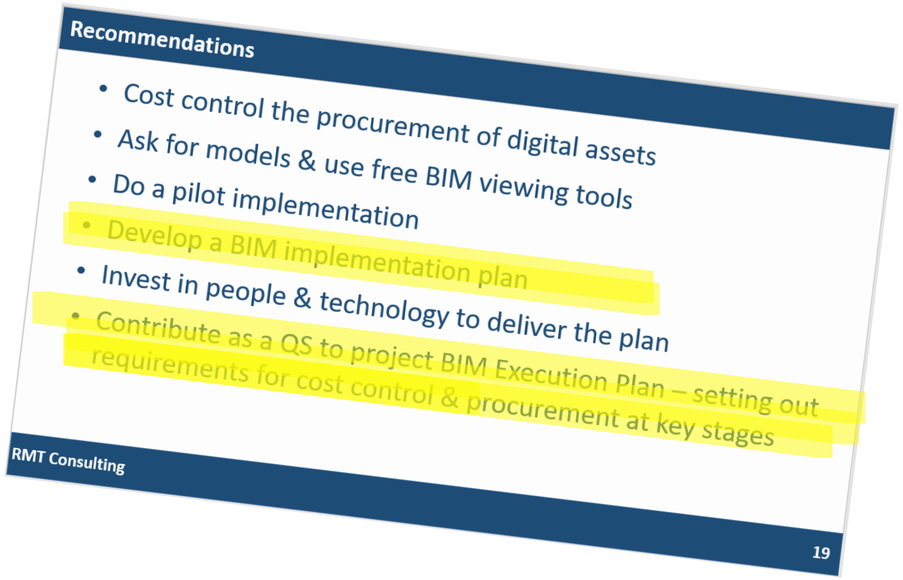
1. Location
2. Setup
3. Placement
4. Geometry
5. Data (non-graphical)
6. Procedures

Where do we start?

- Start at the top of the model tree & work down.
- Autodesk Viewer – will allow you view Revit files
- BIM Vision - IFC (DEMO)
- Dalux BIM Viewer – IFC & PDF - allows insertion of 2D drawings into 3D model (DEMO)
- BIM Collab Zoom – IFC - has rules based checking (DEMO)
- Autodesk Navisworks Manage – IFC, DWG, DWFx (DEMO)
- Solibri Model Checker – IFC files, rules based checks, measures geometry, has ITO tool

Conclusions

Next steps….



1. Look at & get familiar with models & model validation techniques
2. Use the model to give project insights
3. Develop your input into the BIM Execution Plan
4. Schedule out the information you need at different project stages
5. Do a section\element of a project as a pilot

walk before you run…
couch to 5km….scale rule to 3D model

Surprise the Design Team & read the BIM Execution Plan…..

just don’t expect to see it executed….

it’s more of a BIM Plan