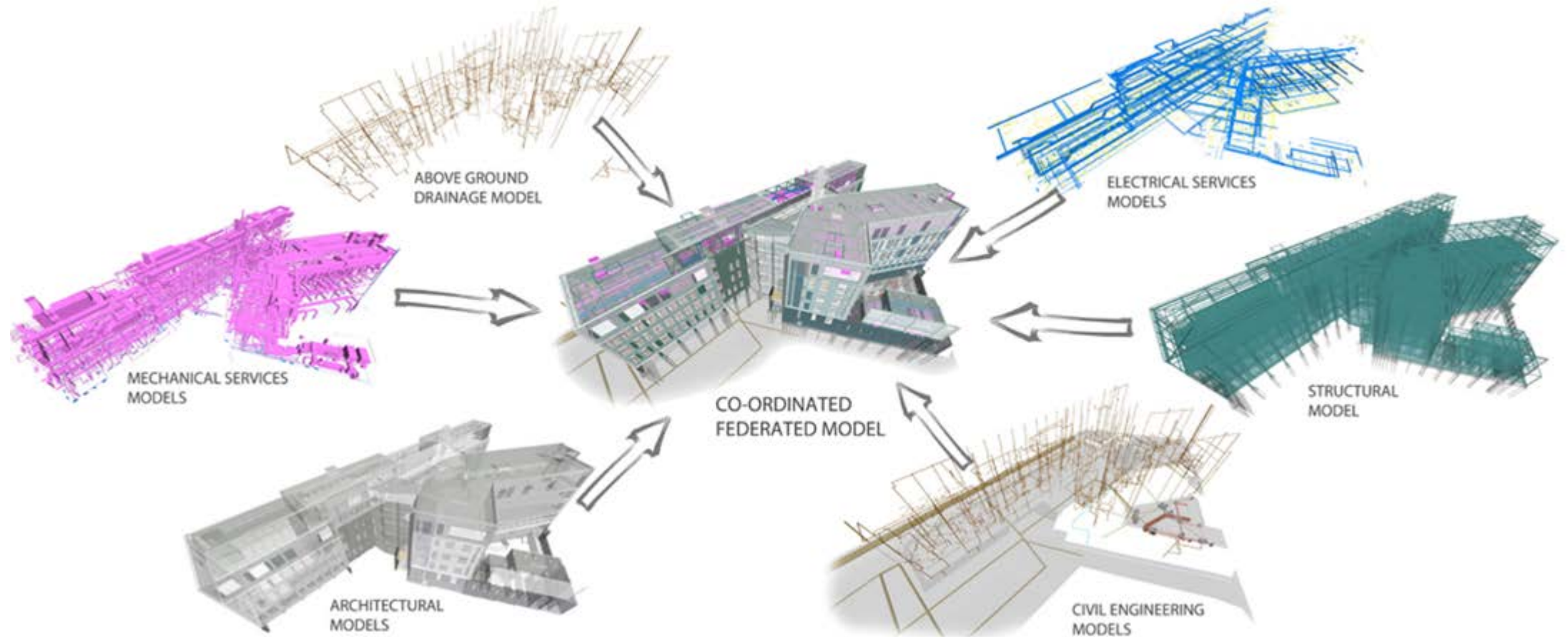


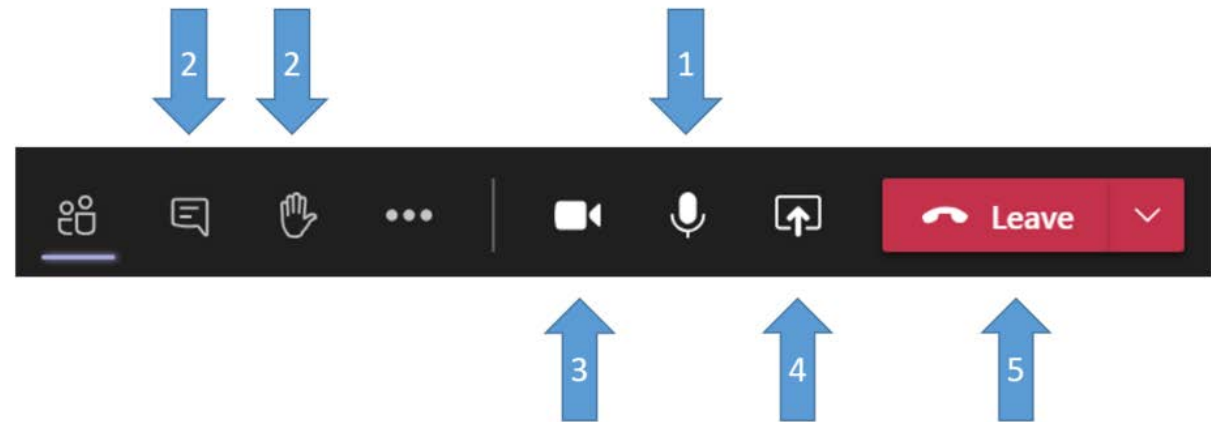
Session 1: Construction Technology & BIM



Session 1: Construction Technology & BIM

MS TEAMS HOUSEKEEPING

- House Keeping
 - Introductions
 - What is it all about?
 - What am I expected to do?
1. Mute your Microphone
 2. Use Chat to Ask Questions or Put your hand Up
 3. If you have a poor connection you can switch off your Camera
 4. I may ask you to share your screen.
 5. When the lecture ends please hang up



<

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Search

Activity

Teams

Assignments

Calendar

Files

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All teams



ACBA 7002 Construction Technol... ⋮

● General

Wk 07 GT Lecture 11-11-20

Wk 08 GT Lecture 18-11-20

Wk 10 GT Lecture 02-12-20

Wk 11 GT Lecture 09-12-20

Wk 12 GT Lecture 16-12-20

 **General**

Posts

Files

Class Notebook

Assignments

Grades

+

+ New ▾

↑ Upload ▾

↻ Sync

🔗 Copy link

↓ Download

+ Add cloud storage

🔗 Open in SharePoint

General

	Name ▾	Modified ▾	Modified By ▾
● 	Class Materials		Gavin Traylor

About Me:

Gavin Traylor (Gavin is fine)

- **Subject Experience in Construction Technology & BIM.**
- Chartered Architect with over 20 years of experience, working within the public and private sector.
- Since April 2019, a Lecturer in Construction @ uwtsd teaching on both the Built and Architecture portfolios.
- Prior to working at uwtsd was Operational Manager for the multidiscipline 'in house' design and construction management for Cardiff Council. 45 staff consisted of, Architects, Architectural Technologists / Technicians, Structural engineers, Mechanical & Electrical Engineers, Construction Project Managers, Quantity Surveyors, Principal Designer (CDM), Clerk of Works and Business Support Team.
- Studied at the Welsh School of Architecture at undergraduate level (RIBA Part 1) and Birmingham School of Architecture at postgraduate level (RIBA Part 2 and Part 3)
- Former Chair of CLAW Design Group and client board member SEWSCAP Procurement Framework.
- Former Chair of Design Circle & RSAW Council Member
- President Elect Royal Society of Architects in Wales.

.....but much more importantly.....



What is it all about?

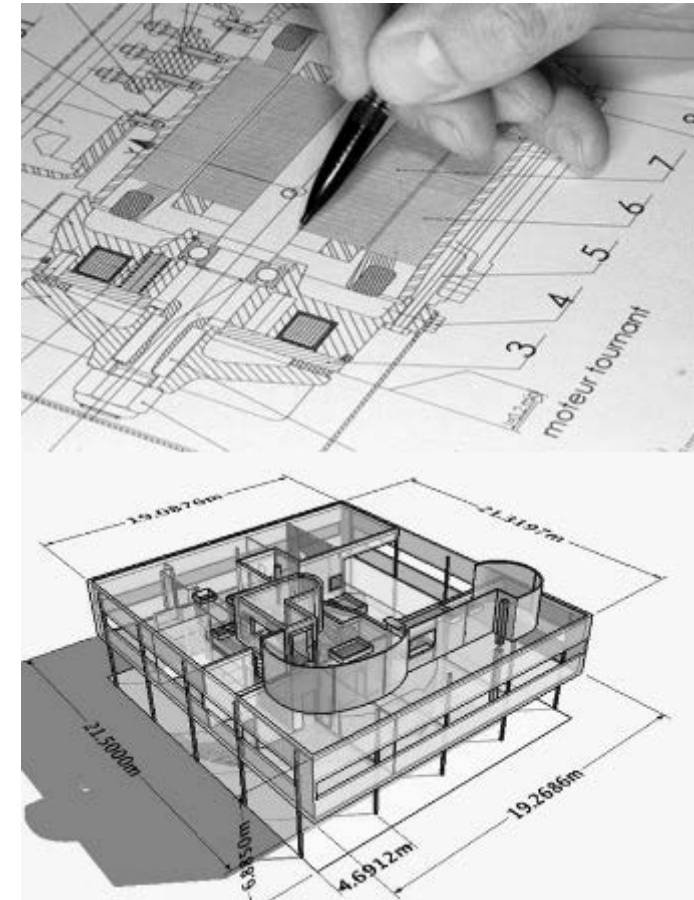
Aims:

To generate knowledge and understanding of the design, construction and evolution of our traditional and future building stock by providing a vehicle for 'Learning from the Past' to aid the buildings and facilities that will shape tomorrow.

To critically review the impact that BIM, laser scanning, robotics, drones and virtual digital technologies will have in helping shape and enhance the performance of buildings in the future.

Learning Outcomes

- Evaluate how past and present technologies can inform decisions for future design, construction, use and new uses.
- Critically analyse and appraise existing developments and settlements making recommendations that can enhance sustainability and performance.



What am I expected to do?

Mixture of lecture based and practical activities over semester 1.

General Overview (Me)

Fundamentals of BIM

Building Typologies, Challenges, Opportunities.

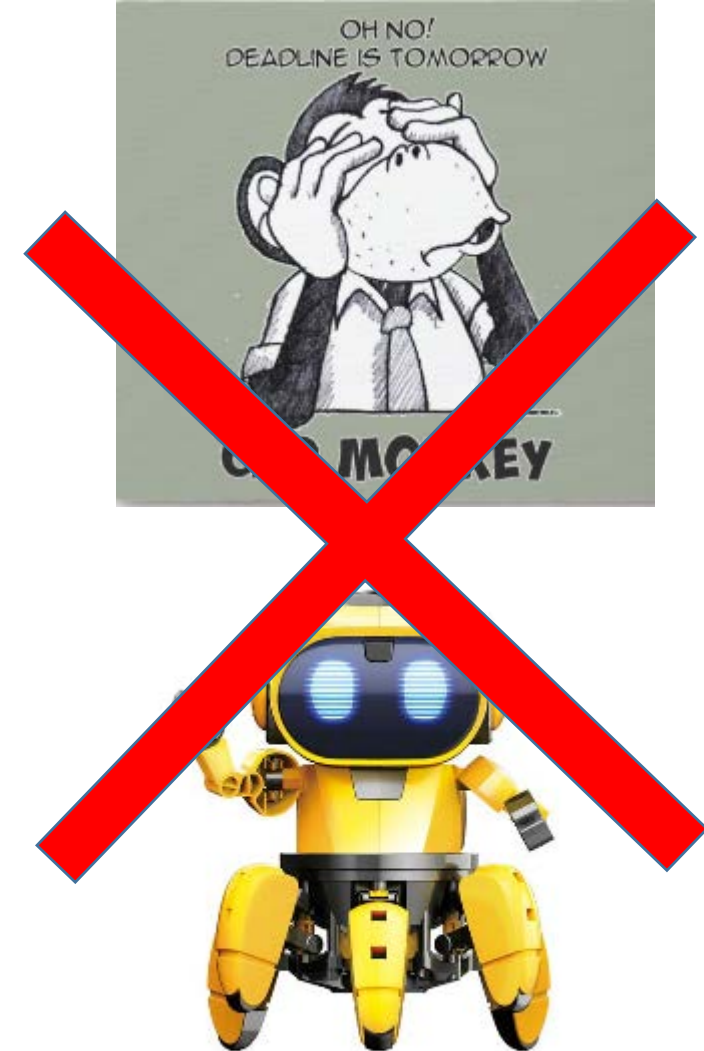
BIM as a strategic design, management and evaluation tool

Analysis using Digital technologies

Evaluation using Digital tools

General Overview (You)

- You need to know how to use the Library and Online resources
- You need to attend all timetabled activities
- You need to manage your time and meet deadlines
- Ask Gavin / Trevor if you have any problems regarding the module



Module Code	ACBA7002	
Module Title	Construction Technology and Building Information Management	
Classification	Reading List entry	Electronic*
Essential	Wu, P., and Wang X. (2019) Innovative Production And Construction: Transforming Construction Through Emerging Technologies.	☐
Essential	Sacks, R. Eastman E., et al. (2018) BIM Handbook: A Guide to Building Information Modeling for Owners, Designers, Engineers, Contractors, and Facility Managers. Wiley.	☐
Essential	Watts, A. (2016). Modern Construction: Case Studies Paperback – 31 Oct 2016	☐
Further	Journal of Building Pathology and Refurbishment http://www.emeraldgroupublishing.com/products/journals/journals.htm?id=ss#	☐
Further	Groak, S. (1992).The Idea of Building: Thought and Action in the Design and Production of Buildings. E & FN SPON	☐
Further	Bryan, T., (2010) Construction Technology: Analysis and Choice	☐
Further	Brand, S. (1994) How Buildings Learn. Viking Press. ISBN 978-0-670-83515-7	☐
Further	Building Conservation Directory: Accessed at: http://buildingconservation.com . This long-established portal contains numerous papers written by experts that address the underlying case material.	☒
Further	Brand, S. (1998) - How Buildings Learn A book and six-part BBC 2 documentary video series which is intended for public domain use and today openly accessible via the internet on 'You Tube'.	☒



Supplementary Reading List.

Key BIM Standards, ISO and PAS – refer to 'Little Book of BIM' guide.

BSi (2019) *The Little Book of BIM*

BSi (2019) *Introduction to the New International Standard ISO 19650*

Reid, E (2016) *Understanding Buildings*

Hall & Greeno (2017) *Building Services Handbook*

Chudley, Greeno, Merritt (2016) *Building Construction Handbook*

Feilden Clegg Bradley (2017) *The Environmental Handbook*

<https://bimblog.house/> Dan Rossiter (BSi)



Why do we draw?

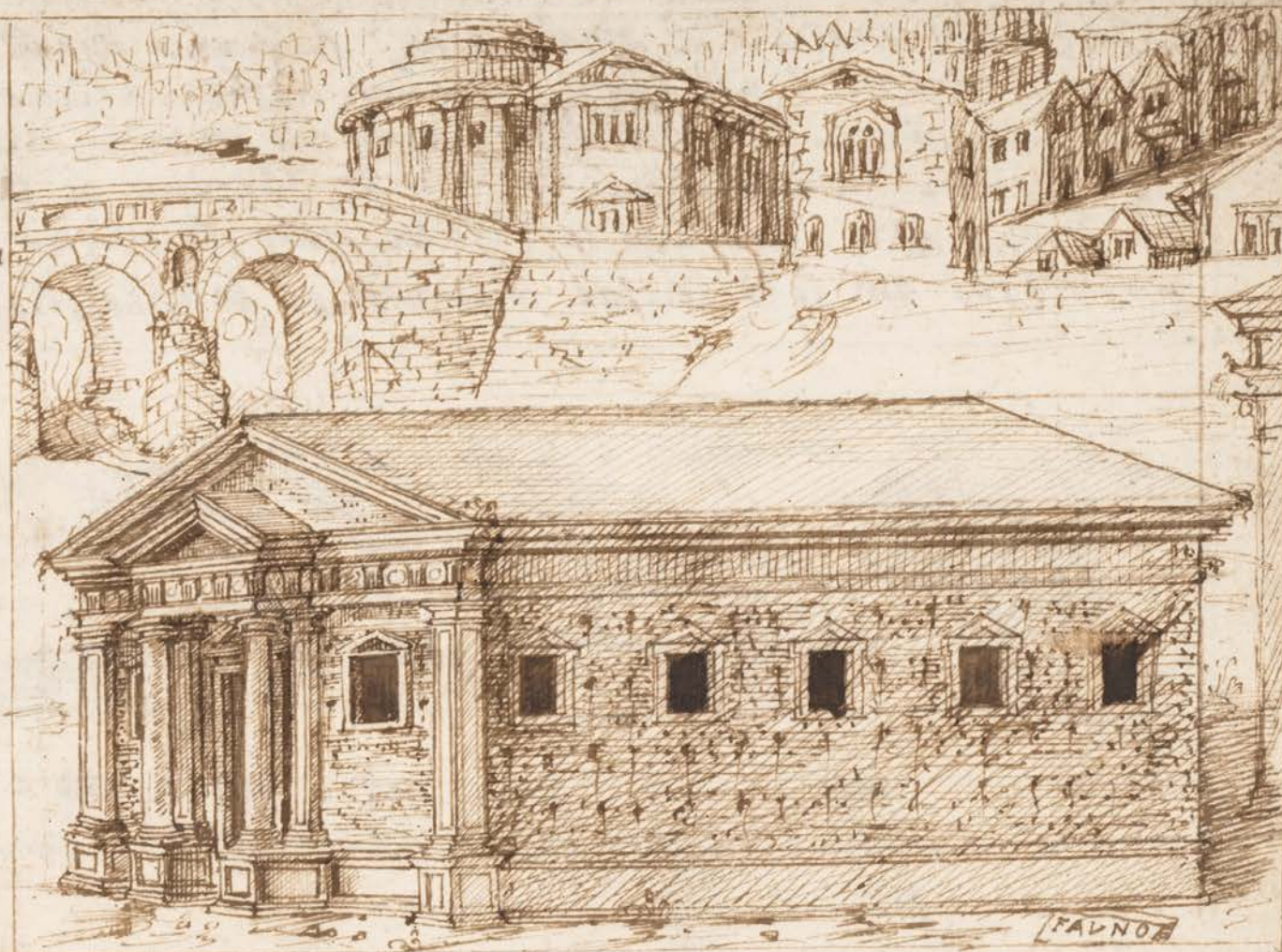
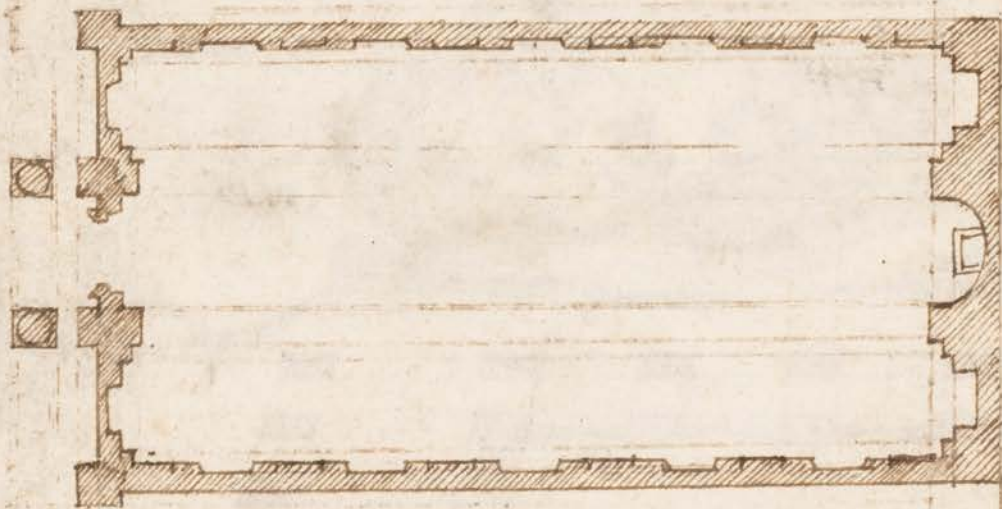
Cave Paintings Argentina



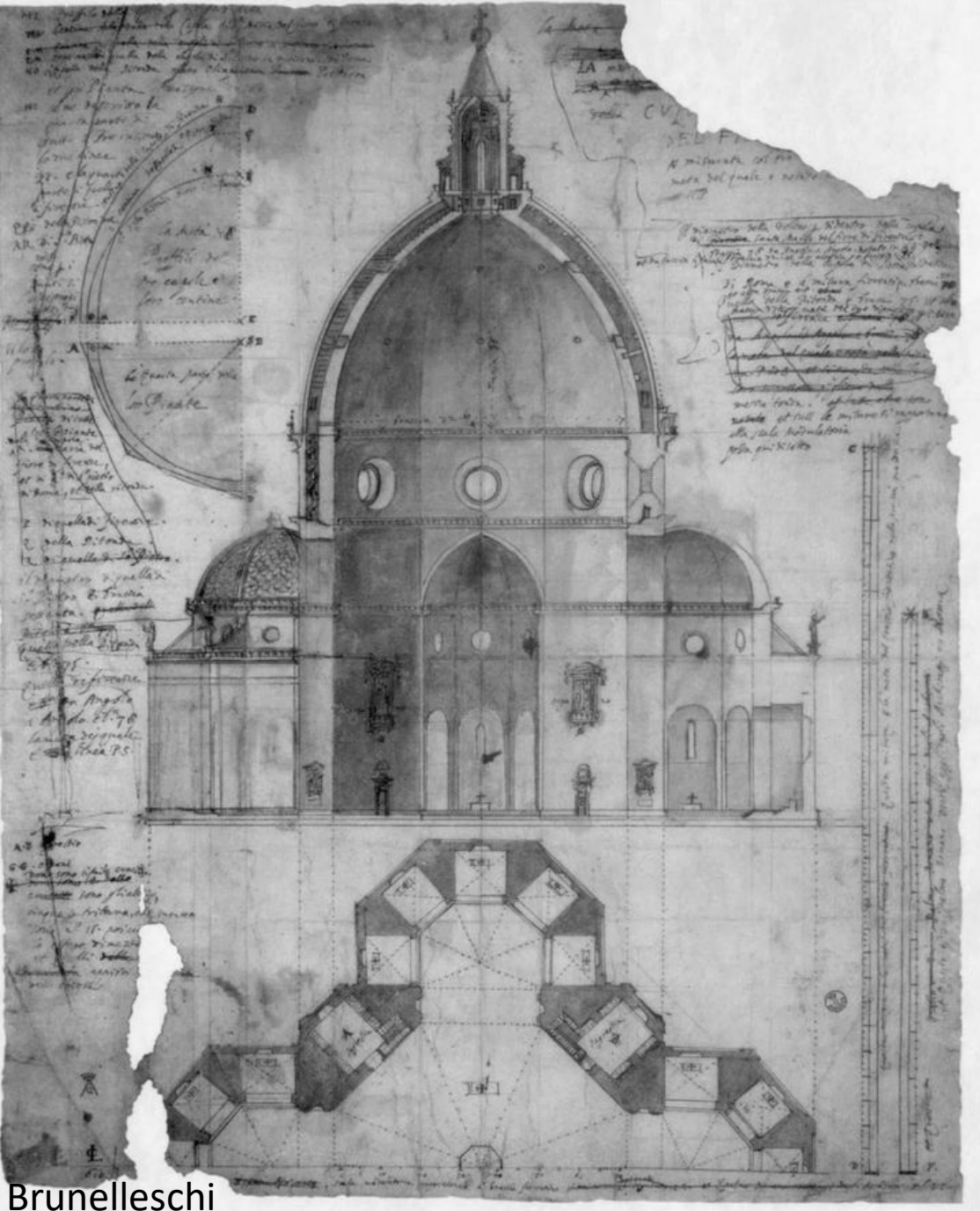
Cave Paintings France



In Antis. Sma quando bandiera nella porta di An
te oustro facciata della murata la quale si ranno
sopra la cella: e tra le Antis del mezzo so
no due colonne e sopra la porta alzata quel
la simprina cio e misura la quale qui sotto
si uede la pianta e nel pro filo. E lo est impa
re di questo Tempio era alle tre forme
da tre parti la quale eucina: alla porta
Colonna romana

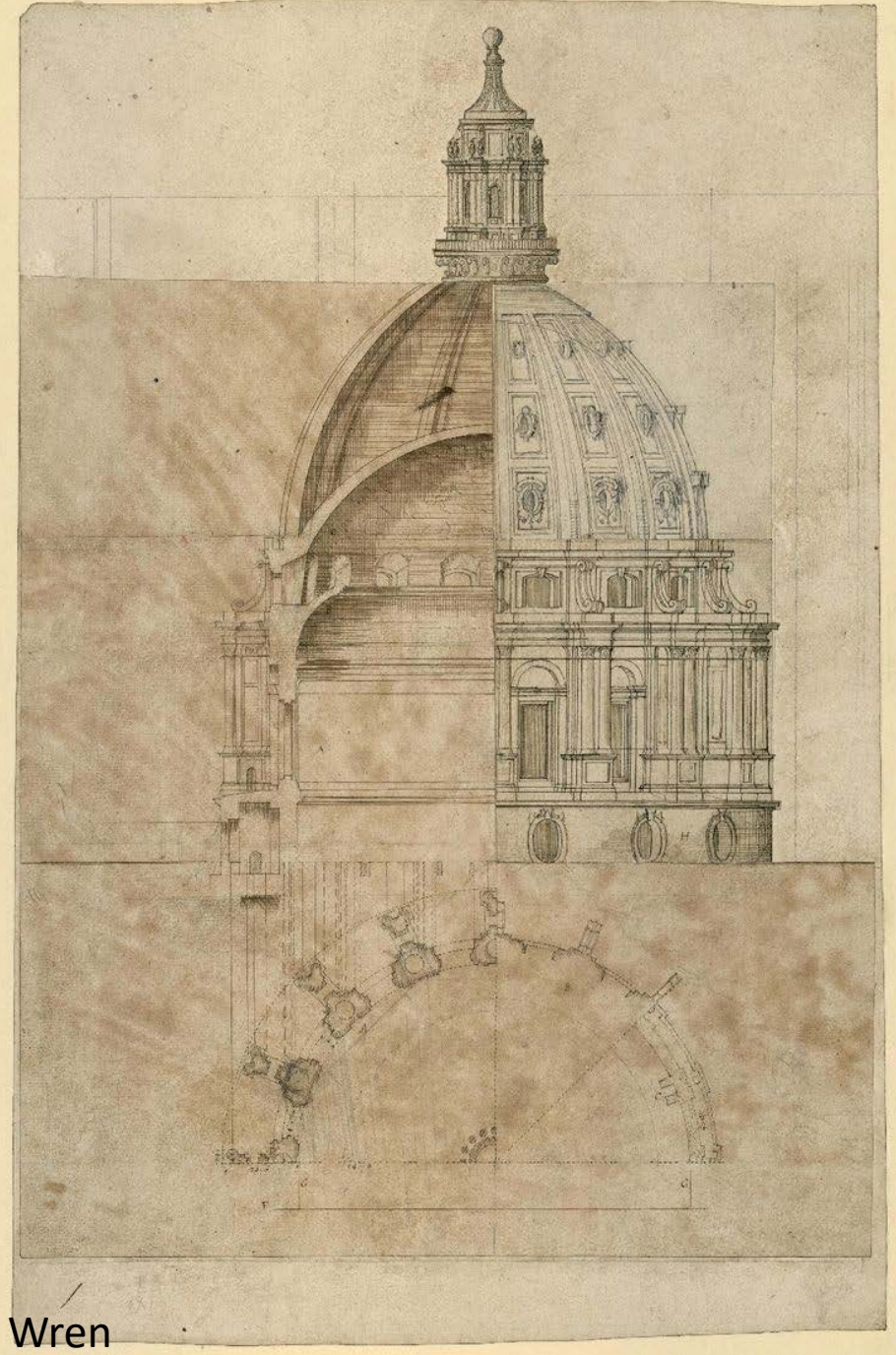


Prosopio: elo. e. chontra colonna. ha ogni cola chontr in Antis. ma la cholonni chontra la due ante an-
gulari. E di sopra li E. pistilli siccome ancora in Antis. cia scuna dalla destra e dalla sinistra
in li angolari ussanti. cioe in li angoli della porta. Lo esemplare di questo e nel liola tiberi-
na nel Tempio di Giove e di Fauno. siccome qui sotto si uede. la pianta e il pro-
filo alla foggia di diti Tempi.



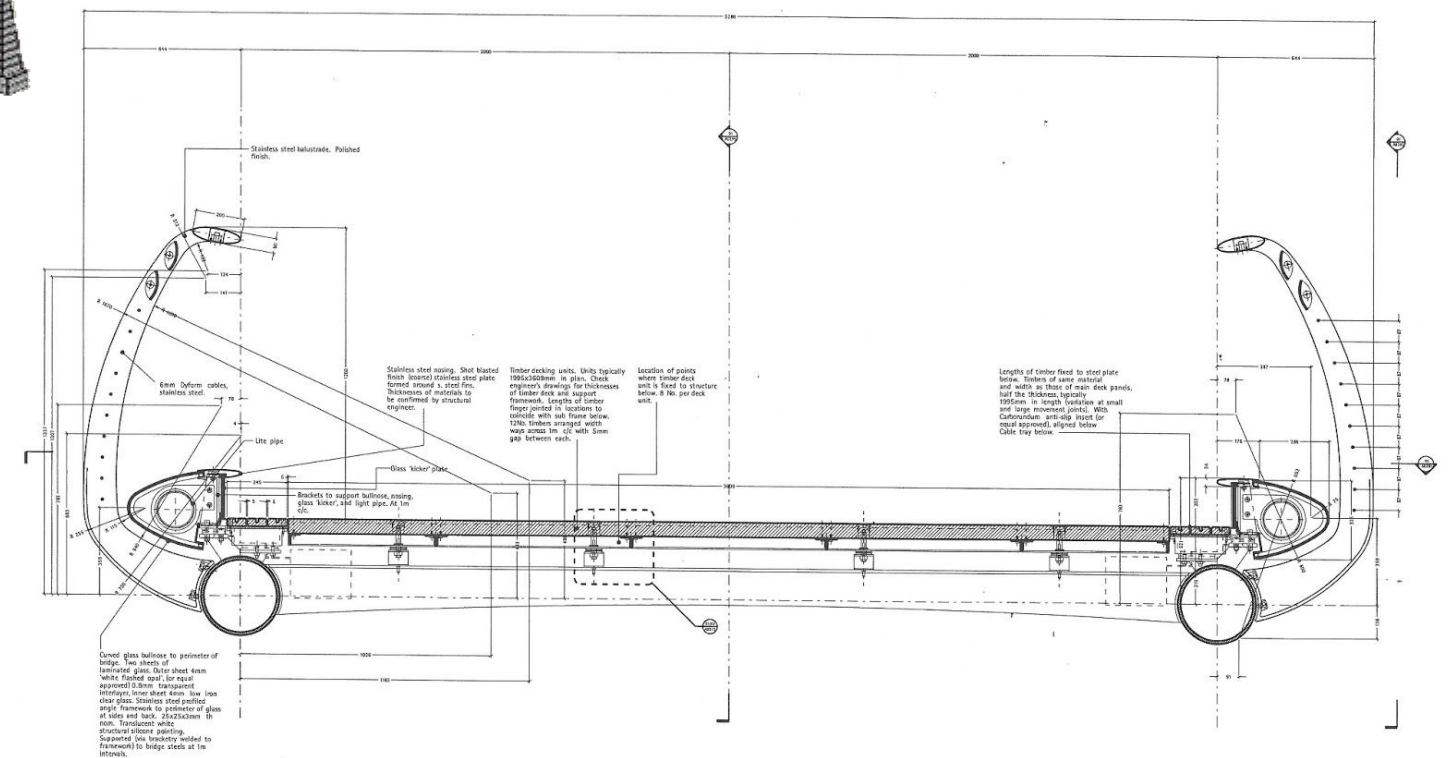
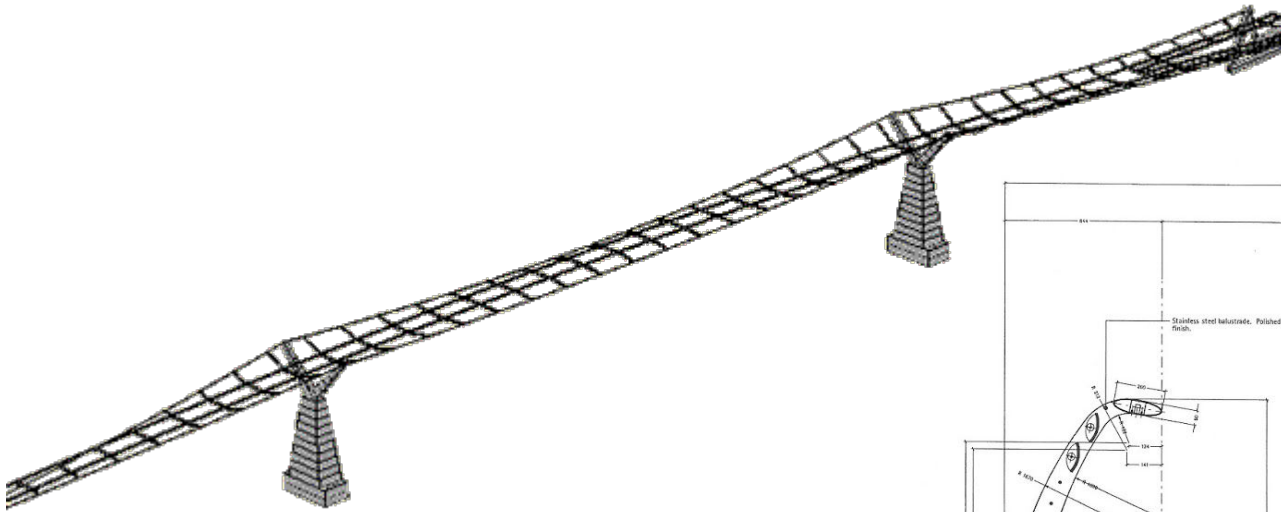
Brunelleschi

