

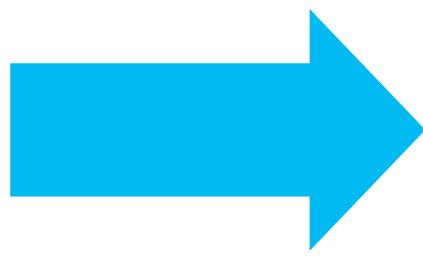


*build***offsite**
promoting construction *offsite*
3rd July 2013

HMYOI Cookham Wood

Houseblock and Education Building

ONE TEAM DELIVERY : ONE TEAM OPERATION



INTRODUCTION

Terry Stocks:
Head of Estates Projects & Programme Delivery
Ministry of Justice

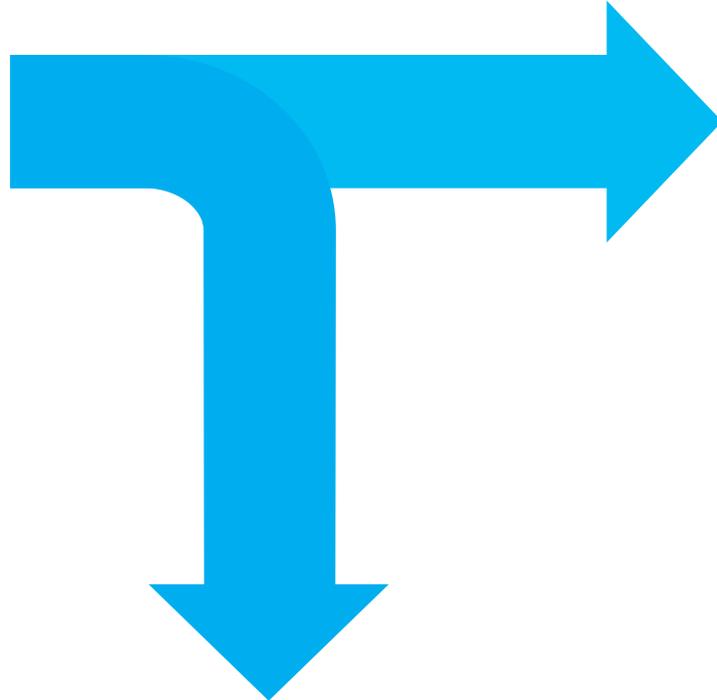


The Ministry of Justice (MOJ) have been implementing collaborative forms of procurement and early contractor engagement (ECI) for over ten years. More recently we have introduced Building Information Modelling (BIM). We view BIM as an important collaborative tool, that if used in a Lean and Collaborative delivery environment helps release the potential for clients and industry to do something differently which could be the catalyst for radical change.

From the MOJ's position as an Intelligent Client and exponent of lean in construction, it was an obvious move to bring all our learning and experience together to run Cookham Wood as a Cabinet Office best practice project highlighting the benefits of bringing the Construction Strategy Initiatives together (ECI, BIM, Project Bank Accounts, Soft Landings and Lean delivery and benchmarking) and showcase how they can be used in unison, realising significant benefits in reduced cost, predictability and SME engagement.

The MOJ have been a champion of the current Construction Strategy and will continue to innovate to play a key role in achieving Peter Handsford, the Chief Construction Advisor, 'Construction 2025' vision.

ONE TEAM DELIVERY : ONE TEAM OPERATION



THE TEAM



Neil Sanderson: Senior Project Sponsor
Ministry of Justice



Fiona Moore: Strategic Alliance Manager
HLN Architects



Colin Magner: Associate CAD/BIM Manager
Arup



Andrew Pearson: Associate Director
Interserve Construction



Ian Hampson: Project Manager
Interserve Construction



Richard Pooley: Design Manager
Interserve Construction



Martin Taylor: M&E Project Manager
Encore

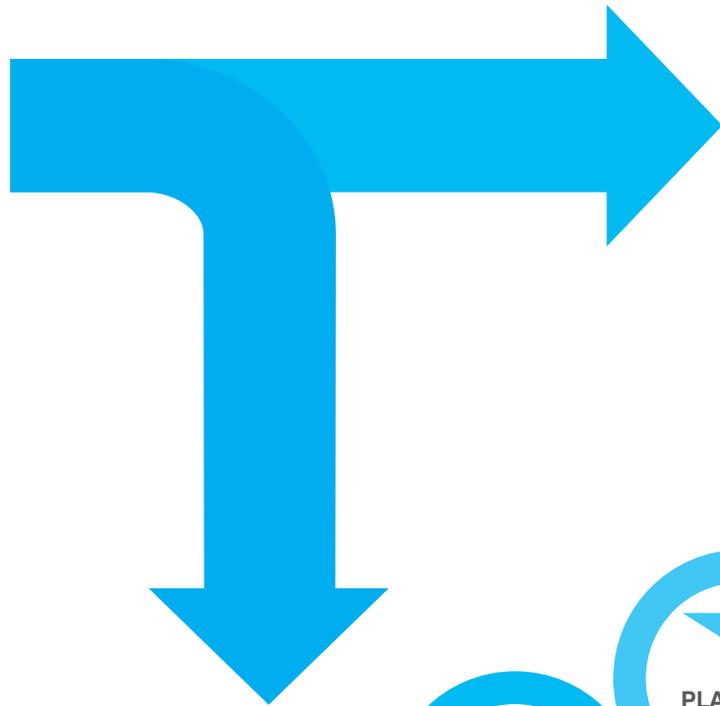


Alex Jones: BIM & VDC Manager
Interserve Construction

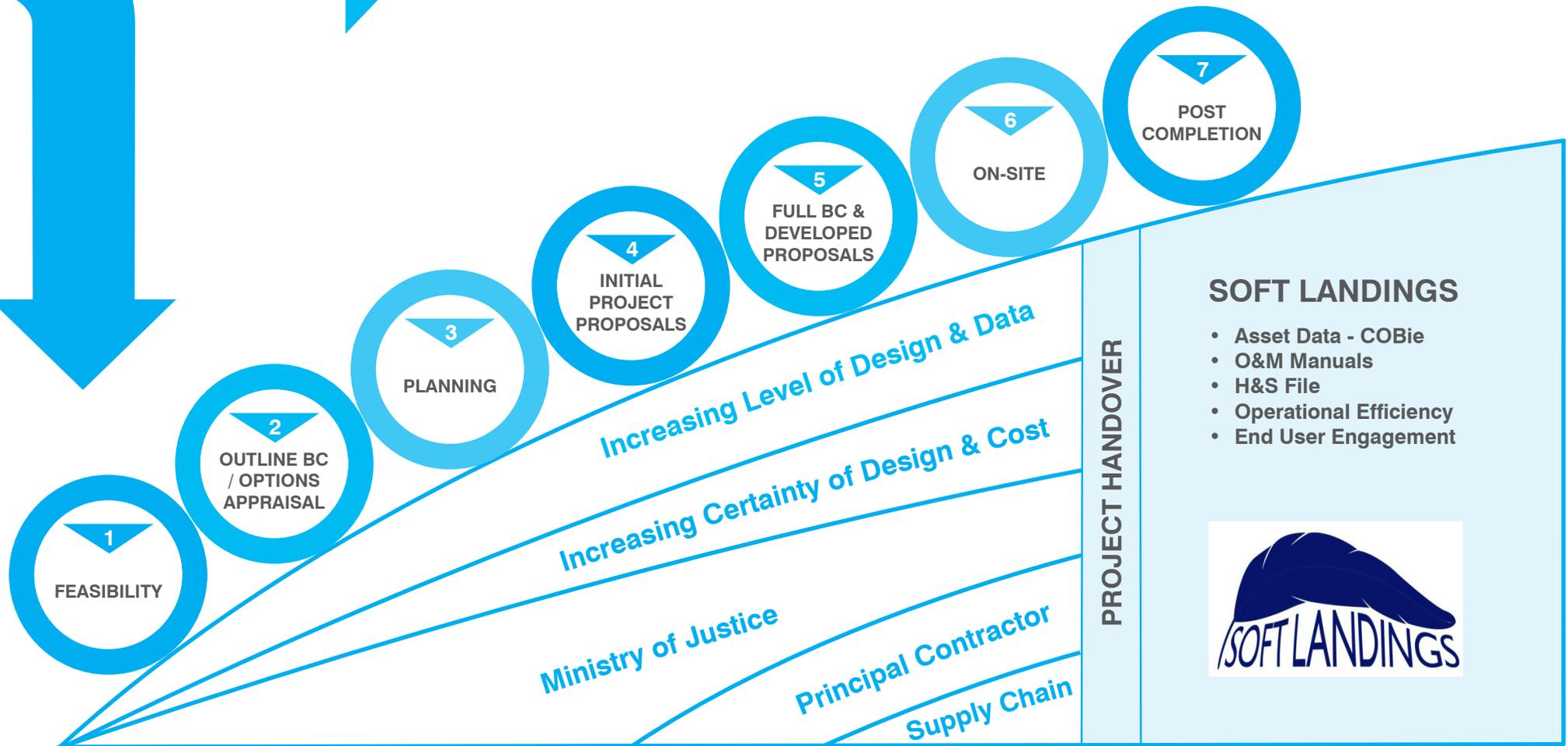


Helen Bryson: Project Manager
Faithful+Gould

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BETTER FOR LESS



ONE TEAM DELIVERY : ONE TEAM OPERATION

PROJECT INITIATIVES

- Lean Principles
- BIM
- Soft Landings
- Two Stage Tendering - Early Contractor Engagement
- Project Bank Accounts

Promoting Collaborative Working

The MoJ uses PPC 2000 form of Contract for all of our work. This Form actively promotes Collaborative Working throughout its stages.

The MoJ utilises a Contractor Framework to procure our work. We have a Consultant Framework to assist with Outline Proposals.



ONE TEAM DELIVERY : ONE TEAM OPERATION



PROJECT HISTORY

Neil Sanderson:
Senior Project Sponsor
Ministry of Justice

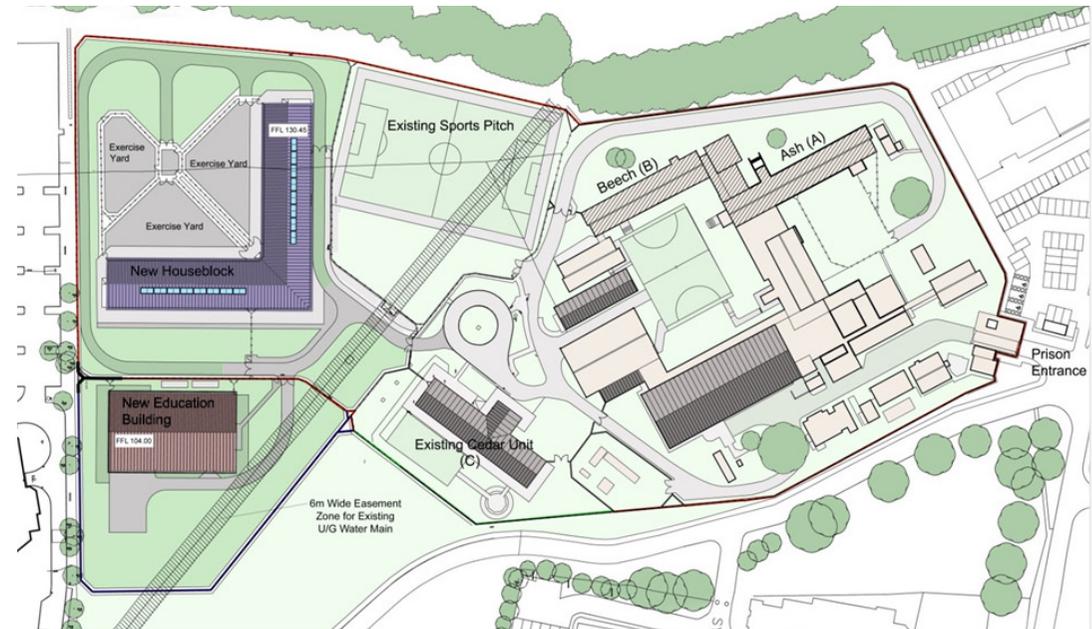
HMYOI Cookham Wood is situated near Rochester in Kent next door to the original "Borstal" Establishment (now called HMP Rochester).

Built in 1978, by Prisoners and Works Staff, the use of Cookham Wood was changed in 2008 from Women to Young People (Male). From the start this caused problems in control leading to the detriment of the building condition.

Two years ago we sought approval to proposals to re-build part of the Prison rather than carry out constant repairs (at increasing cost). This proposal fitted the Government's New for Old concept. In late 2011 the project was suggested as a BIM Trial Project.

HMYOI Cookham Wood is situated near Rochester in Kent next door to the original "Borstal" Establishment (now called HMP Rochester). Built in 1978, by Prisoners and Works Staff, the use of Cookham Wood was changed in 2008 from Women to Young People (Male). From the start this caused problems in control leading to the detriment of the building condition.

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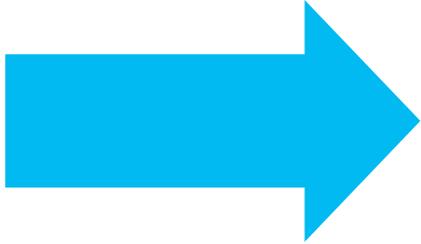
The MoJ team of HLN/URS took the lead on this by translating our 2D standard designs into the required BIM model. We did this in SIX WEEKS with little outside assistance.

We also had to prove that the "End Users" very specific requirements would work within our Standard Type of building. This project had to get full Planning Approval BEFORE being allowed to proceed. This is due to substantial historical Planning Authority problems.

The project is using a Soft Landings process through all areas and this will become more apparent as we proceed here. Contractually we have a Project Bank Account in place to test and report on this initiative.

One of the Team's major problems in progress towards full Contractor involvement was the very substantial limitations of the Client's IT systems and capabilities.