<https://i.pinimg.com/736x/01/8c/3c/018c3cd63084fa038882c6d9659dfff3.jpg>



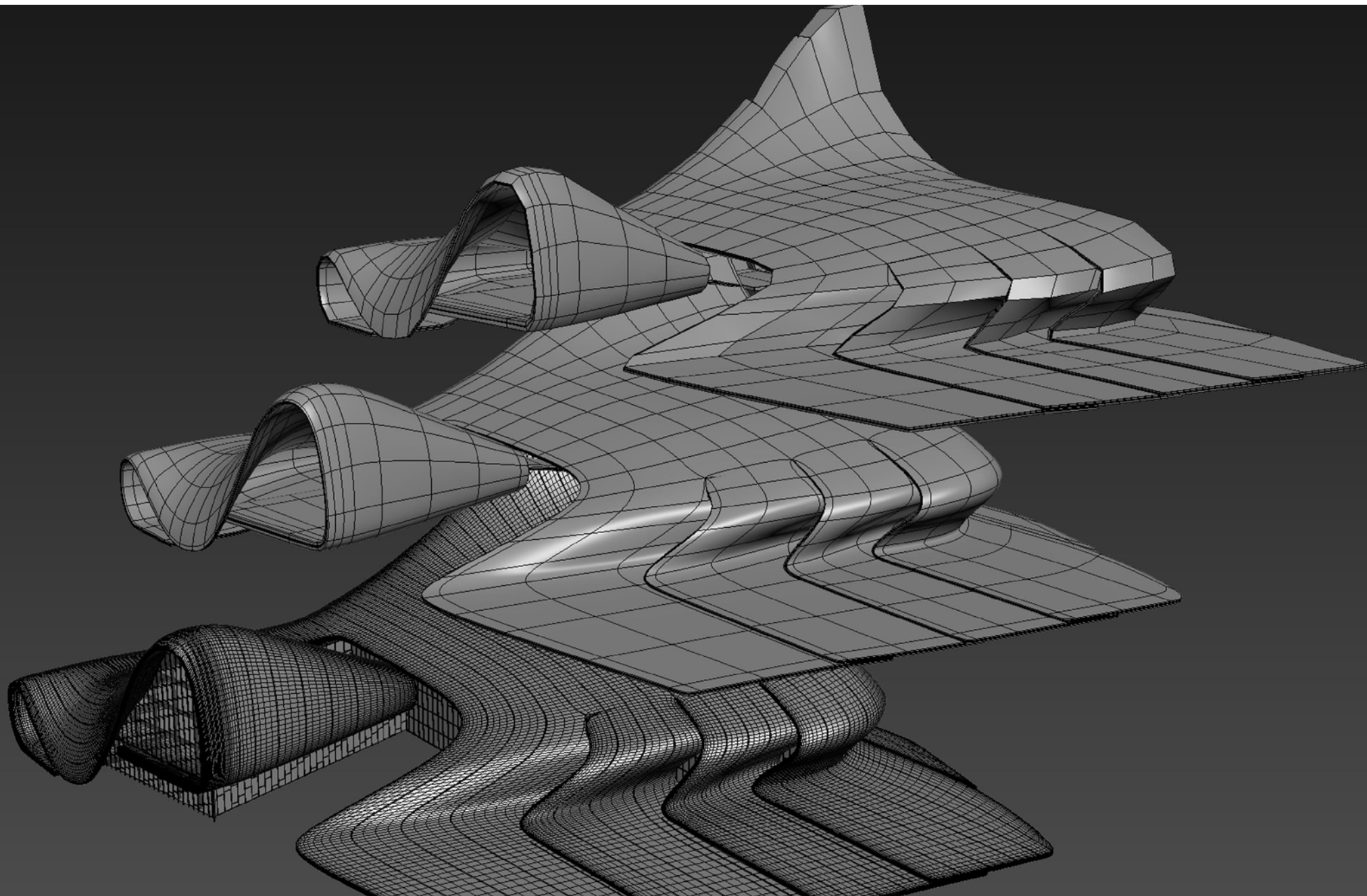
Wren

<https://i.pinimg.com/736x/c5/d0/34/c5d0340fa47008f13b4b6b94cf3aea6c.jpg>



Key Plan	Remarks 1. As per the design, the bridge is to be constructed in accordance with the design and specifications of the design team. 2. The bridge is to be constructed in accordance with the design and specifications of the design team. 3. The bridge is to be constructed in accordance with the design and specifications of the design team. 4. The bridge is to be constructed in accordance with the design and specifications of the design team. 5. The bridge is to be constructed in accordance with the design and specifications of the design team. 6. The bridge is to be constructed in accordance with the design and specifications of the design team. 7. The bridge is to be constructed in accordance with the design and specifications of the design team. 8. The bridge is to be constructed in accordance with the design and specifications of the design team. 9. The bridge is to be constructed in accordance with the design and specifications of the design team. 10. The bridge is to be constructed in accordance with the design and specifications of the design team.	Notes 1. As per the design, the bridge is to be constructed in accordance with the design and specifications of the design team. 2. The bridge is to be constructed in accordance with the design and specifications of the design team. 3. The bridge is to be constructed in accordance with the design and specifications of the design team. 4. The bridge is to be constructed in accordance with the design and specifications of the design team. 5. The bridge is to be constructed in accordance with the design and specifications of the design team. 6. The bridge is to be constructed in accordance with the design and specifications of the design team. 7. The bridge is to be constructed in accordance with the design and specifications of the design team. 8. The bridge is to be constructed in accordance with the design and specifications of the design team. 9. The bridge is to be constructed in accordance with the design and specifications of the design team. 10. The bridge is to be constructed in accordance with the design and specifications of the design team.	FOR TENDER	Rev 1. As per the design, the bridge is to be constructed in accordance with the design and specifications of the design team. 2. The bridge is to be constructed in accordance with the design and specifications of the design team. 3. The bridge is to be constructed in accordance with the design and specifications of the design team. 4. The bridge is to be constructed in accordance with the design and specifications of the design team. 5. The bridge is to be constructed in accordance with the design and specifications of the design team. 6. The bridge is to be constructed in accordance with the design and specifications of the design team. 7. The bridge is to be constructed in accordance with the design and specifications of the design team. 8. The bridge is to be constructed in accordance with the design and specifications of the design team. 9. The bridge is to be constructed in accordance with the design and specifications of the design team. 10. The bridge is to be constructed in accordance with the design and specifications of the design team.	The Millennium Bridge Typical Bridge Cross Section 14.12.00 15 A0296a 01
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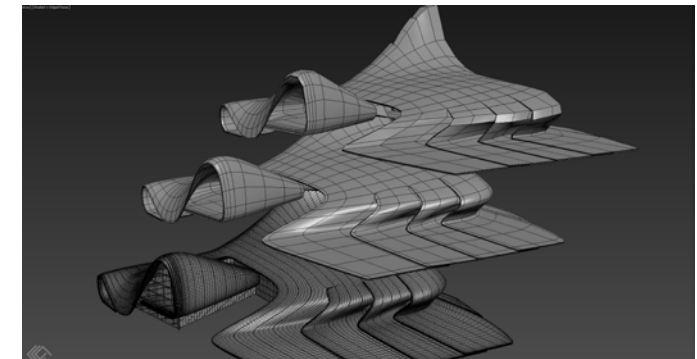
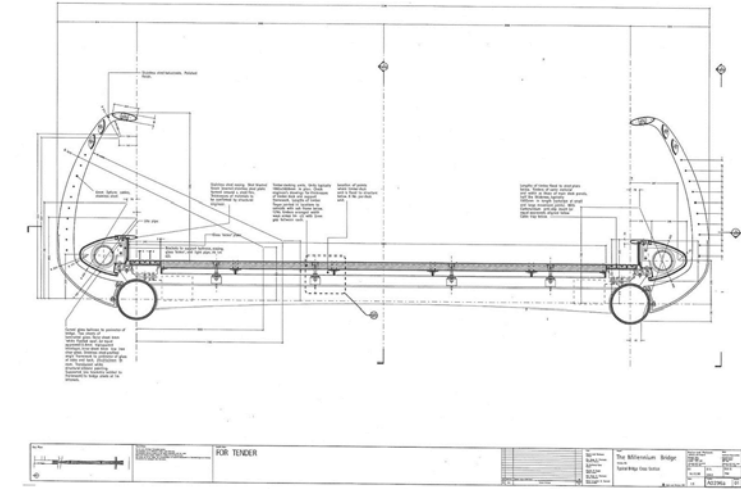
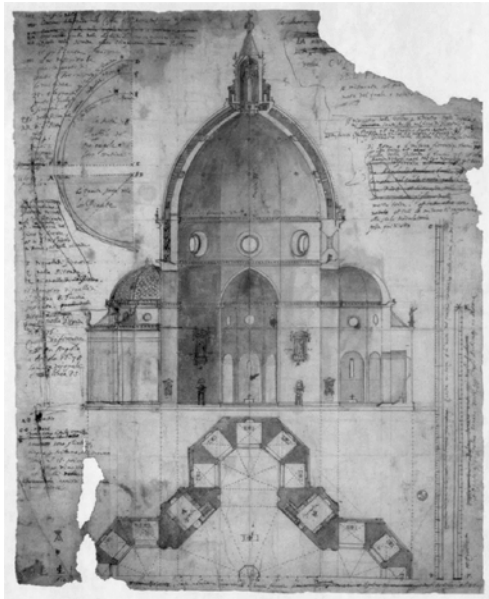
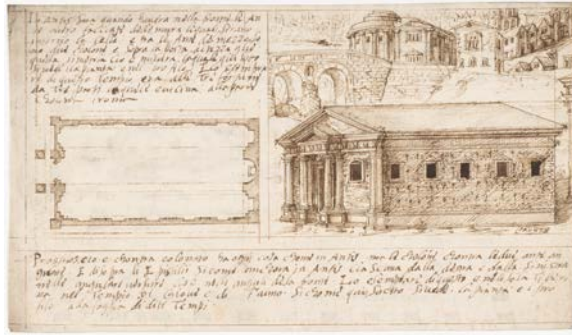
Arup & Foster

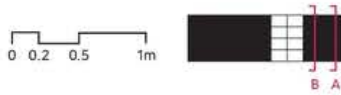


Zaha Hadid

https://evermotion.org/files/publications_images/nr_00414_9.jpg

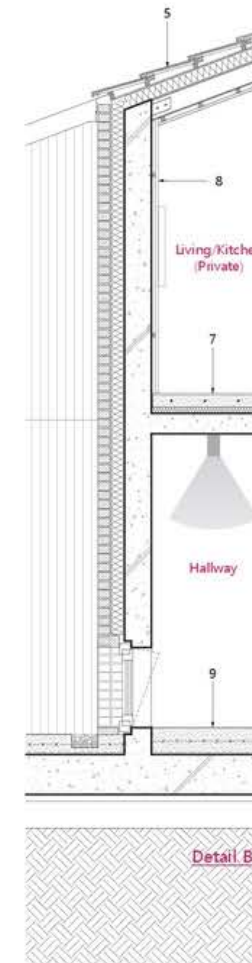
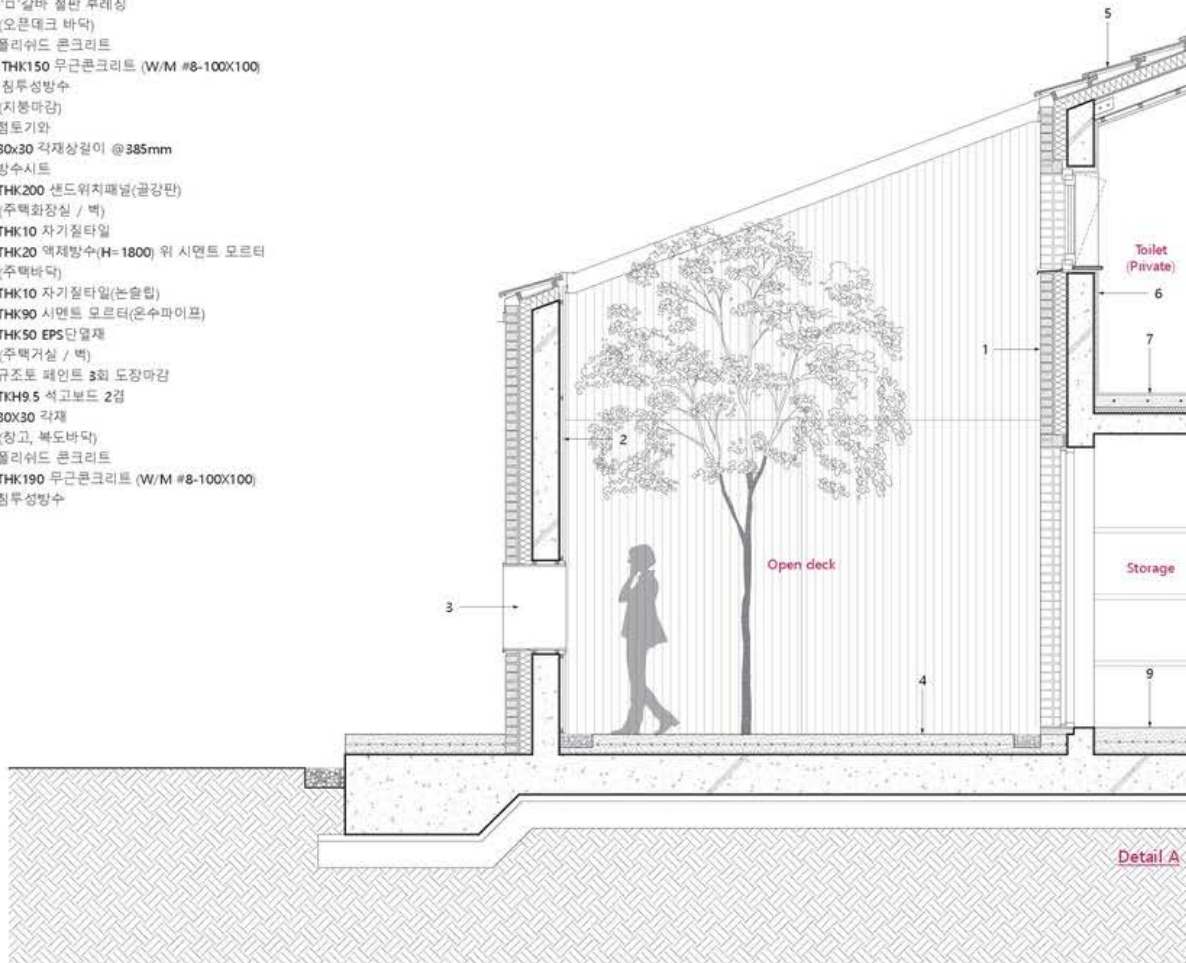
A picture is worth a thousand words





detail A_B

- 1 (외장재)
57X90X230 전벽돌 0.5B쌓기
THK120 단열재
- 2 (오픈데크_벽)
열차우목재 마감
THK9.5 합판 1겹
30X30 각파이프 @600
- 3 (마감마감)
폴소도장
'모'갈바 칠판 후레싱
- 4 (오픈데크 바닥)
폴리우드 콘크리트
THK150 무근콘크리트 (W/M #8-100X100)
침투성방수
- 5 (지붕마감)
점토기와
30x30 각재상철이 @385mm
방수시트
THK200 샌드위치패널(골강판)
- 6 (주벽화장실 / 벽)
THK10 자기질타일
THK20 액체방수(H=1800) 위 시멘트 모르타
- 7 (주벽바닥)
THK10 자기질타일(눈솔림)
THK90 시멘트 모르타(운수파이프)
THK50 EPS 단열재
- 8 (주벽거실 / 벽)
규조토 패인트 3회 도장마감
THK9.5 석고보드 2겹
30X30 각재
- 9 (창고, 복도바닥)
폴리우드 콘크리트
THK190 무근콘크리트 (W/M #8-100X100)
침투성방수



Drawings prepared in the Construction Industry

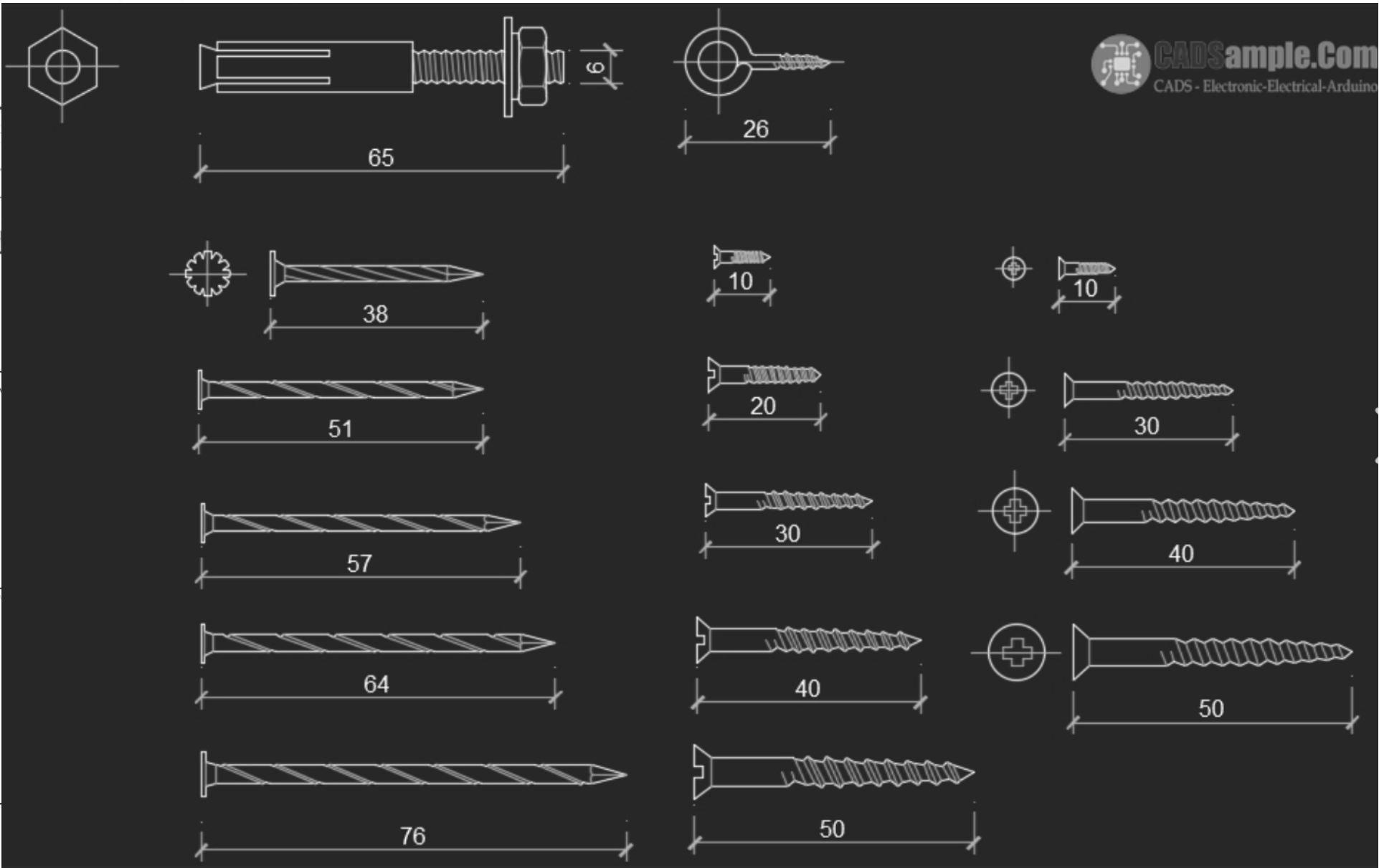
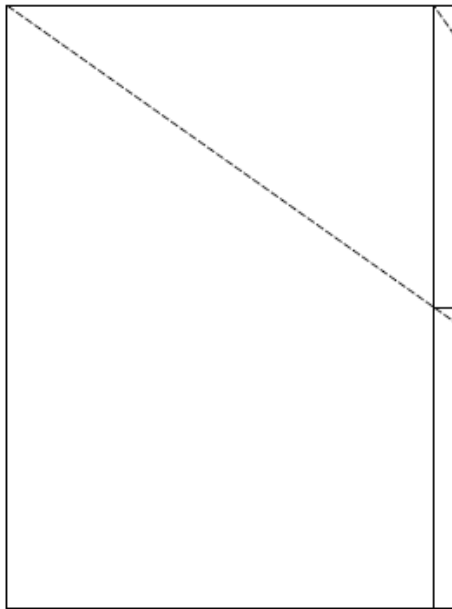
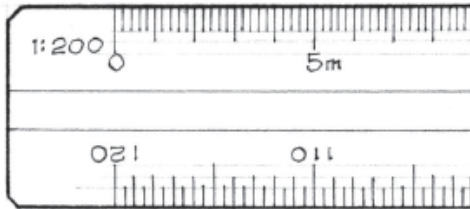
Must:

- Convey a message
- Read with understanding
- Demonstrate Knowledge
- Convey Ideas
- Explain a Narrative / Story

Industry conventions assist in the legibility of drawn information.

How do we draw within the Construction Industry?

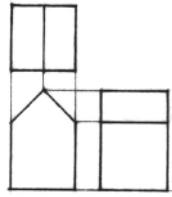
Appropriate Scale Drawings



Conventions

Projection Systems

Orthographic Projection



When we study how each projection system represents the same subject, we can see how different pictorial effects result. We categorize these pictorial systems into multiview drawings, paraline drawings, and perspective drawings.

Pictorial Systems

Multiview Drawings

- Multiview drawings consist of plans, sections, and elevations.
- The principal face in each view is oriented parallel to the picture plane.

Paraline Drawings

Isometrics: The three major axes make equal angles with the picture plane.

Dimetrics: Two of the three major axes make equal angles with the picture plane.

Trimetrics: All three major axes make different angles with the picture plane.

Axometric Projection

Oblique Projection

Elevation obliques: A principal vertical face is oriented parallel to the picture plane.

Plan obliques: A principal horizontal face is oriented parallel to the picture plane.

Perspective Projection

Perspective Drawings

1-point perspectives: One horizontal axis is perpendicular to the picture plane while the other horizontal axis and the vertical axis are parallel with the picture plane.

2-point perspectives: Both horizontal axes are oblique to the picture plane and the vertical axis remains parallel with the picture plane.

3-point perspectives: Both horizontal axes as well as the vertical axis are oblique to the picture plane.

These pictorial views are available in most 3D CAD and modeling programs. The terminology, however, may differ from what is presented here.

Orthographic Projection

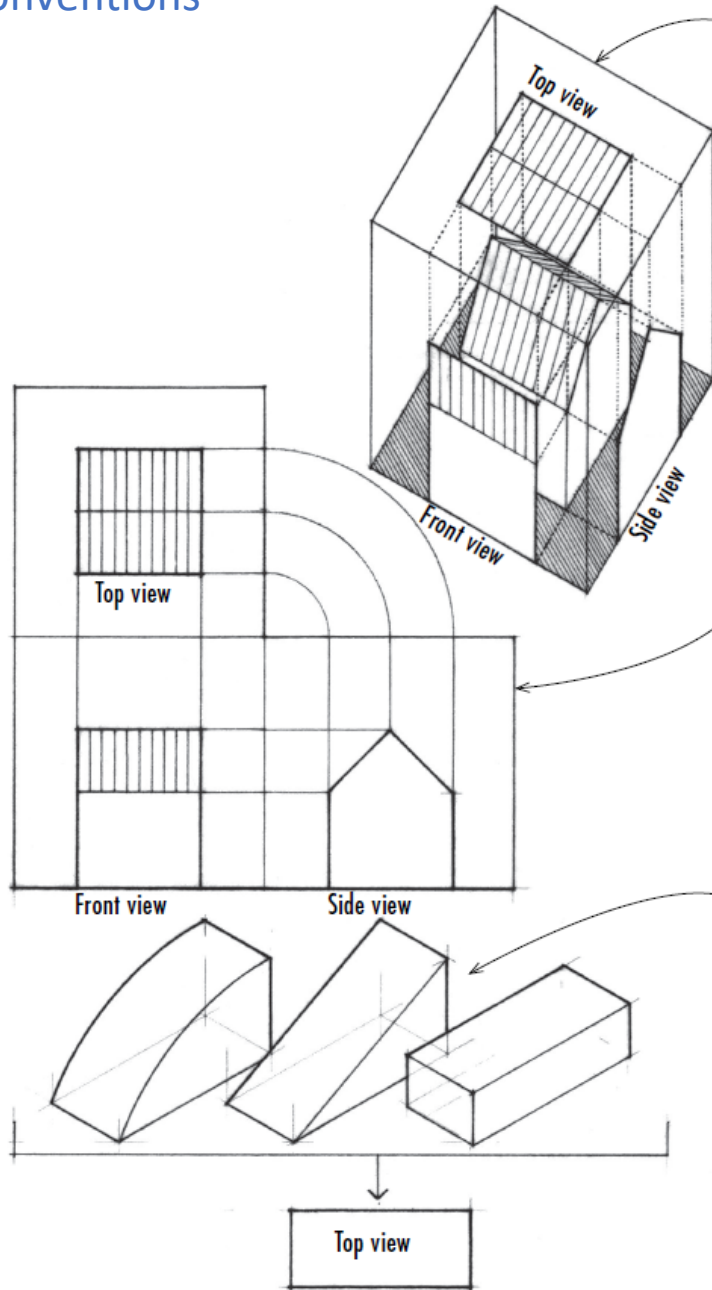
Drawings that can be prepared through orthographic projection to produce

PLANS

SECTIONS

ELEVATIONS

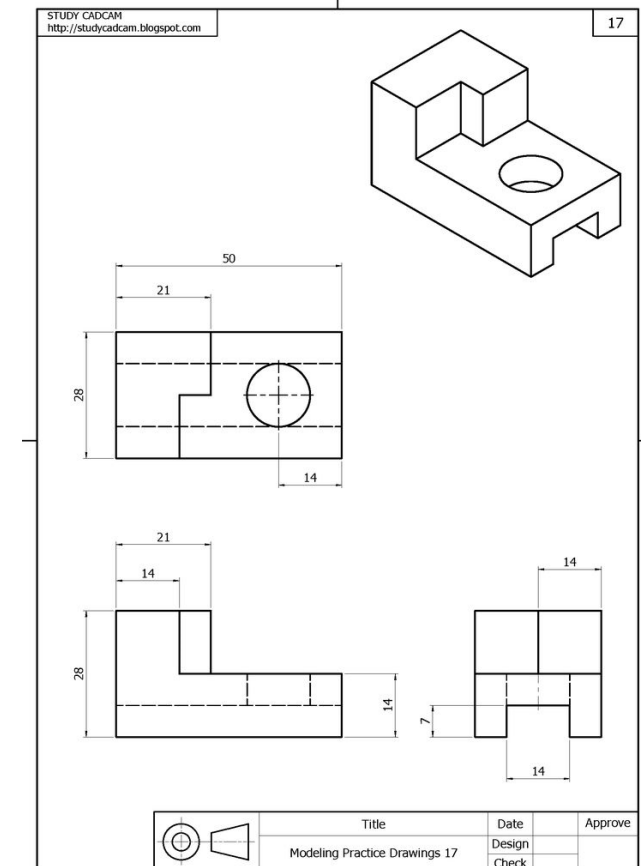
Conventions



- If we enclose an object within a transparent picture-plane box, we can name the images projected orthographically onto the principal picture planes.
- Top views are orthographic projections cast onto the horizontal picture plane. In architectural drawing, top views are called plans.
- Front and side views are orthographic projections cast onto the vertical picture planes. In architectural drawing, front and side views are called elevations.
- See Chapter 4 for floor plans and sections, which are orthographic projections of cuts made through a building.
- To make it easier to read and interpret how a series of orthographic projections describe a three-dimensional whole, we arrange the views in an orderly and logical fashion.
- The most common layout results when we unfold the transparent picture-plane box into a single plane represented by the drawing surface. The top or plan view revolves upward to a position directly above and vertically aligned with the front or elevation view, while the side view revolves to align horizontally with the front view. The result is a coherent set of related orthographic views.
- Although these three objects have different forms, their top views appear to be identical. Only by looking at related orthographic projections are we able to understand the three-dimensional form of each object. We should therefore study and represent three-dimensional forms and constructions through a series of related orthographic projections.
- The mind must be able to read and assemble a set of multiview drawings to fully understand the nature of the three-dimensional subject.

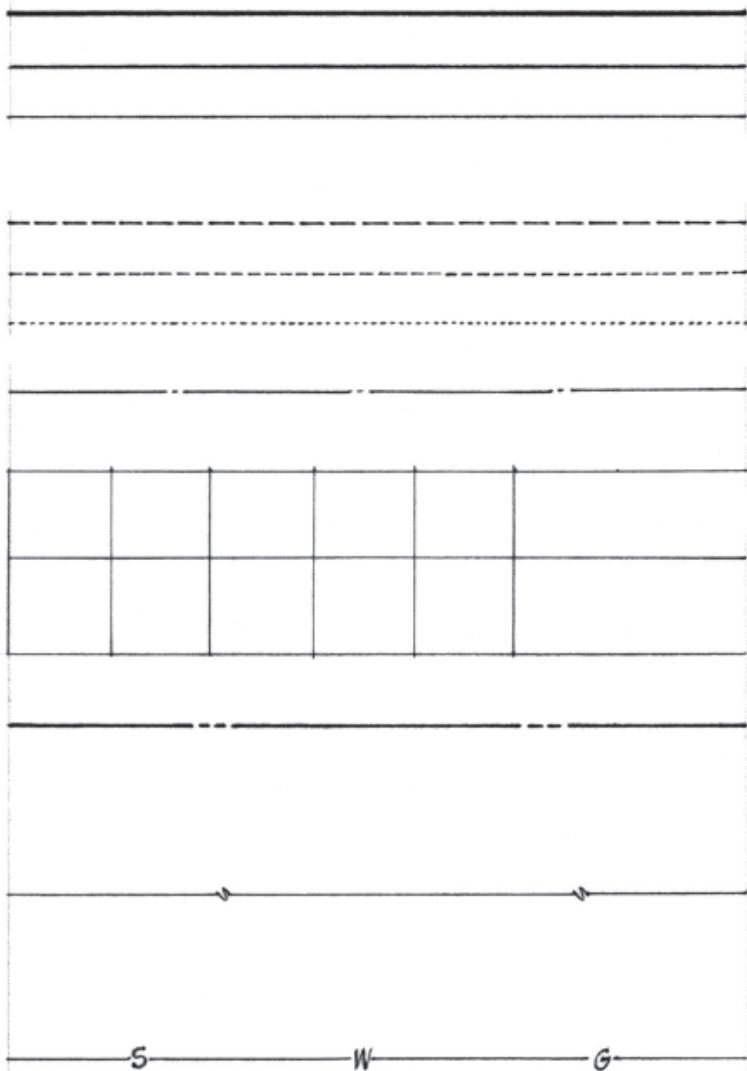
Orthographic Projection

CAD Packages can assist us to create multiple view of the same object through projection



<https://free-clipart-pictures.com/images/orthographic-drawing-mug-5.jpg>

Conventions - Lines



- Solid lines delineate the form of objects, such as the edge of a plane or the intersection of two planes. The relative weight of a solid line varies according to its role in conveying depth.
- Dashed lines, consisting of short, closely spaced strokes, indicate elements hidden or removed from our view.
- Centerlines, consisting of thin, relatively long segments separated by single dashes or dots, represent the axis of a symmetrical object or composition.
- Grid lines are a rectangular or radial system of light solid lines or centerlines for locating and regulating the elements of a plan.
- Property lines, consisting of relatively long segments separated by two dashes or dots, indicate the legally defined and recorded boundaries of a parcel of land.
- Break lines, consisting of relatively long segments joined by short zigzag strokes, are used to cut off a portion of a drawing.
- Utility lines consist of relatively long segments separated by a letter indicating the type of utility.

Line type conventions assist in the legibility of drawn information. The quality, thickness, scale and type of line can help communicate the importance of the line.

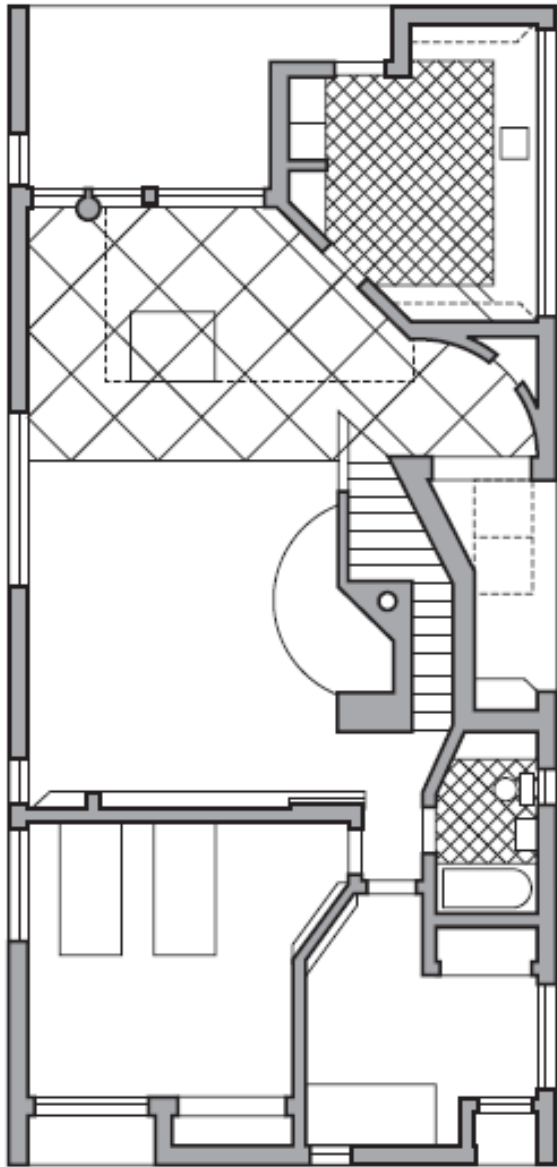
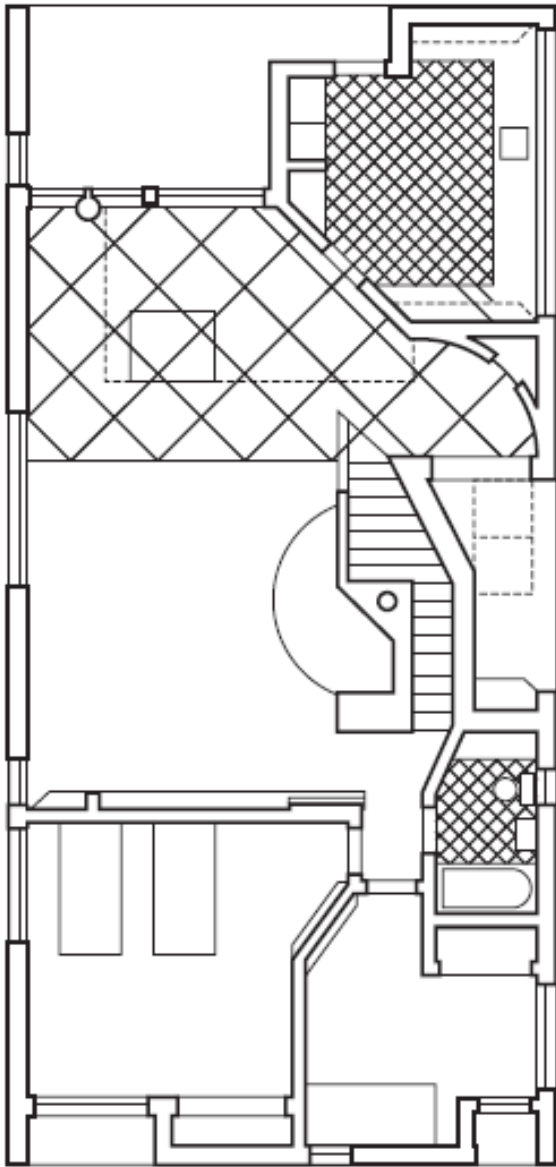
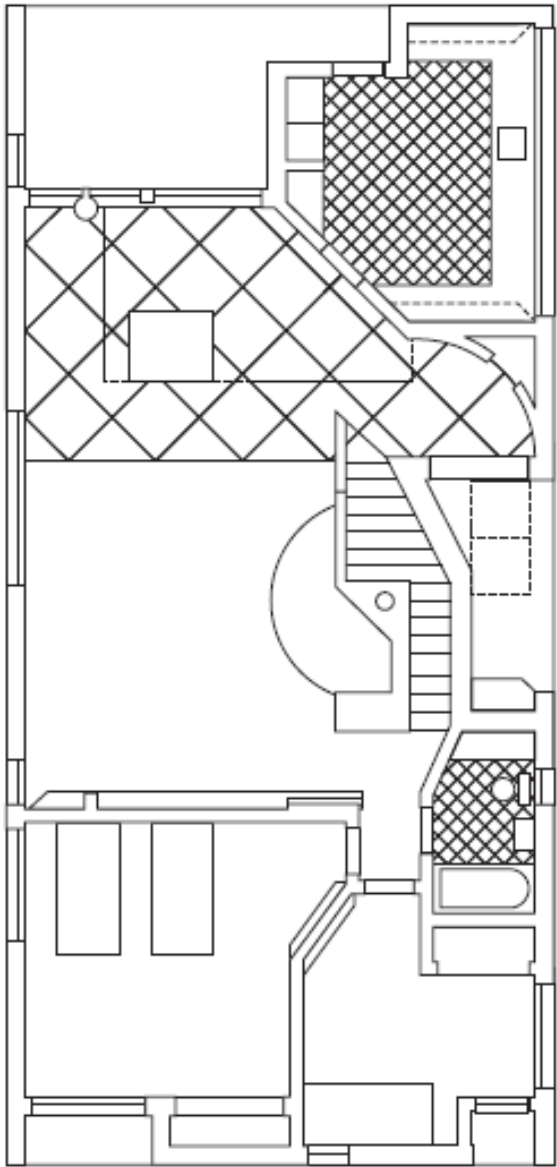
E.G

Thick Solid line depicting a section cut.

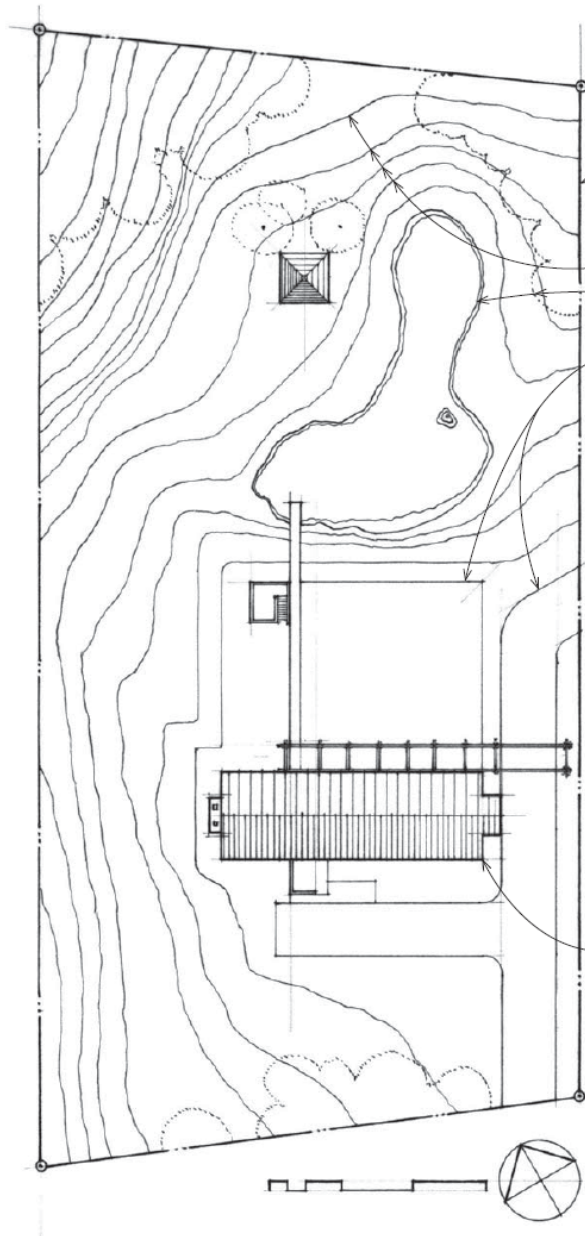
Dashed lines depicting something hidden from view.

Centrelines through steelwork allowing accuracy between column positions.

Conventions - Lines



Conventions - Plans



A site plan describes the location and orientation of a building or building complex on a plot of land and in relation to its context. Whether this environment is urban or rural, the site plan should describe the following:

- Legally recorded boundaries of the site, indicated by a broken line consisting of relatively long segments separated by two short dashes or dots
- Physical topography of the terrain with contour lines
- Natural site features, such as trees, landscaping, and watercourses
- Existing or proposed site constructions, such as walks, courts, and roadways
- Architectural structures in the immediate setting that impact the proposed building

In addition, a site plan may include:

- Legal constraints, such as zoning setbacks and rights-of-way
- Existing or proposed site utilities
- Pedestrian and vehicular entry points and paths
- Significant environmental forces and features

Roof Plans

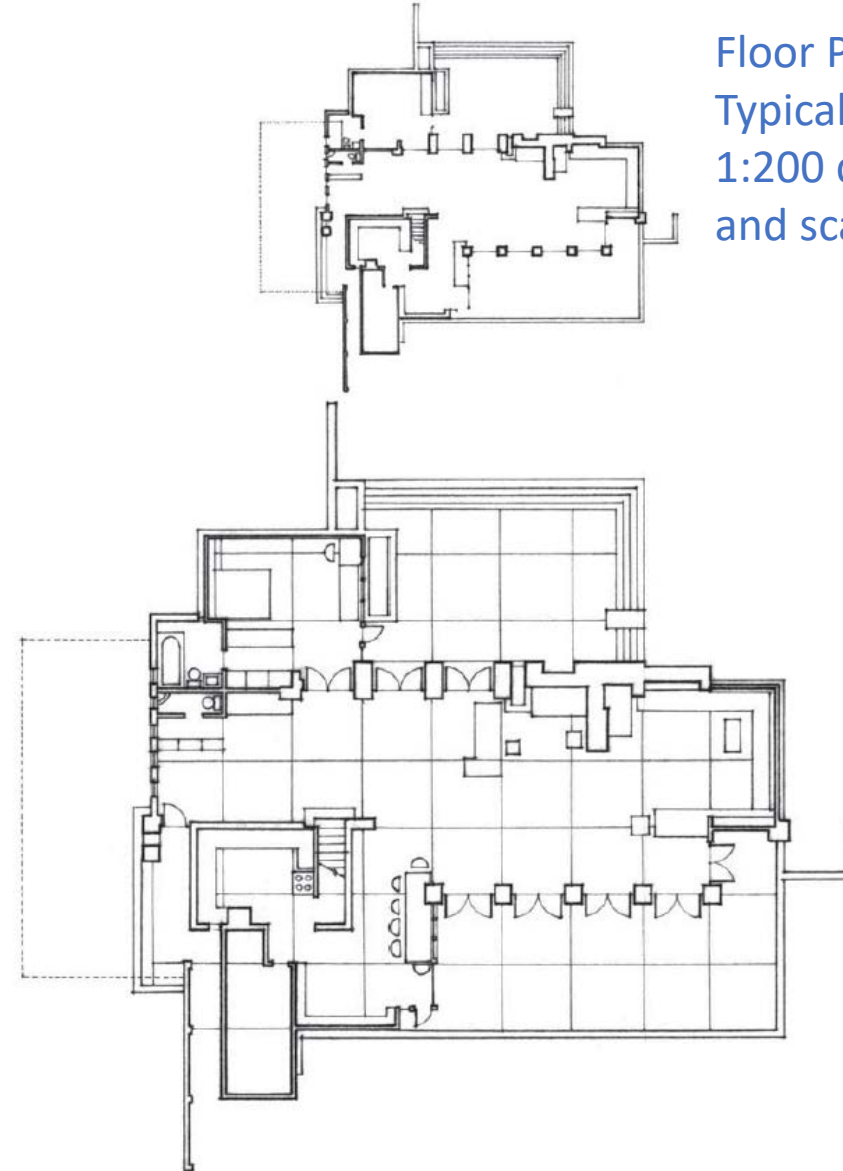
A roof plan is a top view describing the form, massing, and material of a roof or the layout of such rooftop features as skylights, decks, and mechanical housings.

- Roof plans are typically included in the site plan for a proposed building or building complex.

Site Plans

Typical scale 1:1250 / 1:500

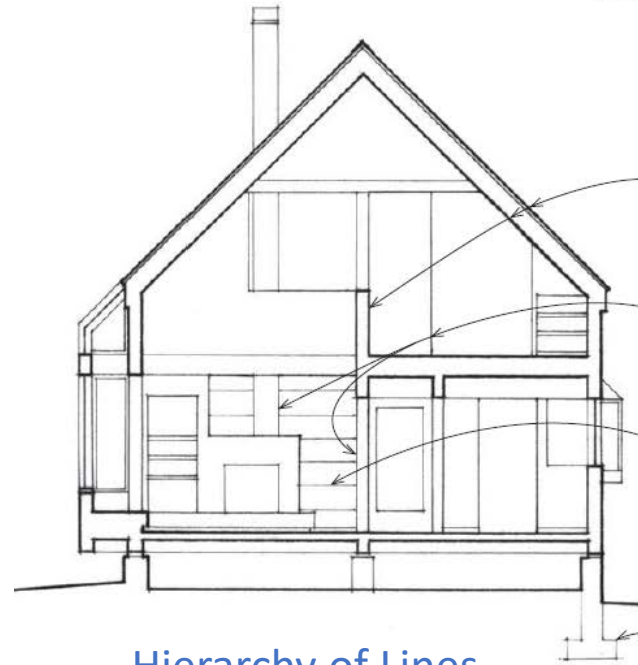
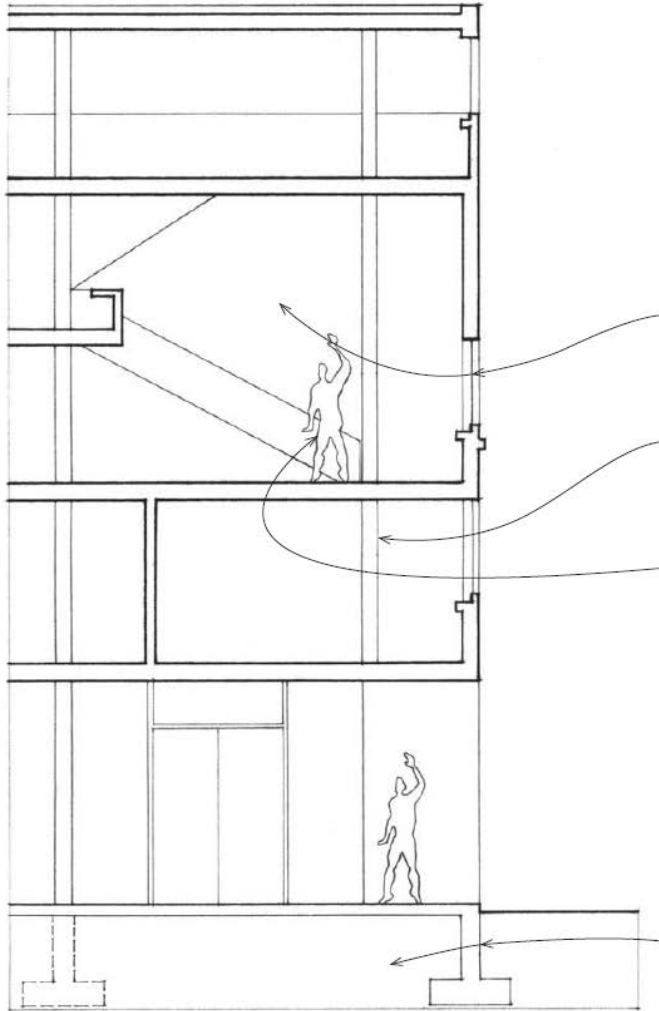
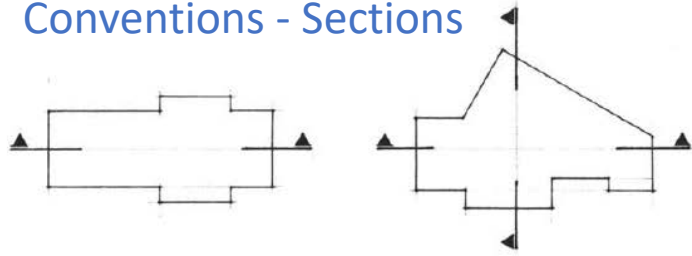
- Graphic scale designates the scale of the site plan and a north arrow indicates the orientation of the site.



Floor Plans

Typical scales 1:100 / 1:200 depending on size and scale of the building.

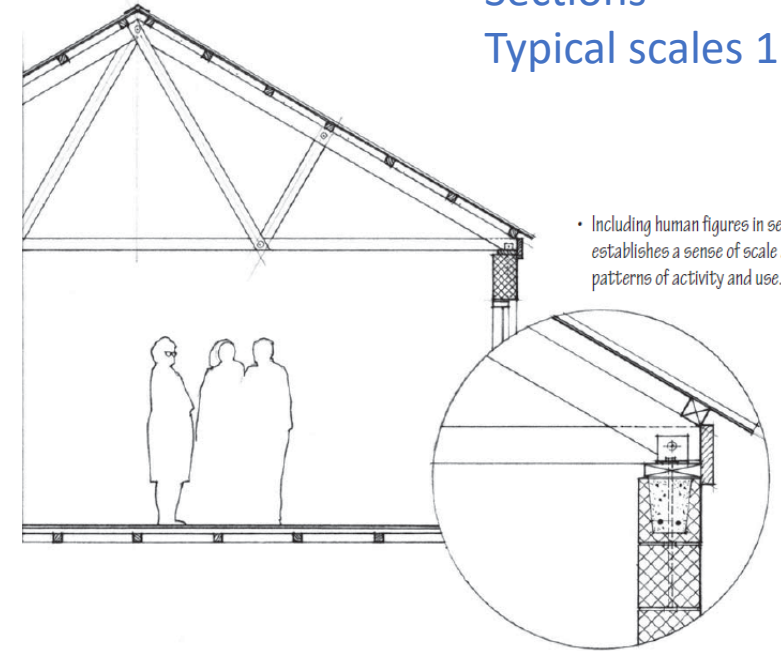
Conventions - Sections



Hierarchy of Lines

Sections

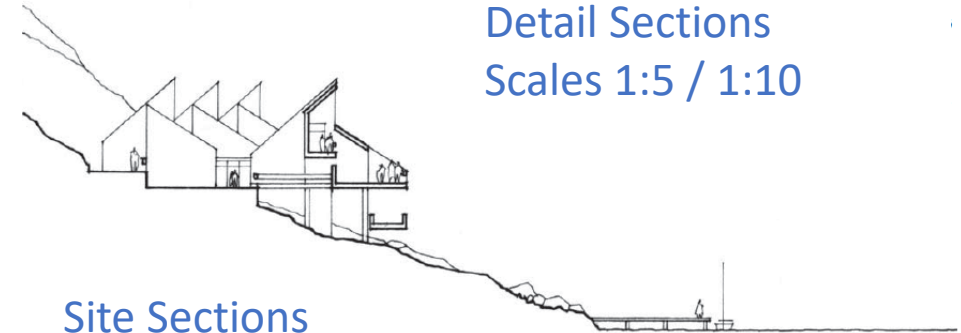
Typical scales 1:20 / 1:50



- Including human figures in section drawings establishes a sense of scale and reminds us of patterns of activity and use.

Detail Sections

Scales 1:5 / 1:10

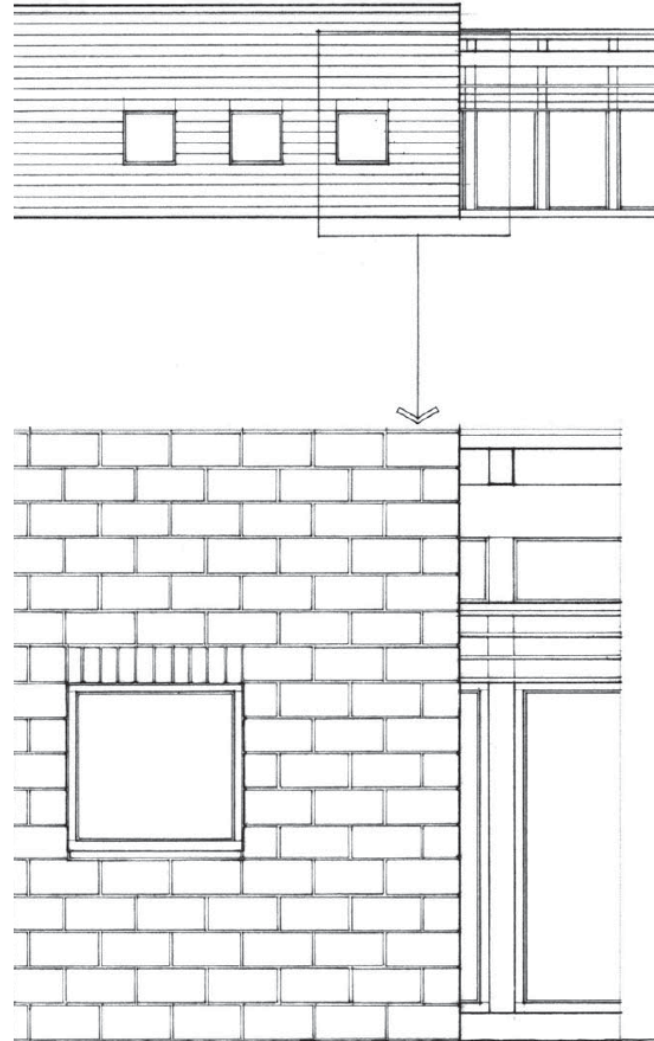
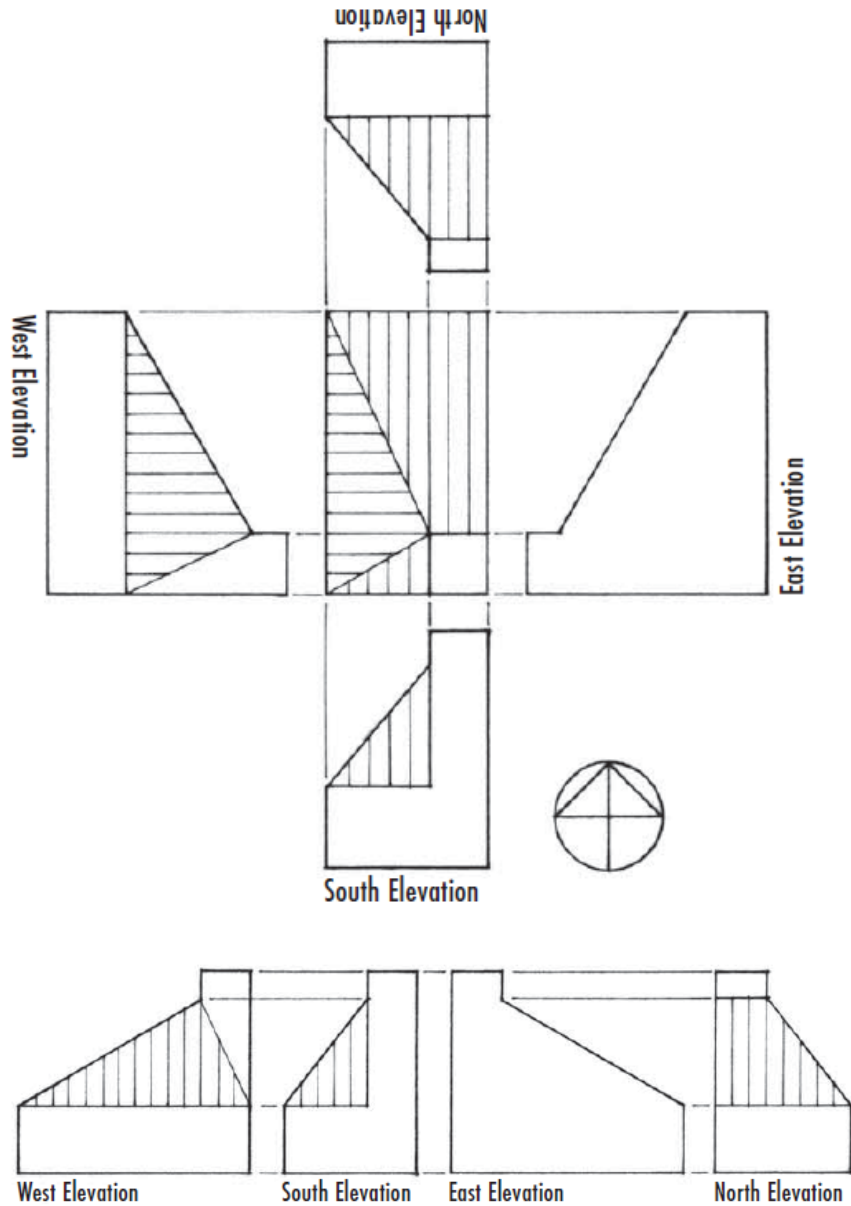


Site Sections

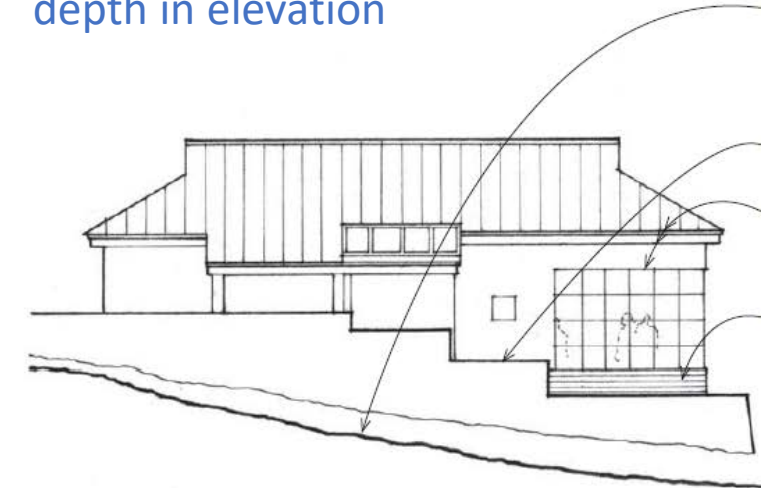
Scale 1:200 / 1:500

Conventions - Elevations

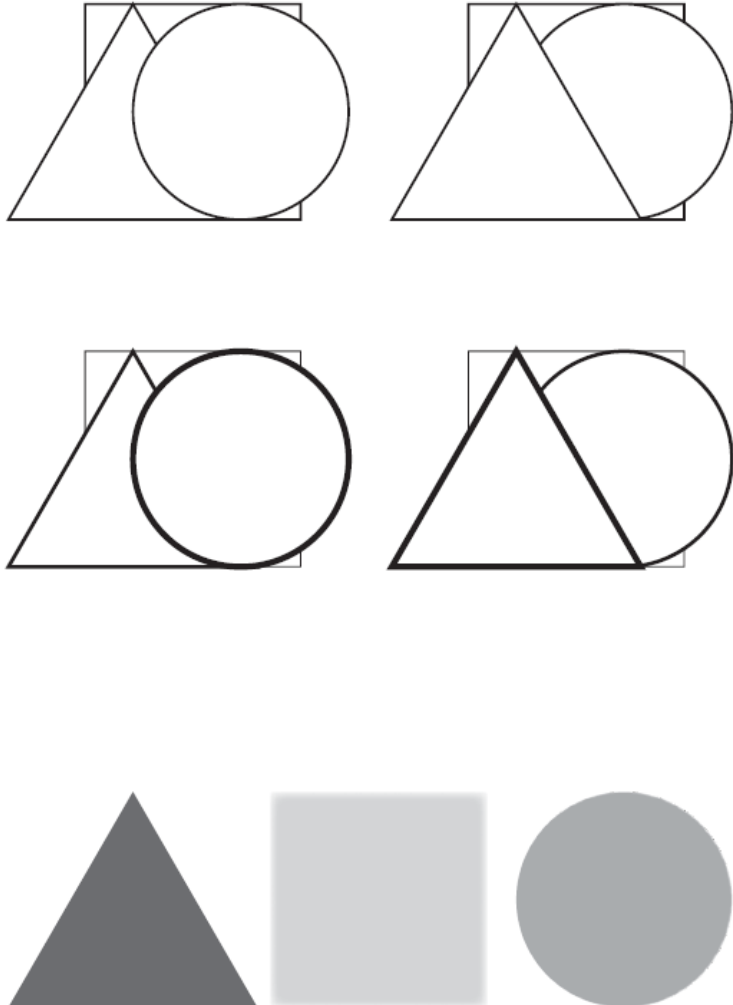
Elevations are normally drawn in a scale relative to the floor plans. 1:100
Further detail can be emphasised at a larger scale. (1:50)



Hierarchy of Lines, showing depth in elevation



Conventions - Depth

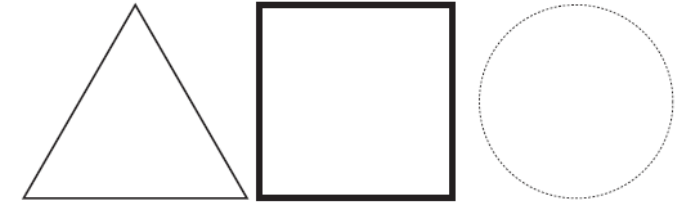


Spatial Depth Cues

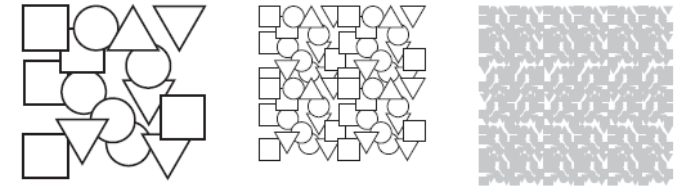
The examples on the previous two pages illustrate the use of varying line weights and detail to convey a sense of spatial depth in the drawing of building elevations. This series of drawings illustrates in a more discrete and abstract way how visual cues can enhance the sense of depth in any orthographic projection.

- **Continuity of Outline:** We tend to perceive a shape as being in front of another when it has continuity of outline and disrupts the profile of the other shape. Since this visual phenomenon relies on nearer objects overlaying or projecting in front of objects farther away, we often refer to this depth cue simply as overlap.
- By itself, overlap tends to create relatively shallow intervals of space. However, we can achieve a greater sense of intervening space and depth if we combine overlap with other depth cues, such as by varying the line weights of a pure-line drawing. Darker and thicker profile or contour lines tend to advance and appear to be in front of lighter and thinner outlines.
- **Atmospheric Perspective:** A progressive muting of hues, tonal values, and contrast occurs with increasing distance from the observer. Objects seen up close in the foreground of our visual field typically possess more saturated colors and sharply defined contrasts in value. As they move farther away, their colors become lighter in value and more subdued, and their tonal contrasts more diffuse. In the background, we see mainly shapes of grayed tones and muted hues.

- **Perspective of Blur:** This depth cue reflects the fact that we normally associate clarity of vision with nearness and blurring of outlines with farness. The graphic equivalent of perspective blur is a diminishing or diffusion of the edges and contours of more distant objects. We can use either a lightly drawn line or a broken or dotted line to delineate these edges of shapes and contours of forms that exist beyond the focus of a drawing.



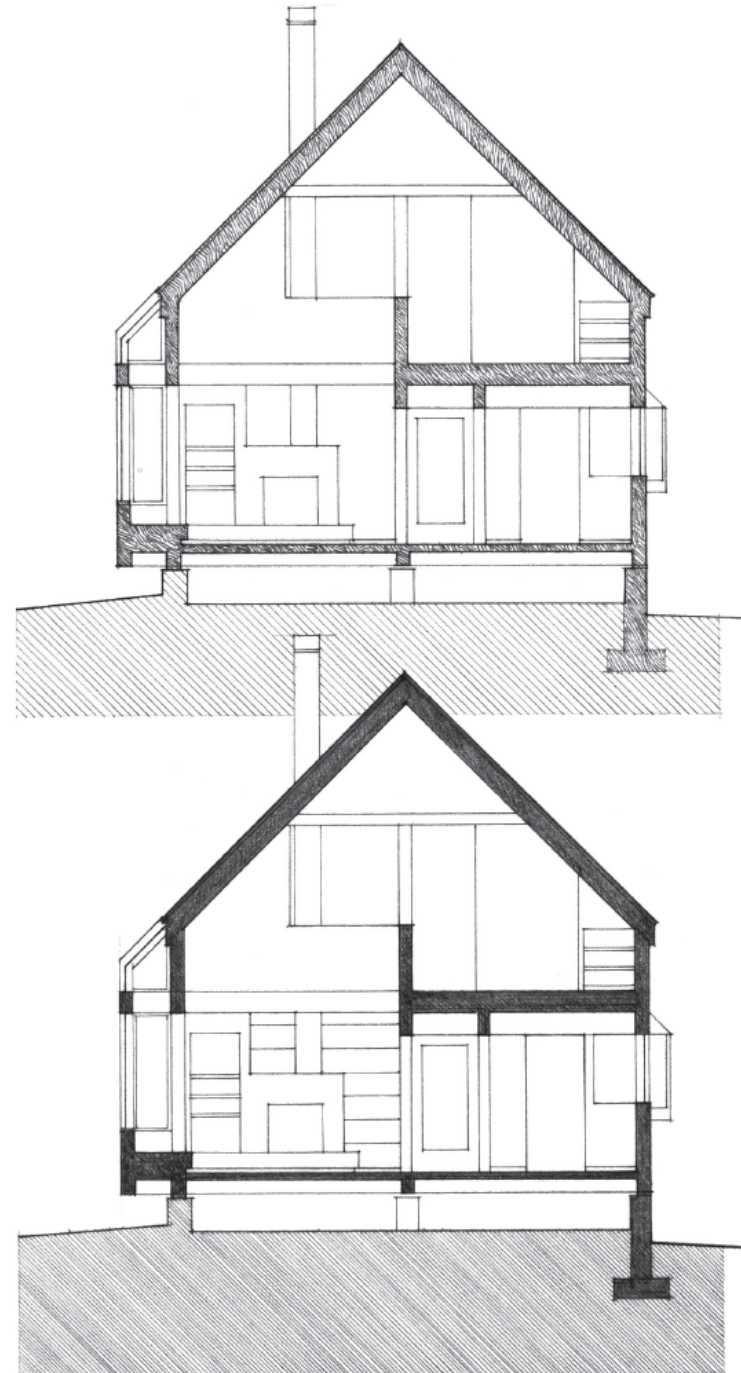
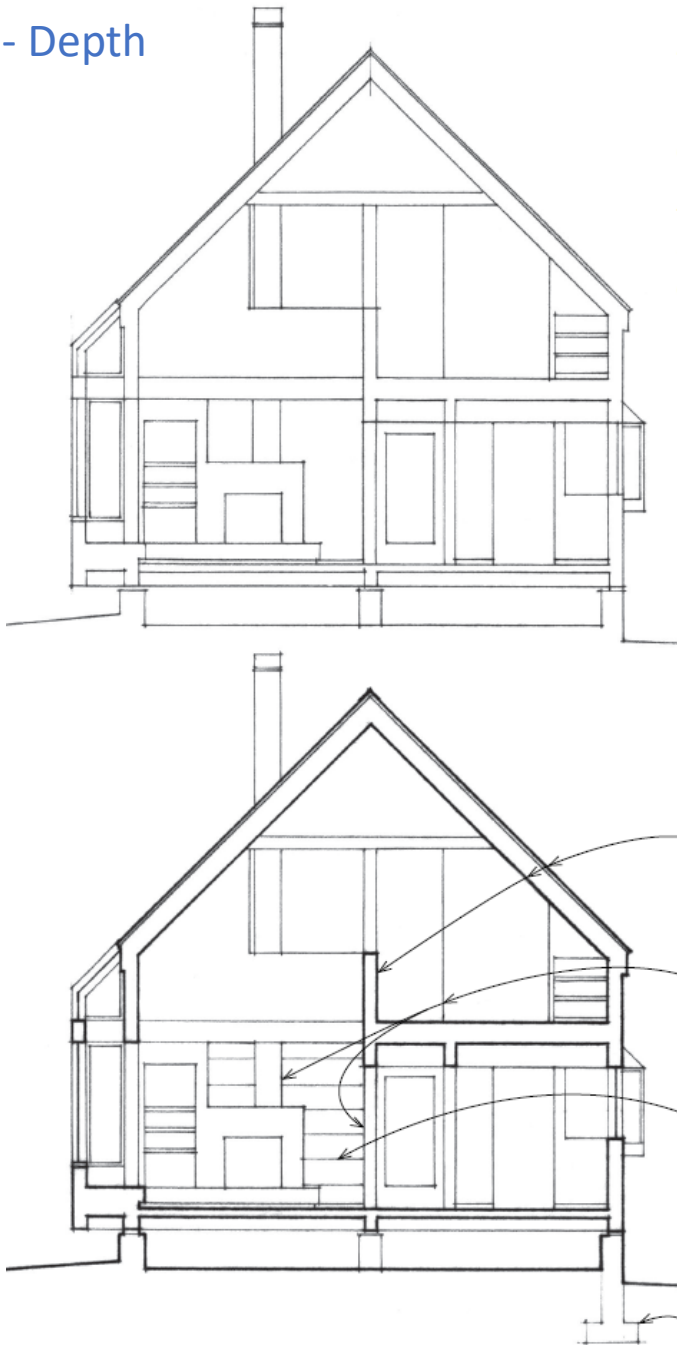
- **Texture Perspective:** The density of the texture of a surface gradually increases as it recedes into the distance. The graphic technique for depicting the visual phenomenon of texture perspective involves gradually diminishing the size and spacing of the graphic elements used to portray a surface texture or pattern, whether they be dots, lines, or tonal shapes. Proceed from identifying units in the foreground to delineating a textured pattern in the middleground and finally to rendering a tonal value in the background.



- **Light and Shade:** Any abrupt shift in brightness stimulates the perception of a spatial edge or profile separated from a background surface by some intervening space. This depth cue implies the existence of overlapping shapes and the use of contrasting tonal values in a drawing. See Chapter 7 for more information on the use of tonal values in architectural graphics.



Conventions - Depth



CAD Packages can assist in demonstrating spatial depth through hatching.

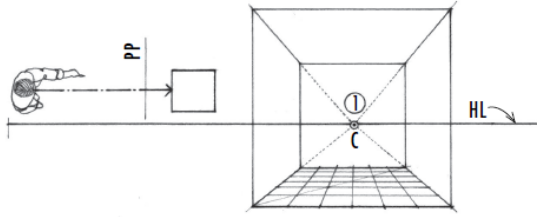
Other Drawing Types

TYPES OF PERSPECTIVE

In any rectilinear object, such as a cube, each of the three principal sets of parallel lines has its own vanishing point. Based on these three major sets of lines, there are three types of linear perspective: one-, two-, and three-point perspectives. What distinguishes each type is simply the observer's angle of view relative to the subject. The subject does not change, only our view of it, but the change of view affects how the sets of parallel lines appear to converge in linear perspective.

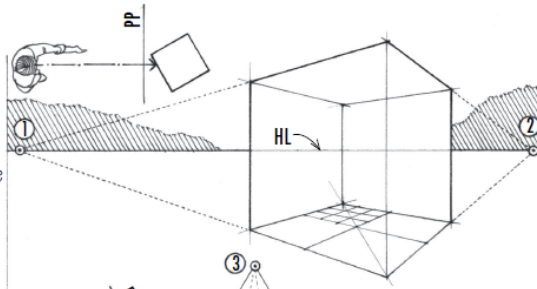
One-Point Perspective

If we view a cube with our central axis of vision (CAV) perpendicular to one of its faces, all of the cube's vertical lines are parallel with the picture plane (PP) and remain vertical. The horizontal lines that are parallel with PP and perpendicular to CAV also remain horizontal. The lines that are parallel with CAV, however, will appear to converge at the center of vision (C). This is the one point referred to in one-point perspective.



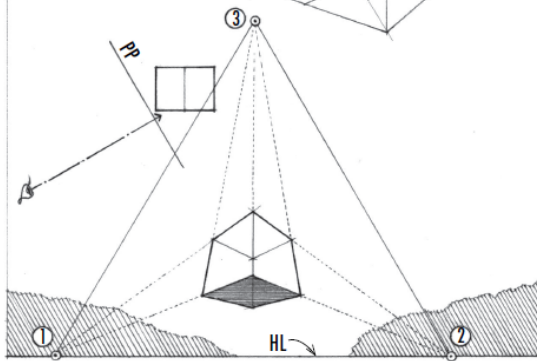
Two-Point Perspective

If we shift our point of view so that we view the same cube obliquely, but keep our central axis of vision (CAV) horizontal, then the cube's vertical lines will remain vertical. The two sets of horizontal lines, however, are now oblique to the picture plane (PP) and will appear to converge, one set to the left and the other to the right. These are the two points referred to in two-point perspective.

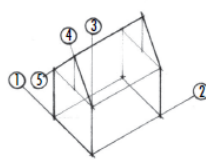


Three-Point Perspective

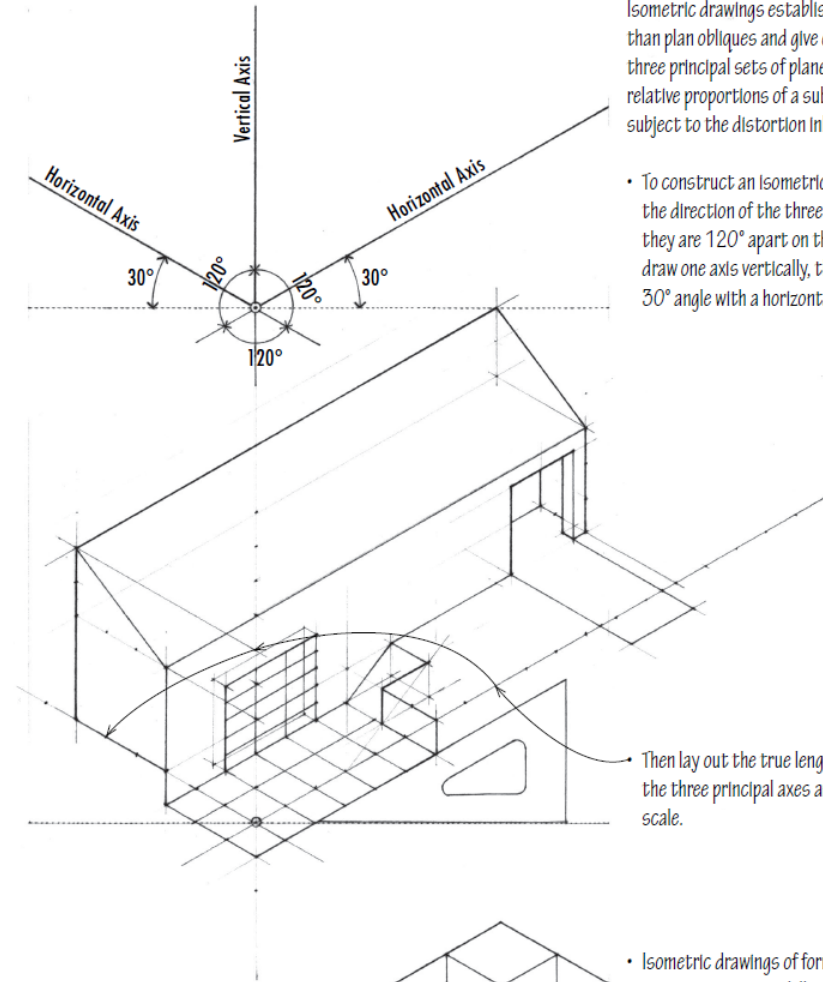
If we lift one corner of the cube off the ground plane (GP), or if we tilt our central axis of vision (CAV) to look down or up at the cube, then all three sets of parallel lines will be oblique to the picture plane (PP) and will appear to converge at three different vanishing points. These are the three points referred to in three-point perspective.