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BIM: Collaboration

Fiona Moore:
Strategic Alliance Manager
HLN Architects



information



in one place

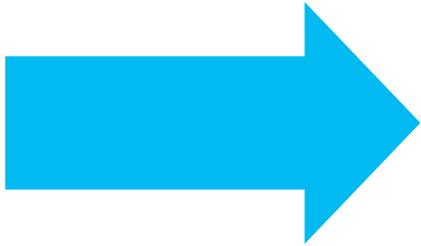


integrated



intelligently used

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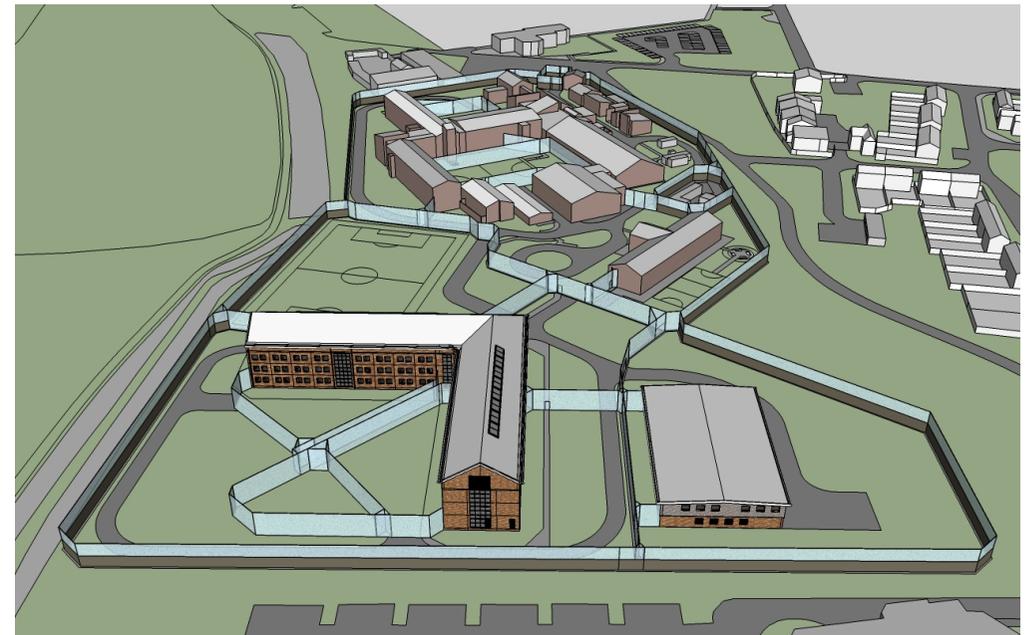


SOFT LANDINGS: Benefits to Stakeholders

Fiona Moore:
Strategic Alliance Manager
HLN Architects

By drawing the Planning submission as a 3D model from which 2D planning documentation is derived, it is easy to then use this model, setting it within the site context, to demonstrate the impact of the proposal on the public realm surrounding the site, especially to those affected by the scheme such as local residents.

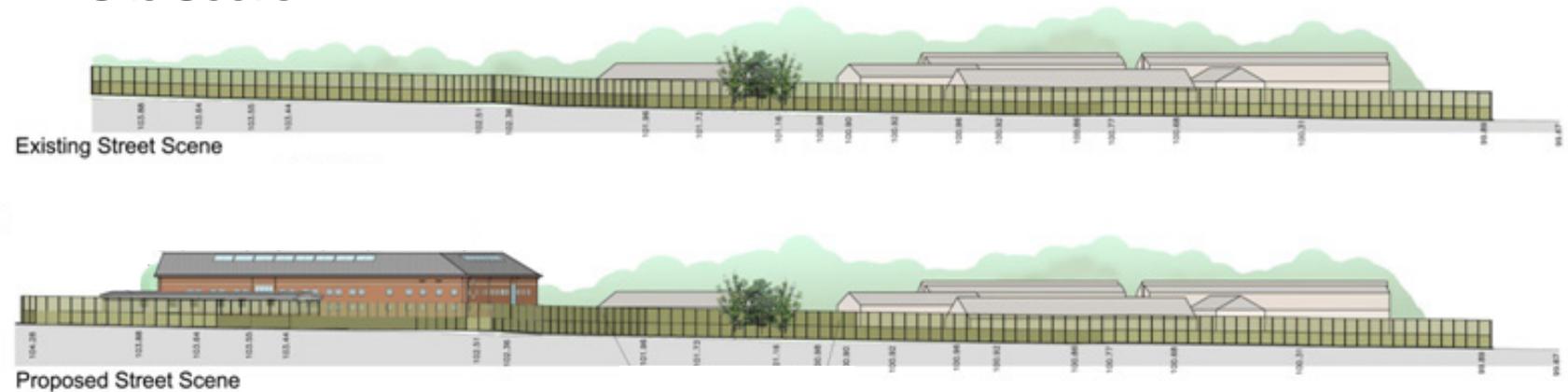
The ability to show a 3D animation of the whole site to Medway Council's Planning Committee, allowed them to more easily understand the impact of the proposed scheme at Cookham Wood.



ONE TEAM DELIVERY : ONE TEAM OPERATION

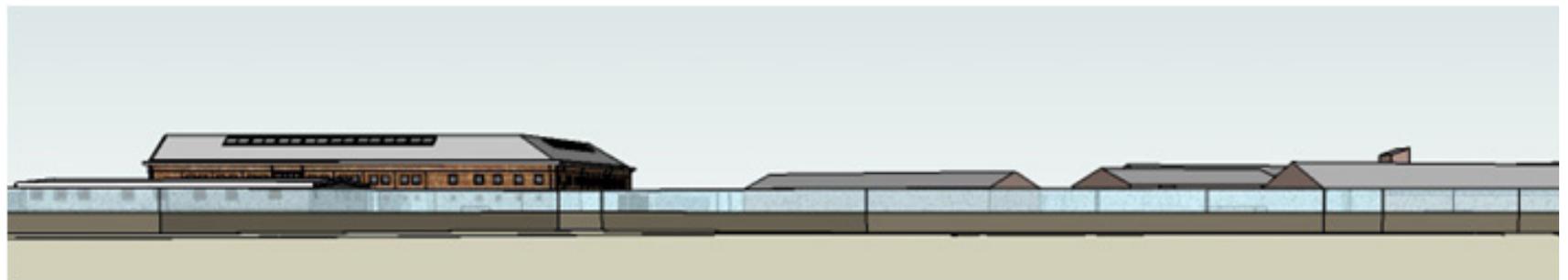


2D Site Section



In the past the most efficient way of showing how a scheme would look from adjacent roads and properties was to produce a 2D site section. This doesn't represent a very realistic view of the site.

3D Street Scene



Now, using a 3D model, we are able to give the scheme a more realistic and accurate perspective, which again helps to present the scheme to the Planning Authority and also local residents at Public Liaison events.



SOFT LANDINGS: End user engagement

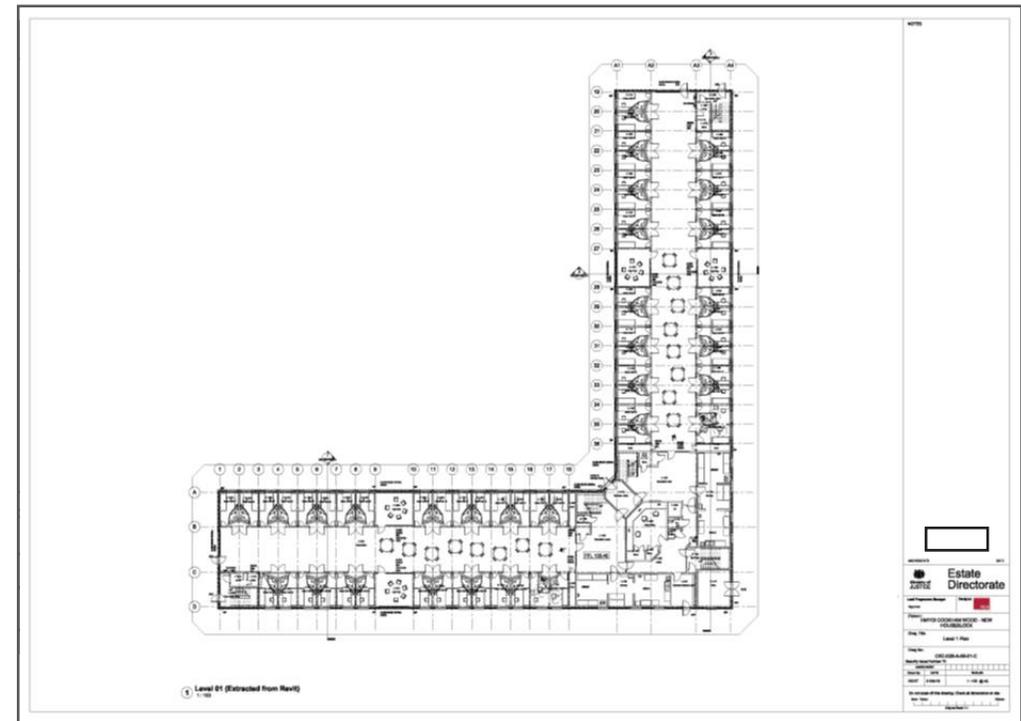
Fiona Moore:
Strategic Alliance Manager
HLN Architects

In the past 2D drawings have been used to explain scheme proposals to stakeholders, including those who are going to occupy and operate the buildings. It is often the case that those who don't work within construction find it hard to interpret and understand line drawings, which can result in schemes being signed off, that once built, are not as the stakeholder expected.

In the case of the Cookham Wood project, the use of the 3D model enabled us to more clearly illustrate the building design and its eventual operation. For example the Governor, Emily Thomas, saw that if what had previously been a glazed screen was converted back to bars, it would allow sound transference, enabling staff in the central core to more easily hear if there was any disturbance on the wings.

Early project scoping and stakeholder engagement, aided by the use of the BIM model as a visual tool, has contributed towards considerable financial savings and Soft Landings.

The following comments from the Governor, on the next two pages, speak for themselves.



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SOFT LANDINGS: End user engagement

“For the first time I could understand a building design. It allowed me to contribute and comment (both positively & negatively) for the first time rather than having to look at a flat drawing”.

 SOFT LANDINGS

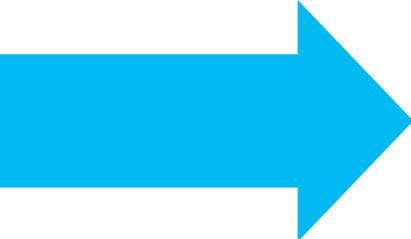


Emily Thomas

Governor HMYOI Cookham Wood

Winner of the 2012 Leadership Award, Civil Service Awards

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SOFT LANDINGS: End user engagement

“The developed models for the buildings allowed me to present to my Senior Management Team and Staff Managers a walk-through of the buildings highlighting views into and out of areas that normally I couldn’t do until completion. All before anything started!”

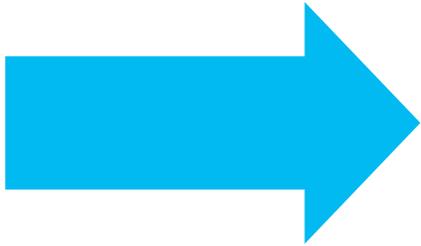
“I understand that as the model develops I will have further opportunity to access it with staff who will operate the Units - this can only bring positive benefits”.



Emily Thomas

Governor HMYOI Cookham Wood

Winner of the 2012 Leadership Award, Civil Service Awards



BIM: Design

Colin Magner
Associate | CAD/BIM Manager
Arup

Accessing all project information from a single combined model significantly reduces scope for error.

Whatever the format of the deliverable (drawing, builderswork detail, schedule), the information is all drawn from the same source and hence has to be consistent and is also much easier to update. Changing the model changes all the views, regardless of format.

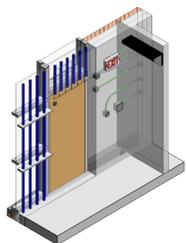
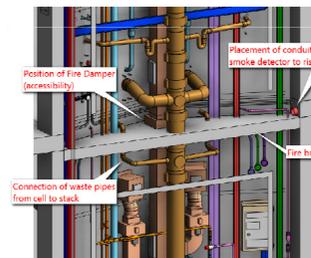
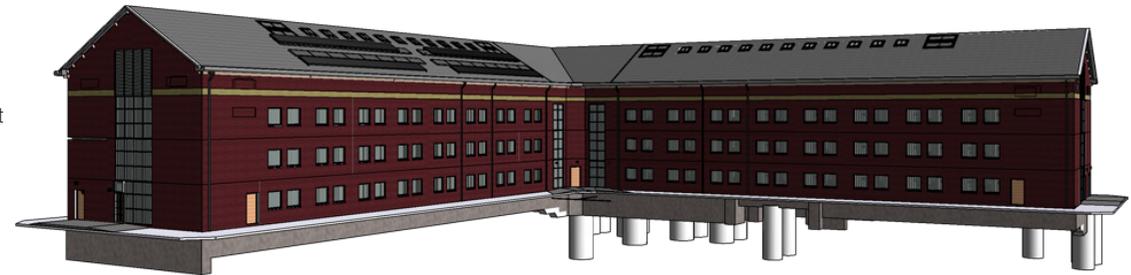
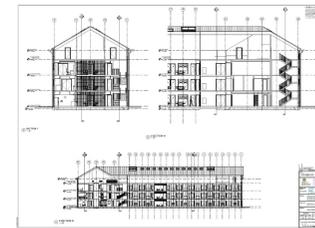
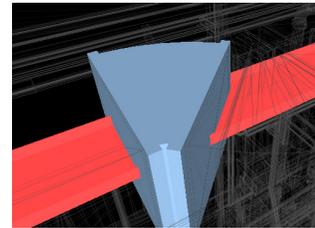
Evolution of design and installation can be tracked through space and equipment parameters.