Note that each type of perspective does not imply that there are only one, two, or three vanishing points in a perspective. The actual number of vanishing points will depend on our point of view and how many sets of parallel lines there are in the subject being viewed. For example, if we look at a simple gable-roofed form, we can see that there are potentially five vanishing points, since we have one set of vertical lines, two sets of horizontal lines, and two sets of inclined lines.



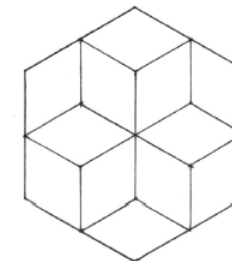
ISOMETRIC DRAWINGS



Isometric drawings establish a lower angle of view than plan obliques and give equal emphasis to the three principal sets of planes. They preserve the relative proportions of a subject or scene and are not subject to the distortion inherent in oblique views.

- To construct an isometric drawing, first establish the direction of the three principal axes. Because they are 120° apart on the picture plane, if we draw one axis vertically, the other two axes make a 30° angle with a horizontal on the drawing surface.

Then lay out the true lengths of all lines parallel to the three principal axes and draw them to the same scale.



- Isometric drawings of forms based on the square can create an optical illusion and be subject to multiple interpretations. This ambiguity results from the alignment of lines in the foreground with those in the background. In such cases, a plan oblique might be a better choice.

CAD packages can assist in preparing views through snap grids and dynamic 3D modelling.

Typical CAD packages



AUTODESK
AUTOCAD
2020



VECTORWORKS®
A NEMETSCHEK COMPANY

GRAPHISOFT®
ARCHICAD



Rhinoceros®



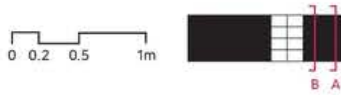
AUTODESK
CIVIL3D



SketchUp

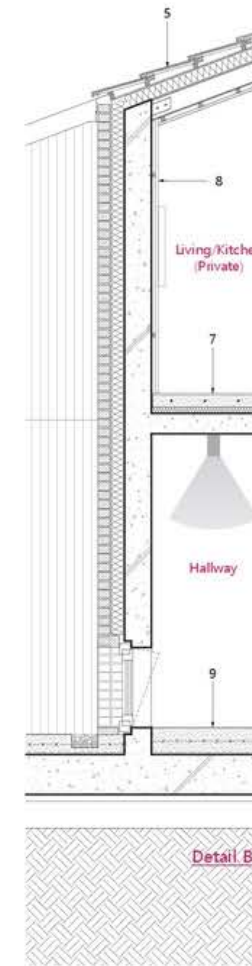
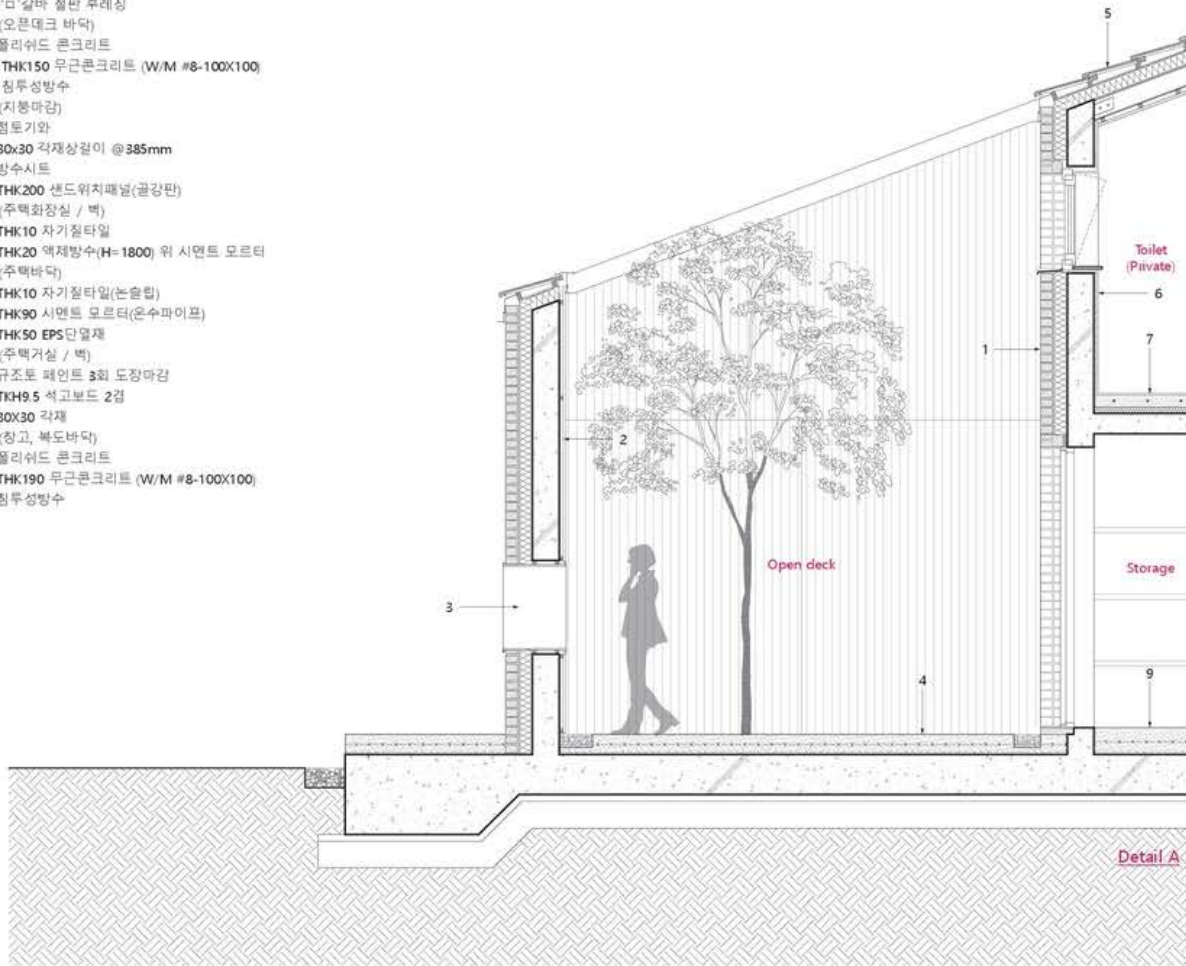


AUTODESK®
REVIT®



detail A_B

- 1 (외장재)
57X90X230 전벽돌 0.5B쌓기
THK120 단열재
- 2 (오픈데크_벽)
열차우목재 마감
THK9.5 합판 1겹
30X30 각파이프 @600
- 3 (마감마감)
플라스틱
·갈바 철판 후레싱
- 4 (오픈데크 바닥)
폴리우드 콘크리트
THK150 무근콘크리트 (W/M #8-100X100)
침투성방수
- 5 (지붕마감)
점토기와
30x30 각재상철이 @385mm
방수시트
THK200 샌드위치패널(골강판)
- 6 (주벽화장실 / 벽)
THK10 자기질타일
THK20 액체방수(H=1800) 위 시멘트 모르타
- 7 (주벽바닥)
THK10 자기질타일(눈솔림)
THK90 시멘트 모르타(운수파이프)
THK50 EPS단열재
- 8 (주벽거실 / 벽)
규조토 페인트 3회 도장마감
THK9.5 석고보드 2겹
30X30 각재
- 9 (창고, 복도바닥)
폴리우드 콘크리트
THK190 무근콘크리트 (W/M #8-100X100)
침투성방수



Drawings prepared in the Construction Industry

Must:

- Convey a message
- Read with understanding
- Demonstrate Knowledge
- Convey Ideas
- Explain a Narrative / Story

Industry conventions assist in the legibility of drawn information.

Is this enough?

How can we improve the way
we communicate?

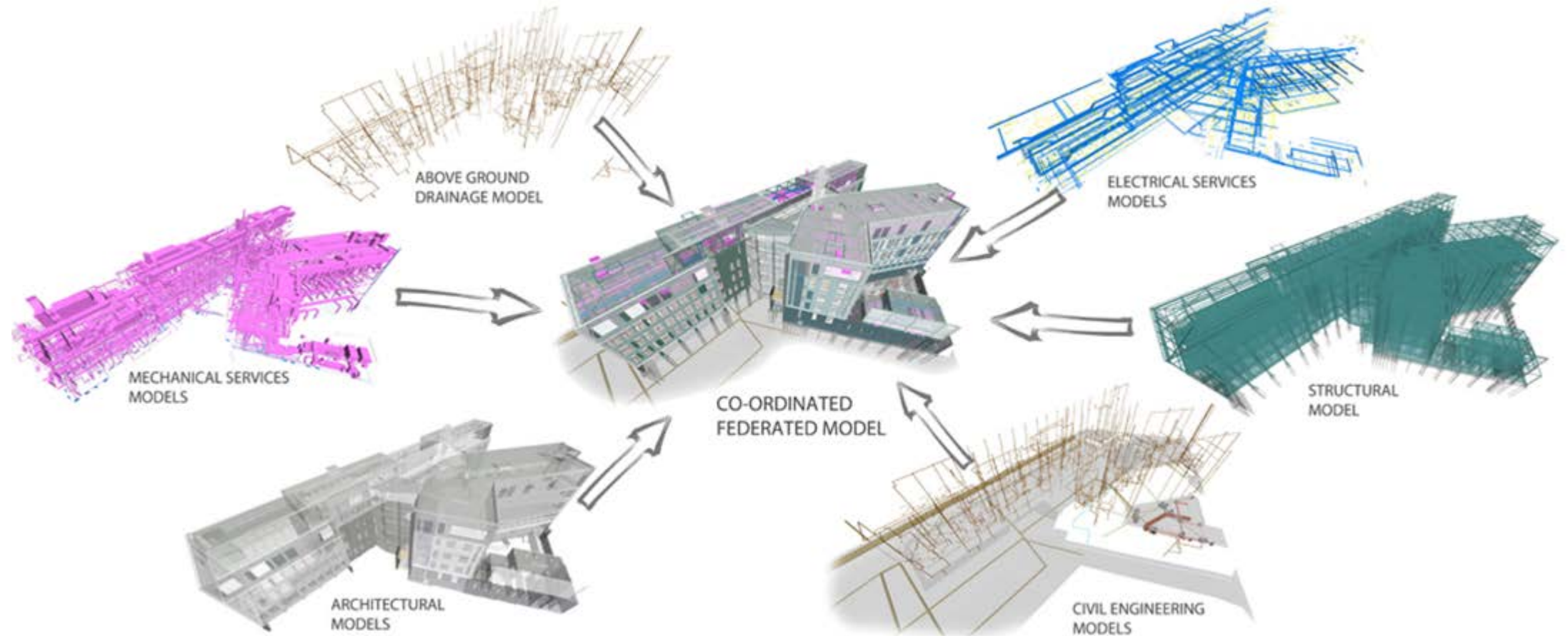
BIM?

What is your understanding of BIM?

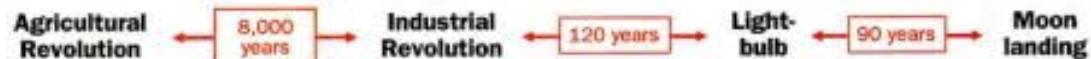


BIM is a Process NOT Software

An Introduction to BIM



1 The accelerating pace of change ...



2 ... and exponential growth in computing power ...

Computer technology, shown here climbing dramatically by powers of 10, is now progressing more each hour than it did in its entire first 90 years

COMPUTER RANKINGS

By calculations per second per \$1,000



Analytical engine
Never fully built, Charles Babbage's invention was designed to solve computational and logical problems



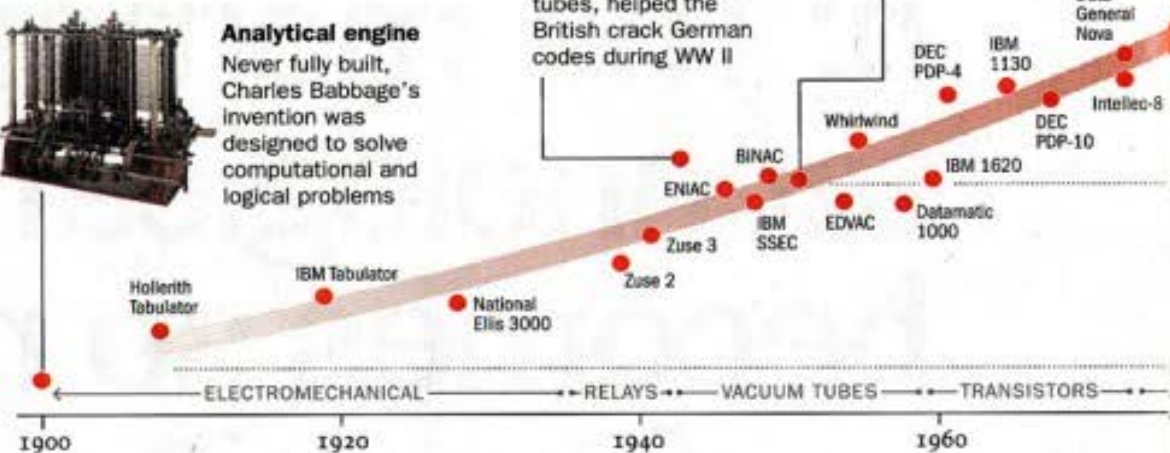
Colossus

The electronic computer, with 1,500 vacuum tubes, helped the British crack German codes during WW II



UNIVAC I

The first commercially marketed computer, used to tabulate the U.S. Census, occupied 943 cu. ft.



3 ... will lead to the Singularity



Apple II

At a price of \$1,298, the compact machine was one of the first massively popular personal computers



Power Mac G4

The first personal computer to deliver more than 1 billion floating-point operations per second

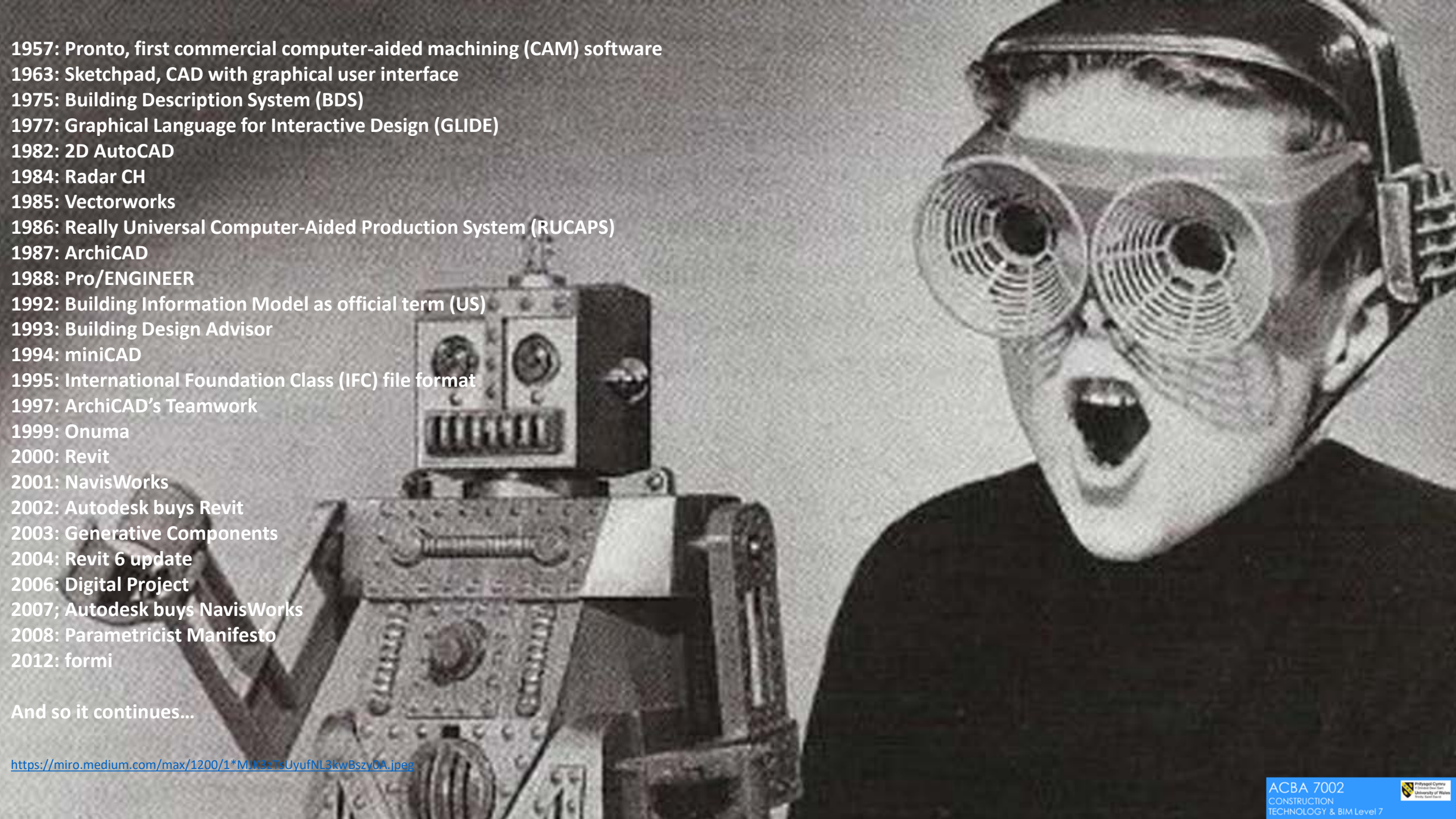
2045
Surpasses brainpower equivalent to that of all human brains combined

Surpasses brainpower of human in 2023



Surpasses brainpower of mouse in 2015





1957: Pronto, first commercial computer-aided machining (CAM) software
1963: Sketchpad, CAD with graphical user interface
1975: Building Description System (BDS)
1977: Graphical Language for Interactive Design (GLIDE)
1982: 2D AutoCAD
1984: Radar CH
1985: Vectorworks
1986: Really Universal Computer-Aided Production System (RUCAPS)
1987: ArchiCAD
1988: Pro/ENGINEER
1992: Building Information Model as official term (US)
1993: Building Design Advisor
1994: miniCAD
1995: International Foundation Class (IFC) file format
1997: ArchiCAD's Teamwork
1999: Onuma
2000: Revit
2001: NavisWorks
2002: Autodesk buys Revit
2003: Generative Components
2004: Revit 6 update
2006: Digital Project
2007; Autodesk buys NavisWorks
2008: Parametricist Manifesto
2012: formi

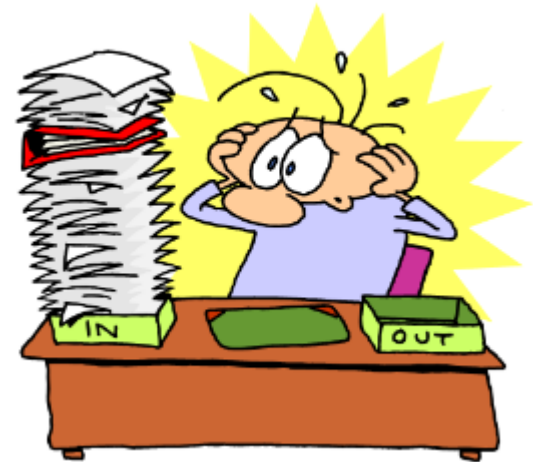
And so it continues...

https://miro.medium.com/max/1200/1*MW3zTsUyufNL3kwBszy0A.jpeg

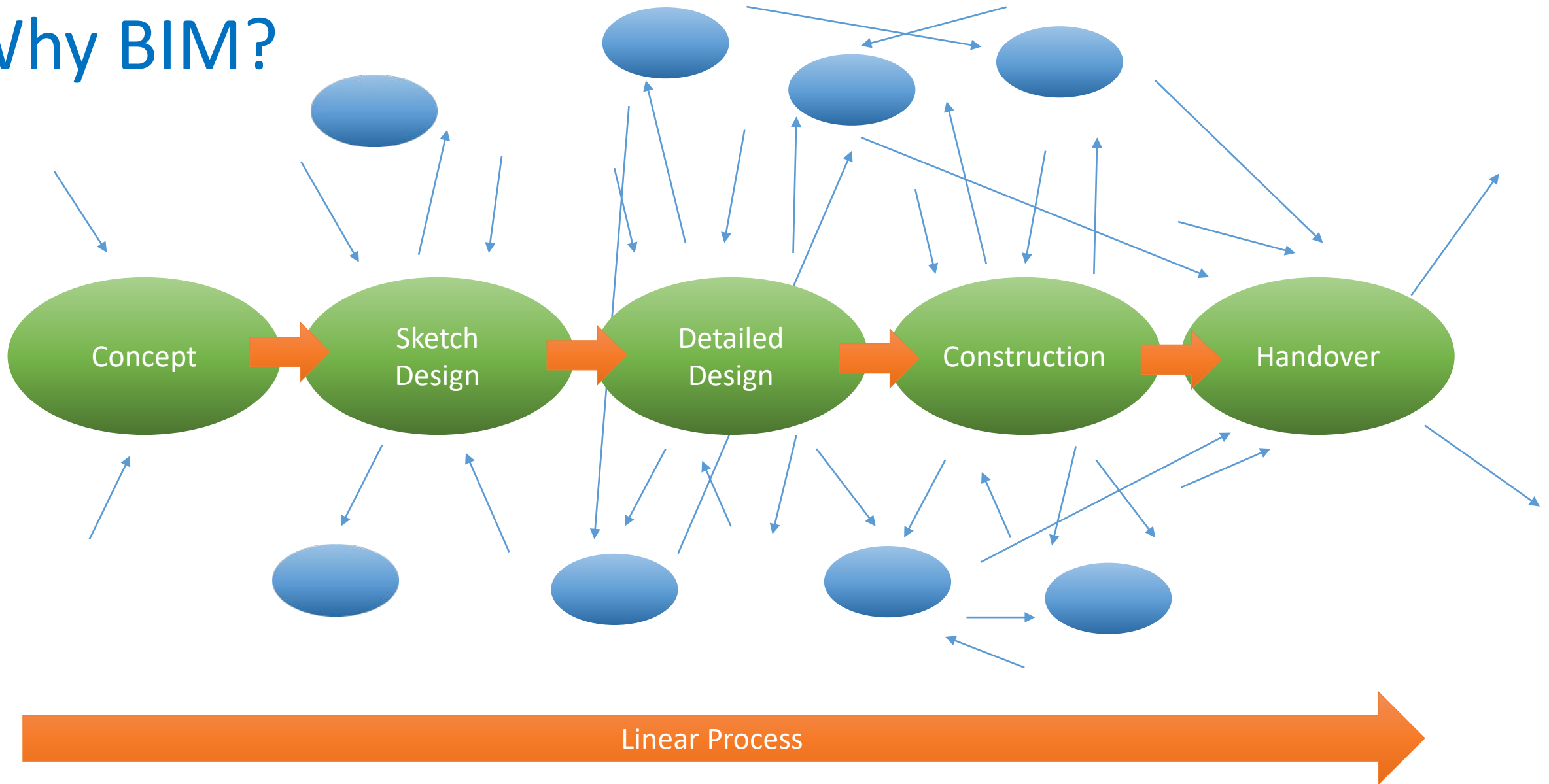
Building Information Modelling

What it really means is a PROCESS of.....

Better Information Management



Why BIM?



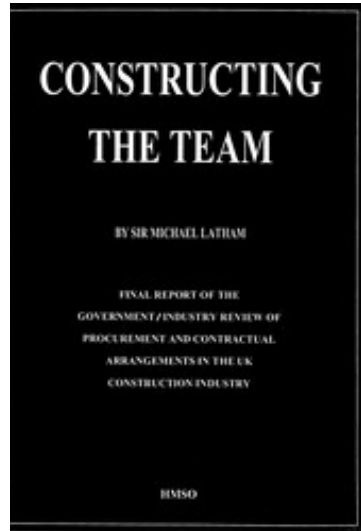
Why BIM?



Origins in UK



Latham
Report



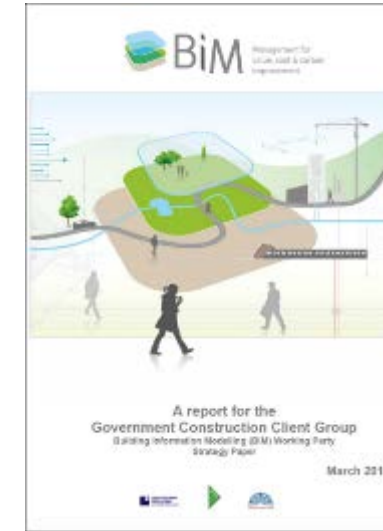
Egan Report

Accelerating
Change



Never
Waste A
Good Crisis

BIS BIM
Strategy



Government
Construction
Strategy

1994

1998

2002

2009

2011

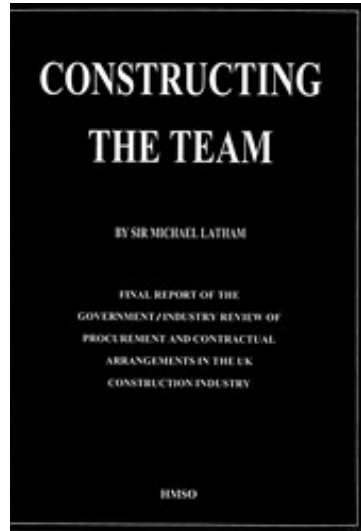
2011

Sir Michael **Latham** described as 'ineffective', 'adversarial', 'fragmented' and 'incapable of delivering for its customers'.

Origins in UK



Latham
Report



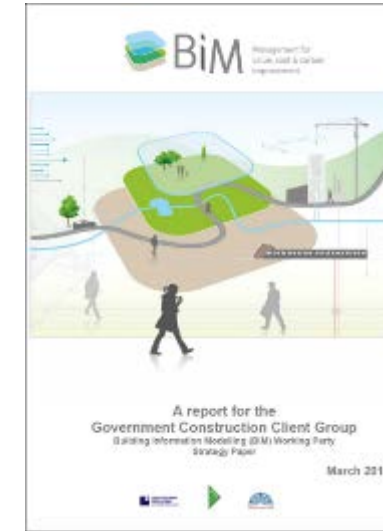
Egan Report

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Never
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Good Crisis

BIS BIM
Strategy



Government
Construction
Strategy

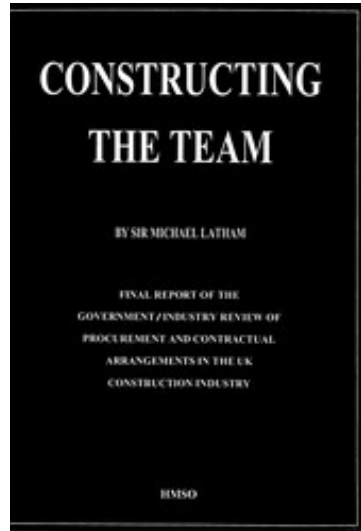


Rethinking Construction through 'demonstration projects', and regional 'cluster groups' or best practice clubs.

Origins in UK



Latham
Report



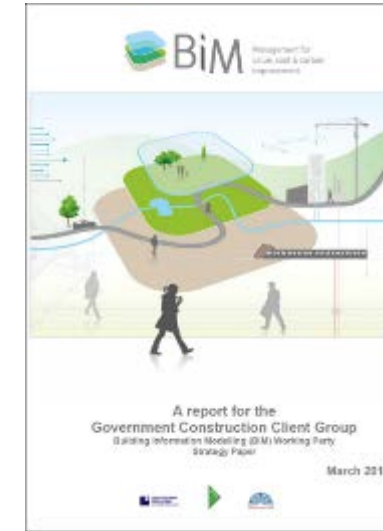
Egan Report

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Change



Never
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BIS BIM
Strategy



Government
Construction
Strategy

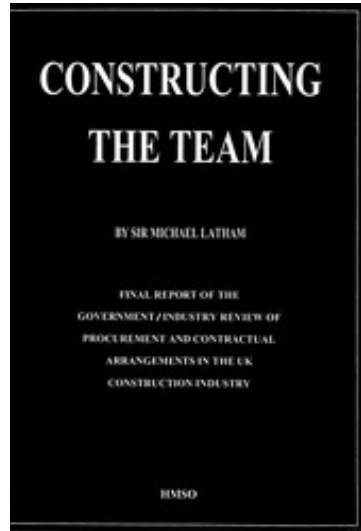


By the end of 2004 20% of construction projects by value should be undertaken by integrated teams and supply chains; and, 20% of client activity by value should embrace the principles of the Clients' Charter.

Origins in UK



Latham
Report



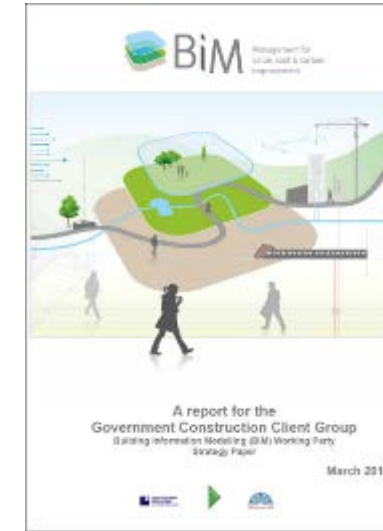
Egan Report

Accelerating
Change



Never
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Good Crisis

BIS BIM
Strategy



Government
Construction
Strategy

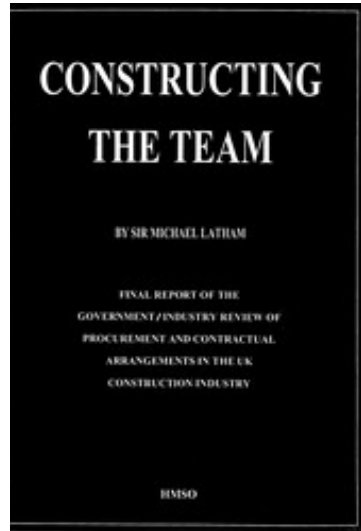


Wolstenholme stated that some progress had been made against Egan's targets, but that the industry's performance fell considerably short in several categories and that compliance with some of Egan's targets was only accomplished in a superficial manner.

Origins in UK



Latham
Report



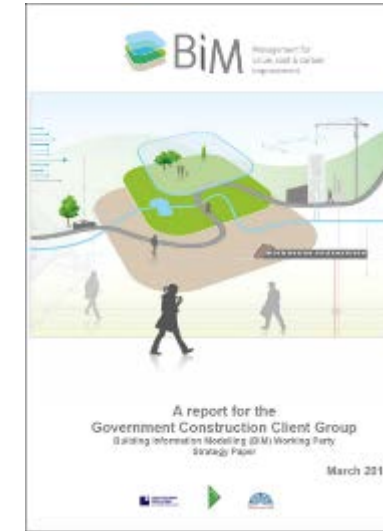
Egan Report

Accelerating
Change



Never
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Good Crisis

BIS BIM
Strategy



Government
Construction
Strategy

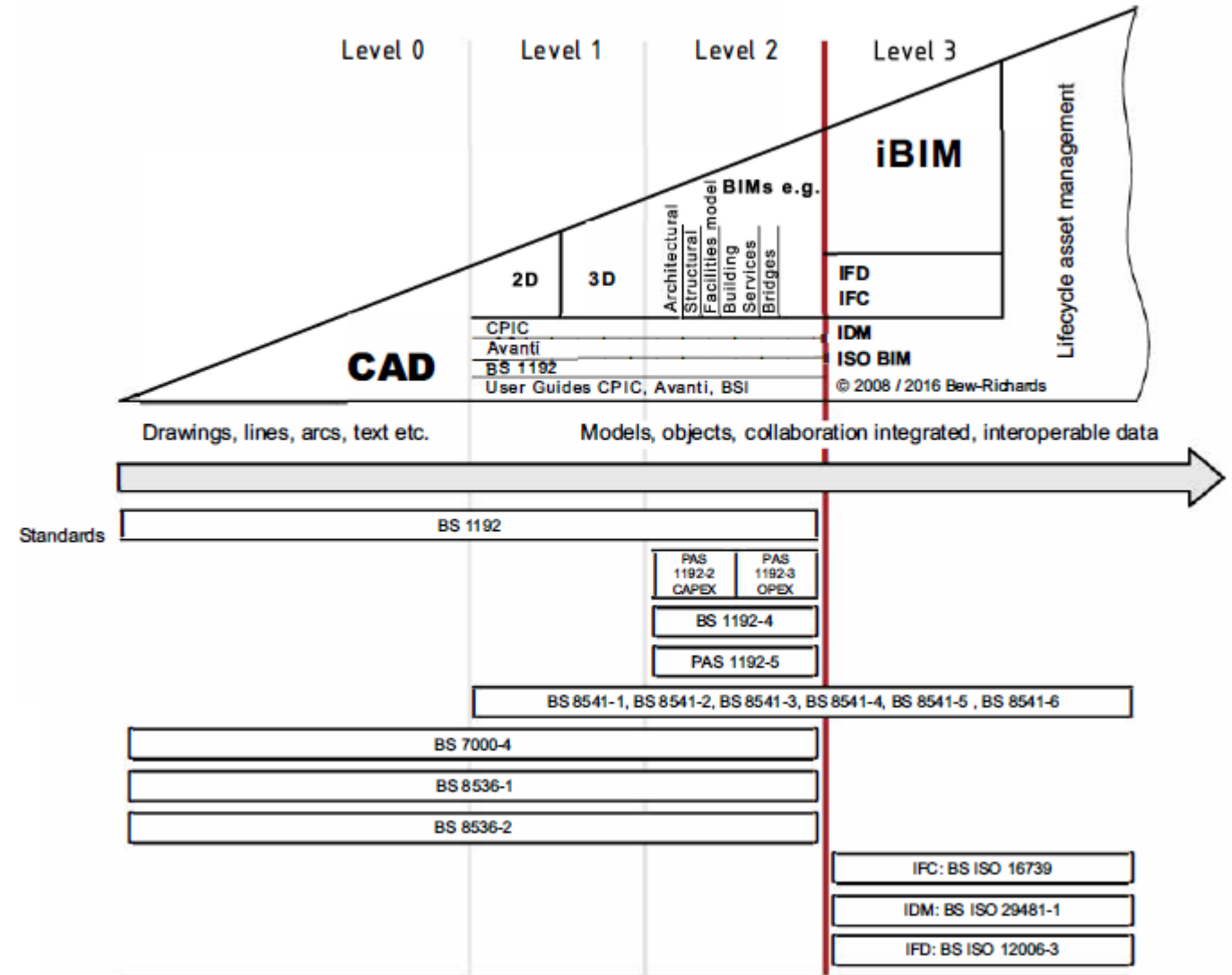


The BIM working group looked at the construction and post-occupancy benefits of BIM for use in the UK building and infrastructure markets. Highlighting recommendations of the working group for a strategy to deliver a structured Government/Sector capability to increase BIM take-up over a five year horizon.

Maturity



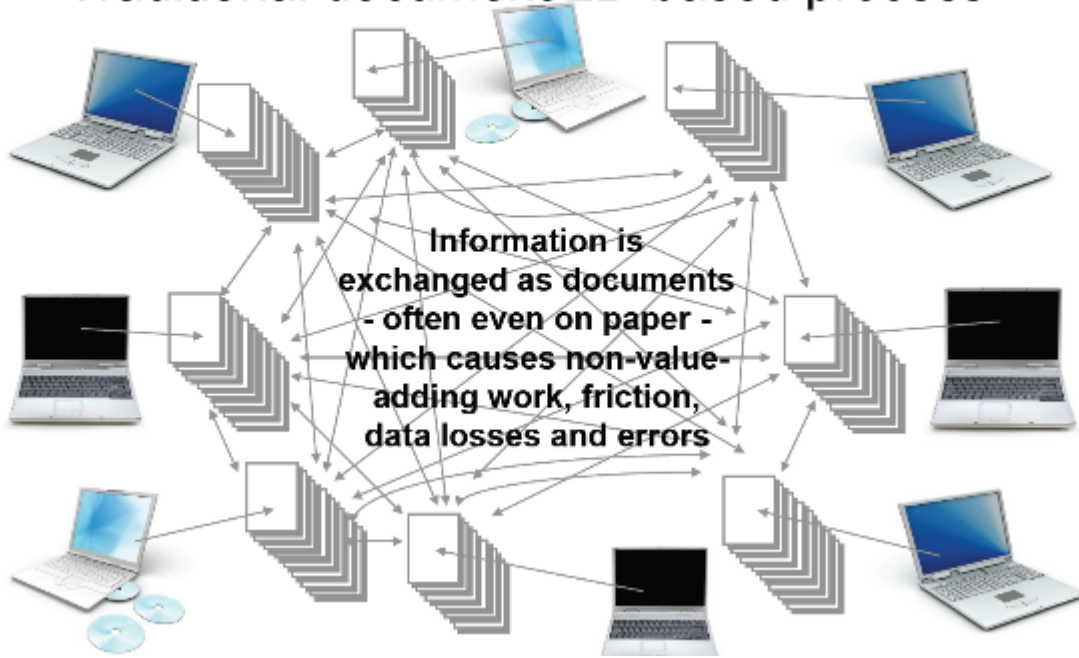
The Construction Strategy aimed at reducing the cost of public sector assets by up to 20% by 2016. To achieve this strategy, the government mandated that construction suppliers tendering for centrally-procured government projects to be working at BIM Level 2.



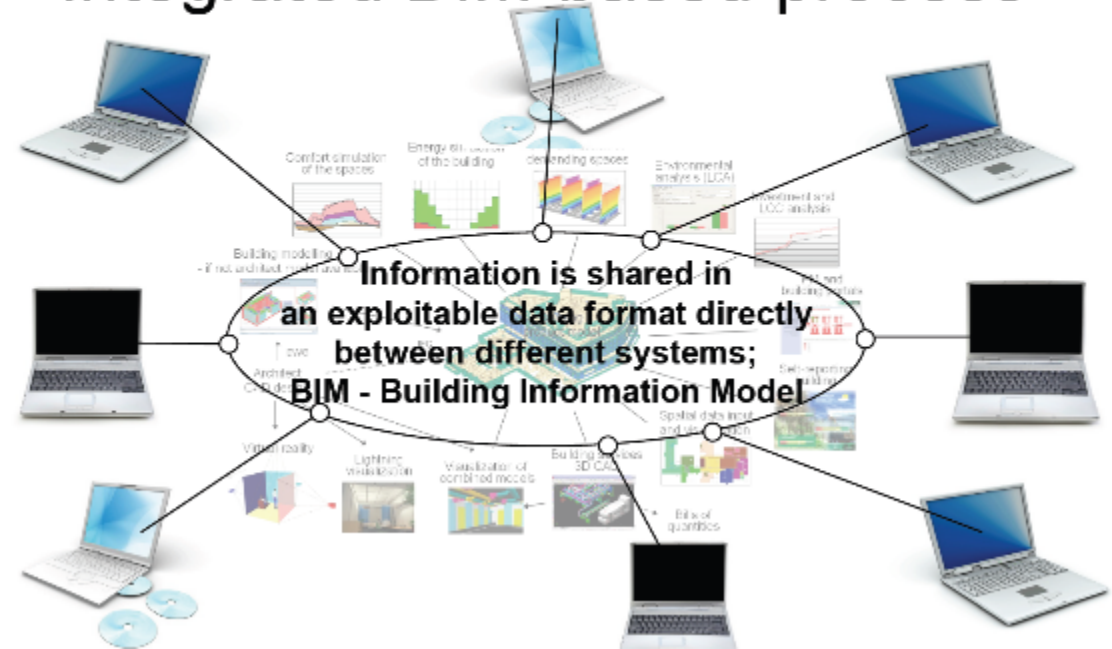
Bew Richards Wedge

Benefits

Traditional document/2D-based process



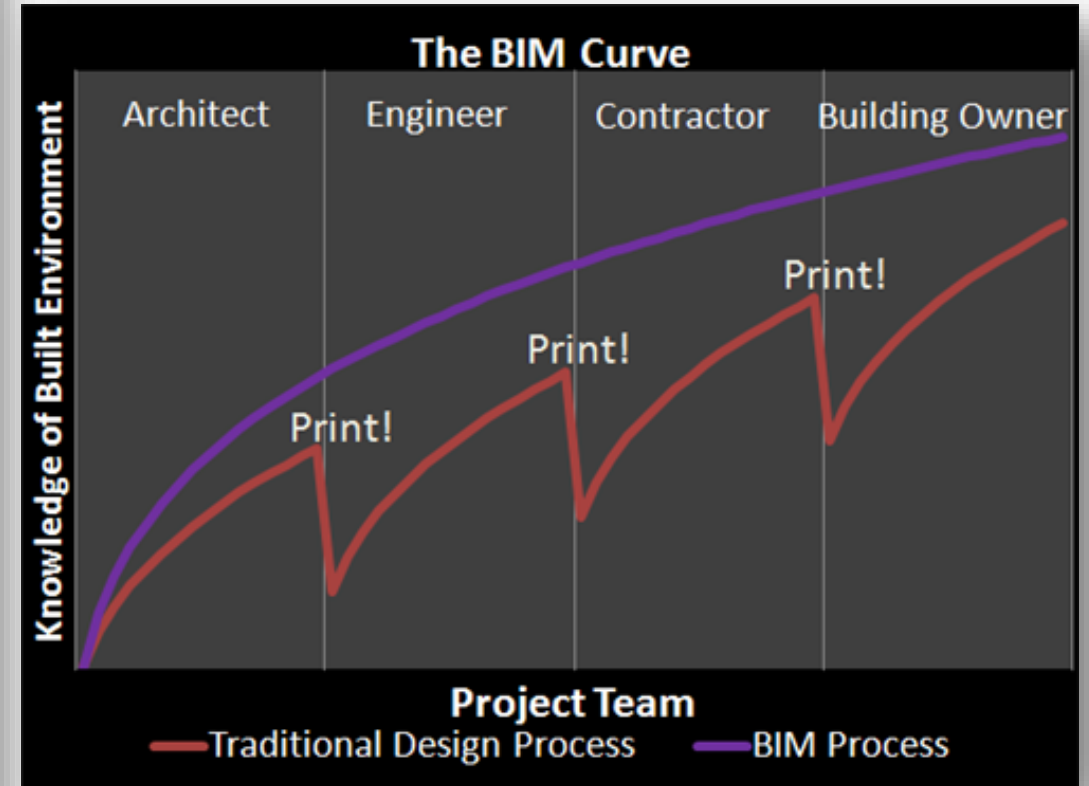
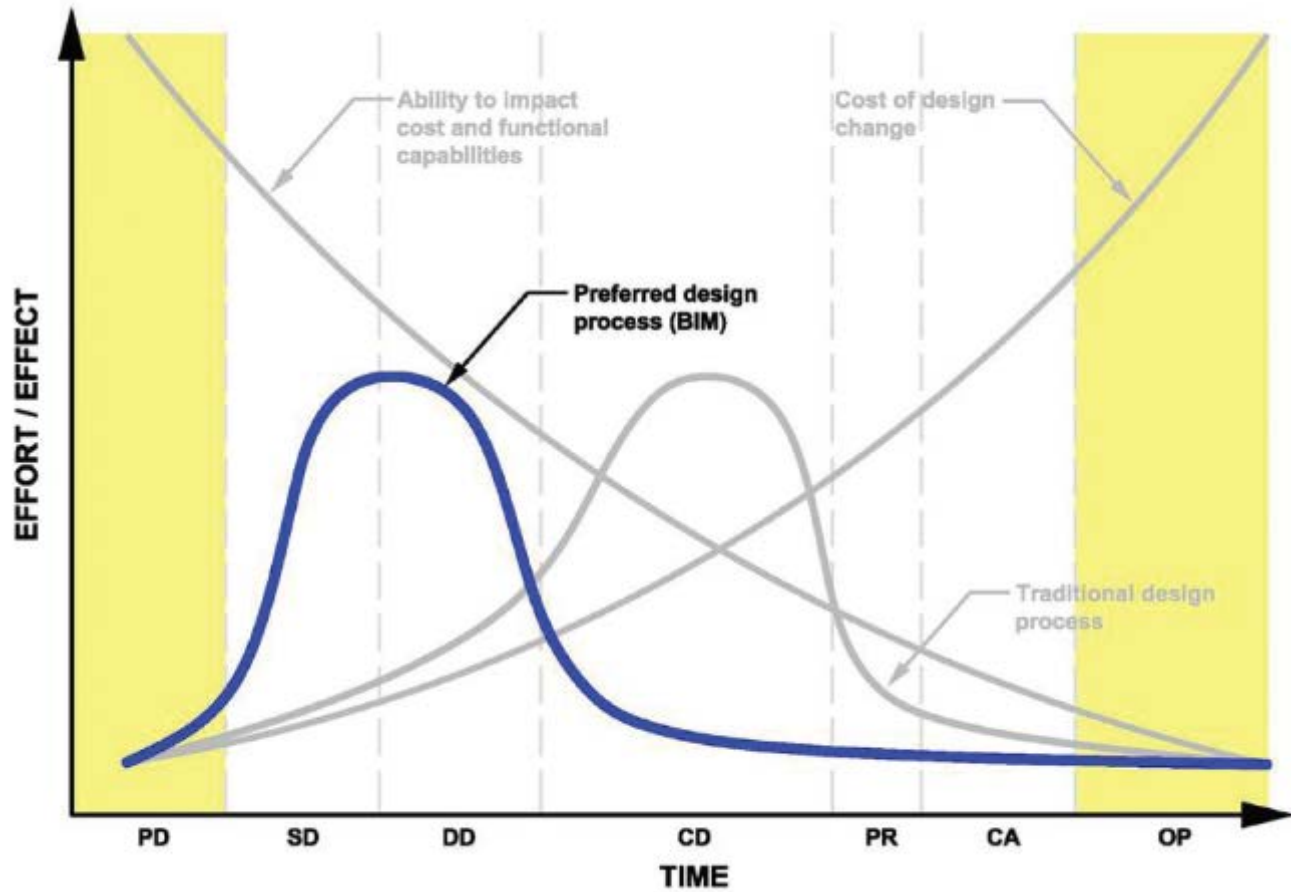
Integrated BIM-based process



BIM Advanced, CE Wales, 16/01/2013

Design, Construct, Operate and Maintain. **One Truth!**

Change Management



Change Management



RIBA Plan of Work 2020

Stage Boundaries:

Stages 0-4 will generally be undertaken one after the other.
Stages 4 and 5 will overlap in the Project Programme for most projects.

Stage 5 commences when the contractor takes possession of the site and finishes at Practical Completion.

Stage 6 starts with the handover of the building to the client immediately after Practical Completion and finishes at the end of the Defects Liability Period.
Stage 7 starts concurrently with Stage 6 and lasts for the life of the building.

Planning Note:

Planning Applications are generally submitted at the end of Stage 3 and should only be submitted earlier when the threshold of information required has been met. If a Planning Application is made during Stage 3, a mid-stage gateway should be determined and it should be clear to the project team which tasks and deliverables will be required.
See Overview guidance.

Procurement:

The RIBA Plan of Work is procurement neutral – See Overview guidance for a detailed description of how each stage might be adjusted to accommodate the requirements of the Procurement Strategy.

ER Employer's Requirements
CP Contractor's Proposals

The RIBA Plan of Work organises the process of briefing, designing, delivering, maintaining, operating and using a building into eight stages. It is a framework for all disciplines on construction projects and should be used solely as guidance for the preparation of detailed professional services and building contracts.

	0	1	2	3	4	5	6	7
	Strategic Definition	Preparation and Briefing	Concept Design	Spatial Coordination	Technical Design	Manufacturing and Construction	Handover	Use
	Projects span from Stage 1 to Stage 6; the outcome of Stage 0 may be the decision to initiate a project and Stage 7 covers the ongoing use of the building.							
Stage Outcome at the end of the stage	The best means of achieving the Client Requirements confirmed If the outcome determines that a building is the best means of achieving the Client Requirements , the client proceeds to Stage 1	Project Brief approved by the client and confirmed that it can be accommodated on the site The brief remains 'live' during Stage 2 and is derogated in response to the Architectural Concept	Architectural Concept approved by the client and aligned to the Project Brief The brief remains 'live' during Stage 2 and is derogated in response to the Architectural Concept	Architectural and engineering information Spatially Coordinated	All design information required to manufacture and construct the project completed Stage 4 will overlap with Stage 5 on most projects	Manufacturing, construction and Commissioning completed There is no design work in Stage 5 other than responding to Site Queries	Building handed over, Aftercare initiated and Building Contract concluded	Building used, operated and maintained efficiently Stage 7 starts concurrently with Stage 6 and lasts for the life of the building
Core Tasks during the stage	Prepare Client Requirements Develop Business Case for feasible options including review of Project Risks and Project Budget Ratify option that best delivers Client Requirements Review Feedback from previous projects Undertake Site Appraisals	Prepare Project Brief including Project Outcomes and Sustainability Outcomes , Quality Aspirations and Spatial Requirements Undertake Feasibility Studies Agree Project Budget Source Site Information including Site Surveys Prepare Project Programme Prepare Project Execution Plan	Prepare Architectural Concept incorporating Strategic Engineering requirements and aligned to Cost Plan , Project Strategies and Outline Specification Agree Project Brief Derogations Undertake Design Reviews with client and Project Stakeholders Prepare stage Design Programme	Undertake Design Studies , Engineering Analysis and Cost Exercises to test Architectural Concept Coordinated design aligned to updated Cost Plan , Project Strategies and Outline Specification Initiate Change Control Procedures Prepare stage Design Programme	Develop architectural and engineering technical design Prepare and coordinate design team Building Systems information Prepare and integrate specialist subcontractor Building Systems information Prepare stage Design Programme Specialist subcontractor designs are prepared and reviewed during Stage 4	Finalise Site Logistics Manufacture Building Systems and construct building Monitor progress against Construction Programme Inspect Construction Quality Resolve Site Queries as required Undertake Commissioning of building Prepare Building Manual Building handover tasks bridge Stages 5 and 6 as set out in the Plan for Use Strategy	Hand over building in line with Plan for Use Strategy Undertake review of Project Performance Undertake seasonal Commissioning Rectify defects Complete initial Aftercare tasks including light touch Post Occupancy Evaluation	Implement Facilities Management and Asset Management Undertake Post Occupancy Evaluation of building performance in use Verify Project Outcomes including Sustainability Outcomes Adaptation of a building (at the end of its useful life) triggers a new Stage 0
Core Statutory Processes during the stage:	Strategic appraisal of Planning considerations	Source pre-application Planning Advice Initiate collation of health and safety Pre-construction Information	Obtain pre-application Planning Advice Agree route to Building Regulations compliance Option: submit outline Planning Application	Review design against Building Regulations Prepare and submit Planning Application See Planning Note for guidance on submitting a Planning Application earlier than at end of Stage 3	Submit Building Regulations Application Discharge pre-commencement Planning Conditions Prepare Construction Phase Plan Submit form F10 to HSE if applicable	Carry out Construction Phase Plan Comply with Planning Conditions related to construction	Comply with Planning Conditions as required	Comply with Planning Conditions as required
Procurement Route	Traditional Design & Build 1 Stage Design & Build 2 Stage Management Contract Construction Management Contractor-led	Appoint client team	Appoint design team	ER CP Appoint contractor	Tender Appoint contractor ER CP Appoint contractor	CP Appoint contractor		Appoint Facilities Management and Asset Management teams, and strategic advisers as needed
Information Exchanges at the end of the stage	Client Requirements Business Case	Project Brief Feasibility Studies Site Information Project Budget Project Programme Procurement Strategy Responsibility Matrix Information Requirements	Project Brief Derogations Signed off Stage Report Project Strategies Outline Specification Cost Plan	Signed off Stage Report Project Strategies Updated Outline Specification Updated Cost Plan Planning Application	Manufacturing Information Construction Information Final Specifications Residual Project Strategies Building Regulations Application	Building Manual including Health and Safety File and Fire Safety Information Final Certificate Practical Completion certificate including Defects List Asset Information If Verified Construction Information is required, verification tasks must be defined	Feedback on Project Performance Final Certificate Feedback from light touch Post Occupancy Evaluation	Feedback from Post Occupancy Evaluation Updated Building Manual including Health and Safety File and Fire Safety Information as necessary

Core RIBA Plan of Work terms are defined in the RIBA Plan of Work 2020 Overview glossary and set in Bold Type.

Further guidance and detailed stage descriptions are included in the RIBA Plan of Work 2020 Overview.

© RIBA 2020

RIBA Plan of Work 2020 Overview



RIBA Plan of Work

www.ribaplanofwork.com

RIBA Architecture.com

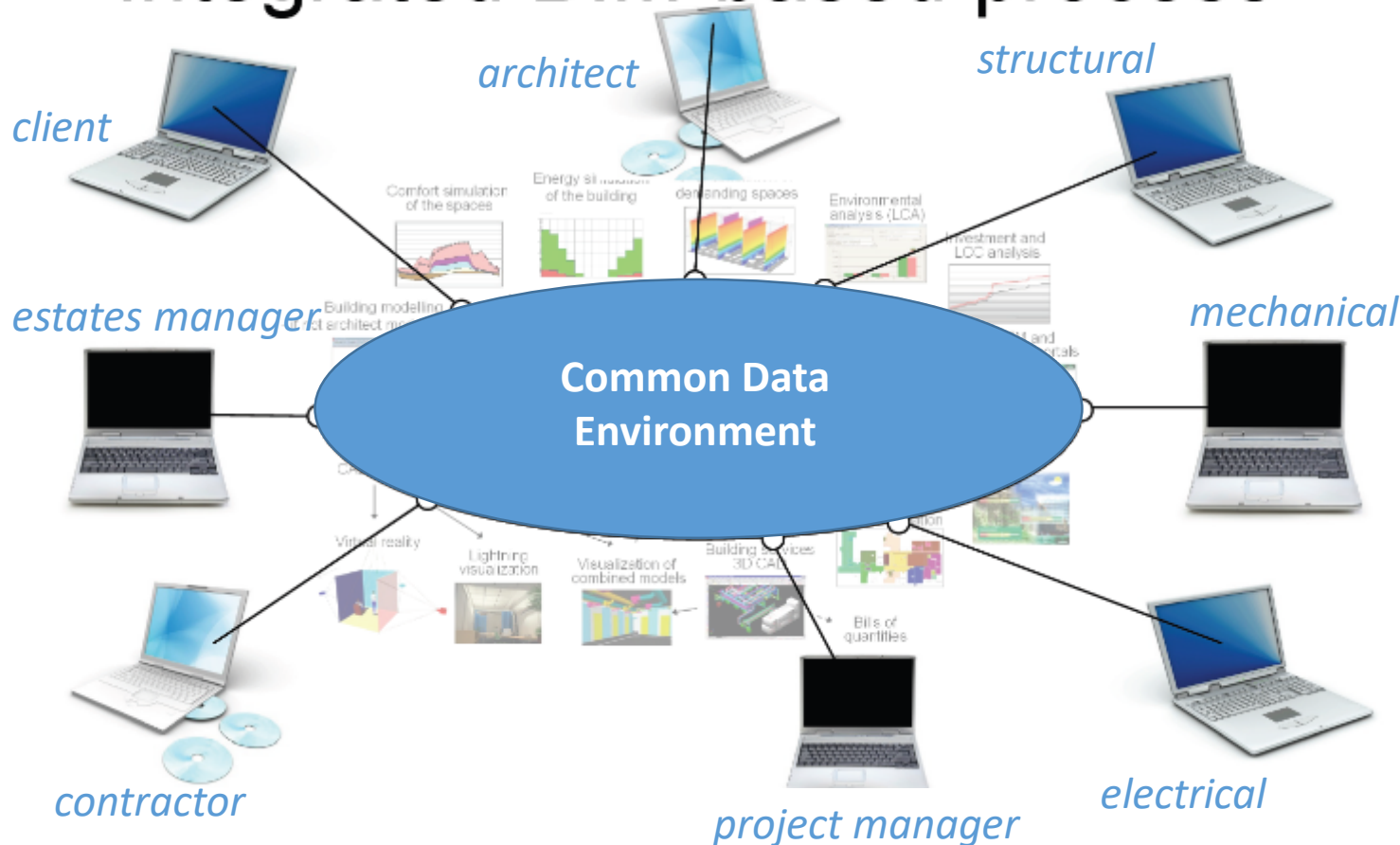
<https://www.architecture.com/-/media/GatherContent/Test-resources-page/Additional-Documents/2020RIBAPlanofWorkoverviewpdf.pdf>

Clash Detection



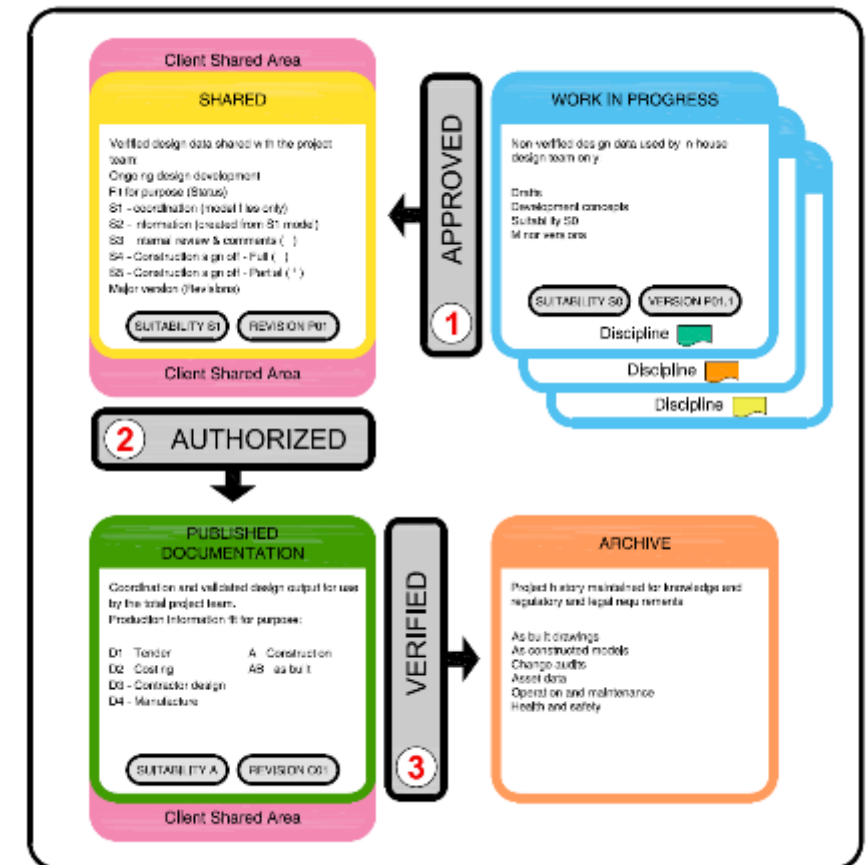
Application

Integrated BIM-based process



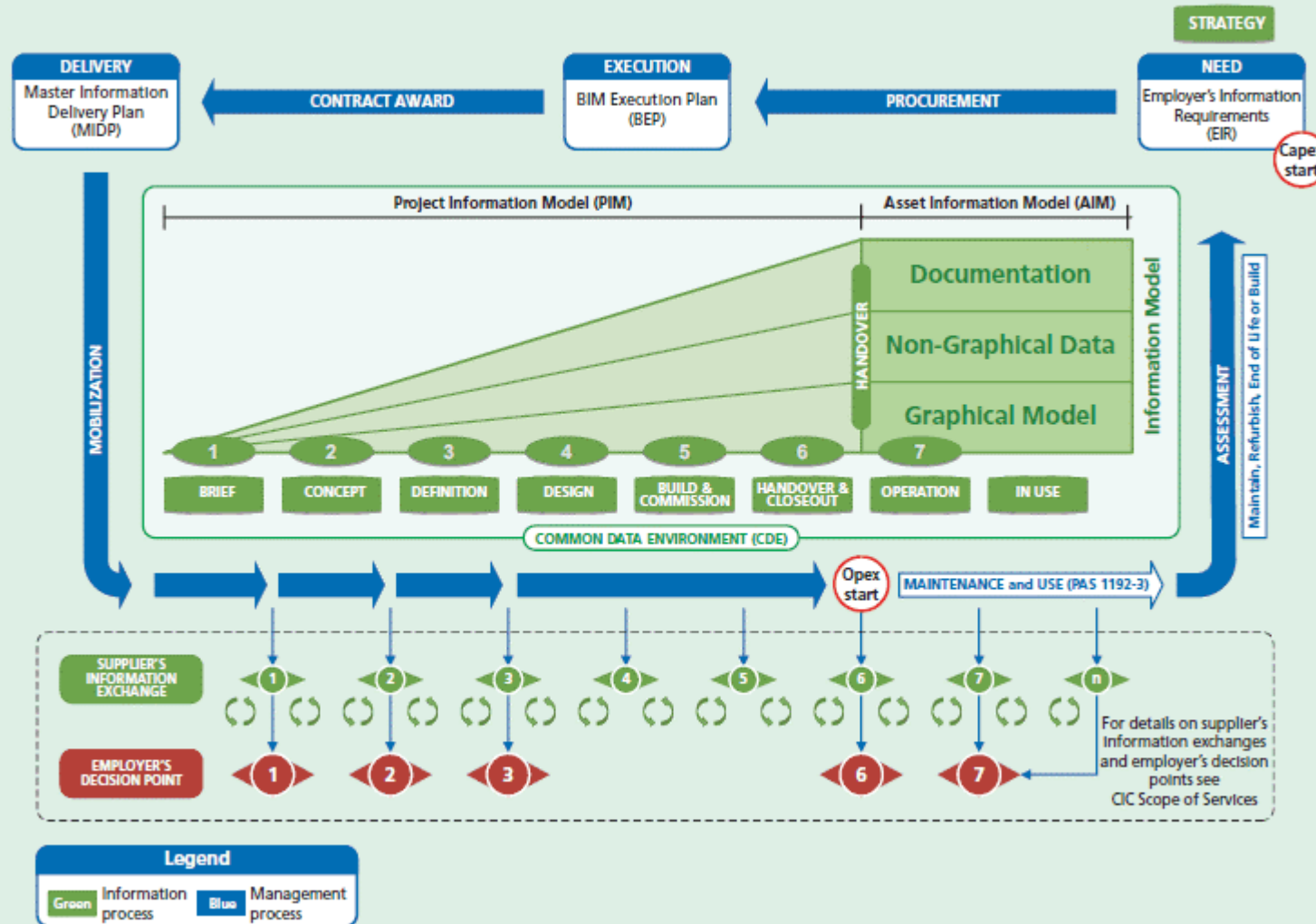
The structured use of a Common Data Environment (CDE) requires strict discipline by all members of a design team in terms of adherence to agreed approaches and procedures, compared with a more traditional approach. The benefits can only be realized with a commitment to operate in a disciplined and consistent manner throughout a project.

PAS 1192-2:2013

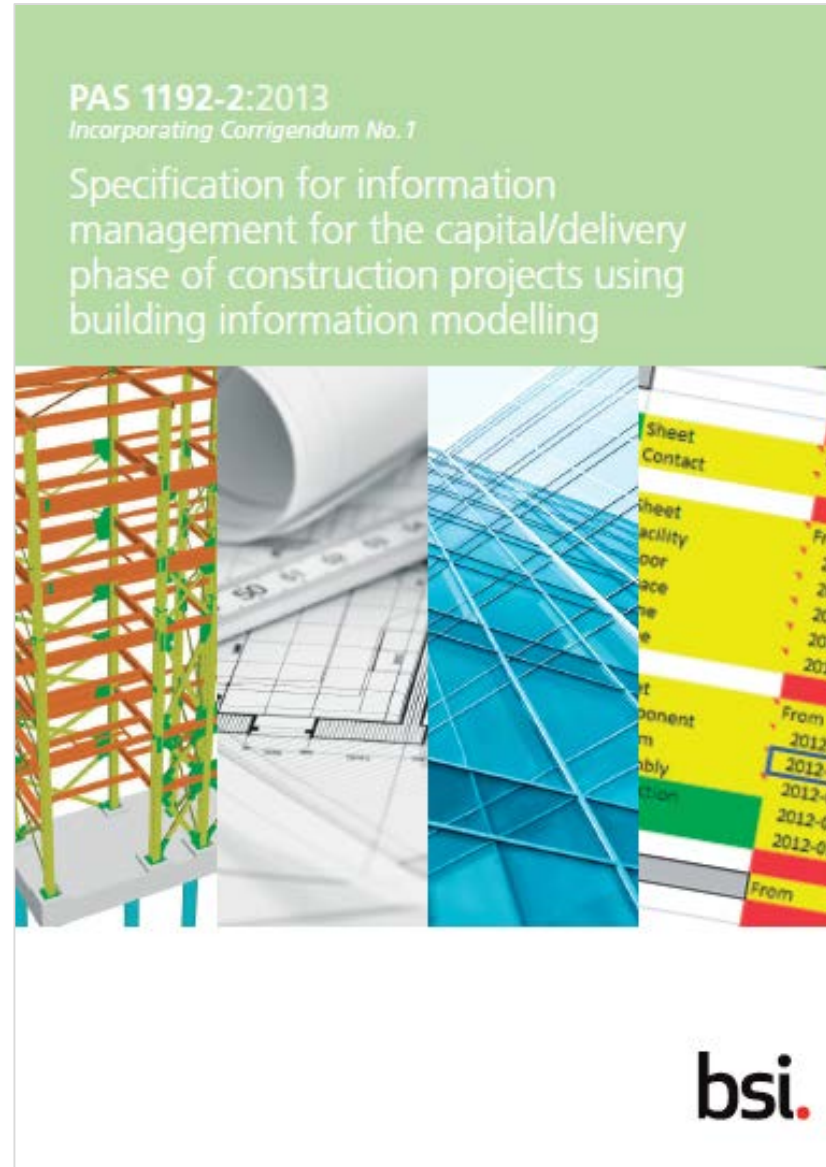
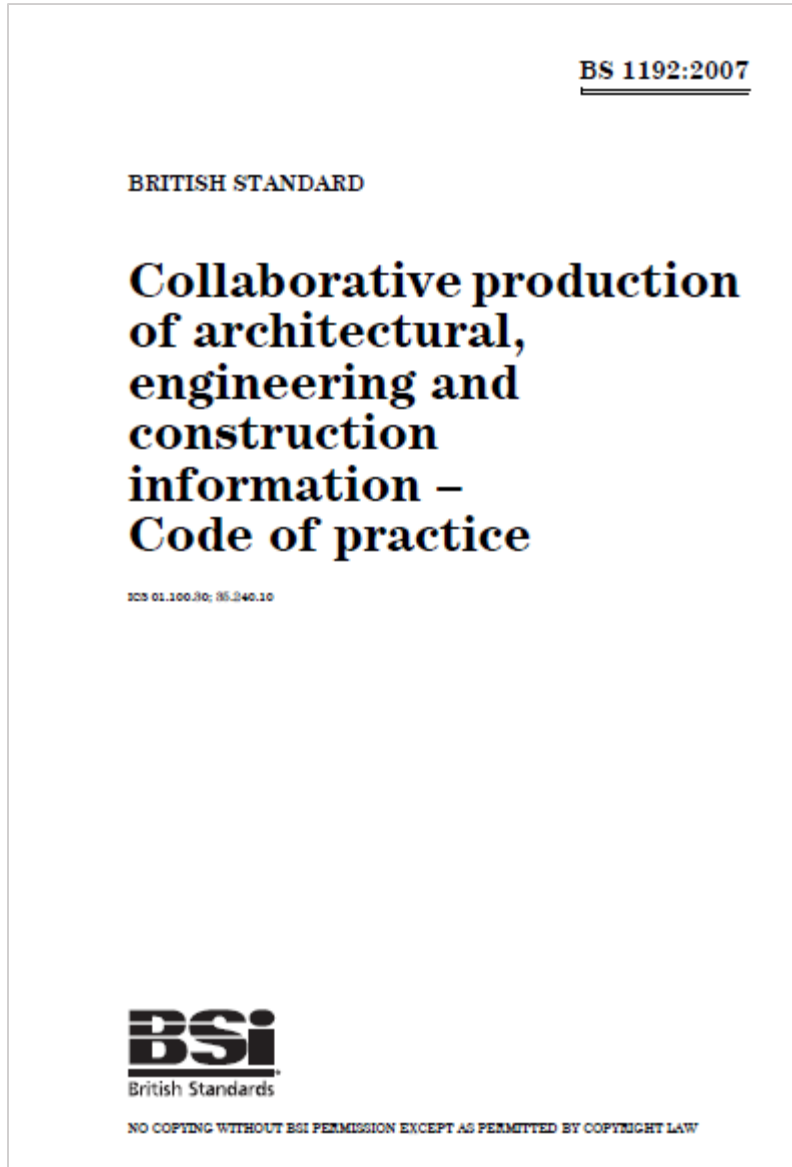


BIM Process Diagram

The information delivery cycle

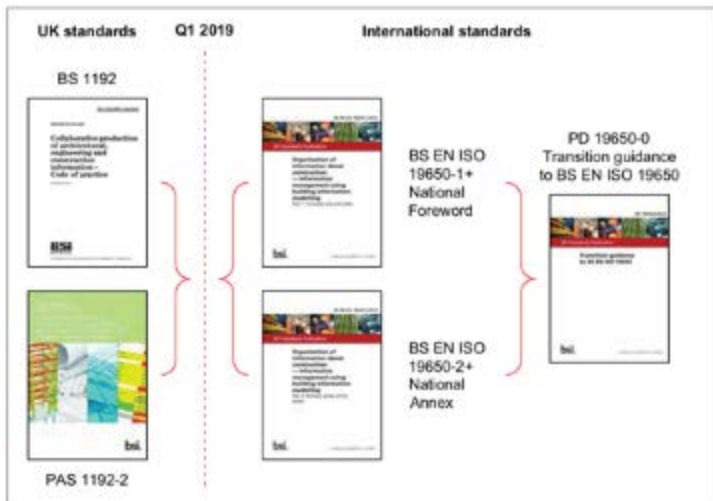


Key Standards



New
Guidance
came into
place
January
2019...

New Standards Q1 2019



BS EN ISO 19650-1:2018



BSI Standards Publication

Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) - Information management using building information modelling

Part 1: Concepts and principles

bsi.

BS EN ISO 19650-2:2018



BSI Standards Publication

Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) - Information management using building information modelling

Part 2: Delivery phase of the assets

bsi.



Introducing the new international standard for BIM, ISO 19650

Embedding digital innovation and
accelerating global adoption

bsi.

...making excellence a habit®



What does the ISO 19650 suite consist of?

BS 1192:2007+A2:2016 on principles, and **PAS 1192-2** on the capital delivery phase are superseded by the following standards which are available on the BSI Shop:

- **BS EN ISO 19650-1:** Organization and digitization of information about buildings and civil engineering works, including building information modelling -- Information management using building information modelling: Concepts and principles
- **BS EN ISO 19650-2:** Organization and digitization of information about buildings and civil engineering works, including building information modelling -- Information management using building information modelling: Delivery phase of the assets

Also available on the BSI Shop the following document is published alongside these standards:

- **PD 19650-0 - UK Transition Guidance**, which will along with the UK National Forewords and National Annex aid implementation of the ISO standards in the UK and within the ISO framework

It's anticipated that **PAS 1192-3** and **PAS 1192-5** (the information management of assets and security-minded standards for BIM) will be superseded by the following standards in 2020:

- **BS EN ISO 19650-3** Organization and digitization of information about buildings and civil engineering works, including building information modelling -- Information management using building information modelling -- Part 3: Operational phase of assets
- **BS EN ISO 19650-5** Organization and digitization of information about buildings and civil engineering works, including building information modelling -- Information management using building information modelling -- Part 5: Security-minded approach to information management

	UK Standards		International Standards	
2019	BS 1192:2007+A2:2016 PAS 1192-2	⎓	BS EN ISO 19650-1 + National Foreword BS EN ISO 19650-2 + National Annex	PD 19650-0 + Guide to BS EN ISO 19650
2020	PAS 1192-3 PAS 1192-5	➡	BS EN ISO 19650-3 BS EN ISO 19650-5	

Moving from the UK 1192 series to the ISO 19650 series

The good news is that the differences between the ISO standards and the UK standards are not major as the approach to BIM is very similar with the main differences relating to the terms and definitions. This milestone publication creates a fantastic opportunity to achieve even greater improvements in collaboration and customer satisfaction using BIM.

BSI clients currently holding BIM certification or verification, including the BSI Kitemark, will have the opportunity to transition their system to reflect the new ISO. To help you

upgrade we will be producing lots of supporting materials and services including webinars, training courses developed by experts, and informative whitepapers and articles.

If you are new to BIM, there's no better time to take advantage of the benefits this can mean for your organization.