Outputs and deliverables are cut straight from model. We estimate this has created significant savings and improvement in accuracy, for example, in the detailing of builderswork for the pre-cast elements over and above traditional methods which would have required generating individual 2D plans, sections and elevations for each element.

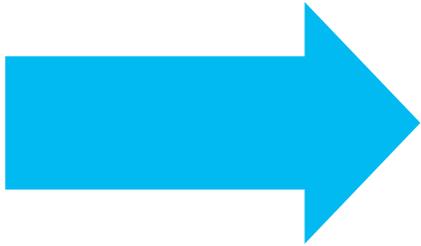
Reduces contractors production phase for co-ordinated working and installation drawings.

LIDAR scans can be brought back into the BIM for validation and amendment of the model.

Many of the benefits of BIM in design are realised during the construction phase in experiencing less issues on site, ultimately reducing timescales, abortive work and cost.



ONE TEAM DELIVERY : ONE TEAM OPERATION



BIM: Design

Colin Magner
Associate | CAD/BIM Manager
Arup

Representation from software showing three different views of the model (traditional 2D view, 3D view and schedule) related to lighting design in a single space.

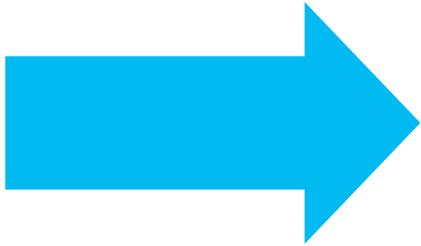
The screenshot displays three views of a lighting design model in a single space:

- 2D View (Top Left):** A floor plan showing lighting layouts for Level 03. It includes a scale of 1:100 and various lighting fixture symbols.
- 3D View (Top Right):** A perspective view of the space, showing a long table and several chairs, with lighting fixtures integrated into the design.
- Schedule (Bottom):** A table titled "E - Lighting Fixture Schedule by Space" listing various lighting fixtures and their properties.

Product Name	Product Model/Part No.	Type	Lamp	Space: Name	Space: Number
Light line Integra Infil Section	LL14314	494		Under Grad Studio Textile	331
494: 6					
Light line Integra Infil Section	LL14315	797		Under Grad Studio Textile	331
797: 1					
Thorlux Light line Integra Sca	LL14320	797E		Under Grad Studio Textile	331
797E: 1					
Light line Integra Smart Lumin	LL14307DFS27123	B	2x49W	Under Grad Studio Textile	331
B: 8					
Light line Integra End Kt		Lighting_T		Under Grad Studio Textile	331
Lighting_Thorlux_Integra End: 2					
Light line Integra Wall Kt		Lighting_T		Under Grad Studio Textile	331
Lighting_Thorlux_Integra Wall Kt: 2					

Properties panel on the right shows settings for the selected view, including View Scale (1:100), Display Model (Normal), and Orientation (Project North).

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BIM: Design Benefits

Colin Magner
Associate | CAD/BIM Manager
Arup

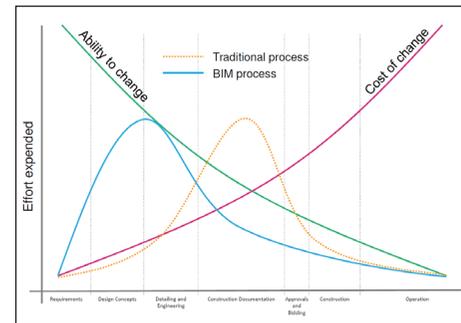
A consequence of adopting BIM is that more design effort is required at the front-end of the process. This needs to be accounted for in project programmes. The benefits of this increased effort are largely realised by dealing with co-ordination and change at an early stage, prior to construction, when it is most efficient to do so.

Regular sharing of models amongst design team members (work-in-progress models shared weekly), using project protocols to determine exchange method and project extranet to share files. Regular sharing keeps all disciplines up to date with design changes and avoids risk of receiving a large batch of changes late in the process.

Use of 3D model in design meetings allows us to focus and visualise the issues quickly and accurately leading to efficient resolution. We also record comments from review directly in the model.

Use of 3D model enables co-ordination that otherwise would be very difficult e.g. level to level or below ground co-ordination.

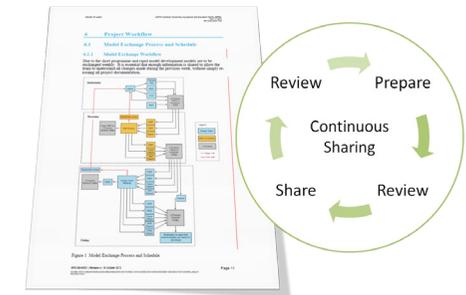
Design Effort



Design Review

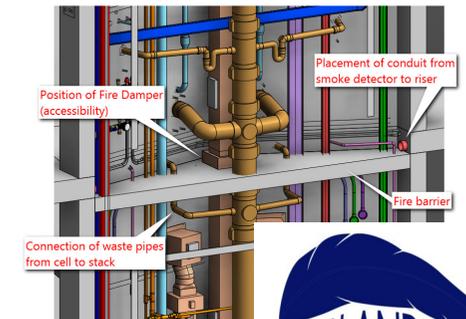


Exchange of Information

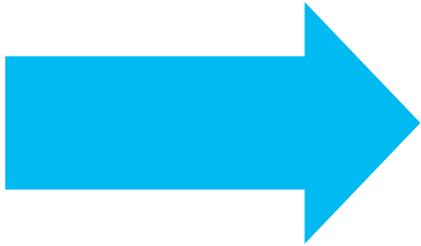


BS/PAS: 1192

Multi-disciplinary Integration



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BIM: Design Benefits

Colin Magner
Associate | CAD/BIM Manager
Arup

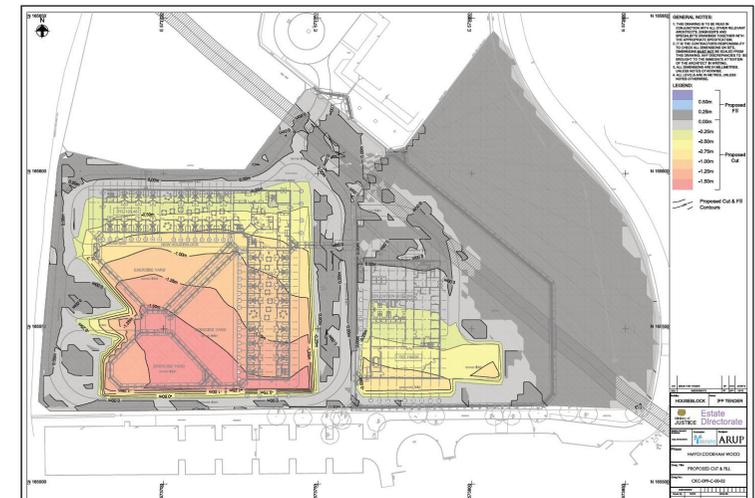
Development of ground model which collates all relevant site data provided tremendous benefits at the early project stages in terms of visualisation of the site topography and assessing most efficient solutions for cut and fill, foundation design and contamination. The model was presented in the form of an interactive pdf so that the whole team could access the data without specialist tools.

Design can be verified using in-built design functionality of software.

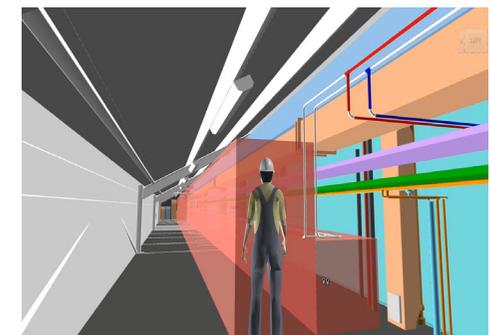
Being able to embed maintenance/access zones for plant and equipment enables us to verify spaces are kept clear, visible in both 2D and 3D and through automatic clash detection.

We also represented key residual health and safety risks for construction and operation directly in the model. This is much more effective in communicating hazards and risks to operatives than a traditional, hard copy register would be.

Ground Access Model



Health & Safety



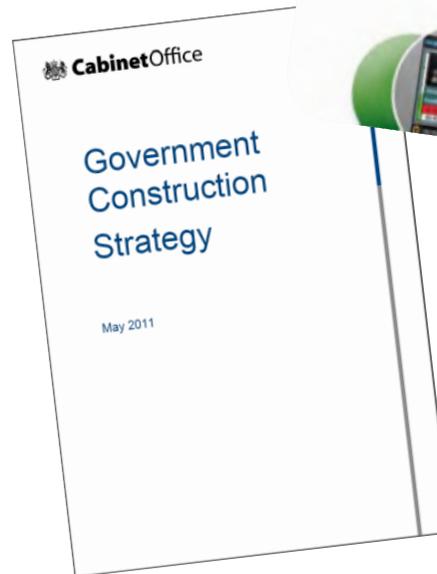
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Drivers for Lean and BIM

Andrew Pearson
Associate Director
Interserve Construction

- **Government mandate BIM 2016 (Level 2)**
- **Government construction strategy (2011) aims to reduce costs by 20%**
- **Greater focus on WLC-OPEX, Waste, Carbon Content and Asset Management = need for smarter data management**

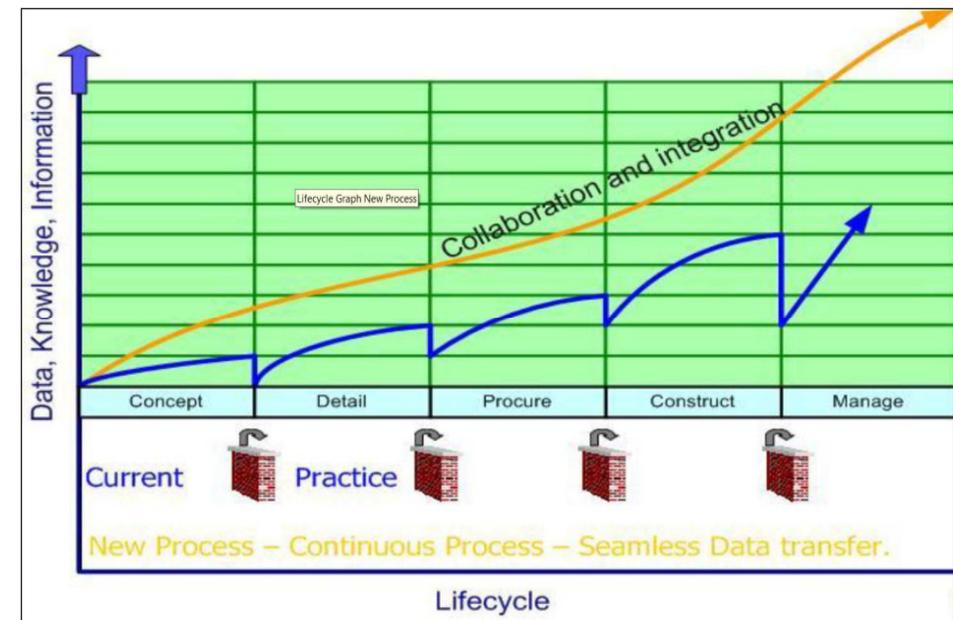


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Where's the saving / waste?

Andrew Pearson
Associate Director
Interserve Construction

- 30% of the construction process is **rework**
- 60% of the **labour effort is wasted**
- 10% loss is due to **wasted materials**
- 3-5% of the construction turnover **lost at discipline interface** and loss of interoperability
- Construction information is therefore often:
 - inaccurate
 - incomplete
 - ambiguous

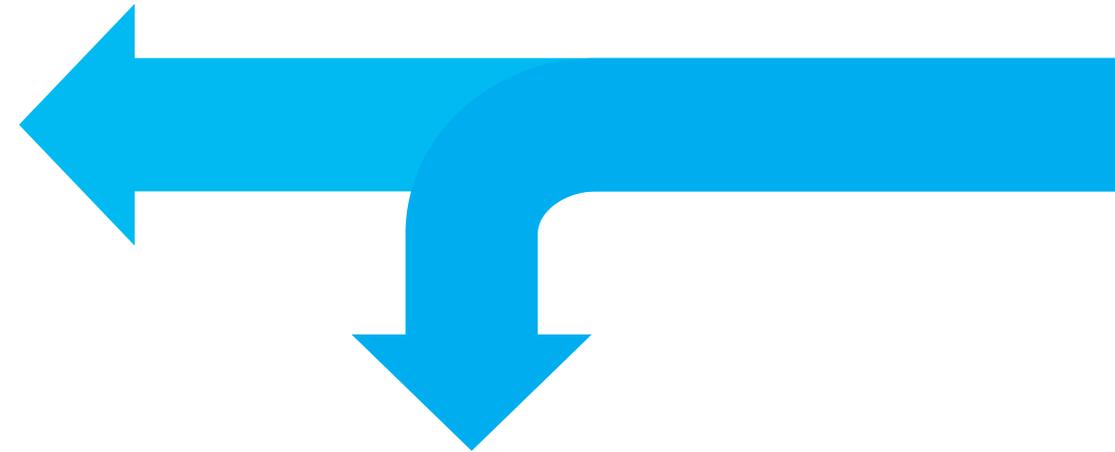


The Economist

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Interserve: Ingenuity at work

Andrew Pearson
Associate Director
Interserve Construction



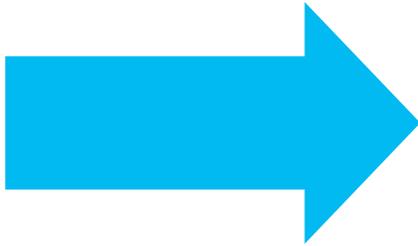
What does this mean to the constructor and look like in delivery?

- We need to improve our game, change our thinking and approach...embrace the challenge

"...by changing nothing, nothing changes."

Tony Robbins

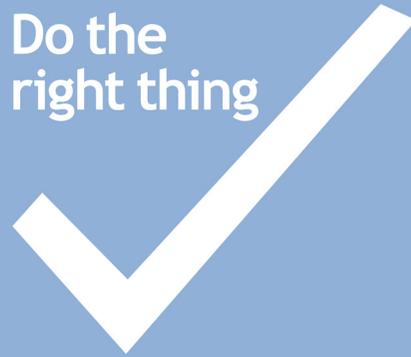
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Interserve: Live our values

Andrew Pearson
Associate Director
Interserve Construction

Do the
right thing



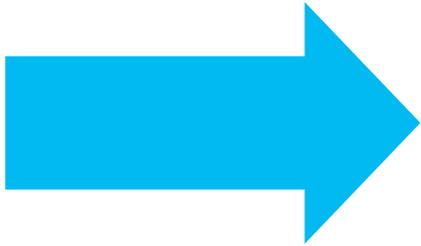
Doing the right thing means not accepting 'that will do', and not walking by when you could make a positive difference. The right thing also means the safe thing and the sustainable thing.

Bring
better
to life



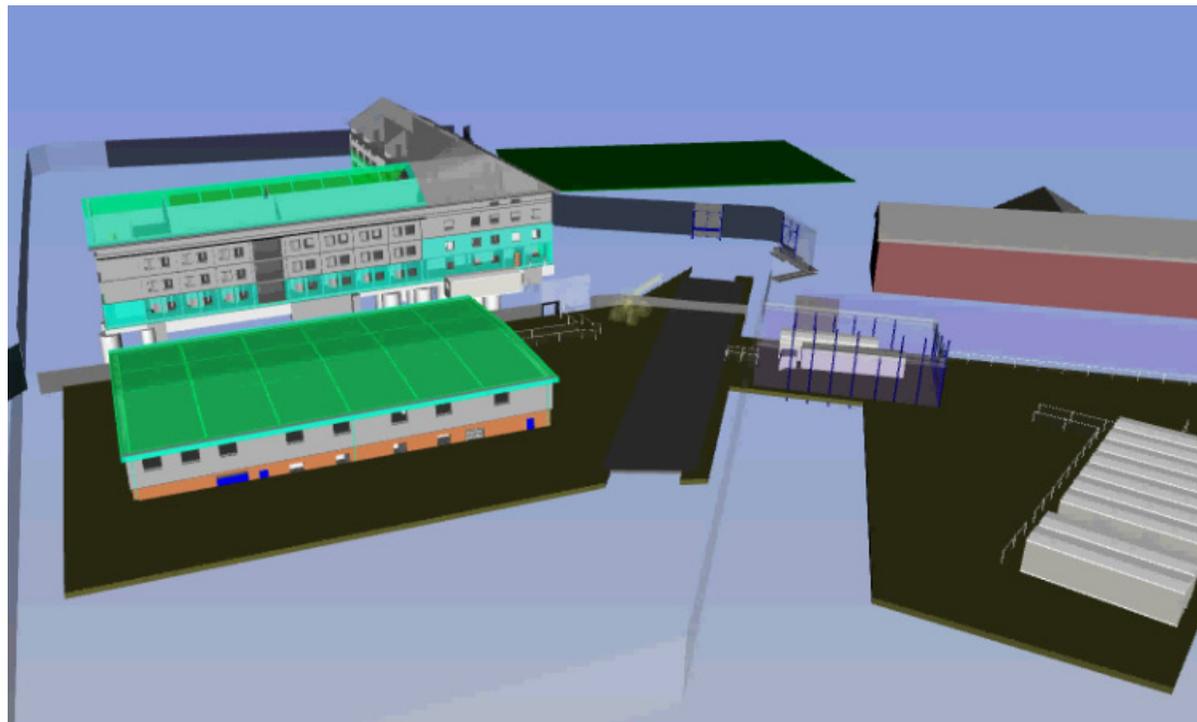
We are all about believing we can do better. Asking questions, thinking differently, seeking solutions, and creating ideas to support our customers and add value.

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Welcome: Your 4D induction

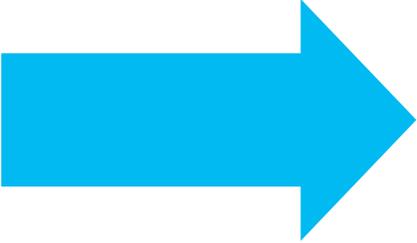
Alex Jones
BIM & VDC Manager
Interserve Construction



The team have linked the model to our construction programme to effectively simulate the construction sequence. This has proved an effective tool to engage new starters during inductions and help them to familiarise themselves with our construction site.

It's a great tool to share the build sequence with those who aren't used to reading typical programme charts.

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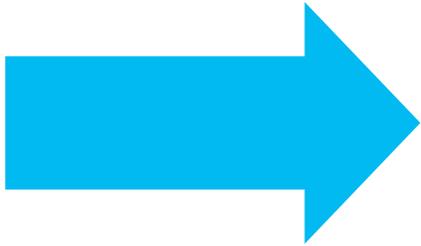
BIM: Improved Design Quality

Andrew Pearson
Associate Director
Interserve Construction

- Virtually 'Built Off Site'

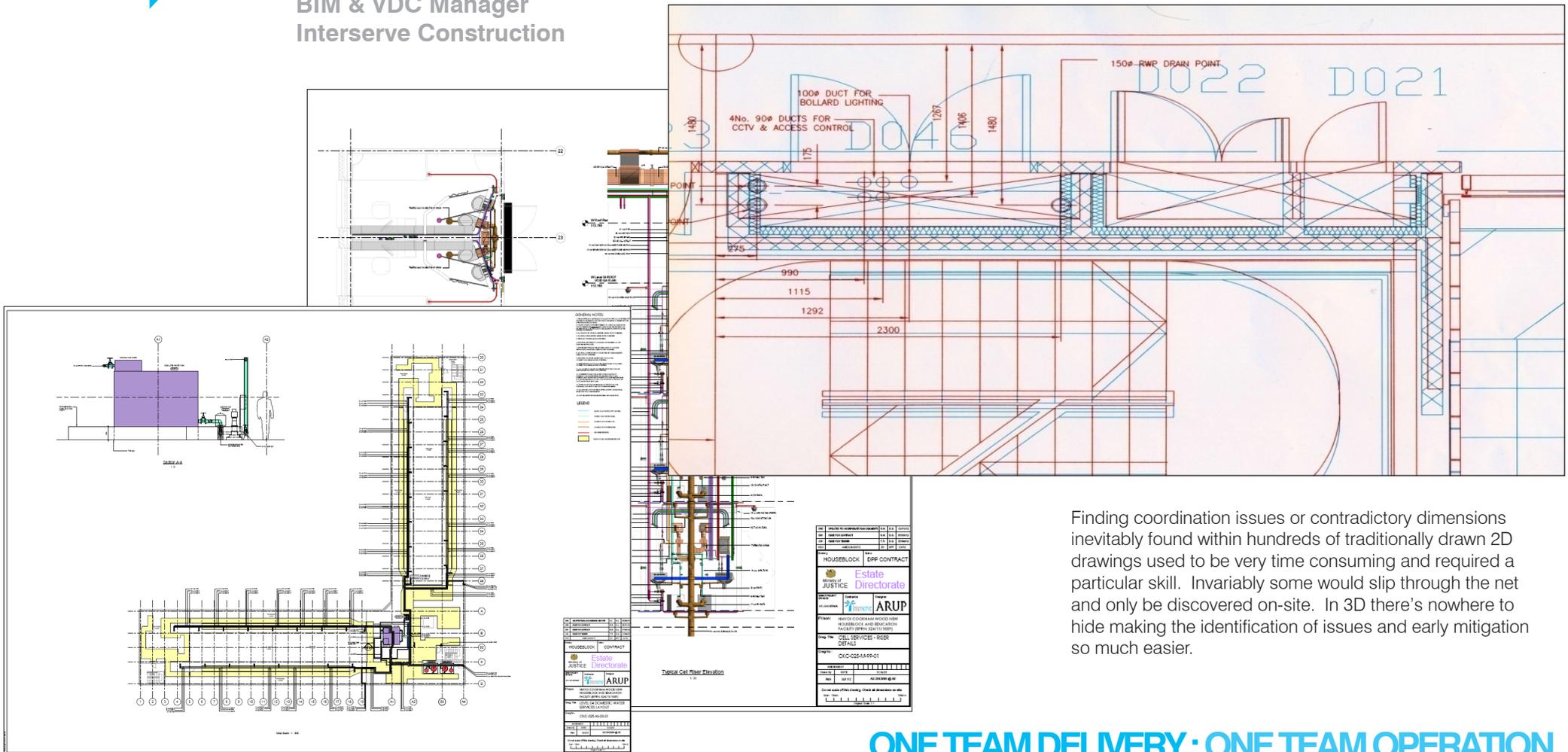


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Co-ordinating Design: Made easy...

Alex Jones
BIM & VDC Manager
Interserve Construction



Finding coordination issues or contradictory dimensions inevitably found within hundreds of traditionally drawn 2D drawings used to be very time consuming and required a particular skill. Invariably some would slip through the net and only be discovered on-site. In 3D there's nowhere to hide making the identification of issues and early mitigation so much easier.

ONE TEAM DELIVERY : ONE TEAM OPERATION



Model Checking and Co-ordination

Alex Jones
 BIM & VDC Manager
 Interserve Construction

- **Model Risk Register for easy tracking of model issues**

Aspects of the design continue to develop even when the contractor has started on site. Interserve have continued to coordinate models during the construction phase and use a *Model Risk Register* to log, delegate and prioritise issues found to ensure they are resolved in good time.

Design Review - Team's Risk Register

Project: **Cookham Wood**
 Location: **EDUCATION BLOCK**
 Today: **25 April 2013**

STATUS	Owner	3D TAG No	Date Raised	Age Days	DEADLINE	Days to Deadline	Date Closed	Late?	
2_High	ALL	15	26/02/13	43	29/03/13	-20			HIGH - Need to match
2_High	ARC	12	26/02/13	43	29/03/13	-20			Ceiling
2_High	ARC	14	26/02/13	43	29/03/13	-20			
2_High	ARC	27	26/02/13	43	29/03/13	-20			A number of ins
2_High	ARC	42	26/02/13	43	29/03/13	-20			Raised to HIGH - jus
2_High	MEP	17	26/02/13	43	29/03/13	-20			
2_High	MEP	41	26/02/13	43	29/03/13	-20			Noted that local cha
2_High	MEP	46	26/02/13	43	29/03/13	-20			Noted that local cha
2_High	MEP	32	26/02/13	43	29/03/13	-20			Noted that local cha
3_Low	ALL	61	26/02/13	43	29/03/13	-20			
3_Low	ARC	2	26/02/13	43	29/03/13	-20			
3_Low	ARC	4	26/02/13	43	29/03/13	-20			
3_Low	ARC	7	26/02/13	43	29/03/13	-20			

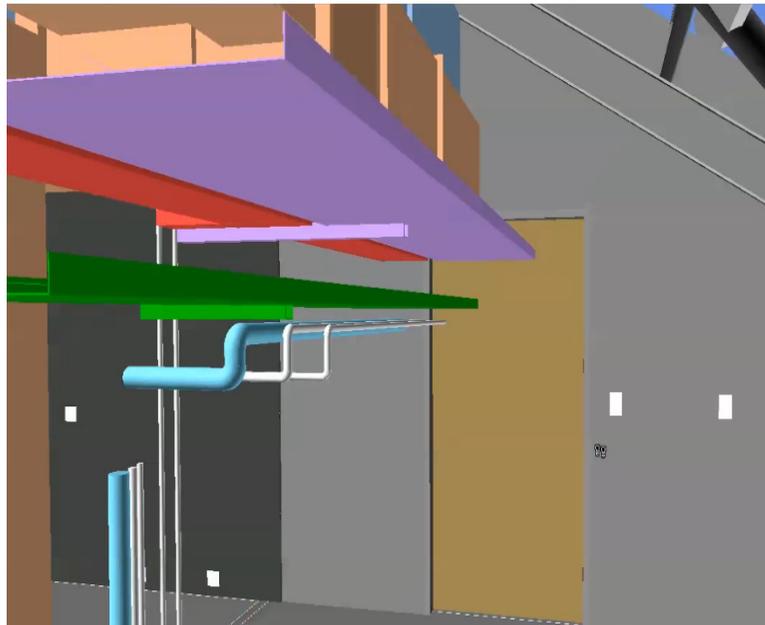


Co-ordinated Design

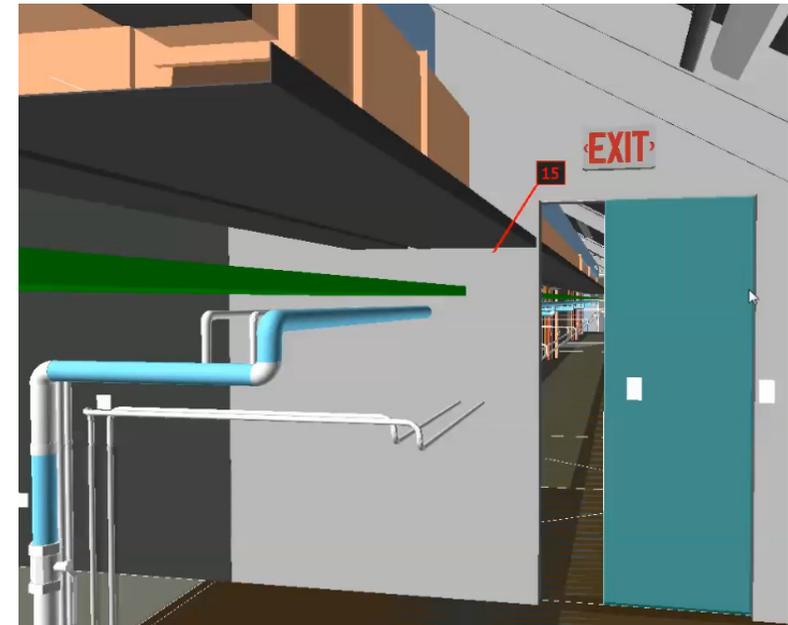
Alex Jones
BIM & VDC Manager
Interserve Construction

Here is an example of the architect's door mis-coordinated with the services design. The before and after shows the door moved appropriately – you may notice that the light switch locations now need revising! The team have had fun 'walking' around the model spotting and removing these issues ahead of construction.