Little Book of BIM

2019 edition

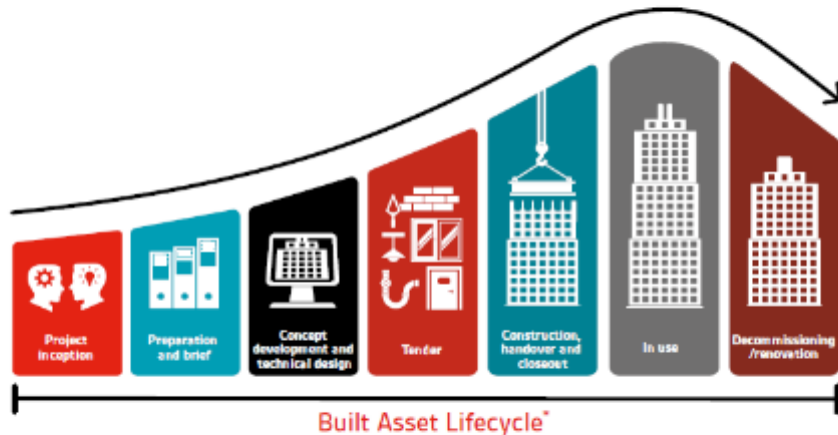
Includes ISO 19650 Standards

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BIM Definition

Building Information Modelling (BIM) is a collaborative way of working underpinned by digital technologies, which allow for more efficient methods of designing, delivering and maintaining physical built assets throughout their entire lifecycle. Greater efficiencies can be realized due to significant pre-planning during the design and construction phases, providing comprehensive information at handover stage.



* This asset lifecycle concept is based on the RIBA Plan of Work 2013

3

Key Standards for BIM

BS EN ISO 19650-1:2018 – Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) – Information management using building information modelling. Concepts and principles. This will supersede BS 1192:2007+A2:2016.

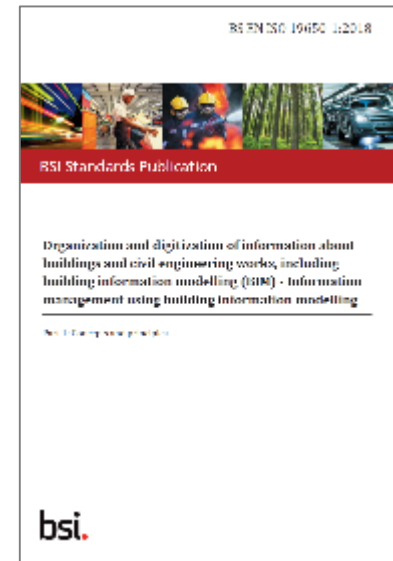
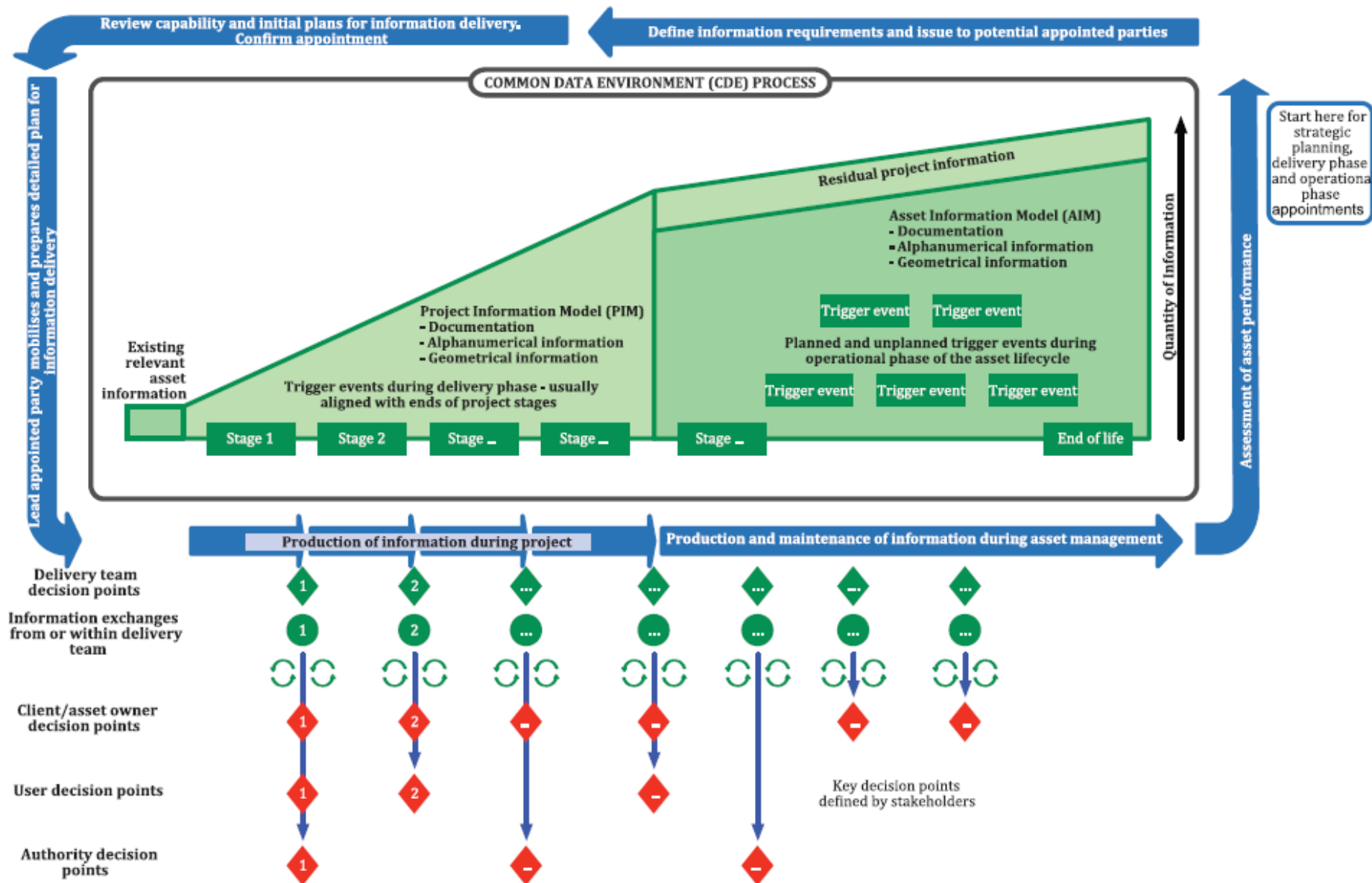
BS EN ISO 19650-2:2018 – Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) – Information management using building information modelling. Delivery phase of the assets. This will supersede PAS 1192-2:2013.

PD 19650-0:2019 – Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM). Guide to BS EN ISO 19650:2018

PAS 1192-3:2014 – Specification for information management for the operational phase of assets using building information modelling.



BIM Process Diagram



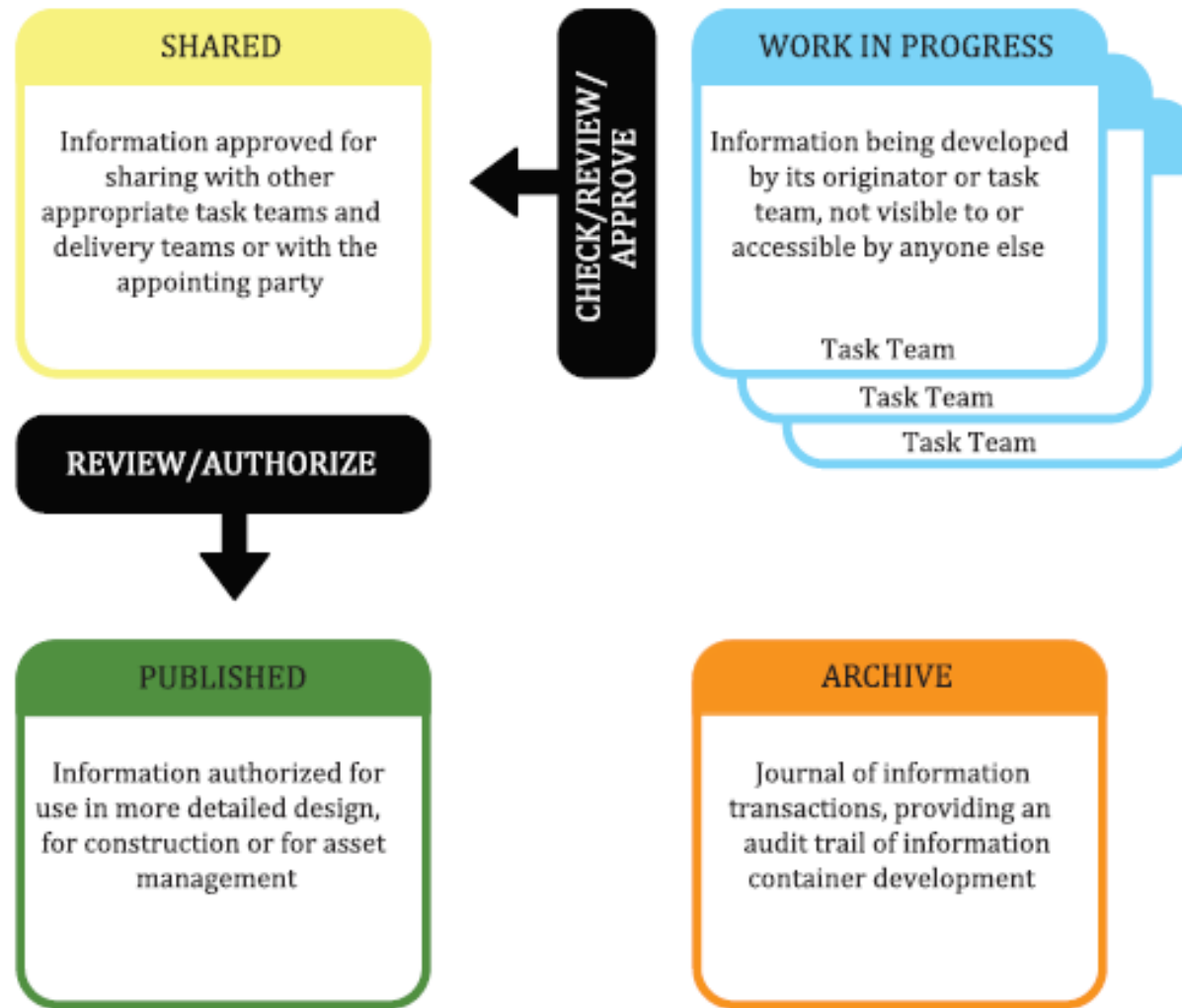


Figure 10 — Common data environment (CDE) concept

Conventions

UNIVERSITY OF WALES TRINITY SAINT DAVID

BIM NAMING CONVENTION GUIDE: All files: Models, Drawings & Documents

THE CODE	Project	Originator	Zone	Level	Type	Role	Number	Description*	Suitability*	Revision*
CODE LENGTH	2-6 Characters	3 - 6 Characters	1-2 Characters	2 Characters	2 Characters	1 Character Only	4 Characters	6-8 Characters	2 Characters	Single Character
DESCRIPTION	A single common project identifier that is recognizably distinct from any individual organization's internal job number.	The company that produced the data.	Use XX as the default. Only use Zones if project requires. This is then defined by the chosen Model segregation. There should be at least one 'zone' per role. EG. Arch Model, Mech Model, Struct Model, etc.	The level the data refers to: ZZ – Multi Level XX – No Level GF - Ground Flr 01 – First Flr 02 – Second Flr Etc. Mezzanines M1 M2 Etc. All levels below ground floor prefix 'B' B1 B2 Etc.	This is simply the type or form of data eg: For Files: AF Animation File CM Combined Model DR 2D Drawing M2 2D model M3 3D model MR Model rendering VS Visualization For Documents: BQ Bill of Quants CA Calculations CO Correspondence CP Cost Plan DB Database FN File Note HS Health & Safety IE Information Exchange MI Minutes / Action Notes	A Architect / Architectural B Building Surveyor C Civil Engineer D Drainage Engineer E Electrical Engineer F Facilities Manager G Geographical Surveyor H Heating & Ventilation Designer I Interior Designer K Client L Landscape Architect M Mechanical Engineer P Public Health Engineer Q Quantity Surveyor S Structural Engineer T Planner W Contractor X Subcontractor Y Specialist Designer Z General	This is a 4 digit code denoting drawing grouping and number. It consists of a 1 digit Drawing Group plus the 3 digit individual drawing no: Eg. 1001 Where 1 at the beginning is the drawing group and the 3 latter digits are sequential numbers.	Drawing / Model description ie. GAPLAN SITE GEO MOD SECTION SCHEMAT BREEAM FINISHES etc.	This is for the 2 digit suitability code that indicates and governs the development stages of information and documents throughout the BIM process.	The revision number of the drawing. eg: A, B, C etc
NOTES	Use the 4 digit Company project numerics here - NB. NUMBER ONLY For Student Projects MODULE CODE ie 4005	NB. A specific unique identifier for each organisation should be defined upon them joining the project ie. Use company initials	NB. A more complex project may need to be divided into several diff zones. If so the Zone Strategy should be agreed at beginning of project	IE. Roof plan would be multi level.	MS Method Statement PP Presentation PR Programme RD Room Data Sheet RI Request for Information RP Report SA Schedule of Accommodation SH Schedule SN Snagging List SP Specification SU Survey		Drawings Groups are as follows: 0 - General 1 - Substructure 2 - Superstructure 3 - Openings 4 - Finishes 5 - Piped & ducted services 6 - Electrical 7 - Fixtures & Fittings (Fixed) 8 - Loose Furniture 9 - External Works	There is no specific standard for description but avoid long, unweildy descriptions as this will affect your ability to file in Windows	Please refer to opposite tabled from BS1192:2007 issue sheet for the appropriate suitability status codes.	
EXAMPLE	4005	UWSTD	XX	ZZ	DR	A	1001	GEO MOD	S1	A
* = Optional add ons within schema that we as UWTSD have chosen to include. NB. There are other optional fields in the schema that we have opted to leave out ie: Classification (uniclass codes) Guide authored by G Traylor, UWTSD, October 2019. Based on BS 1192:2007 + A2:2016 & BS 1192-2:2013										

Status	Description
Work in Progress	
S0	Initial status or WIP
	Master document index of file identifiers uploaded into the extranet.
Shared (Non-Contractual)	
S1	Suitable for Co-ordination
	The file is available to be „shared“ and used by other disciplines as a background for their information.
S2	Suitable for Information
S3	Suitable for Internal Review & Comment
S4	Suitable for Construction Approval
S5	Suitable for Manufacture
S6	Suitable for PIM Authorization (Information Exchanges 1-3)
S7	Suitable for AIM Authorization (Information Exchange 6)
D1	Suitable for Costing
D2	Suitable for Tender
D3	Suitable for Contractor Design
D4	Suitable for Manufacture/Procurement
AM	As Maintained
Published Documentation (Contractual)	
A	Suitable for Construction
B	Partially signed-off:
	For Construction with minor comments from the Client. All minor comments should be indicated by the insertion of a cloud and a statement of “in abeyance” until the comment is resolved, then resubmitted for full authorization.
AB	As-Built Handover documentation, PDF, native models, COBie etc.

Conventions

4005 _UWTSD _XX _GF_DR _A _0001 _GenA _AB

An 'As Built' Ground Floor, General Arrangement plan drawing produced by the architect.

4005 _UWTSD _XX _XX_SP _C _0001 _NBS _A

An NBS Specification suitable for construction, produced by the Civil Engineer

Tools

Drawing, Modelling and Specifications



VECTORWORKS®
A NEMETSCHEK COMPANY



Clash Detection, Virtual Build



Collaboration and CDE Platforms



BIMXtra

CAFM and CObie Outputs



Guidance in a World of Acronyms

1 Bs BIM Strategy													2 Su Surveys and Reports				
3 Fr Framework	4 Cu Culture and behaviour	Strategy Foundations Collaboration Process People Technology Standards Enabling Tools Resources												5 Bt BIM Toolkit	6 Lod Level of detail	7 Loi Level of Information	8 Vi Videos
9 Co Common methods	10 Po Process	11 As Assessment and need	12 Eir Employers info requirements	13 Cm Communication	14 In Investment	15 Sf Software	16 Cd Capital delivery phase	17 Cl Collaborative business relationships	18 Li Library objects	19 Cs Classification	20 An Analysis tools	21 Ev Events					
22 Pr Procurement tools	23 Fo Forms of procurement	24 Ex Execution	25 Bep BIM execution plan	26 So Soft skills	27 Ch Change process	28 Ha Hardware	29 Op Operational phase	30 Pt Protocol	31 Pe Prequalification questionnaires	32 Cafm Computer-aided Facilities Management	33 Ct Cost tools	34 Fu Forums and user groups					
35 Ca Capability and capacity	36 Di Digital tools	37 De Delivery	38 Midp Master information delivery plan	39 Cp Cooperation	40 Sh Share success	41 Tr Training	42 Fm Facilities management	43 Qu Quality management systems	44 Bsdd BuildingSMART data dictionary	45 Pg Programme tools	46 Ad Administration tools	47 Sc Social media					
		48 St Standardisation and interoperability	49 Ma Maintenance and use	50 Cde Common data environment	51 Ci Champion	52 Av Availability	53 Fi File storage	54 Dg Digital security	55 Ds Design management systems	56 Ifc Industry foundation classes	57 Au Authoring tools	58 Mo Model viewers and checkers	59 Bl Blog posts				
		60 Dpow Digital Plan of Work	61 If Information exchange	62 Sp Support	63 En Engage	64 Ir Infrastructure	65 Br Briefing	66 Am Asset management	67 Idm Information delivery manual	68 Sp Specification tools	69 Fl File sharing and collaboration	70 Bo Books					
Digital Plan of Work stages																	
71 Sr Strategy	72 Bi Brief	73 Df Definition	74 Dn Design	75 Bu Build and commission	76 Hn Handover and closeout	77 Oe Operation	78 Ed End of life										

<https://www.thenbs.com/knowledge/periodic-table-of-bim>

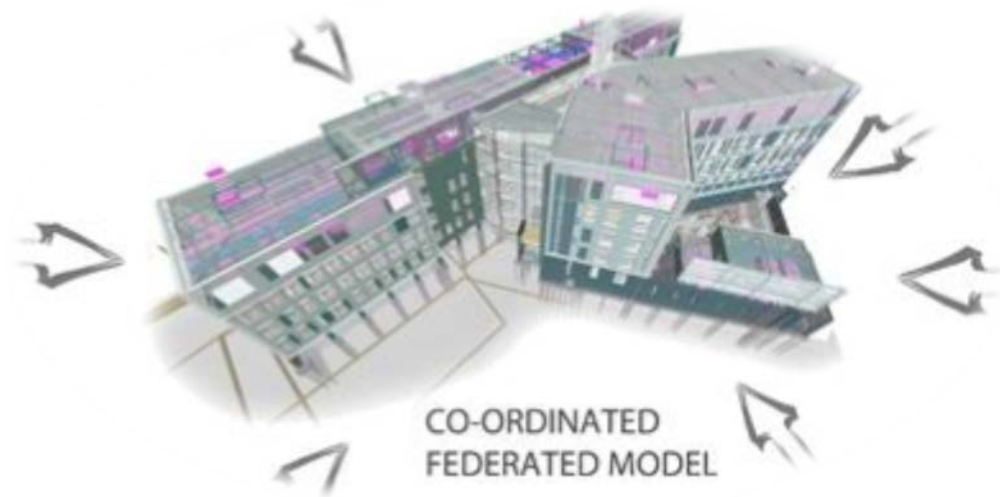
How can we collaborate?

Tools such as Revizto enable a collaborative process using
2D and 3D Modelling with Intelligent Data



revizto™

<https://revizto.com/en/>





revizto™

All teams



ACBA 7002 Construction Technol... ⋮

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- Wk 08 GT Lecture 18-11-20
- Wk 10 GT Lecture 02-12-20
- Wk 11 GT Lecture 09-12-20
- Wk 12 GT Lecture 16-12-20

Search



General

Posts

Files

Class Notebook

Assignments

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Revizto 4: Next Gener... ▾

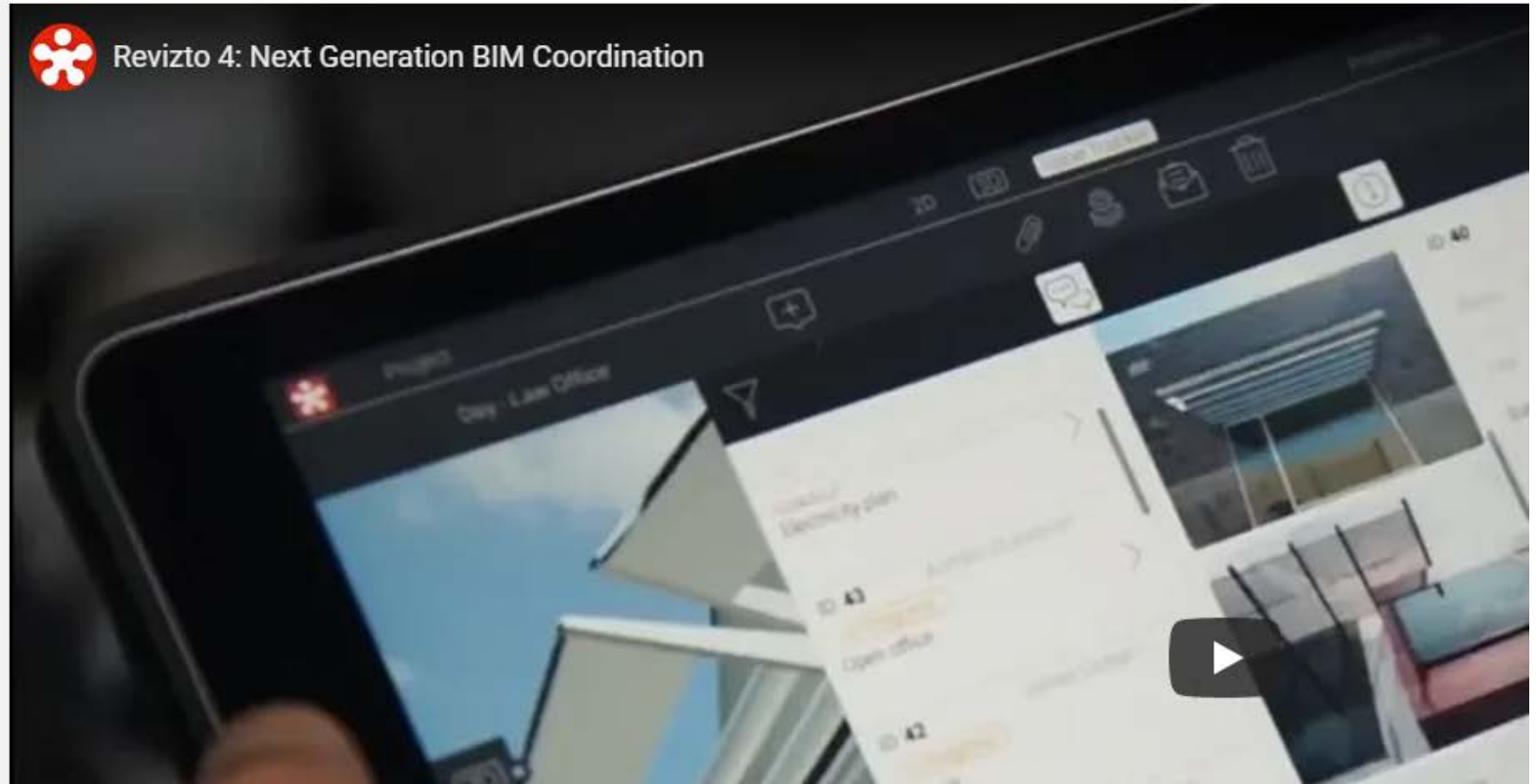


Revizto 4: Next Generation BIM Coordination

Revizto | 18.8K views | 2 years ago



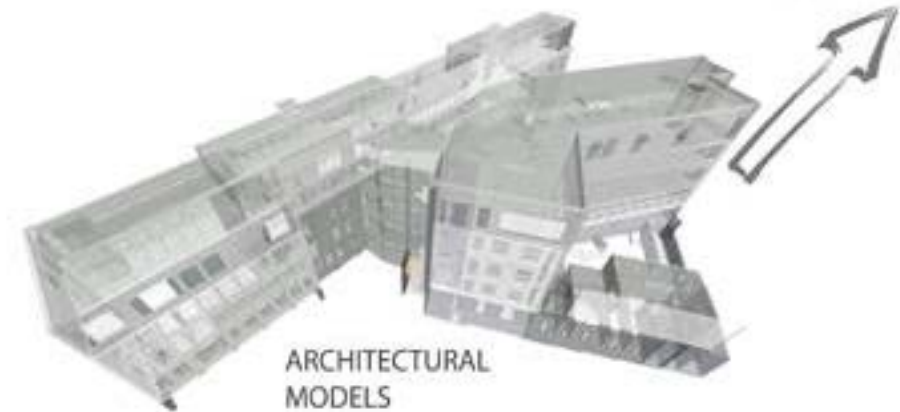
Revizto 4: Next Generation BIM Coordination



<https://youtu.be/UezYNxzITIA>

How can we create data rich intelligent models?

Tools such as Revit enable intelligent 3D Modelling that can be linked into a BIM Process.



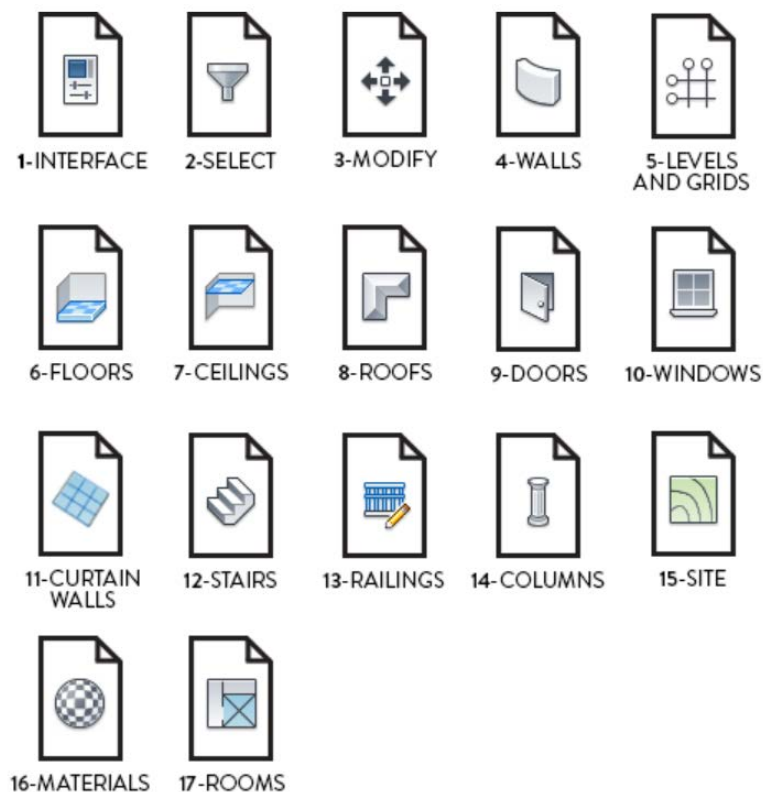
Remember a Revit Model alone is not BIM



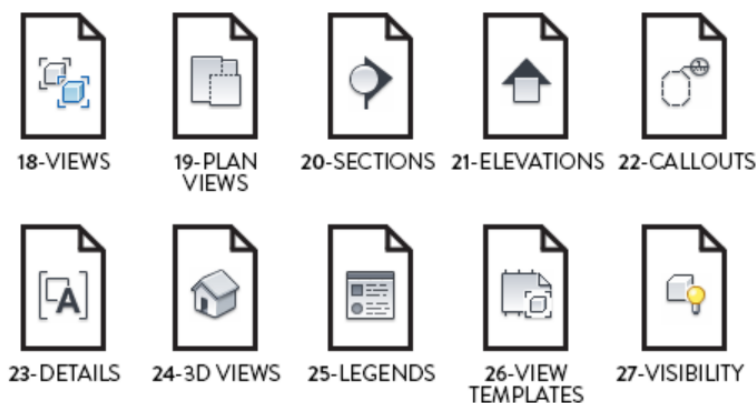
https://www.autodesk.com/education/edu-software/overview?_ga=2.119678017.834319708.1600961686-1615692111.1593105833&sorting=featured&page=1

AUTODESK[®] REVIT[®] the basics

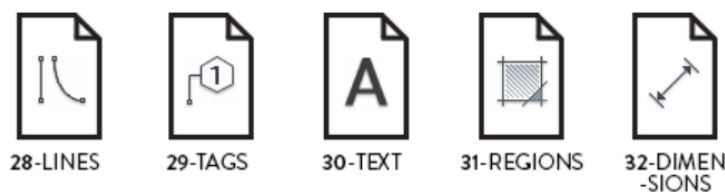
PART 1: MODEL



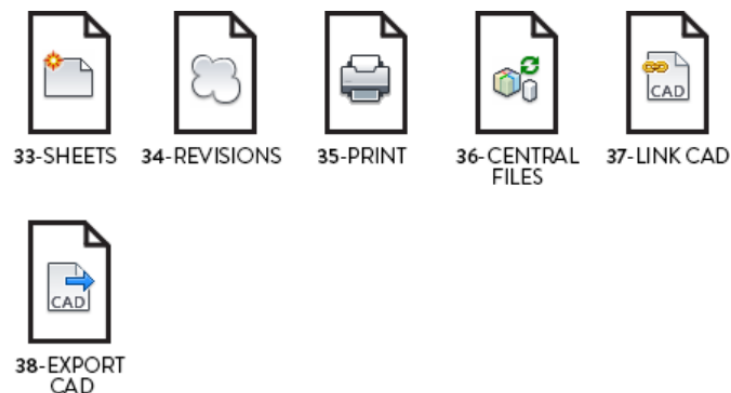
PART 2: VIEWS



PART 3: ANNOTATE



PART 4: PUBLISH AND COLLABORATE



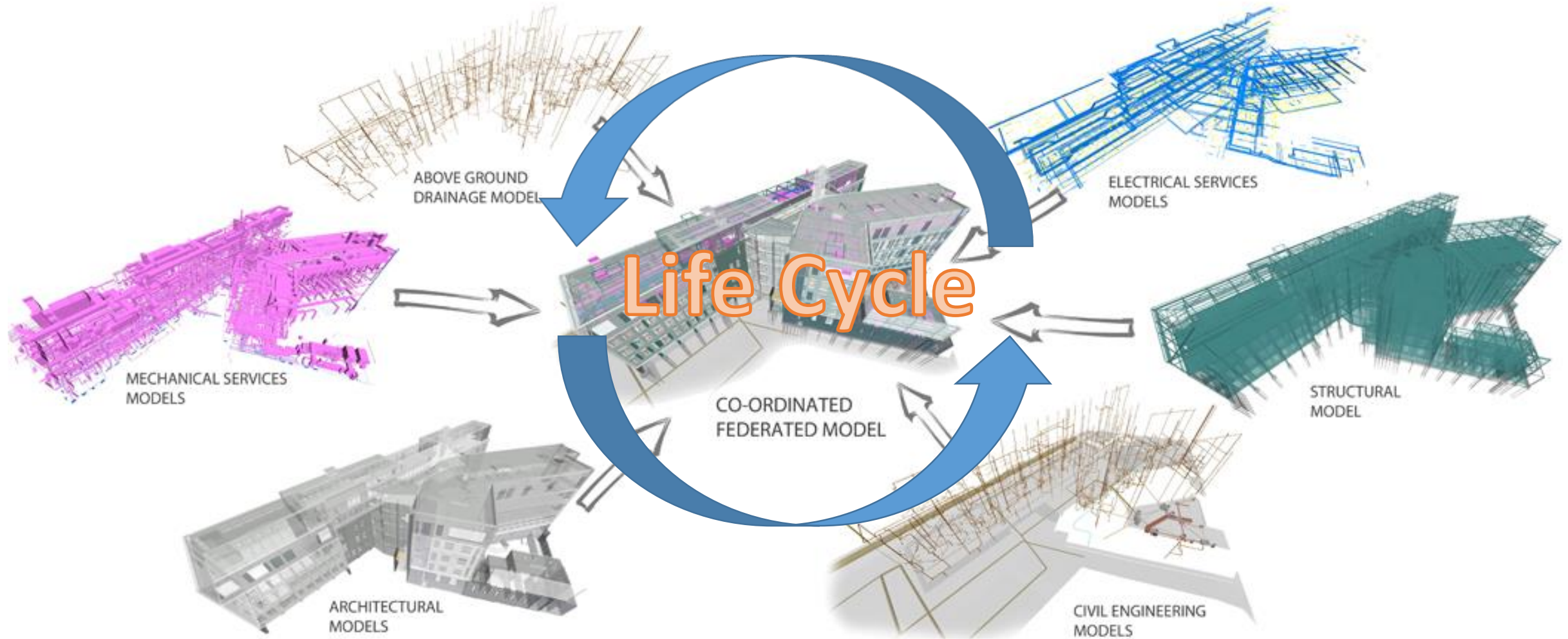
PART 5: ADVANCED TOOLS



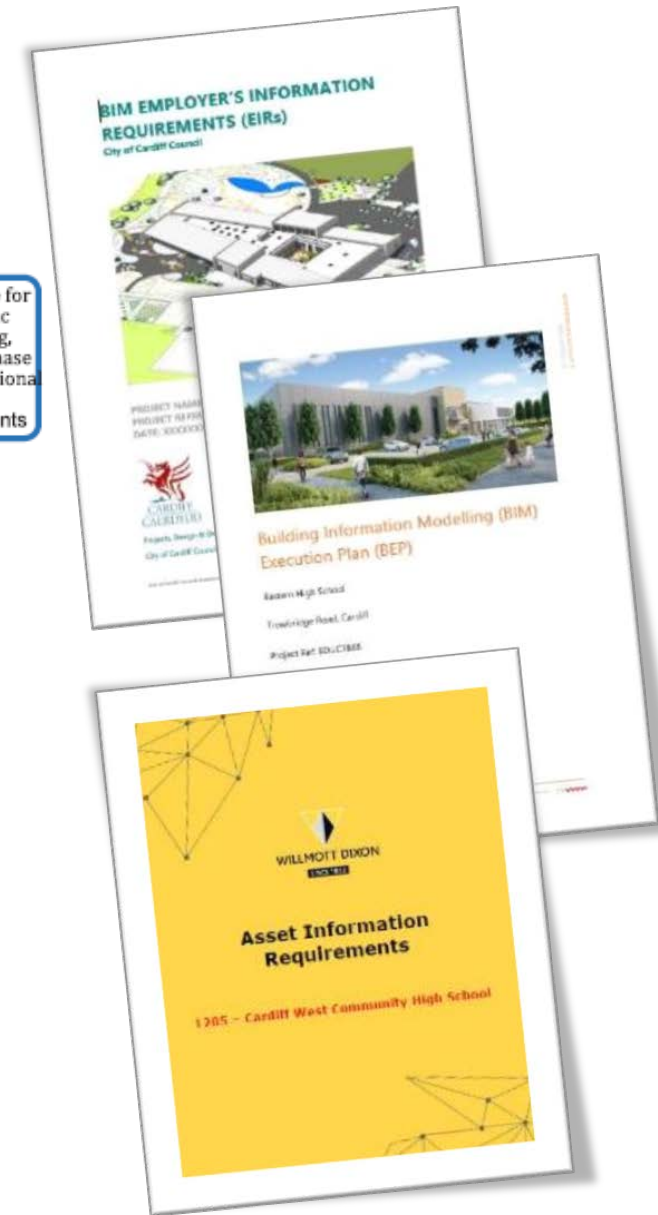
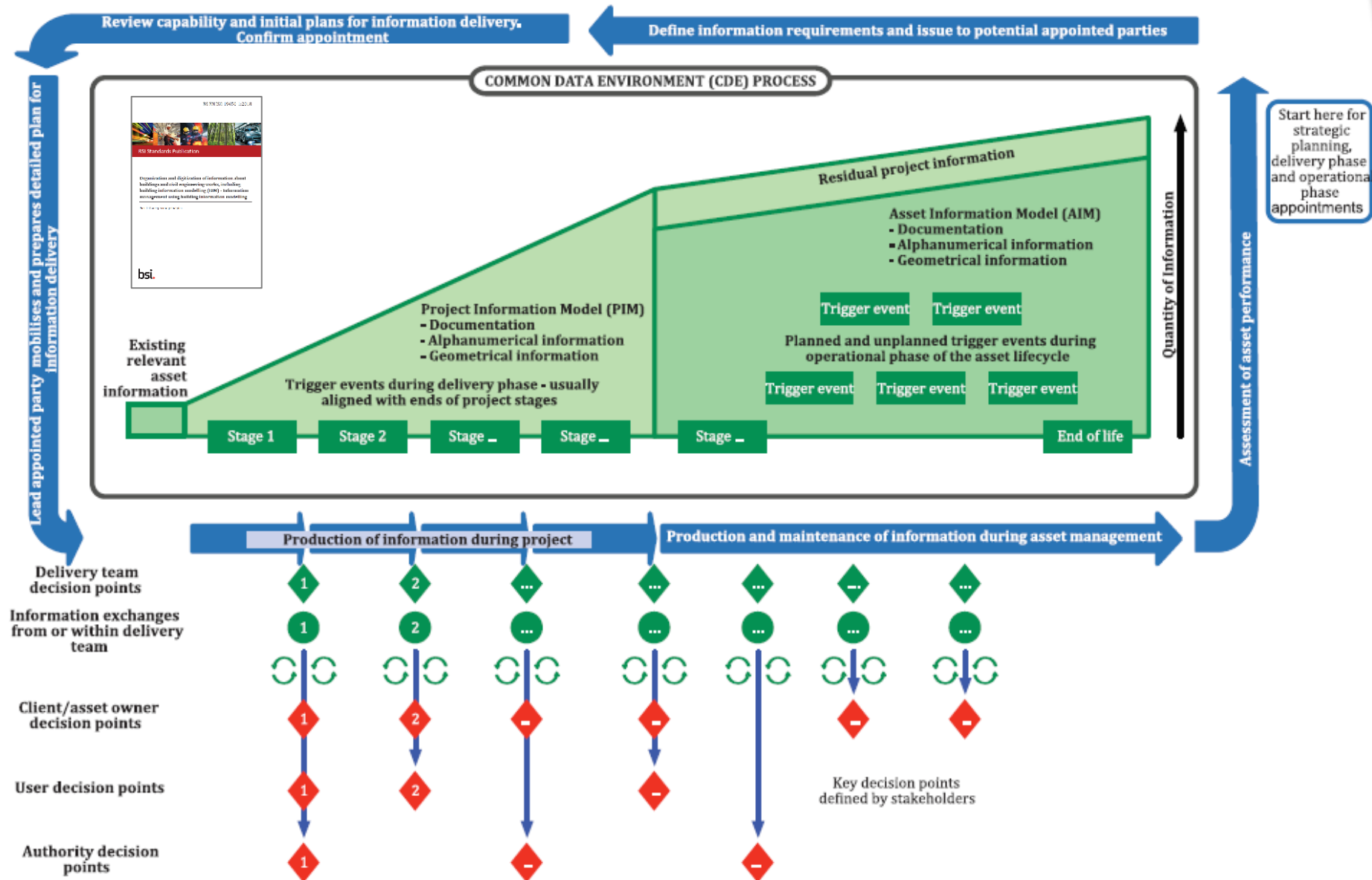
<https://revitpure.com/basics>