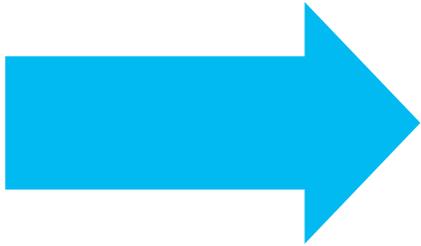
Before



After



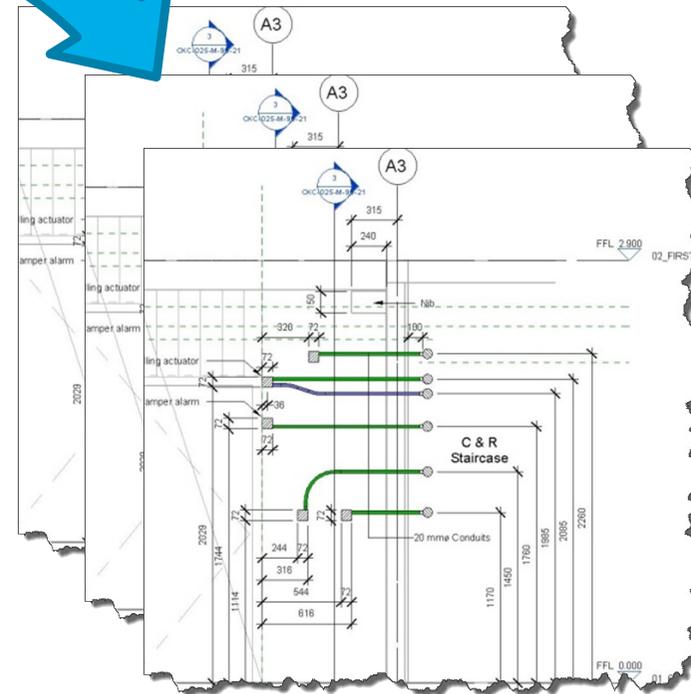
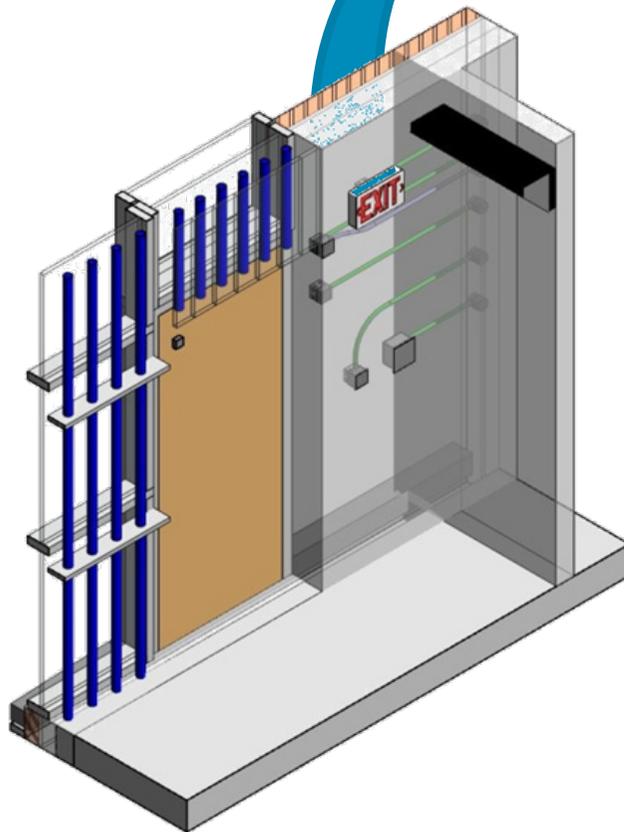
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Co-ordinating Design: 'Perfect information'

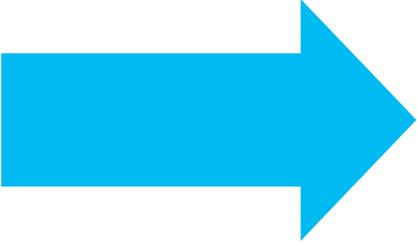
Alex Jones
BIM & VDC Manager
Interserve Construction

- Drawings produced from model



= 'perfect information'

ONE TEAM DELIVERY: ONE TEAM OPERATION



Building Off Site: Assembling on site

Alex Jones
BIM & VDC Manager
Interserve Construction

- ‘Perfect information’ = greater confidence and ability to build off site



*build*offsite
promoting construction *offsite*

ONE TEAM DELIVERY : ONE TEAM OPERATION



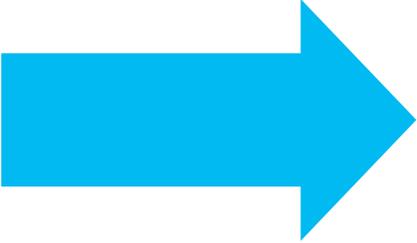
Building Off Site: Assembling on site

Alex Jones
BIM & VDC Manager
Interserve Construction

- Pre-cast cell pods



ONE TEAM DELIVERY : ONE TEAM OPERATION



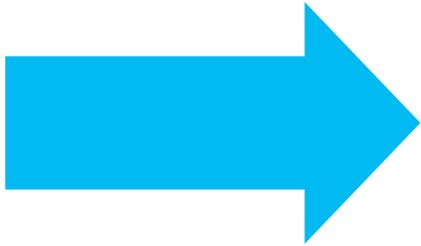
Building Off Site: Assembling on site

Alex Jones
BIM & VDC Manager
Interserve Construction

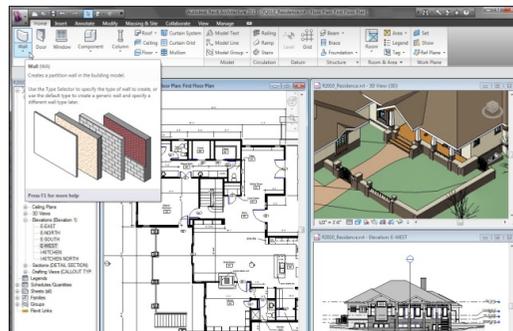
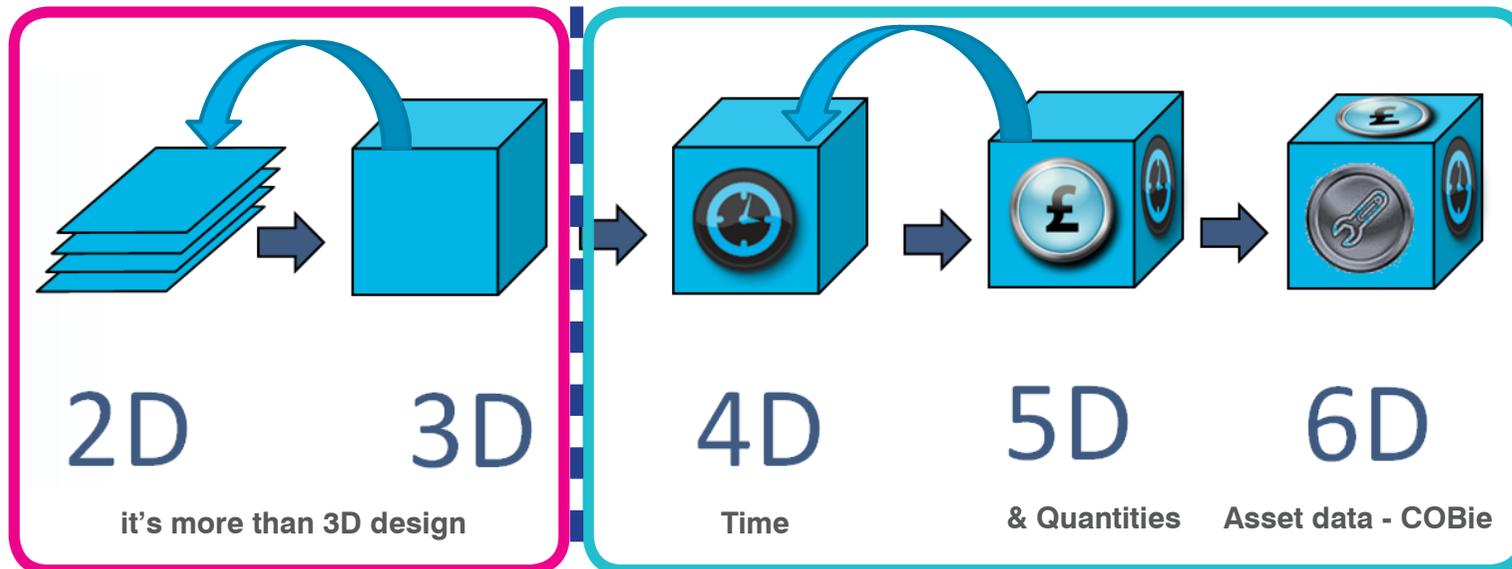
- Level 1 site assembly



ONE TEAM DELIVERY : ONE TEAM OPERATION

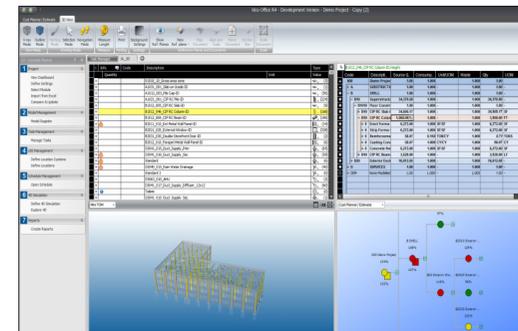


What is BIM & Lean?: Integrated and intelligently used..?

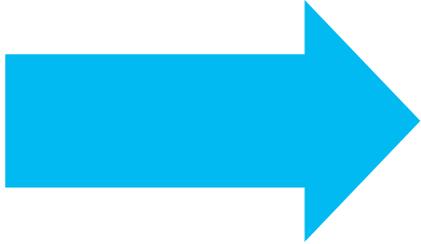


Authoring Tools

- Revit
- ArchiCAD
- Bentley
- Civils3D
- Google Sketchup
- CADduct
- Tekla



Leverage value for construction management and FM



Integrated Quantities: & Cost Plan (5D)

The screenshot displays a software interface for project cost planning. On the left, a 'Reference Library' table lists various work items with codes and descriptions. The main area shows a 'Project Cost Plan' table with columns for Code, Description, Source Q, Consump., Unit/UOM, Waste, Qty, UOM, PA Unit, Unit Cost, Var Unit, PA Net T., Net Total, and Var Net. A 3D model of a building is visible in the bottom right corner.

Reference Library

- We are capturing bill items and unit costs to grow a reference library to help deliver even tighter cost plans going forward

Project Cost Plan

- The project's cost plan has been supported by accurate quantities derived from the model

Embedded Data

- Spec Codes
 - Waste
 - Carbon
 - LCC
 - Procurement
- We are adding more and more intelligent data into our reference library to help us provide smarter solutions with respect to whole life cost and carbon content for example.

Automated Take off Quants

- Traditional take-off has been replaced by an automated engine taking a fraction of the time to provide 'construction calibre' quantities



Brickworks Quantities from Model:

Code	Description	Source Q.	Consump..	Qty	UOM	Unit Cost	Net Total	Var Net Total	Var Unit C
HB.10C	Roof Drainage	1.0	1.000	1.0	-	0.0	0.00		
HB.10E	Vertical Envelope	1.0	1.000	1.0	-	161,316.3	▲ 161,316.35	161,226.35	16
HB.10E.001	Curtain Walling	262.0	1.000	262.0	M	0.0	0.00		
HB.10E.002	External Brickwork	2,078.4	1.000	2,078.4	M2	77.6	▲ 161,316.35	3,358.51	
02.05.01.01.0050.01	Clay Facing Brickwork; Freshfield Lane First Quality Facing, stretcher	1,977.3	1.000	1,977.3	M2	61.0	▼ 120,636.54	-4,427.53	
MAT.03.02.01.000	Cement Mortar (1-3)	1,977.3	0.060	118.6	M3	0.0	0.00		
MAT.03.03.01.000	Common Bricks BS 3921 (Multiples of 1000)	1,977.3	0.124	245.2	1000	0.0	0.00		
LAB.30.01.11.025	Masonry Gang (2+1)	1,977.3	0.292	577.4	HR	0.0	0.00		
PAC.40.01.13.005	Masonry Package	1,977.3	61.010	120,636.5	£	1.0	120,636.54		
02.05.01.01.0050.03	Clay Facing Brickwork_Brick on Edge Windows; Freshfield Lane First	271.7	1.000	271.7	M2	21.9	▲ 5,966.53	849.60	
MAT.03.02.01.000	Cement Mortar (1-3)	271.7	0.060	16.3	M3	0.0	0.00		
MAT.03.03.01.000	Common Bricks BS 3921 (Multiples of 1000)	271.7	0.124	33.7	1000	0.0	0.00		
LAB.30.01.11.025	Masonry Gang (2+1)	271.7	0.292	79.3	HR	0.0	0.00		
PAC.40.01.13.005	Masonry Package	271.7	21.960	5,966.5	£	1.0	5,966.53		
02.05.01.01.0050.04	Clay Facing Brickwork_FeatureBand; Freshfield Lane First Quality	101.1	1.000	101.1	M2	67.0	▼ 6,779.68	-212.00	
		101.1	0.060	6.1	M3	0.0	0.00		
		101.1	0.124	12.5	1000	0.0	0.00		
		101.1	0.292	29.5	HR	0.0	0.00		
		101.1	67.080	6,779.7	£	1.0	6,779.68		
		2,078.4	1.000	2,078.4	M2	13.4	▼ 27,933.60	-1,018.04	
		2,078.4	1.025	2,130.4	M2	0.0	0.00		
		2,078.4	0.008	16.6	HR	0.0	0.00		
		2,078.4	13.440	27,933.6	£	1.0	27,933.60		
		1.0	1.000	1.0	-	0.0	0.00		

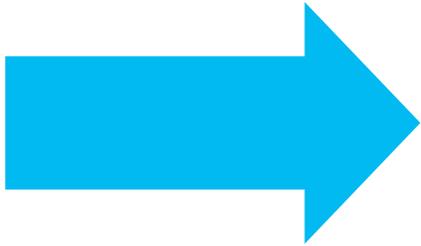
HEMPYOT COOKHAM WOOD HOUSEBLOCK

BILL OF QUANTITIES REV 1

Item	Description	Qty	Unit	Rate	Amount	Comments & Qualifications
F10/10	CLAY FACING BRICKWORK TO EXTERNAL WALLS					
	Freshfield Lane First Quality Facing, stretcher bond, bucket handle joint	2,049.91	m2	61.01	125,065.07	Mortar, 1:1:6 natural
F10/10	CLAY FACING BRICKWORK TO EXTERNAL WALLS - REVEALS TO WINDOWS AND DOORS					
	Freshfield Lane First Quality Facing, stretcher bond, bucket handle joint	497.63	m2	24.99	12,437.53	Mortar, 1:1:6 natural
F10/10	CLAY FACING BRICKWORK TO EXTERNAL WALLS - BRICK ON EDGE TO WINDOWS					
	Freshfield Lane First Quality Facing, stretcher bond, bucket handle joint	232.98	m2	21.56	5,116.93	Mortar, 1:1:6 natural
F10/10	CLAY FACING BRICKWORK TO EXTERNAL WALLS - FEATURE BAND					
	Freshfield Lane Selected Light Red, stretcher bond, bucket handle joint	104.23	m2	67.08	6,991.68	Mortar, 1:1:6 natural
F10/35	ENGINEERING BRICKWORK TO BOTTOM COURSES OF EXTERNAL WALLS, BELOW GROUND LEVEL AND DPC					
	Staffordshire Blue Dughacon Perf, stretcher bond	91.72	m2	83.04	7,616.41	Part Load Charge/Handage Inclusive
F30/10	CONCRETE FILL BASE OF CAVITY WALL					
	Weak mix, to a minimum of 150mm	10.32	m3	213.50	2,202.99	Allowed Concox Semi Dry GEN 1
F30/10	WEEPHOLES					
	At 450mm centres above openings, at 900mm centres at cavity tops	1,738.84	nr	1.35	2,347.43	Allowed Nytons Connected Nywep
F30/16	PARTIAL FILL CAVITY INSULATION					
	Celotex TU8-R CW3 100Z, 100mm thick	2,154.14	m2	13.44	28,951.64	As Spec
	CAVITY TIES					
	Brick to PC Concrete Wall, drill & fix, 900mm horizontally, 450mm vertically	5,277.64	m2	5.35	28,235.39	Allowed 175mm Cramp and Fixing



ONE TEAM DELIVERY : ONE TEAM OPERATION



Steelwork Quantities and Cost from Model:

The screenshot displays a software interface for steelwork quantity and cost extraction. On the left, a 3D model shows a steel frame structure. On the right, a table lists various steel components with their quantities and units. Below the 3D view, a detailed table provides a breakdown of quantities and costs for different steelwork items.

Code	Description	Source	Consumpt.	Qty	UOM	Unit Cost	Net Total	%Parent Ass.
[15]	Winpro WPC 85x65x6	110.253	1.000	110.253	m	36.00	3,969.11	100.00
[4]	MET SEC	435.251	1.000	435.251	m	15.00	6,528.77	8.71
[5]	Metsec 142C13_VERT	75.930	1.000	75.930	m	15.00	1,138.95	17.42
[6]	Metsec-142C13_HORIZONTAL	359.321	1.000	359.321	m	15.00	5,389.82	82.54
02.01.01.13	Parallel Flange Channels	1.000	1.000	1.000	Sum	7,696.00	7,696.00	9.51
02.01.01.01.13.0100	Parallel Flange Channels-260x75x28_S275	80.000	0.028	2.240	t	1,300.00	2,912.00	37.84
02.01.01.01.13.0180	Parallel Flange Channels-200x75x23_S275	160.000	0.023	3.680	t	1,300.00	4,784.00	62.16
02.01.01.01.07	Universal Columns	1.000	1.000	1.000	Sum	15,706.89	15,706.89	19.54
02.01.01.01.07.0600	Universal Columns-152x152x30_S275	6.440	0.030	0.193	t	1,300.00	251.17	1.62
02.01.01.01.07.0580	Universal Columns-152x152x37_S275	7.241	0.037	0.268	t	1,300.00	348.31	2.22
02.01.01.01.07.0460	Universal Columns-254x254x73_S275	13.265	0.073	0.968	t	1,300.00	1,258.82	8.01
02.01.01.01.07.0540	Universal Columns-203x203x52_S275	27.167	0.052	1.413	t	1,300.00	1,836.47	11.69
02.01.01.01.07.0500	Universal Columns-203x203x71_S275	20.260	0.071	1.438	t	1,300.00	1,870.04	11.91
02.01.01.01.07.0520	Universal Columns-203x203x60_S275	32.757	0.060	1.965	t	1,300.00	2,555.07	16.27
02.01.01.01.07.0560	Universal Columns-203x203x46_S275	126.873	0.046	5.836	t	1,300.00	7,587.01	48.30
02.01.01.01.05	Universal Beams	1.000	1.000	1.000	Sum	38,374.45	38,374.45	47.71
02.01.01.01.05.1220	Universal Beams-254x146x31_S275	4.668	0.031	0.145	t	1,300.00	188.13	0.48
02.01.01.01.05.1100	Universal Beams-305x127x37_S275	8.874	0.037	0.328	t	1,300.00	426.84	1.11
02.01.01.01.05.1300	Universal Beams-203x133x30_S275	11.000	0.030	0.330	t	1,300.00	429.00	1.12

ONE TEAM DELIVERY : ONE TEAM OPERATION



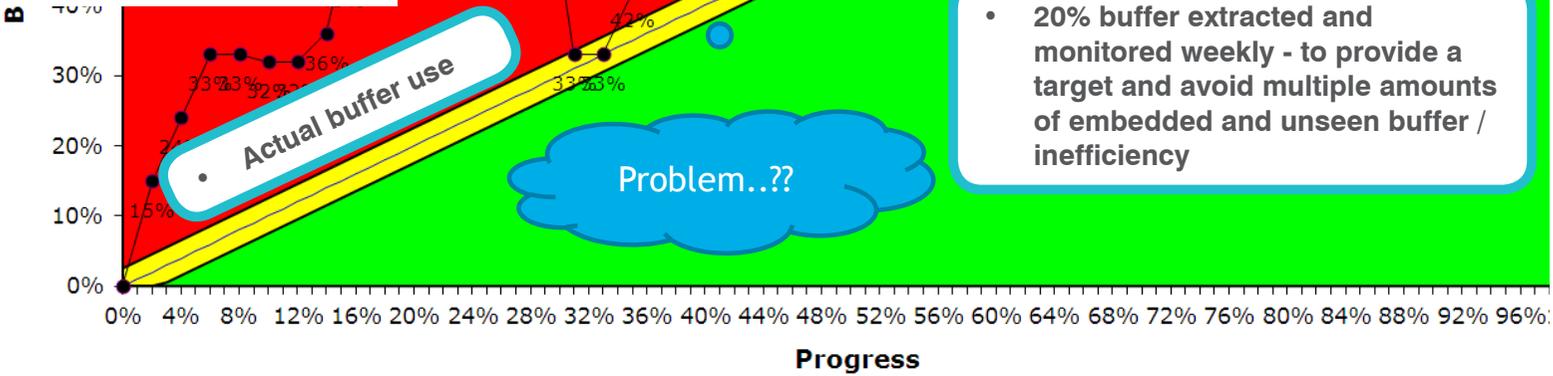
Becoming Lean: Performance Measurement & Information Centre