<https://academy.autodesk.com/>

Building Information Modelling



BIM Process Diagram





EIR

Exchange Information Requirements

BEP

BIM Execution Plan

AIR

Asset Information Requirements

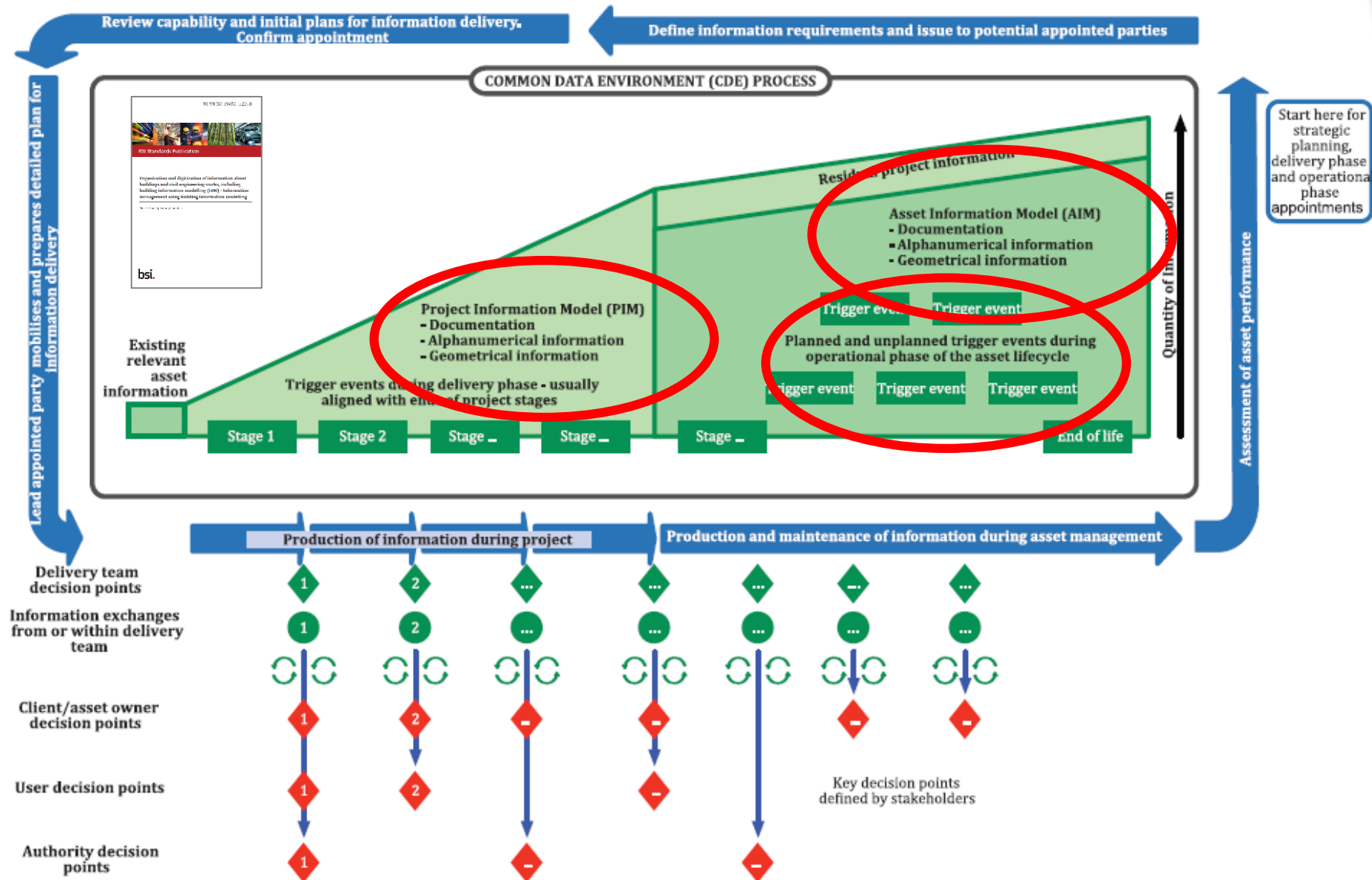
BIM Handover Package

 01-Documentation

 02-Models

 03-COBie Construction Operations Building Information Exchange

BIM Process Diagram



Are these the same?

How do we evaluate?

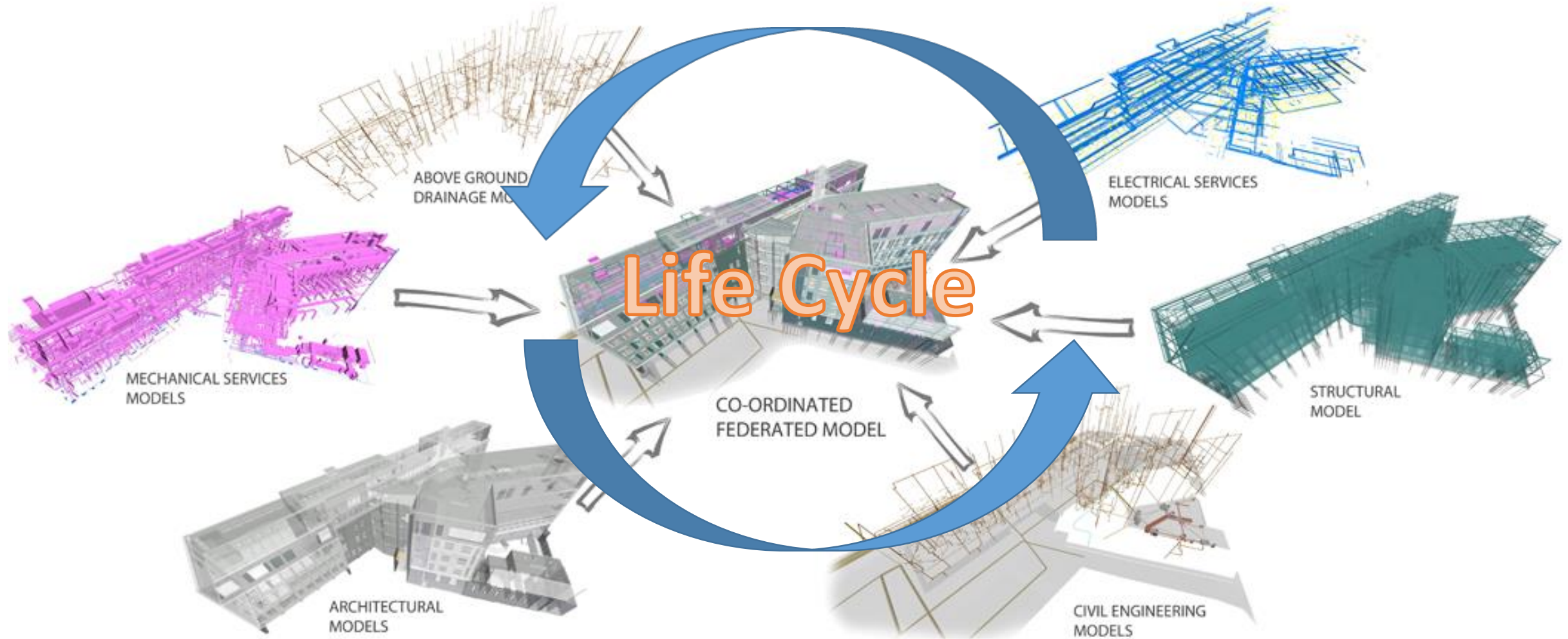
What can we learn?

How can we improve?

How is this managed?

What about existing building stock?

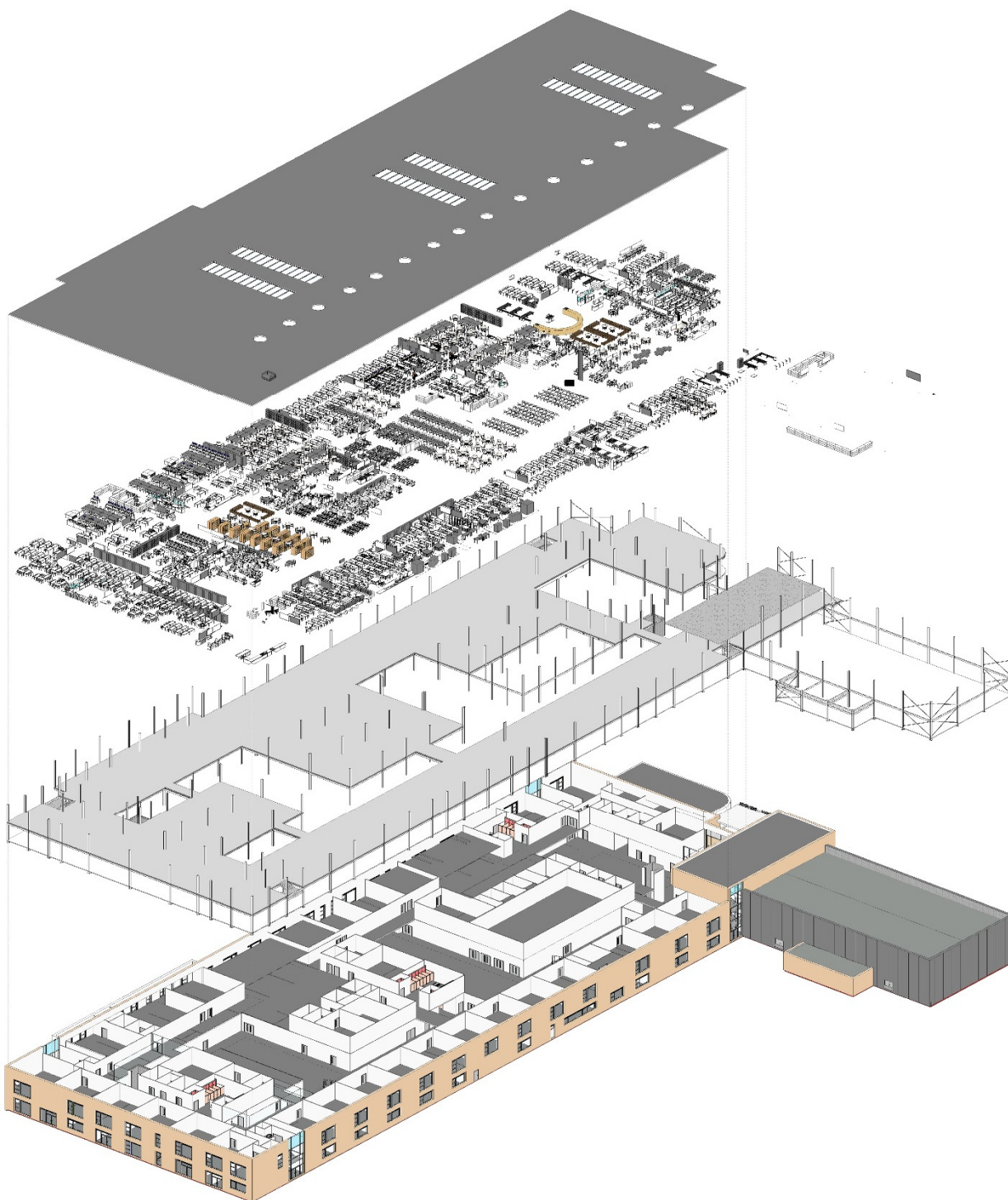
Building Information Modelling



Life Cycle of the Asset

What about?

Management and Controls for Maintenance
Introduction of Sustainability Measures
Monitoring Energy Performance
Health and Safety - Statutory Observations
Management of Alterations, Adaptations and
Refurbishment
Introduction of New Technologies



BIM EMPLOYER INFORMATION REQUIREMENTS (EIRs)

City of Cardiff Council



Prepared By:

Andrew Beadle, Head of BIM, Powell Dobson Architects.

Version History:

Revision A - Initial draft for review and comment. 06.10.15



Index

1.0 Introduction

2.0 Objectives of this Document

3.0 Technical Requirements

4.0 Management



1.0 Introduction

This Employers Information Requirement (EIR) document has been put together by Powell Dobson Architects specifically for the Eastern High School project. The document is presented in a draft format, to help establish client specific requirements to be included in the BIM throughout the design and construction stages of the project.

The purpose of this EIR is to inform the creation of a project specific BIM Implementation plan and contains the requirement of how information is to be delivered to the Employer at project completion. It also gives guidance on how this information should be allowed for from project inception and monitored throughout the design and construction phases of work.

This document follows the CLAW EIR core contents and guidance notes in addition to providing specific City of Cardiff Council requirements.



2.0 Objectives of this Document

The aim of this document is to establish a standard methodology which all teams working on the procurement of City of Cardiff Council (CCC) projects should follow. The intention is that information passed on to CCC as derived from the Building Information Model is done so in a concise and consistent manner, and is directly applicable to the client's bespoke Asset and Facility Management plan.

In order to provide the above the document aims to:-

- Satisfy current BIM Legislation
- Be easily understood through use of Plain Language.
- Be appropriate to the project and current working practices.

The above is to act as a starting point for the City of Cardiff Council. Any comments received from members of the client or contractor's team may be incorporated into this document. As such active participation in the creation of this document has been encouraged as much as practically possible.



3. TECHNICAL REQUIREMENTS

3.1 Software Platforms

The City of Cardiff Council has already invested in several licenses of AUTODESK REVIT, and as such it is requested that any BIM projects are undertaken using this as the primary Authoring and collaboration platform between all Consultants. This will enable the client to undertake any future amendments to the model such as minor alterations or the manipulation / replacement of asset data if required.

It is suggested that the latest practicable version of Revit is used, but it is understood that the use of software plug-ins and issues of interoperability may require a slightly older version of the software to be used. The actual version / release of software is to be agreed and adhered to at project inception and logged in the project specific BIM Implementation Plan, in this case Revit 2016.

It is a requirement that all Revit models supplied to the client are supplied fully Quality and clash checked against one another in conjunction with the Project Specific BIM Implementation Plan.

It is a direct client requirement that a separate Architectural, Structural and MEP model should be produced as a minimum with each consultant taking ownership over their individual model, and that any sub consultant or subcontract models are provided in both Navisworks NWC and IFC file formats if not deliverable using Revit.

The design team and contractor will be responsible for creating, monitoring and formatting data to suit the client FM database.

3.2 Data Exchange Format

The client requests that a combination of Revit models, NWC and IFC model files, DWF and PDF drawing files and an excel database containing all available data are issued to them preferably through a web based information exchange at the following key milestones – prior to Planning, prior to Tender, prior to construction and prior to completion. These data exchanges will be monitored against the Asset Information Requirements contained within this document, with the pre-completion exchange requiring full compliance with these requirements.



3.3 Project Co-ordinates

The Revit models will be integrated into a federated model through the use of a shared co-ordinate system based on the UK OS grid, setting the survey point in each model to 0,0,0 (real world location just off the West Coast of Cornwall). A further local grid may be set up using the project base point only.

Each model will provide the following as a check against special co-ordination.

- Intersection of grids AA and 01 using OS Eastings and Northings
- Intersection of grids XX and 99 using OS Eastings and Northings
- Ground Floor FFL using height in mm above sea level.
- Origin rotation (rotation between true and project North)

The shared co-ordinate system set out above should translate through to any CAD drawings or model files produced from the Revit models.

3.4 Space Designation

All Room / Space names and numbers should be consistent across all discipline models, and should follow the numbering convention below:-

3.5 Block Numbers

Due to the nature of the building it will not be split into blocks as would sometimes be the case. However the reference to Block number has been retained in the Title block reference to align with future City of Cardiff Council projects.

3.6 Room Numbers

Room numbers will be given a 'G' prefix on the ground floor level of the building. Rooms on the first floor will all receive a '1' prefix, with rooms on the second floor receiving a '2' prefix and so on. Room numbering should always start at the main entrance lobby and work clockwise around the building.



3.7 Departments

Rooms should be categorized into the following departments which relates specifically to Secondary schools as:-

- Art
- Catering
- Circulation
- Design & Technology
- Drama
- General Teaching
- ICT / Business
- Large Spaces
- Learning Resource
- Music & Drama
- Net Float
- Plant
- Science
- Staff / Admin
- Storage (Non Teaching)
- Storage (Teaching)
- Toilets

3.8 Level of Detail (LOD)

A consultant transmittal sheet shall be produced at each of the data exchanges highlighted above. This should provide the model revision, required level of Detail and achieved level of Detail against each of the relevant model elements (i.e. walls, doors, air handling units, structural columns). This transmittal sheet should clearly explain work in progress in order to avoid abortive time spent analysing data contained with the model. PAS1192:part2 should be used as a guide to the breakdown of elements and typical LOD's to be assigned against each. The above assignment of LOD's should be set in the project specific BIM Implementation plan.



4. Management

4.1 Standards

This EIR has been put together referencing the recommendations and guidance made within the following documents:-

- PAS1192: part 2 (and associated sections from BS1192:2007)
- PAS1192: part 3



4.2 BIM File Numbering System

In accordance with PAS1192:2 the following file naming convention will be used for the Eastern High Project. A simplified version of the unique reference has been used to aid the client in identifying the various models, in addition to a field to encompass file type.

E05107001-PDA-00-Revit-CR-A-Building Model-A

Project Specific Reference – E05107001 – CCC Individual Building Reference (UPRN)

Originator Code (Author) – PDA – Powell Dobson Architects

MCC – Mccanns

CAM - Cambria

Volume / Zone / Model – 00 - denotes that the model covers several zones.
Zones to be set by Mccanns if required.

File Type – Revit – Denotes a Revit (RVT) file.
Navis – Denotes a Navisworks (NWC) file.
IFC -- Denotes an Industry Foundation Class (IFC) File

Model Use Reference – CR – Clash Rendition (For Co-ordination)
FC – For Construction
FM – For Facility Management

Originator Discipline – A – Architect
M – Mechanical
E – Electrical
P – Plumbing
S – Structures
C – Contractor / Subcontractor

Quick Reference - Building Model
Ventilation Model
Power and Data Model
Structural Model

Revision – Indicates Current Version of Model



4.3 Drawing Numbering System

The following project drawing numbering system shall be used

E05107001-PDA-A-00-00-GA-(20)200-A

Project Specific Reference – E05107001 – CCC Individual Building Reference (UPRN)

Originator Code (Author) – PDA – Powell Dobson Architects

MCC – Mccanns

CAM – Cambria

Originator Discipline –

A – Architect

M – Mechanical

E – Electrical

P – Plumbing

S – Structures

C – Contractor / Subcontractor

Volume / Zone / Model –

00 - denotes that the model covers several zones.

Zones to be set by Mccanns if required.

Level

00 – Ground Floor

01 – First Floor

02 – Second Floor

ZZ – Drawing covers several levels (sections, elevations & views)

Drawing Type

GA – General Arrangement

DT – Detail

BC – Building Control

Drawing Number

(20)200

Revision

A and so forth

DWG files exported from the BIM will use the layering standards as set out in BS1192 which should be selected from the 'Modify DWG/DXF Export Setup' within Revit. This will export Revit elements to the British Standard for layer naming convention and layer colour and will enable CCC to be presented with DWG files representing commonality across all projects.



4.4 Roles and Responsibilities

The following roles in connection with BIM will be taken on directly by the employer.

4.5 Asset / FM Information Manager

The person undertaking this role will be responsible for the following:-

- Briefing the Design team and contractor as to the extent of Asset information applicable to the project and the way in which it is to be presented at completion of the project.
- Comparing the asset information as presented at each project milestone (see 1.2), with the required information as set out by the EIR's.
- Advising the project team on any gaps / inaccuracies in the above.
- Checking to determine whether the drawings and other information meet the requirements set out in the EIR.
- Collation of data created from the relevant models and inputting this into the client FM Software / System.

The following roles in connection with BIM will be taken on directly by the design team / contractor:-

4.6 Lead Designer

The person undertaking this role will be responsible for the following:-

- Co-ordination within the federated BIM.
- Compliance with the Technical section of this document in relation to the federated model.

4.7 BIM Co-ordinator

The person undertaking this role will be responsible for the following:-

- Ensuring consultant / sub contract Building Information models are in keeping with the PIM.
- Clash detection / co-ordination of the federated model.
- Monitoring of Geometrical actual LOD against required LOD at key milestones.



4.8 Planning the Work and Data Segregation

Information should be managed in accordance with the processes described in PAS1192-2, PAS1192-3 and BS 1192 (2007).

4.9 Security

There is no specific security provision however the Project Specific BIM Implementation plan should confirm policy arrangements.

4.10 Co-ordination and Clash Detection

A full explanation of the process for Quality checking and Clash detection proposed by the Design Team and Contractor will be included in the BIM Implementation plan. This will contain details on the following items:-

- Clash Detection Software
- Process Overview
- Regularity of checks
- Responsibilities
- Outputs
- Technical Query Workflow
- Tolerance Strategy
- Clash resolution process

4.11 Collaboration Process

A full explanation of the collaborative process should be given in order to demonstrate competence and capability in the BIM Implementation plan. This should include:-

- The Form of Sharing (which should typically be Revit model exchanges via a web based platform as outlined in item 1.2 above).



- Extent / LOD of model Geometry and imbedded data.
- Frequency of collaboration and exchange (as a minimum as outlined in the RIBA 2013 plan of works).

The design team will also ensure that the client team are given full walkthroughs of the current building model (in Navisworks or other similar software) in model review workshops at the following key milestones:-

- Prior to planning application
- Prior to tender / pricing
- Prior to start on site.

4.12 Health and Safety / Construction Design Management

The BIM can be used as a means to demonstrate to all site personnel, operators and managers the safety requirements of the site and completed building. The contractor and design team are to demonstrate how BIM will be used to contribute to this process with some examples given below:-

1. Demonstration of the construction process by linking the contractors GANT chart to BIM geometry in order to create a '4D' building model (BIM against time).
2. Embellishment of the above to demonstrate such issues as:-
 - Delivery routes.
 - Safe pedestrian passage routes.
 - Hoarding lines.
 - Temporary fire escape routes / stairs
 - Site access, signing in points and site office location.
3. Subdivision of the above to demonstrate week by week site operations in more detail.
4. Creation of a movie or similar to demonstrate the above to both the HSE and site operatives at induction stage.

The extent to which the BIM will be used in relation to H&S will need to be fully explained in the BIM Implementation Plan.



4.13 Systems Performance

Design Team models should generally be federated to ensure that each individual file size is under 200MB. Any Revit models above an individual file size of 100MB should be worksetted to ensure individual elements can be loaded independently if required, at client receipt of the Revit model.

Details of the federation / split of models shall be given to the client by the design team with model zones being clearly identified in the BIM Implementation Plan.

4.14 Compliance Plan

The design team / contractor is to demonstrate the following in relation to providing data compliant to CCC requirements for asset data as set out in 2.10 below:-

- Quality assurance / control procedures both in relation to the BIM itself and the data contained within.
- The software that is to be used to deliver the asset information in the required xmls (TBC) format.
- The level of assurance for supplying this data – will certain parts of this be dependent on subcontractor data for example.
- The period of aftercare upon completion should data need to be amended or managed.



4.15 Delivery Strategy for Asset Information

Presently the level of asset information required by the client as taken directly from the BIM is as follows:-

For Each Room (Core Property Data)

1. Uprn*(Site Reference)
2. Building Name*
3. Creation Date*
4. Block Reference*
5. Block Name*
6. Uprn2* Building Reference
7. Floor
8. Gross Internal Area (Building as whole)*
9. Gross External Area (Building as whole)*
10. Uprn3 Building / Block reference
11. Block Reference
12. Floor Reference
13. Room Reference – Concatenated from Room number and floor in Revit.
14. Room Name
15. Room Use – In this case all Education*
16. Room Type – i.e. Store, Office, Workshop (Department in Revit)
17. Height of Room
18. Internal Area – Room Area in Revit
19. Perimeter

For information followed by an asterix it may be more efficient to add this as a block of information directly into the exported database via excel or similar.

UPRN – Unique Property Reference number.

Other Information for discussion

- Sink, bottle filler and water faucet numbers and positions tied back to the core data to track water hygiene.
- Room finishes tied back to core data for condition surveys.
- Location of Hazardous materials tied back to core data.



4.16 Data Drops and project deliverables

Information will be exchanged at intervals as set out in the RIBA plan of works (2013).

4.17 Clients Strategic Purposes

The clients primary use of the data exported from the BIM will be:-

'Section to be completed upon receipt of client FM standard spreadsheet'.

4.18 BIM specific competence assessment.

This EIR has been formulated as a guide in relation specifically to the Eastern High project and as such the design team and contractor has already been appointed based on their BIM experience. Any guidance related to the selection of design team members based on the core competencies within the CLAW document are therefore not relevant to this project.

A Project Implementation plan is required from the contractor team as the next step to fulfilling these requirements.





Building Information Modelling (BIM) Execution Plan (BEP)

Eastern High School

Trowbridge Road, Cardiff

Project Ref: EDUC7865

Date: 19th November 2015

Document Control Sheet

Rev.	Status	Page Nos.	Amendment	Date	By

The Post Contract-Award Building

Information Modelling Execution Plan (BEP)

Preface

The BEP shall list the agreed targets for responsibility, timely delivery, exchange, reuse and final handover to the clients. It will also list all of agreed elements as outlined in the Employers Information Requirements, the Brief, the BS1192:2007, PAS1192-2:2013, the CPlx Protocol and the contract documents.

This BEP is structured in accordance with PAS1192-2:2013.

Project Delivery Manager

This document is owned and maintained by the current Project Delivery Manager listed below.

Project Delivery Manager - Name	Company Responsible
Andrew Beadle	Head of BIM, Powell Dobson Architects

Project Team Representatives and Role

Company Name	Representative and Authorised Responsible Agent	Role
Powell Dobson Architects	Andrew Beadle	Lead Designer / BIM Co-ordinator
Powell Dobson Architects	Barrie Jones	
Wilmott Dixon	Richard Hart	Design Manager / CDE Manager
Wilmott Dixon	Anthony Brophy	BIM Manager
McCann Partnership	Chris Morgan	Electrical Consultant / Author
McCann Partnership	Graham Curr	Mechanical Consultant / Author

Document Authority

This project plan has been agreed by the representatives of the project team as listed above with the authority of their parent companies to accept this document as the **Agreed BIM Execution Plan**.

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1 Project Information

Table 1 – Project information

Project Name	Eastern High School
Project Address	Trowbridge Road, Cardiff
Project Number (Clients Project Number or reference)	EDUC7865
Contract Form	NEC Professional Services Contract (Option A) NEC3 ECC Option C Target Contract with Activity Schedule
Project Design Start Date	August 2015
Project Construction Start Date	April 2016
Project Completion and Handover Date	Sept 2017
Project Description (EIR)	150928_CCC BIM Employer Information Requirements.
Project Brief and CDM requirements	Capita H and S Log 131015
Project Deliverable as defined in the EIR and COBie project templates (see also the CPlx Protocol)	May be an additional document, please reference.

2 Information required by the EIR

PAS1192-2:2013 Clause 5.3 defines the minimum contents of the Employers Information Requirements. The following subsections of the BEP respond to the parts of the EIR specifically requesting bidders' proposals.

2.1 *Planning of work and data segregation*

Required in response to the EIR by PAS1192-2 Clause 5.3 a) 3).

The planning of work and data segregation aspects of the project are described in later parts of the BEP, in particular Section 3 Management, Section 4 Planning and documentation and Section 5 Standard method and procedure.

2.2 *Co-ordination and clash detection*

Required in response to the EIR by PAS1192-2 Clause 5.3 a) 4).

This section of the BEP contains the bidders' proposals for managing the co-ordination process. The requirements for co-ordination are stated in PAS1192-2 Clause 9.4.

2.3 *Collaboration process*

Required in response to the EIR by PAS1192-2 Clause 5.3 a) 5).

This is described in Section 4.2.

2.4 *Health and safety/CDM management*

Required in response to the EIR by PAS1192-2 Clause 5.3 a) 6).

This section of the BEP contains the bidders' proposals for using BIM and the Common Data Environment to support the management of health and safety and CDM requirements.

2.5 *Compliance plan*

Required in response to the EIR by PAS1192-2 Clause 5.3 a) 10).

This section of the BEP contains the bidders' proposals for managing the co-ordination process. See Section 2.2, above.

3 Management

This section of the BEP covers the requirements of PAS1192-2 Clause 7.2.1 a).

3.1 Roles, responsibilities and authorities

At the start of a project it is important to identify the roles and responsibilities of the design teams. Table 2 is used to record the names and contact details of the individuals fulfilling the necessary project roles

Table 2 – Roles and responsibilities

Role Company	Name	Email and Telephone number
Lead Designer Powell Dobson Architects	Andrew Beadle	
Project Delivery Manager Powell Dobson Architects	Andrew Beadle	
Construction Manager Wilmott Dixon	Richard Hart	
Project Information Manager Powell Dobson Architects / Wilmott Dixon	Andrew Beadle / Anthony Brophy	
Task Team Manager * Wilmott Dixon	Anthony Brophy	
Task Team Manager * Powell Dobson Architects	Andrew Beadle	
Task Team Manager * McCann & Partners	Chris Morgan	
Task Team Manager * Cambria Consulting	Geoff Carter	
Task Team BIM Authors * Powell Dobson Cambria Consulting McCann & Partners	Barrie Jones Matthew Diggins Graham Carr	
Project Manager Capita	Mark Radcliffe	

** Note – specify these roles for each task team involved in the project*

The standard authorities of the different roles related to production and management of information are given in Table 3.

Table 3 – Role authorities

Role	Authority
Project Information Manager	Enforce the Project BIM Standard and ensure delivery of the Information requirement in the EIR.
Lead Designer	Enforce spatial coordination
Task Team Manager	Enforce documentation standards
Interface Manager	Negotiate space allocation
Task Team Information Manager	Reject non compliant models, drawings & documents
CAD Coordinator	Enforce CAD related Project BIM Standards

3.2 Major project milestones

Table 4 – Major project milestones

Start Date	Design Completion	Detail Design Completion + Fabrication	Construction	As Constructed Models, Documents and Data	Handover.
August 2015	October 2015	March 2016	May 2016	Aug 2017	Sept 2017

Only the Major milestones are listed. A more detail and co-ordinated MIDP and Project Plan must be developed and agreed with the stakeholders.

3.3 Project information model delivery strategy

The major goals and objectives for the BIM implementation must be considered and stated as a project strategy document, append to this document, under the headings listed in Table 5.

Table 5 – Strategy for information delivery

Brief	Concept	Definition	Design	Build & Commission	Handover & Closeout	In use

3.4 **Survey strategy**

Table 6 – Survey strategy

Survey Method	Delivery Format	Survey Origin	Details, notes
Point cloud	Not Used	NA	
Light detecting and ranging (LIDAR)	Not Used	NA	
Global navigation satellite systems (GNSS)	Not Used	NA	
OS Data	DWG	OS	
Topographical Data	DWG	Local	

3.5 **Existing legacy data use**

As provided and defined by the EIR.

3.6 **Approval of information**

To ensure that model, drawing files and spreadsheet extraction are adequately checked, some form of agreed approvals process needs to be in place to enable the design teams and the contractor (or client) to approve and sign-off the development of the design information for a project and to assign responsible team members.

Table 7 – Schedule of information approval responsibilities

Name	Role or Title	Models	Drawings	Peer Review	Lead Designer/Lead Contractor	Client Review Team
Andrew Beadle	As Table 2	X	X	X		
Barrie Jones	As Table 2	X	X	X		
Richard Hart	As Table 2		X		X	
Anthony Brophy	As Table 2	X			X	
Geoff Carter	As Table 2	X	X	X		
Matthew Diggins	As Table 2	X	X	X		
Chris Morgan	As Table 2	X	X	X		
Graham Carr	As Table 2	X	X	X		
Mark Radcliffe	As Table 2					X

3.7 *PIM authorization process*

The design and construction approval process should be specified, agreed and documented as early as possible in the project. This includes the sign off of specialist design completion information.

Sign off and authorisation process to be agreed and published in coordination with the abilities of the collaboration or EDMS solution and inserted here.

4 Planning and documentation

This section of the BEP covers the requirements of PAS1192-2 Clause 7.2.1 b).

4.1 Revised Project Implementation Plan

The revised PIP confirms the capability of the supply chain.

The PIP consists of the following completed CPLx documentation:

- Supply chain capability summary form, which summarises the contents of ...
- Supplier building information management assessment form(s)
- Supplier IT assessment form(s)
- Supplier resource assessment form(s)

These are available as separate templates on the CPLx website.

The supplier resource for the project can also be summarised as per the example in Table 8.

Table 8 – Supplier resource summary

Supplier	Discipline	Resource numbers	Levels of competence	Years of Experience	Names of individuals
Powell Dobson	Qualified Architect	2	RIBA, CAD/BIM, Specification Author	35 15	Jeff Tucker Andrew Beadle
Powell Dobson	Architectural Technologist (CIAT)	1	CIAT, CAD/BIM Trained	41	Barrie Jones
Cambria Consulting	Qualified Structural Engineer	3	MIStructE,		
Etc					

4.2 Agreed project processes for collaboration and information modelling

Table 9 – Processes for collaboration and information modelling

Company	Solution	Network	Database	File based	Comments
Powell Dobson	Revit	4Projects	Model	RVT	
Cambria	Revit	4Projects	Model	RVT	
MCcanns	Revit	4Projects	Model	RVT	
Powell Dobson	Solibri	4Projects	Model	IFC	Clash Detection

The clash rendition viewer to be used across the whole project.

Table 10 – Clash rendition viewer

Agreed clash rendition viewer	Version
Solibri	v9.5

This section of the BEP also covers the agreed authorisations for security and extranet access and authority to distribute documents.

Table 11 – Authorisations for security, extranet and document distribution

Company	Authorised Manager	Authority (Upload, download, change Access/Distribution)
Powell Dobson	Andrew Beadle	Upload, Download, Change to personal uploads only.
Powell Dobson	Barrie Jones	Upload, Download, Change to personal uploads only.
Cambria Consulting		
MCcann & Partners		

4.3 Agreed matrix of responsibilities across the supply chain

It is important to define who models what (the BIM Author) and to what Level of Detail (LOD).

There are 7 levels of detail defined in the PAS1192-2 which do not reflect specific modelling guidelines for any particular software, rather a generic definition of model detail (graphical), how individual objects display themselves and the level of information as a minimum to answer the English question stated in the EIR.

Table 12 – Responsibility matrix for information production

	Example Software	Native Format	Exchange Format(s)	Plan of Work						
				1 Brief	2 Concept	3 Definition	4 Design	5 Build & Commission	6 Handover & Closeout	7 Operation
Model Authoring										
Space Planning		RVT	RVT / IFC / NWC		LOD100	LOD200	LOD300	LOD350	LOD350	LOD350
Site, Urban Design Context		RVT / DWG	RVT / DWG		LOD100	LOD100	LOD100	LOD100	LOD100	LOD100
Site and Existing Buildings		RVT / DWG	RVT / DWG		LOD100	LOD100	LOD100	LOD100	LOD100	LOD100
Architectural Model		RVT	RVT / IFC / NWC	LOD100	LOD200	LOD300	LOD350	LOD350	LOD350	LOD350
Structural Design Model		RVT	RVT / IFC / NWC		LOD100	LOD200	LOD300	LOD350	LOD350	LOD350
HVAC Design Model		RVT	RVT / IFC / NWC			LOD200	LOD300	LOD350	LOD350	LOD350
Building Services MEP Design Models		RVT	RVT / IFC / NWC			LOD200	LOD300	LOD350	LOD350	LOD350
Lighting Design Model		RVT	RVT / IFC / NWC			LOD200	LOD300	LOD350	LOD350	LOD350
Electrical Design Model		RVT	RVT / IFC / NWC			LOD200	LOD300	LOD350	LOD350	LOD350
Hydraulics Design Model		RVT	RVT / IFC / NWC			LOD200	LOD300	LOD350	LOD350	LOD350
Interior Layouts and Design Model		RVT	RVT / IFC / NWC	LOD100	LOD200	LOD300	LOD300	LOD300	LOD300	LOD300
HVAC Fabrication Model							TBC	TBC	TBC	TBC
Structural Steel Fabrication Model							LOD350	LOD350	LOD350	LOD350

Curtain Wall Fabrication Model							TBC	TBC	TBC	TBC
Road and Civil Design							LOD200	LOD200	LOD200	LOD200
Landscaping and External Works Options				LOD100	LOD100	LOD200	LOD200	LOD200	LOD200	LOD200
Renovation and Refurbishment							TBC	TBC	TBC	TBC
Facility Management Model				LOD100	LOD100	LOD200	LOD350	LOD350	LOD350	LOD350
Construction Model				LOD100	LOD100	LOD200	LOD350	LOD350	LOD350	LOD350
Subcontractor 01							TBC	TBC	TBC	TBC
Subcontractor 01							TBC	TBC	TBC	TBC
Model Analysis										
Brief Development				LOD100						
Alternative Design Options Analysis				LOD100	LOD100	LOD200				
Design Performance Analysis					LOD100	LOD200	LOD300			
Sun and Shadow Studies					LOD100	LOD200				
Structural Analysis				LOD100	LOD100	LOD200	LOD350	LOD350		
Thermal Simulation				LOD100	LOD100	LOD300				
Sustainability Analysis						LOD300				
LCA Analysis						LOD300	LOD350			
Model Clash Detection Rendition						LOD300	LOD350	LOD350		
Cost Planning and Control				LOD100	LOD100	LOD200	LOD300			

Construction Scheduling / 4D Animation				LOD100		LOD300				
Security Analysis						LOD300				
Code Checking and Regulatory Compliance							LOD350			
Acoustic Analysis and Design					LOD200	LOD300	LOD350			
Disabled Access and Egress				LOD100	LOD200	LOD300	LOD350			
Fire Protection					LOD200	LOD300	LOD350			
FM, Operation and Maintenance				LOD100	LOD100	LOD200	LOD300	LOD350	LOD350	LOD350
Automated/Linked Specifications				N/A	N/A	N/A	N/A	N/A		
Heritage Documentation and Assessment				N/A	N/A	N/A	N/A	N/A		
Solar Envelopes				LOD100	LOD200	LOD300	LOD350			
Overshading					LOD200		LOD350			
Daylight Analysis					LOD200		LOD350			
Solar Analysis				LOD100	LOD200	LOD300	LOD350			
Photovoltaic Collectors				LOD100	LOD200	LOD300	LOD350	LOD350		

4.4 Task information delivery plan (TIDP)

A task information delivery plan (TIDP) for each task within the project shall be prepared using the template below so that the format is consistent with the format required for the master information delivery plan. When completed by all team members the TIDPs should be published in this document appendix and on the project extranet.

Refer to Appendix A – Populated Wilmott Dixon MIDP

4.5 Master information delivery plan (MIDP)

The master information delivery plan (MIDP) shall be developed from the separate TIDPs produced for each task within the project. This more detailed, co-ordinated MIDP must be developed and agreed with the stakeholders. When completed the MIDP should be published in this document appendix and on the project extranet as a project plan.

Refer to Appendix A – Populated Wilmott Dixon MIDP

5 Standard method and procedure

This section of the BEP covers the requirements of PAS1192-2 Clause 7.2.1 c).

5.1 Volume strategy

See Section 5.3 (file naming convention), sub-section Volume for the definitions and abbreviations of volumes to be used on the project.

5.2 PIM origin and orientation

The origin and orientation of the project are based on the project location and its reference to other global or local grids, for example Ordnance Survey. Some projects have their own grid system: Crossrail, for instance, uses the London Grid specified for that project, as did the Olympics programme.

See the CPIC Production Information 2003 publication for specific requirements. *Table 14 – Record of information model origin and orientation*

Point	Grid intersection notation	Easting (m)	Northing (m)	Elevation or site Datum
Site local grid origin	TBC	TBC	TBC	9710mm GF FFL ASL
Grid origin Bottom Left Intersection	Y/1	323004506	179901213	9710mm GF FFL ASL
Grid Intersection Bottom Right	Z/36	323110925	179984809	9710mm GF FFL ASL
Grid Intersection Top Left	A/1	322953072	179964729	9710mm GF FFL ASL

5.3 File naming convention

In accordance with PAS1192:2 the following file naming convention will be used for the Eastern High Project. A simplified version of the unique reference has been used to aid the client in identifying the various models, in addition to a field to encompass file type.

EDUC7865-PDA-A-Revit-CR-A-Building Model-A

Project Specific Reference –	EDUC7865 – CCC Individual Building Reference (UPRN)
Originator Code (Author) –	PDA – Powell Dobson Architects MCC – McCanns CAM - Cambria
Volume / Zone / Model –	A – Client request that all information relate to Zone A.
File Type –	Revit – Denotes a Revit (RVT) file. Navis – Denotes a Navisworks (NWC) file. IFC -- Denotes an Industry Foundation Class (IFC) File
Model Use Reference –	CR – Clash Rendition (For Co-ordination) FC – For Construction FM – For Facility Management
Originator Discipline –	A – Architect M – Mechanical E – Electrical P – Plumbing S – Structures C – Contractor / Subcontractor
Quick Reference -	Building Model Ventilation Model Power and Data Model Structural Model
Revision-	Indicates Current Version of Model

Drawing naming convention

In accordance with PAS1192:2 the following drawing naming convention will be used for the Eastern High Project.

EDUC7865-PDA-A-A-00-GA-(20)200-A

Project Specific Reference –	EDUC7865 – CCC Individual Building Reference (UPRN)
Originator Code (Author) –	PDA – Powell Dobson Architects MCC – McCanns CAM – Cambria
Originator Discipline –	A – Architect M – Mechanical E – Electrical P – Plumbing S – Structures C – Contractor / Subcontractor
Volume / Zone / Model –	A – Client request that all information relate to Zone A.
Level	00 – Ground Floor 01 – First Floor 02 – Second Floor ZZ – Drawing covers several levels
Drawing Type	GA – General Arrangement DT – Detail BC – Building Control
Drawing Number	(20)200
Revision	A and so forth

DWG files exported from the BIM will use the layering standards as set out in BS1192 which should be selected from the 'Modify DWG/DXF Export Setup' within Revit. This will export Revit elements to the British Standard for layer naming convention and layer colour and will enable CCC to be presented with DWG files representing commonality across all projects.

Metadata

Extend the standard Metadata status codes as required for the project, add to but do not change the codes in the PAS1192-2.

Table 24 – Metadata status codes from PAS1192-2

Status	Description
Work in Progress	
S0	Initial status or WIP Master document index of file identifiers uploaded into the extranet.
Shared (Non-Contractual)	
S1	Suitable for Co-ordination The file is available to be „shared“ and used by other disciplines as a background for their information.
S2	Suitable for Information
S3	Suitable for Internal Review & Comment
S4	Suitable for Construction Approval
S5	Suitable for Manufacture
S6	Suitable for PIM Authorization (Information Exchanges 1-3)
S7	Suitable for AIM Authorization (Information Exchange 6)
D1	Suitable for Costing
D2	Suitable for Tender
D3	Suitable for Contractor Design
D4	Suitable for Manufacture/Procurement
AM	As Maintained
Published Documentation (Contractual)	
A	Suitable for Construction
B	Partially signed-off: For Construction with minor comments from the Client. All minor comments should be indicated by the insertion of a cloud and a statement of “in abeyance” until the comment is resolved, then resubmitted for full authorization.
AB	As-Built Handover documentation, PDF, native models, COBie etc.

5.4 Layer naming convention

Layer Naming to be in accordance with BS1192:2007.

5.5 Agreed construction tolerances for all disciplines

Table 26 – Agreed tolerances for construction elements according to project discipline

Discipline	Element	Tolerance
Architect	TBC	TBC
Structural Engineer	TBC	TBC
MEP Engineer	TBC	TBC

5.6 Drawing sheet templates

Table 27 – List of drawing sheet templates

Sheet Size	Sheet File name
A0	PAS1192:2 Compliant A0 Drawing Tile Block
A1	PAS1192:2 Compliant A1 Drawing Tile Block
A1P	PAS1192:2 Compliant A1P Drawing Tile Block (Portrait)
A2	PAS1192:2 Compliant A2 Drawing Tile Block
A2P	PAS1192:2 Compliant A2P Drawing Tile Block (Portrait)
A3	PAS1192:2 Compliant A3 Drawing Tile Block
A3P	PAS1192:2 Compliant A3P Drawing Tile Block (Portrait)
A4	PAS1192:2 Compliant A0 Drawing Tile Block

All drawing template must be rendered and presented at one of a number of approved scales, which are typically defined by the „CAD Manager“. Scales other than those approved should not be used. The templates shall also be in the standard format for sharing and interoperability.

Table 28 – Drawing sheet scales

Drawing Sheet Scales	
All drawings must be rendered and presented at one of a number of approved scales, which are typically defined by the „CAD Manager“. Scales other than those approved should not be used.	
Scale	Description of detail
1:1000	1:1000 Scale Detail shows shape and layout
1:500	
1:200	
1:100	1:100 Scale Detail shows shape, layout and construction elements

1:50	1:50 Scale Detail shows how the construction elements meet at junctions
1:20	
1:10	
1:5	1:5 Scale detail show shape, dimensions and assembly of the separate construction elements
1:2	1:2 Scale detail show shape, dimensions and assembly of the separate construction elements
1:1	All model files must be modelled at 1:1 Scale

5.7 Annotations, dimensions, abbreviations and symbols

Each discipline should provide the Design Manager and the CAD manager with a full list to be used on the project. This list should be published to all members of the project team to ensure consistency of the document graphical presentation and shall be consistent throughout the project. Also see BS8541 Parts 1, 2, 3 and 4.

Dimensions should be derived automatically from the underlying CAD coordinates by using the 'associative dimensioning' function of CAD systems. Dimensions should not be entered as 'text' as they are purely graphic characters having no relationship with the underlying CAD coordinates and will cause the relative positions of elements in a drawing to be compromised.

The project team should agree common units of measurement. These should include distance (e.g. metre and millimetre) and angles (e.g. degrees/radians measured clockwise or counter clockwise).

Table 29 – Agreed units of measurement

Type of information	Millimetres	Metres	Degrees	Radians	Clockwise	Counter
Survey		X	X			
Roads		X				
Models	X		X		X	
Drawings	X		X			

5.8 Attribute data

Attribute data for the project as defined in the EIR and templates to suit client CAfm software.

6 IT solutions

This section of the BEP covers the requirements of PAS1192-2 Clause 7.2.1 d).

6.1 Software versions

The CAD software and versions that will be used by the design teams shall be agreed before starting the project.

Table 30 – Agreed software versions

Company	Database	CAD software	Version	Format	Comments
Powell Dobson	Model	Revit	2016	RVT	
Powell Dobson	Model	Solibri	v9.5	IFC	
Powell Dobson	Model	Navisworks	2016	NWC	
Cambria	Model	Revit	2016	RVT	
MCcann	Model	Revit	2016	RVT	
Subcontractor 1	Model	TBC	TBC	TBC	
Subcontractor 2	Model	TBC	TBC	TBC	
Subcontractor 3	Model	TBC	TBC	TBC	

6.2 Exchange formats

The agreed formats for model and drawing file exchange are

Table 31 – Agreed exchange formats for models and drawings

	RVT	NWC	IFC	PDF	DWG	Excel
Models	X	X	X			
Drawings				X	X	
Final drawing format				X	X	
Schedules or spreadsheets				X		X

6.3 Process and data management systems

The process and data management systems shall be described under section 4.2 Agreed project processes for collaboration and information modelling.



WILLMOTT DIXON

SINCE 1852

Asset Information Requirements

1205 – Cardiff West Community High School

Document Control Sheet

<u>Rev</u>	<u>Status</u>	<u>Amendment</u>	<u>Date</u>	<u>By</u>
P01.01	S2	Draft, issued for comment	17/03/17	Antony Brophy
P01	S2	Formal issue	11/04/17	Antony Brophy
P02	S2	Updated issue	10/05/17	David McCarthy

1.0 Asset Information Requirements (AIR)

COBie is the Employer's required information exchange schema for asset and operational data and information. The asset includes the Facility as a whole and its constituent Spaces and Components. Spaces are grouped into Zones and Floors. For the schema, Components are grouped into Types and Systems and are allocated to a Space.

In accordance with BS 1192-4 COBie worksheets are categorised into information types:

- Core Asset information
- Operational information
- Supplementary information

Refer to the following tables for a full list of requirements:

Table 1: COBie Definitions (required worksheets)

Table 2: COBie Matrix (required fields within each worksheet)

Table 3: Asset Information Matrix (list of maintainable assets to be captured in COBie)

Table 1 – COBie Definitions

			Information type		
Definitions			Asset	Operational	Supplementary
COBie worksheets	Contact	Named person and/or organisation involved in the facility lifecycle			✓
	Facility	Named distinct operational built or geographic asset, typically a building or a section of infrastructure along with details and extent of geographic site and of the temporal project.	✓		
	Floor	Named intermediate spatial division including distinct vertical levels and horizontal areas and sections with Spaces allocated	✓		
	Space	Named location for activities such as use, inspection or maintenance, including un-occupied or un-inhabitable Spaces but not necessarily inaccessible voices. Spaces may be internal or external	✓		
	Zone	Named set of Spaces (locations) sharing a specific Attribute (such as activity, access, management or conditioning)	✓		
	Type	Named specification for components including equipment, products and materials	✓		
	Component	Named and individually scheduled physical items and features that might require management (inspection, maintenance, services, replacement) during in-use	✓		
	System	Named set of manageable components providing a common function	✓		
	Assembly	Named physical aggregation of a Type or Component into another Type or Component where both the overall assembly part and the constituent part has significance for their operation and use			
	Connection	Name logical relationship between two components			
	Spare	Named replaceable part associated to Types			
	Resource	Named material or skill required to execute Jobs			
	Job	Named task or activity during in-use phase associated to Types			
	Impact	Named economic and environmental measure			
	Document	Named external document associated to an asset			
	Attribute	Named specific characteristic associated to an asset			
	Coordinate	Named position associated to Facility, Floor, Space, Component or Assembly			
	Issue	Named deficiency in the information or risk associated to the asset			

Table 2 – COBie Matrix

2.1 Contact

Ref	COBie Data Field	Notes	Primary Responsibility	Example (BS 1192-4:2014)	Stage Required	COBie (Y/N)
1.00	Contact (ifcActor) <i>named person and/or organization involved in the Facility lifecycle</i>					
1.01	Email	expected	Delivery Team	name@email.com	RIBA Stage 2	Y
1.02	CreatedBy	reference	Delivery Team	name@email.com	RIBA Stage 2	Y
1.03	CreatedOn	expected	Delivery Team	2015-08-08T11:00:00	RIBA Stage 2	Y
1.04	Category	pick	Delivery Team	C12: Quality management	RIBA Stage 2	Y
1.05	Company	expected	Delivery Team	Company name	RIBA Stage 2	Y
1.06	Phone	expected	Delivery Team	01 1111 111111	RIBA Stage 2	Y
1.07	ExtSystem	application	Delivery Team	Authoring application	RIBA Stage 2	Auto
1.08	ExtObject	application	Delivery Team	IfcPersonAndOrganisation	RIBA Stage 2	Auto
1.09	ExtIdentifier	application	Delivery Team	n/a	RIBA Stage 2	Auto
1.10	Department	requirable	Delivery Team	Standards	RIBA Stage 2	N
1.11	OrganizationCode	requirable	Delivery Team	Company name	RIBA Stage 2	N
1.12	GivenName	requirable	Delivery Team	First name	RIBA Stage 2	N
1.13	FamilyName	requirable	Delivery Team	Surname	RIBA Stage 2	N
1.14	Street	requirable	Delivery Team	Address Road	RIBA Stage 2	N
1.15	PostalBox	requirable	Delivery Team	PO Box 111	RIBA Stage 2	N
1.16	Town	requirable	Delivery Team	New Town	RIBA Stage 2	N
1.17	StateRegion	requirable	Delivery Team	County	RIBA Stage 2	N
1.18	PostalCode	requirable	Delivery Team	AA11 1AA	RIBA Stage 2	N
1.19	Country	requirable	Delivery Team	Country	RIBA Stage 2	N

2.2 Facility

Ref	COBie Data Field	Notes	Primary Responsibility	Example (BS 1192-4:2014)	Stage Required	COBie (Y/N)
2.00	Facility (ifcProject) <i>named distinct operational built or geographic asset, typically a building or section of infrastructure</i>					
2.01	Name	expected	Architect	Some School	RIBA Stage 2	Y
2.02	CreatedBy	reference	Architect	name@email.com	RIBA Stage 2	Y
2.03	CreatedOn	expected	Architect	2012-12-12T13:29:49	RIBA Stage 2	Y
2.04	Category	pick	Architect	Co_25_10_77 Secondary schools	RIBA Stage 2	Y
2.05	ProjectName	expected	Architect	SchoolExtension	RIBA Stage 2	Y
2.06	SiteName	expected	Architect	SchoolPark	RIBA Stage 2	Y
2.07	LinearUnits	pick	Architect	Millimetres	RIBA Stage 2	Y
2.08	AreaUnits	pick	Architect	Squaremetres	RIBA Stage 2	Y
2.09	VolumeUnits	pick	Architect	Cubicmetres	RIBA Stage 2	Y
2.10	CurrencyUnit	pick	Architect	Pounds	RIBA Stage 2	Y
2.11	AreaMeasurement	expected	Architect	RICS BCIS	RIBA Stage 2	Y
2.12	ExternalSystem	application	Architect	BIM Authoring application	RIBA Stage 2	Auto
2.13	ExternalProjectObject	application	Architect	IfcProject	RIBA Stage 2	Auto
2.14	ExternalProjectIdentifier	application	Architect	ONG5d_R6T8leptpG\$lx7Lx	RIBA Stage 2	Auto
2.15	ExternalSiteObject	application	Architect	IfcSite	RIBA Stage 2	Auto
2.16	ExternalSiteIdentifier	application	Architect	ONG5d_R6T8leptpG\$lx7Lv	RIBA Stage 2	Auto
2.17	ExternalFacilityObject	application	Architect	IfcBuilding	RIBA Stage 2	Auto
2.18	ExternalFacilityIdentifier	application	Architect	ONG5d_R6T8leptpG\$lx7Lw	RIBA Stage 2	Auto
2.19	Description	requirable	Architect	Single storey secondary school	RIBA Stage 2	N
2.20	ProjectDescription	requirable	Architect	New build secondary school.	RIBA Stage 2	N
2.21	SiteDescription	requirable	Architect	Some school, Address Road, New Town, County, AA11	RIBA Stage 2	N
2.22	Phase	pick	Architect	CIC 6: Handover	RIBA Stage 2	N

2.3 Floor

Ref	COBie Data Field	Notes	Primary Responsibility	Example (BS 1192-4:2014)	Stage Required	COBie (Y/N)
3.00	Floor (ifcBuildingStorey) named <i>intermediate spatial subdivision, including distinct vertical levels and horizontal areas and sections with Spa</i>					
3.01	Name	expected	Architect	Level 0	RIBA Stage 3	Y
3.02	CreatedBy	reference	Architect	name@email.com	RIBA Stage 3	Y
3.03	CreatedOn	expected	Architect	2012-12-12T13:29:49	RIBA Stage 3	Y
3.04	Category	pick	Architect	Floor	RIBA Stage 3	Y
3.05	ExtSystem	application	Architect	Authoring application	RIBA Stage 3	Auto
3.06	ExtObject	application	Architect	IfcBuildingStorey	RIBA Stage 3	Auto
3.07	ExtIdentifier	application	Architect	ONG5d_R6T8leptGyG4uky	RIBA Stage 3	Auto
3.08	Description	requirable	Architect	Entrance level	RIBA Stage 3	N
3.09	Elevation	requirable	Architect	0	RIBA Stage 3	N
3.10	Height	requirable	Architect	4000	RIBA Stage 3	N

2.4 Space

Ref	COBie Data Field	Notes	Primary Responsibility	Example (BS 1192-4:2014)	Stage Required	COBie (Y/N)
4.00	Space (ifcSpace) named location for activities such as use, inspection or maintenance, including un-occupied or un-inhabitable Spaces.					
4.01	Name	expected	Architect	101	RIBA Stage 3	Y
4.02	CreatedBy	reference	Architect	name@email.com	RIBA Stage 3	Y
4.03	CreatedOn	expected	Architect	2012-12-12T13:29:49	RIBA Stage 3	Y
4.04	Category	pick	Architect	SL_25_10_14 Classrooms	RIBA Stage 3	Y
4.05	FloorName	reference	Architect	Level 0	RIBA Stage 3	Y
4.06	Description	expected	Architect	Classroom	RIBA Stage 3	Y
4.07	ExtSystem	application	Architect	Authoring application	RIBA Stage 3	Auto
4.08	ExtObject	application	Architect	IfcSpace	RIBA Stage 3	Auto
4.09	ExtIdentifier	application	Architect	3PbU3I0k5FV03gc98VQGZm	RIBA Stage 3	Auto
4.10	RoomTag	requirable	Architect	CL 101	RIBA Stage 3	N
4.11	UsableHeight	requirable	Architect	2955	RIBA Stage 3	N
4.12	GrossArea	requirable	Architect	24.837	RIBA Stage 3	N
4.13	NetArea	requirable	Architect	24.837	RIBA Stage 3	N

2.5 Zone

Ref	COBie Data Field	Notes	Primary Responsibility	Example (BS 1192-4:2014)	Stage Required	COBie (Y/N)
5.00	Zone (ifcZone) named set of Spaces (locations) sharing a specific Attribute, such as activity, access, management or conditioning					
5.01	Name	expected	Architect	Teaching	RIBA Stage 3	Y
5.02	CreatedBy	reference	Architect	name@email.com	RIBA Stage 3	Y
5.03	CreatedOn	expected	Architect	2013-04-15T00:00:00	RIBA Stage 3	Y
5.04	Category	pick	Architect	Circulation Zone	RIBA Stage 3	Y
5.05	SpaceNames	reference	Architect	101, 102, 104	RIBA Stage 3	Y
5.06	ExtSystem	application	Architect	Authoring application	RIBA Stage 3	Auto
5.07	ExtObject	application	Architect	IfcZone	RIBA Stage 3	Auto
5.08	ExtIdentifier	application	Architect	3PbU3I0k5FV03gc98VQGZn	RIBA Stage 3	Auto
5.09	Description	requirable	Architect	Basic teaching spaces	RIBA Stage 3	N

2.6 Type

Ref	COBie Data Field	Notes	Primary Responsibility	Example (BS 1192-4:2014)	Stage Required	COBie (Y/N)
6.00	Type (ifcElementType) named specification for Components including equipment, products and materials					
6.01	Name	expected	Design Team	White Board	RIBA Stage 3	Y
6.02	CreatedBy	reference	Design Team	name@email.com	RIBA Stage 3	Y
6.03	CreatedOn	expected	Design Team	2013-04-15T00:00:00	RIBA Stage 3	Y
6.04	Category	pick	Design Team	Pr_40_30_25 Display and presentation fittings	RIBA Stage 3	Y
6.05	Description	expected	Design Team	Short Throw Projector	RIBA Stage 3	Y
6.06	AssetType	pick	Design Team	Fixed	RIBA Stage 3	Y
6.07	Manufacturer	reference	Contractor	company@email.com	RIBA Stage 6	Y
6.08	ModelNumber	expected	Contractor	587	RIBA Stage 6	Y
6.09	WarrantyGuarantorParts	reference	Contractor	company@email.com	RIBA Stage 6	Y
6.10	WarrantyDurationParts	expected	Contractor	5	RIBA Stage 6	Y
6.11	WarrantyGuarantorLabor	reference	Contractor	company@email.com	RIBA Stage 6	Y
6.12	WarrantyDurationLabor	expected	Contractor	5	RIBA Stage 6	Y
6.13	WarrantyDurationUnit	pick	Contractor	Year	RIBA Stage 6	Y
6.14	ExtSystem	application	Design Team	Authoring application	RIBA Stage 3	Auto
6.15	ExtObject	application	Design Team	IfcFurnitureType	RIBA Stage 3	Auto
6.16	ExtIdentifier	application	Design Team	1ITs7iOoDD\$830Kgut03mv	RIBA Stage 3	Auto
6.17	ReplacementCost	requirable	Contractor	2760	RIBA Stage 6	N
6.18	expectedLife	requirable	Contractor	15	RIBA Stage 6	N
6.19	DurationUnit	pick	Contractor	Year	RIBA Stage 6	N
6.20	WarrantyDescription	requirable	Contractor	Onsite warranty and advanced replacement warranty	RIBA Stage 6	N
6.21	NominalLength	expected	Design Team	2105	RIBA Stage 3	Y
6.22	NominalWidth	expected	Design Team	50	RIBA Stage 3	Y
6.23	NominalHeight	expected	Design Team	1329	RIBA Stage 3	Y
6.24	Modelreference	requirable	Contractor	Short Throw Projector	RIBA Stage 6	N
6.25	Shape	requirable	Contractor	Rectangular	RIBA Stage 6	N
6.26	Size	requirable	Contractor	2105mm x 1329mm	RIBA Stage 6	N
6.27	Color	requirable	Contractor	White	RIBA Stage 6	N
6.28	Finish	requirable	Contractor	Matt	RIBA Stage 6	N
6.29	Grade	requirable	Contractor	tough	RIBA Stage 6	N
6.30	Material	requirable	Contractor	various	RIBA Stage 6	N
6.30	Constituents	requirable	Contractor	remote controller	RIBA Stage 6	N
6.32	Features	requirable	Contractor	auto-shutdown	RIBA Stage 6	N
6.33	AccessibilityPerformance	requirable	Contractor	visual impairment adapted	RIBA Stage 6	N
6.34	CodePerformance	requirable	Contractor	fully earthed	RIBA Stage 6	N
6.35	SustainabilityPerformance	requirable	Contractor	low-energy	RIBA Stage 6	N

2.7 Component

Ref	COBie Data Field	Notes	Primary Responsibility	Example (BS 1192-4:2014)	Stage Required	COBie (Y/N)
7.00	Component (ifcElement) named and individually scheduled physical items that might require inspection, maintenance, servicing or replacement					
7.01	Name	expected	Design Team	White Board:247849	RIBA Stage 3	Y
7.02	CreatedBy	reference	Design Team	name@email.com	RIBA Stage 3	Y
7.03	CreatedOn	expected	Design Team	2012-12-12T13:29:49	RIBA Stage 3	Y
7.04	TypeName	reference	Design Team	White Board	RIBA Stage 3	Y
7.05	Space	reference	Design Team	101	RIBA Stage 3	Y
7.06	Description	expected	Design Team	WhiteBoard in room 101	RIBA Stage 3	Y
7.07	ExtSystem	application	Design Team	Authoring application	RIBA Stage 3	Auto
7.08	ExtObject	application	Design Team	IfcFurnishingElement	RIBA Stage 3	Auto
7.09	ExtIdentifier	application	Design Team	0ITs7iOoDD\$830Kgut03mv	RIBA Stage 3	Auto
7.10	SerialNumber	requirable	Contractor	S4567901	RIBA Stage 6	N
7.11	InstallationDate	requirable	Contractor	2012-12-12T13:29:49 (pc or commissionng)	RIBA Stage 6	N
7.12	WarrantyStartDate	requirable	Contractor	2012-12-12T13:29:49	RIBA Stage 6	N
7.13	TagNumber	requirable	Contractor	247849	RIBA Stage 6	N
7.14	BarCode	requirable	Contractor	4567901	RIBA Stage 6	N
7.15	AssetIdentifier	requirable	Contractor	2f7761ec-6323-4dfc-80c0-52ae3703f410	RIBA Stage 6	N

2.8 System

Ref	COBie Data Field	Notes	Primary Responsibility	Example (BS 1192-4:2014)	Stage Required	COBie (Y/N)
8.00	System (ifcSystem) named set of manageable Components providing a common function					
8.01	Name	expected	Design Team	Circuit 1	RIBA Stage 3	Y
8.02	CreatedBy	reference	Design Team	name@email.com	RIBA Stage 3	Y
8.03	CreatedOn	expected	Design Team	2012-12-12T13:29:49	RIBA Stage 3	Y
8.04	Category	pick	Design Team	44-08 Electrical Installation - Generally	RIBA Stage 3	Y
8.05	ComponentNames	reference	Design Team	WhiteBoard:247849	RIBA Stage 3	Y
8.06	ExtSystem	application	Design Team	Authoring application	RIBA Stage 3	Auto
8.07	ExtObject	application	Design Team	IfcZone	RIBA Stage 3	Auto
8.08	ExtIdentifier	application	Design Team	3PbU3I0k5FVO3gc98VQGZn	RIBA Stage 3	Auto
8.09	Description	requirable	Design Team	Small power circuit 1	RIBA Stage 3	N

Table 3 - COBie Asset Matrix**1.1 Substructure**

1.1.1 Standard foundations	
1.1.2 Specialist foundation systems	
1.1.3 Lowest floor construction	
1.1.4 Basement excavation	
1.1.5 Basement retaining walls	

2.1 Frames

2.1.1 Structural Steel frames	
2.1.2 Space frames / decks	
2.1.3 Concrete casings to steel frames	
2.1.4 Concrete frames	
2.1.5 Timber frames	
2.1.6 Specialist frames	

2.2 Upper Floors

2.2.1 Floors	✓
2.2.2 Balconies	
2.2.3 Drainage to balconies	

2.3 Roof

2.3.1 Roof structure	
2.3.2 Roof coverings	✓
2.3.3 Specialist roof systems	
2.3.4 Roof drainage	
2.3.5 Roof lights skylights & openings	✓
2.3.6 Roof features	

2.4 Stairs and Ramps

2.4.1 Stairs / ramp structures	✓
2.4.2 Stair / ramp finishes	
2.4.3 Stairs / ramp balustrades & handrails	✓
2.4.4 Ladders / chutes / slides	

2.5 External Walls

2.5.1 External enclosing walls above ground floor level	✓
2.5.2 External enclosing walls below ground level	
2.5.3 Solar / rain screening	
2.5.4 External soffits	
2.5.5 Subsidiary walls, balustrades, handrails, railings	
2.5.6 Façade access / cleaning systems	

2.6 Windows and External Doors

2.6.1 External windows	✓
2.6.2 External doors	✓

2.7 Internal walls and partitions

2.7.1 Walls & partitions	✓
2.7.2 Balustrades & handrails	✓
2.7.3 Moveable room dividers	✓
2.7.4 Cubicles	✓

2.8 Internal Doors

2.8.1 Internal doors	✓
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3.1 Wall Finishes

3.1.1 Finishes to walls	✓
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3.2 Floor Finishes

3.2.1 Finishes to floors	✓
3.2.2 Raised access floors	

3.3 Ceiling Finishes

3.3.1 Finishes to ceilings	✓
3.3.2 False ceilings	
3.3.3 Demountable suspended ceilings	

4.1 Fittings, furnishings & equipment

4.1.1 General fittings, furnishings & equipment	✓
4.1.2 Domestic kitchen fittings & equipment	✓
4.1.3 Special purpose fittings, furnishings & equipment	✓
4.1.4 Signs / notices	
4.1.5 Works of Art	
4.1.6 Non-mechanical & non electrical equipment	
4.1.7 Internal planting	
4.1.8 Bird & vermin control	

5.1 Sanitary appliances

5.1.1 Sanitary Appliances	✓
5.1.2 Sanitary Ancillaries	

5.2 Services equipment

5.2.1 Services equipment	✓
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5.3 Disposal installations

5.3.1 Foul drainage above ground	✓
5.3.2 Chemical, toxic & industrial liquid waste drainage	
5.3.3 Refuse Disposal	

5.4 Water installations

5.4.1 Mains water supply	✓
5.4.2 Cold water distribution	✓
5.4.3 Hot water distribution	✓
5.4.4 Local Hot Water	✓
5.4.5 Steam & condensate distribution	

5.5 Heat source

5.5.1 Heat Source	✓
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5.6 Space heating & Air conditioning

5.6.1 Central Heating	✓
5.6.2 Local Heating	✓
5.6.3 Central Cooling	✓
5.6.4 Local Cooling	✓
5.6.5 Central heating & cooling	✓
5.6.6 Local heating & cooling	✓
5.6.7 Central air conditioning	✓
5.6.8 Local air conditioning	✓

5.7 Ventilation systems

5.7.1 Central ventilation	✓
5.7.2 Local & special ventilation	✓
5.7.3 Smoke extract / control	

5.8 Electrical installations

5.8.1 Electrical mains & sub-mains distribution	✓
5.8.2 Power Installations	✓
5.8.3 Lighting installations	✓
5.8.4 Specialist lighting installations	
5.8.5 Local electricity generation systems	✓
5.8.6 Earthing & bonding systems	

5.9 Fuel installations

5.9.1 Fuel storage	
5.9.2 Fuel distribution systems	

5.10 Lift & conveyor installations

5.10.1 Lifts & enclosed hoists	✓
5.10.2 Escalators	
5.10.3 Moving Pavements	
5.10.4 Powered stair lifts	
5.10.5 Conveyors	
5.10.6 Dock levellers & scissor lifts	
5.10.7 Cranes & unenclosed hoists	
5.10.8 Car lifts, car stacking system, turntables etc.	
5.10.9 Document handling systems	
5.10.10 Other transport systems	

5.11 Fire & lighting protection

5.11.1 Fire fighting systems	
5.11.2 Fire suppression systems	
5.11.3 Lightning protection	

5.12 Communication, security & control installations

5.12.1 Communication systems	✓
5.12.2 Security systems	✓
5.12.3 Central control / building management systems	✓

5.13 Specialist installations

5.13.1 Specialist piped supply systems	
5.13.2 Specialist refrigeration systems	
5.13.3 Specialist mechanical installations	
5.13.4 Specialist electrical installations	
5.13.5 Water features	

8.2 Roads, Paths and pathing

8.2.1 Roads, paths & pavings	
8.2.2 Special surfaces & pavings	

8.3 Soft landscaping

8.3.1 Seeding & turfing	
8.3.2 External planting	
8.3.3 Irrigation systems	

8.4 Fencing, Railings & Walls

8.4.1 Fencing & Railings	
8.4.2 Walls & Screens	
8.4.3 Retaining Walls	
8.4.4 Barriers & Guardrails	

8.5 Site / Street Furniture & Equipment

8.5.1 Site / Street Furniture & Equipment	
8.5.2 Ornamental Features	

8.6 External drainage

8.6.1 Surface water & foul water drainage	
8.6.2 Ancillary drainage systems	
8.6.3 External laboratory & industrial Liquid waste drainage	
8.6.4 Land drainage - Infiltration trenches	

8.7 External services

8.7.1 Water Mains Supply	
8.7.2 Electricity Mains Supply	
8.7.3 External Transformation Devices	
8.7.4 Electricity Distribution to External Plant & Equipment	
8.7.5 Gas Mains Supply (LPG)	
8.7.6 Telecommunications & Other Communication System Connections	
8.7.7 External Fuel Storage & Piped Distribution Systems	
8.7.8 External Security Systems	
8.7.9 External street lighting systems	
8.7.10 Local / District heating installations	