Lean - Thinking

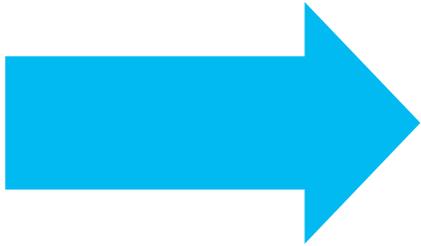
ID	Start Date	Task Name	Duration	Start	Finish
1307	1/11/2010	Planning - 2011 lighting - Fixtures ordered & delivery review submitted	80 days	1/11/2010	19/11/2010
1308	1/11/2010	Planning - External lighting contractor selected	80 days	1/11/2010	19/11/2010
3001	4/11/2010	BB - L1 - North & South - External Doors & single J Gates	2.4 days	4/11/2010	6/11/2010
3002	4/11/2010	BB - L1 - South - Plant Room - External Gate Gates	1 day	4/11/2010	5/11/2010
3003	1/12/2010	BB - L1 - South - Fire Protection - 1st fl	12 days	1/12/2010	13/12/2010
3004	1/12/2010	BB - L1 - South - Plant Allocation Gates	4 days	1/12/2010	5/12/2010
3005	1/12/2010	BB - L1 - South - External Windows - 1st fl	2 days	1/12/2010	3/12/2010
3006	1/12/2010	BB - L1 - South - External Windows - 2nd fl	2 days	1/12/2010	3/12/2010
3007	1/12/2010	BB - L1 - South - External Windows - 3rd fl	2 days	1/12/2010	3/12/2010
3008	1/12/2010	BB - L1 - South - External Windows - 4th fl	2 days	1/12/2010	3/12/2010
3009	1/12/2010	BB - L1 - South - External Windows - 5th fl	2 days	1/12/2010	3/12/2010
3010	1/12/2010	BB - L1 - South - External Windows - 6th fl	2 days	1/12/2010	3/12/2010
3011	1/12/2010	BB - L1 - South - External Windows - 7th fl	2 days	1/12/2010	3/12/2010
3012	1/12/2010	BB - L1 - South - External Windows - 8th fl	2 days	1/12/2010	3/12/2010
3013	1/12/2010	BB - L1 - South - External Windows - 9th fl	2 days	1/12/2010	3/12/2010
3014	1/12/2010	BB - L1 - South - External Windows - 10th fl	2 days	1/12/2010	3/12/2010
3015	1/12/2010	BB - L1 - South - External Windows - 11th fl	2 days	1/12/2010	3/12/2010
3016	1/12/2010	BB - L1 - South - External Windows - 12th fl	2 days	1/12/2010	3/12/2010
3017	1/12/2010	BB - L1 - South - External Windows - 13th fl	2 days	1/12/2010	3/12/2010
3018	1/12/2010	BB - L1 - South - External Windows - 14th fl	2 days	1/12/2010	3/12/2010
3019	1/12/2010	BB - L1 - South - External Windows - 15th fl	2 days	1/12/2010	3/12/2010
3020	1/12/2010	BB - L1 - South - External Windows - 16th fl	2 days	1/12/2010	3/12/2010
3021	1/12/2010	BB - L1 - South - External Windows - 17th fl	2 days	1/12/2010	3/12/2010
3022	1/12/2010	BB - L1 - South - External Windows - 18th fl	2 days	1/12/2010	3/12/2010
3023	1/12/2010	BB - L1 - South - External Windows - 19th fl	2 days	1/12/2010	3/12/2010
3024	1/12/2010	BB - L1 - South - External Windows - 20th fl	2 days	1/12/2010	3/12/2010
3025	1/12/2010	BB - L1 - South - External Windows - 21st fl	2 days	1/12/2010	3/12/2010
3026	1/12/2010	BB - L1 - South - External Windows - 22nd fl	2 days	1/12/2010	3/12/2010
3027	1/12/2010	BB - L1 - South - External Windows - 23rd fl	2 days	1/12/2010	3/12/2010
3028	1/12/2010	BB - L1 - South - External Windows - 24th fl	2 days	1/12/2010	3/12/2010
3029	1/12/2010	BB - L1 - South - External Windows - 25th fl	2 days	1/12/2010	3/12/2010
3030	1/12/2010	BB - L1 - South - External Windows - 26th fl	2 days	1/12/2010	3/12/2010
3031	1/12/2010	BB - L1 - South - External Windows - 27th fl	2 days	1/12/2010	3/12/2010
3032	1/12/2010	BB - L1 - South - External Windows - 28th fl	2 days	1/12/2010	3/12/2010
3033	1/12/2010	BB - L1 - South - External Windows - 29th fl	2 days	1/12/2010	3/12/2010
3034	1/12/2010	BB - L1 - South - External Windows - 30th fl	2 days	1/12/2010	3/12/2010
3035	1/12/2010	BB - L1 - South - External Windows - 31st fl	2 days	1/12/2010	3/12/2010
3036	1/12/2010	BB - L1 - South - External Windows - 32nd fl	2 days	1/12/2010	3/12/2010
3037	1/12/2010	BB - L1 - South - External Windows - 33rd fl	2 days	1/12/2010	3/12/2010
3038	1/12/2010	BB - L1 - South - External Windows - 34th fl	2 days	1/12/2010	3/12/2010
3039	1/12/2010	BB - L1 - South - External Windows - 35th fl	2 days	1/12/2010	3/12/2010
3040	1/12/2010	BB - L1 - South - External Windows - 36th fl	2 days	1/12/2010	3/12/2010
3041	1/12/2010	BB - L1 - South - External Windows - 37th fl	2 days	1/12/2010	3/12/2010
3042	1/12/2010	BB - L1 - South - External Windows - 38th fl	2 days	1/12/2010	3/12/2010
3043	1/12/2010	BB - L1 - South - External Windows - 39th fl	2 days	1/12/2010	3/12/2010
3044	1/12/2010	BB - L1 - South - External Windows - 40th fl	2 days	1/12/2010	3/12/2010
3045	1/12/2010	BB - L1 - South - External Windows - 41st fl	2 days	1/12/2010	3/12/2010
3046	1/12/2010	BB - L1 - South - External Windows - 42nd fl	2 days	1/12/2010	3/12/2010
3047	1/12/2010	BB - L1 - South - External Windows - 43rd fl	2 days	1/12/2010	3/12/2010
3048	1/12/2010	BB - L1 - South - External Windows - 44th fl	2 days	1/12/2010	3/12/2010
3049	1/12/2010	BB - L1 - South - External Windows - 45th fl	2 days	1/12/2010	3/12/2010
3050	1/12/2010	BB - L1 - South - External Windows - 46th fl	2 days	1/12/2010	3/12/2010
3051	1/12/2010	BB - L1 - South - External Windows - 47th fl	2 days	1/12/2010	3/12/2010
3052	1/12/2010	BB - L1 - South - External Windows - 48th fl	2 days	1/12/2010	3/12/2010
3053	1/12/2010	BB - L1 - South - External Windows - 49th fl	2 days	1/12/2010	3/12/2010
3054	1/12/2010	BB - L1 - South - External Windows - 50th fl	2 days	1/12/2010	3/12/2010
3055	1/12/2010	BB - L1 - South - External Windows - 51st fl	2 days	1/12/2010	3/12/2010
3056	1/12/2010	BB - L1 - South - External Windows - 52nd fl	2 days	1/12/2010	3/12/2010
3057	1/12/2010	BB - L1 - South - External Windows - 53rd fl	2 days	1/12/2010	3/12/2010
3058	1/12/2010	BB - L1 - South - External Windows - 54th fl	2 days	1/12/2010	3/12/2010
3059	1/12/2010	BB - L1 - South - External Windows - 55th fl	2 days	1/12/2010	3/12/2010
3060	1/12/2010	BB - L1 - South - External Windows - 56th fl	2 days	1/12/2010	3/12/2010
3061	1/12/2010	BB - L1 - South - External Windows - 57th fl	2 days	1/12/2010	3/12/2010
3062	1/12/2010	BB - L1 - South - External Windows - 58th fl	2 days	1/12/2010	3/12/2010
3063	1/12/2010	BB - L1 - South - External Windows - 59th fl	2 days	1/12/2010	3/12/2010
3064	1/12/2010	BB - L1 - South - External Windows - 60th fl	2 days	1/12/2010	3/12/2010
3065	1/12/2010	BB - L1 - South - External Windows - 61st fl	2 days	1/12/2010	3/12/2010
3066	1/12/2010	BB - L1 - South - External Windows - 62nd fl	2 days	1/12/2010	3/12/2010
3067	1/12/2010	BB - L1 - South - External Windows - 63rd fl	2 days	1/12/2010	3/12/2010
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3070	1/12/2010	BB - L1 - South - External Windows - 66th fl	2 days	1/12/2010	3/12/2010
3071	1/12/2010	BB - L1 - South - External Windows - 67th fl	2 days	1/12/2010	3/12/2010
3072	1/12/2010	BB - L1 - South - External Windows - 68th fl	2 days	1/12/2010	3/12/2010
3073	1/12/2010	BB - L1 - South - External Windows - 69th fl	2 days	1/12/2010	3/12/2010
3074	1/12/2010	BB - L1 - South - External Windows - 70th fl	2 days	1/12/2010	3/12/2010
3075	1/12/2010	BB - L1 - South - External Windows - 71st fl	2 days	1/12/2010	3/12/2010
3076	1/12/2010	BB - L1 - South - External Windows - 72nd fl	2 days	1/12/2010	3/12/2010
3077	1/12/2010	BB - L1 - South - External Windows - 73rd fl	2 days	1/12/2010	3/12/2010
3078	1/12/2010	BB - L1 - South - External Windows - 74th fl	2 days	1/12/2010	3/12/2010
3079	1/12/2010	BB - L1 - South - External Windows - 75th fl	2 days	1/12/2010	3/12/2010
3080	1/12/2010	BB - L1 - South - External Windows - 76th fl	2 days	1/12/2010	3/12/2010
3081	1/12/2010	BB - L1 - South - External Windows - 77th fl	2 days	1/12/2010	3/12/2010
3082	1/12/2010	BB - L1 - South - External Windows - 78th fl	2 days	1/12/2010	3/12/2010
3083	1/12/2010	BB - L1 - South - External Windows - 79th fl	2 days	1/12/2010	3/12/2010
3084	1/12/2010	BB - L1 - South - External Windows - 80th fl	2 days	1/12/2010	3/12/2010
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3086	1/12/2010	BB - L1 - South - External Windows - 82nd fl	2 days	1/12/2010	3/12/2010
3087	1/12/2010	BB - L1 - South - External Windows - 83rd fl	2 days	1/12/2010	3/12/2010
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3089	1/12/2010	BB - L1 - South - External Windows - 85th fl	2 days	1/12/2010	3/12/2010
3090	1/12/2010	BB - L1 - South - External Windows - 86th fl	2 days	1/12/2010	3/12/2010
3091	1/12/2010	BB - L1 - South - External Windows - 87th fl	2 days	1/12/2010	3/12/2010
3092	1/12/2010	BB - L1 - South - External Windows - 88th fl	2 days	1/12/2010	3/12/2010
3093	1/12/2010	BB - L1 - South - External Windows - 89th fl	2 days	1/12/2010	3/12/2010
3094	1/12/2010	BB - L1 - South - External Windows - 90th fl	2 days	1/12/2010	3/12/2010
3095	1/12/2010	BB - L1 - South - External Windows - 91st fl	2 days	1/12/2010	3/12/2010
3096	1/12/2010	BB - L1 - South - External Windows - 92nd fl	2 days	1/12/2010	3/12/2010
3097	1/12/2010	BB - L1 - South - External Windows - 93rd fl	2 days	1/12/2010	3/12/2010
3098	1/12/2010	BB - L1 - South - External Windows - 94th fl	2 days	1/12/2010	3/12/2010
3099	1/12/2010	BB - L1 - South - External Windows - 95th fl	2 days	1/12/2010	3/12/2010
3100	1/12/2010	BB - L1 - South - External Windows - 96th fl	2 days	1/12/2010	3/12/2010

- Detailed buffered programme with logic and 5 day activities
- Weekly measure/update and re-schedule
- Starts and completions measured
- Critical causation established and recorded each week

Planned buffer use (if needed!)



- 20% buffer extracted and monitored weekly - to provide a target and avoid multiple amounts of embedded and unseen buffer / inefficiency

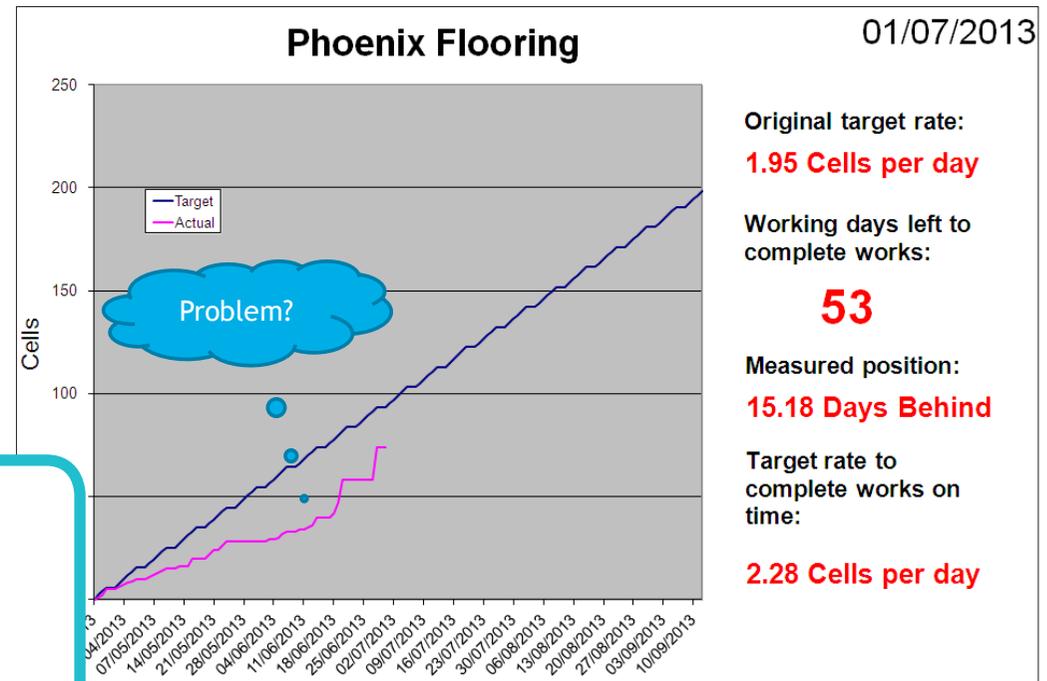


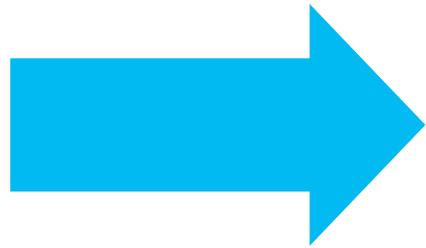
Lean: Performance Measurement and 'Information Centre'

- Trade based performance targets and output indicators (KPI's)
- Readily seen and understood
- Employee engagement and participation in problem solving, performance improvement and achieving the goal

Lean Thinking:

- Root Cause Analysis
- DMAIC
- 5 Whys
- Pereto
- Fishbone - Cause & Effect
- Containment / Countermeasure





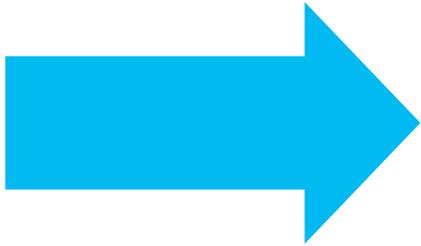
Lean: Collaborative planning and problem solving

- Weekly trade programmes produced and daily team meetings take place

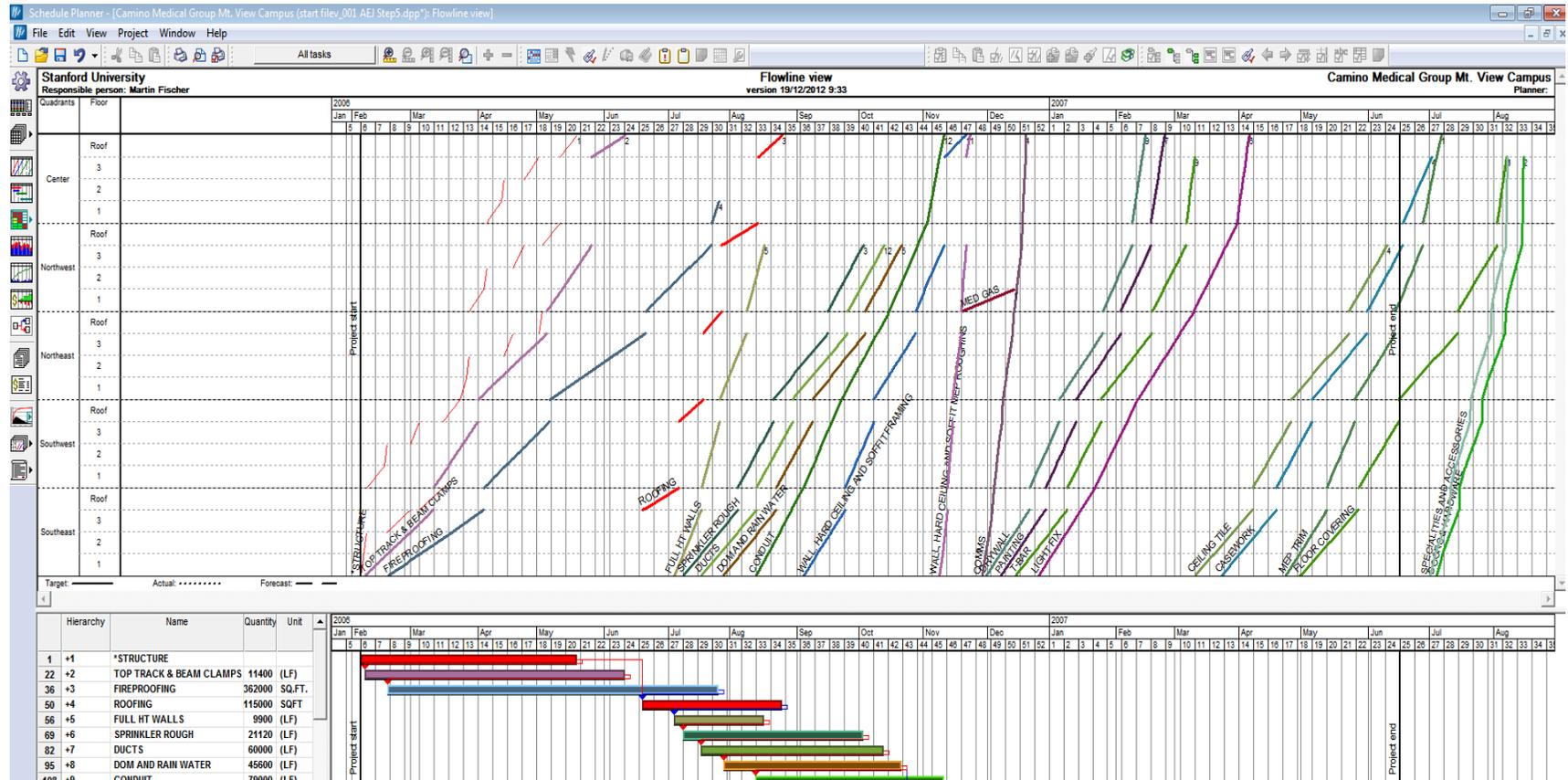


Everyone
has a voice

ONE TEAM DELIVERY : ONE TEAM OPERATION



BIM & Lean: Integrated & Intelligent Planning (4D)



'Flowline' schedules show the traditional gantt chart in a different dimension by simply adding productivity to the view. Now we can see not just the start and end date but the rate of work required to achieve it. This fits really well with our KPI reporting and LEAN production control ethos.

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Ministry of Justice: FM Database - Planet

Fiona Moore
Strategic Alliance Manager
HLN Architects

One of the MoJ's key objectives is to ensure that data is fed from the BIM Model into the Estates Facilities Management programme Planet. It is proposed that this be achieved by using COBie (Construction to Operations Building Information Exchange) data, which enables data extracted from the model to be inputted into another programme.

Once again this ensures that project information is used effectively by:

- Efficiently capturing data throughout the project and then transferring this data to the FM database
- Allowing data to be shared across the MoJ Estate, allowing large scale purchasing and the resultant cost savings
- The possible use of the 3D model to help Works Departments to identify specific maintenance items



Item	Code	Category	Quantity	Unit	Manufacturer	Model	Notes	Location	Level	Asset	Serial	Comments
2000	2000-001	2000-001-01	1	Room	Room 1000	1000	Physical and Special Security Guide 1 Building Element Page 10	1000	1000	1000	1000	
2000	2000-001	2000-001-02	1	Room	Room 1000	1000	Physical and Special Security Guide 1 Building Element Page 10	1000	1000	1000	1000	
2000	2000-001	2000-001-03	1	Room	Room 1000	1000	Physical and Special Security Guide 1 Building Element Page 10	1000	1000	1000	1000	
2000	2000-001	2000-001-04	1	Room	Room 1000	1000	Physical and Special Security Guide 1 Building Element Page 10	1000	1000	1000	1000	
2000	2000-001	2000-001-05	1	Room	Room 1000	1000	Physical and Special Security Guide 1 Building Element Page 10	1000	1000	1000	1000	
2000	2000-001	2000-001-06	1	Room	Room 1000	1000	Physical and Special Security Guide 1 Building Element Page 10	1000	1000	1000	1000	
2000	2000-001	2000-001-07	1	Room	Room 1000	1000	Physical and Special Security Guide 1 Building Element Page 10	1000	1000	1000	1000	
2000	2000-001	2000-001-08	1	Room	Room 1000	1000	Physical and Special Security Guide 1 Building Element Page 10	1000	1000	1000	1000	
2000	2000-001	2000-001-09	1	Room	Room 1000	1000	Physical and Special Security Guide 1 Building Element Page 10	1000	1000	1000	1000	
2000	2000-001	2000-001-10	1	Room	Room 1000	1000	Physical and Special Security Guide 1 Building Element Page 10	1000	1000	1000	1000	

COBie Output from Model

Form 2 - Asset Specific Register

Asset Code	Asset Description	Asset Specific Quantity	Location		Manufacturer	Type/Model	Asset Serial Number	General Comments
			Level 2	Level 1				
2000-001-01	Room 1000	1						
2000-001-02	Room 1000	1						
2000-001-03	Room 1000	1						
2000-001-04	Room 1000	1						
2000-001-05	Room 1000	1						
2000-001-06	Room 1000	1						
2000-001-07	Room 1000	1						
2000-001-08	Room 1000	1						
2000-001-09	Room 1000	1						
2000-001-10	Room 1000	1						

Planet FM Output

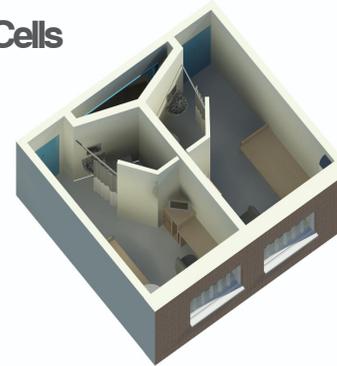


Ministry of Justice: BIM Library

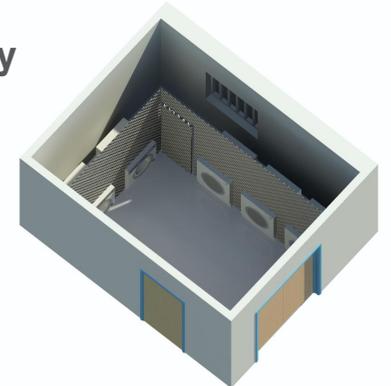
Fiona Moore
Strategic Alliance Manager
HLN Architects

The MoJ are in the process of producing a 3D Technical Standards Library. This information can then be used as the basic building blocks of future projects, increasing standardisation and design efficiency.

Typical Pair of Cells



Laundry



Cell Doors



Gate and Grilles

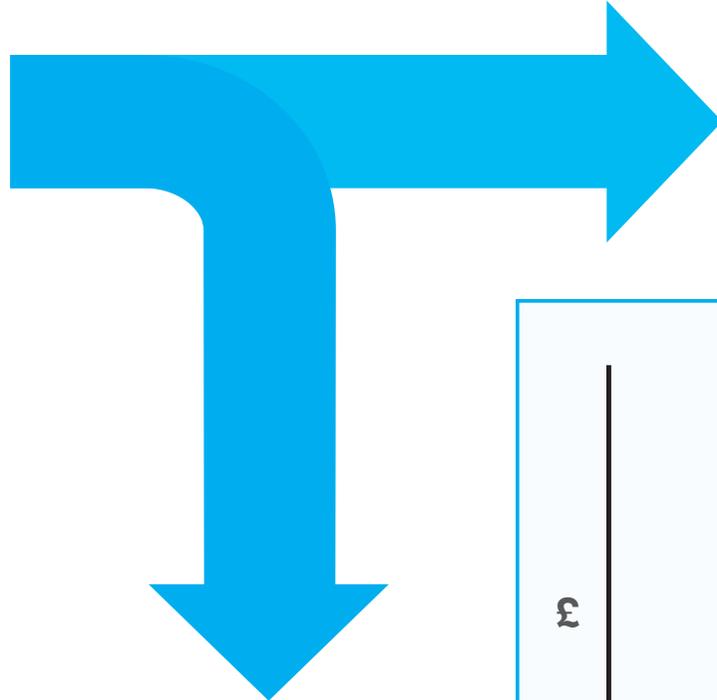
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There have been many positives, but there still remains many challenges with BIM

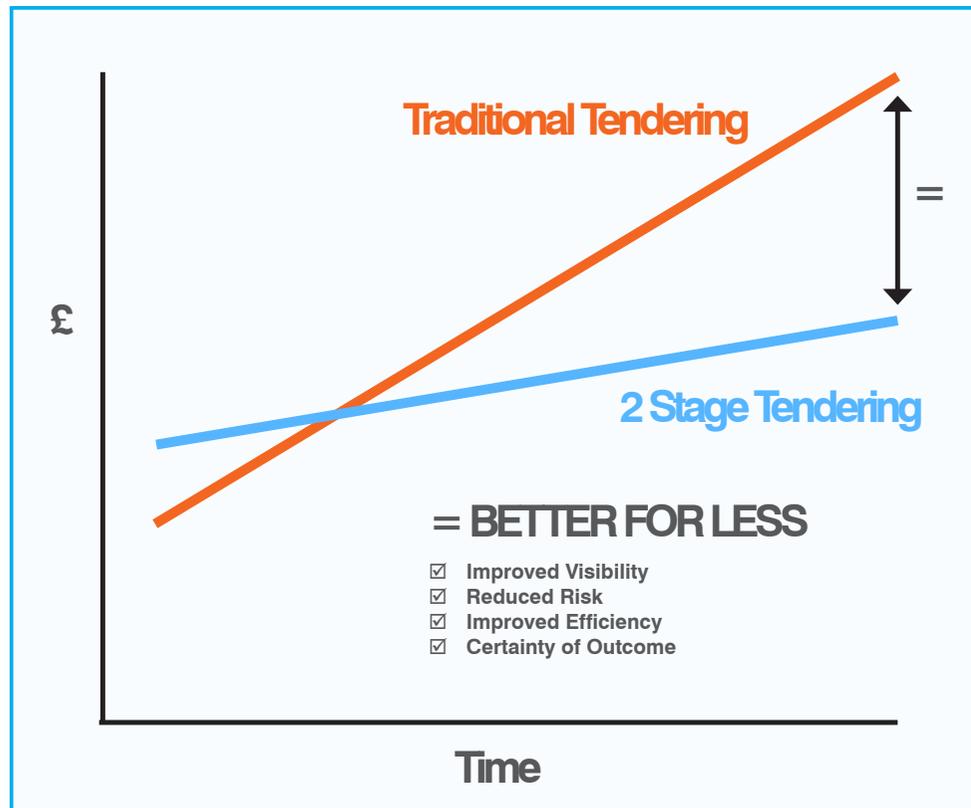
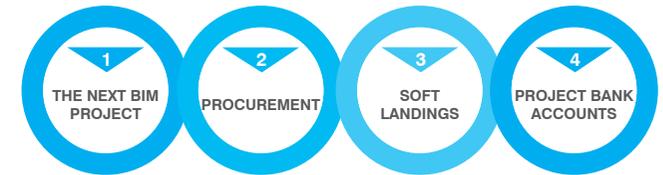
- **CHANGE** - we are doing the same as before but in a different, more effective and more intelligent way
- **COMPATIBILITY** - client team and supply chain compatibility
- **IT CONNECTIVITY & CAPACITY** - for large file transfer, storage and site connections
- **HARDWARE & SOFTWARE COST & INVESTMENT** - justifying and convincing others of expenditure
- **BIM MATURITY** - there is a lack of maturity, difficulty with software interface, competing software and limited knowledge and experience



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What does all this result in for the client?

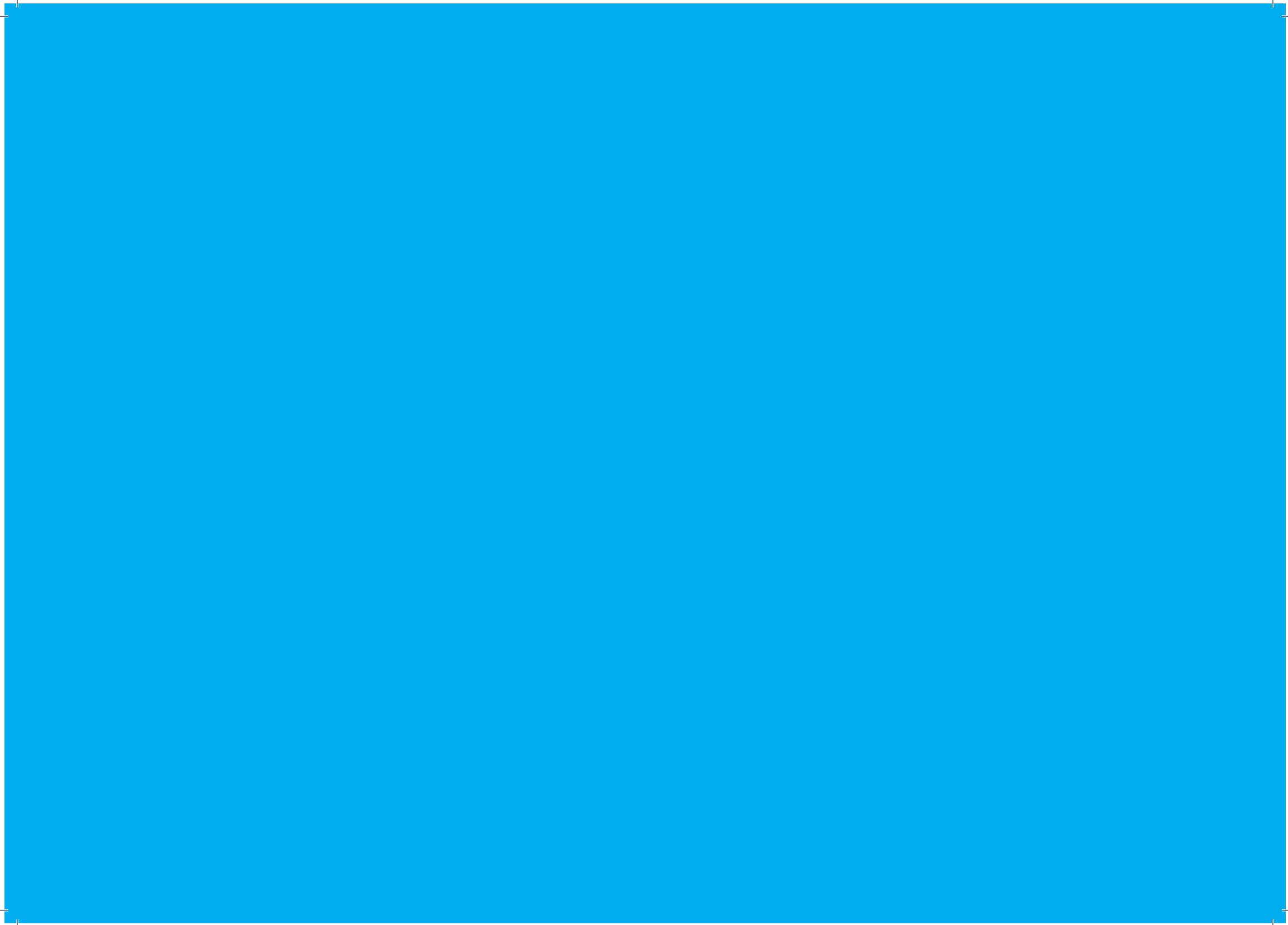
= BETTER FOR LESS

- Improved visibility
- Reduced risk
- Improved efficiency
- Certainty of outcome

Achieved with two stage tendering, collaboration, BiM and Soft Landings, reducing waste and the need for re-work when compared with traditional tendering. All for the long term aim to reduce the completion cost to equal or less than the cost at inception.

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