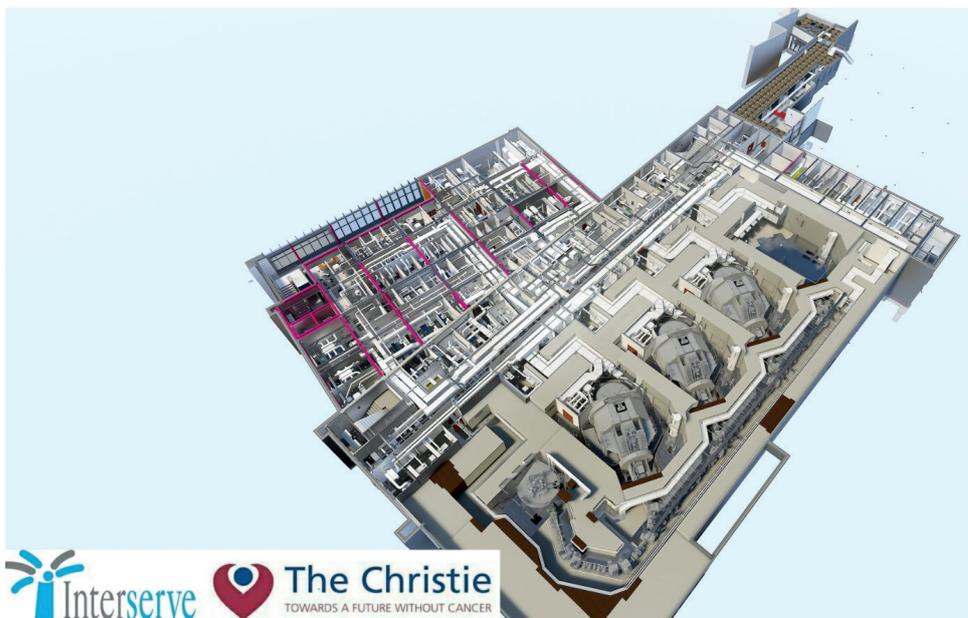


CASE STUDY: Proton Beam Therapy Centre Manchester



The Manchester Proton Beam Therapy Centre is a state of the art cancer treatment centre which is to house the first NHS high energy proton beam therapy treatment in the UK delivered on time and under budget by Interserve. This centre will treat approximately 800-1000 people annually and will be at the heart of cancer treatment for many years to come. The project was delivered under the P21+ framework with a value of approx. £90 million.



The proton kit was developed in parallel to the building design. The procurement process involved working with three different vendors before working with a successful appointed vendor. Sharing and collaborating with BIM models made the

communication easier, overcoming language and cultural barriers, speeding up the engagement and approval process.

Collaborative tools for Stakeholder Engagement

The team recognised early on that stakeholder engagement would be vital to the success of the project. We therefore used a number of new collaborative tools all linked through to the BIM model to ensure our stakeholders (the Trust, FM team, patients and residents) were always aware of what was happening on site

and what to expect. This included the use of 3D printing and ENSCAPE, a full 4K rendering straight from the BIM model that allowed our stakeholders to visualise the spaces within the hospital early on, and effectively comment on how well these worked - or not.

Using Virtual Reality headsets, clinicians were able to undertake virtual tours, allowing them to test space, equipment positions, fixtures and fittings - adjusting and changing them to ensure they provide the best patient experience and journey, whilst future proofing the design.

Estates Sodexo FM Engagement Early



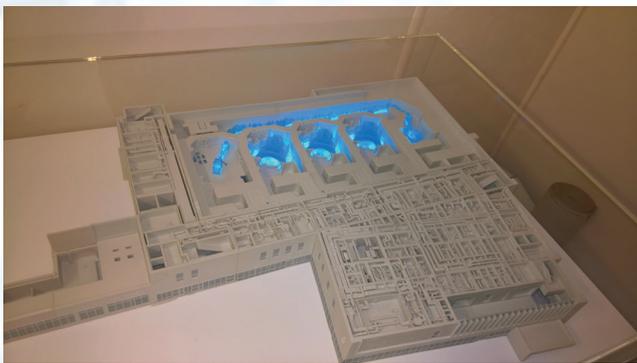
User VR Engagement



Estates Sodexo FM Engagement Early



3d Print of the PBT Scheme



Project Information Management

The use of a Common Data Environment (CDE) is standard to Interserve. At Proton this complements and supports our already collaborative work ethic, and provides a structured means of sharing data, providing an open and collaborative digital environment.

It's all too easy for BIM and digital construction to be restricted to the design office; however, we're championing a number of initiatives to promote its use out in the field. Our digital construction vision is to have "reliable construction information at the point of need". For the site team it's all about having the right tool for the job; and an integrated digital means of complying with our Interserve processes is proving to be a more robust solution than "the way we've always done it" enabling them to focus on the 'value-add'. And it's not just about our Interserve team; we mandate the use of a CDE for our supply chain too so information and data is always shared through a common platform, ensuring we're all always working from a single source of information.

BIM Developments

Instant Dashboard reporting



BIM Developments



Design Review and Clash detection

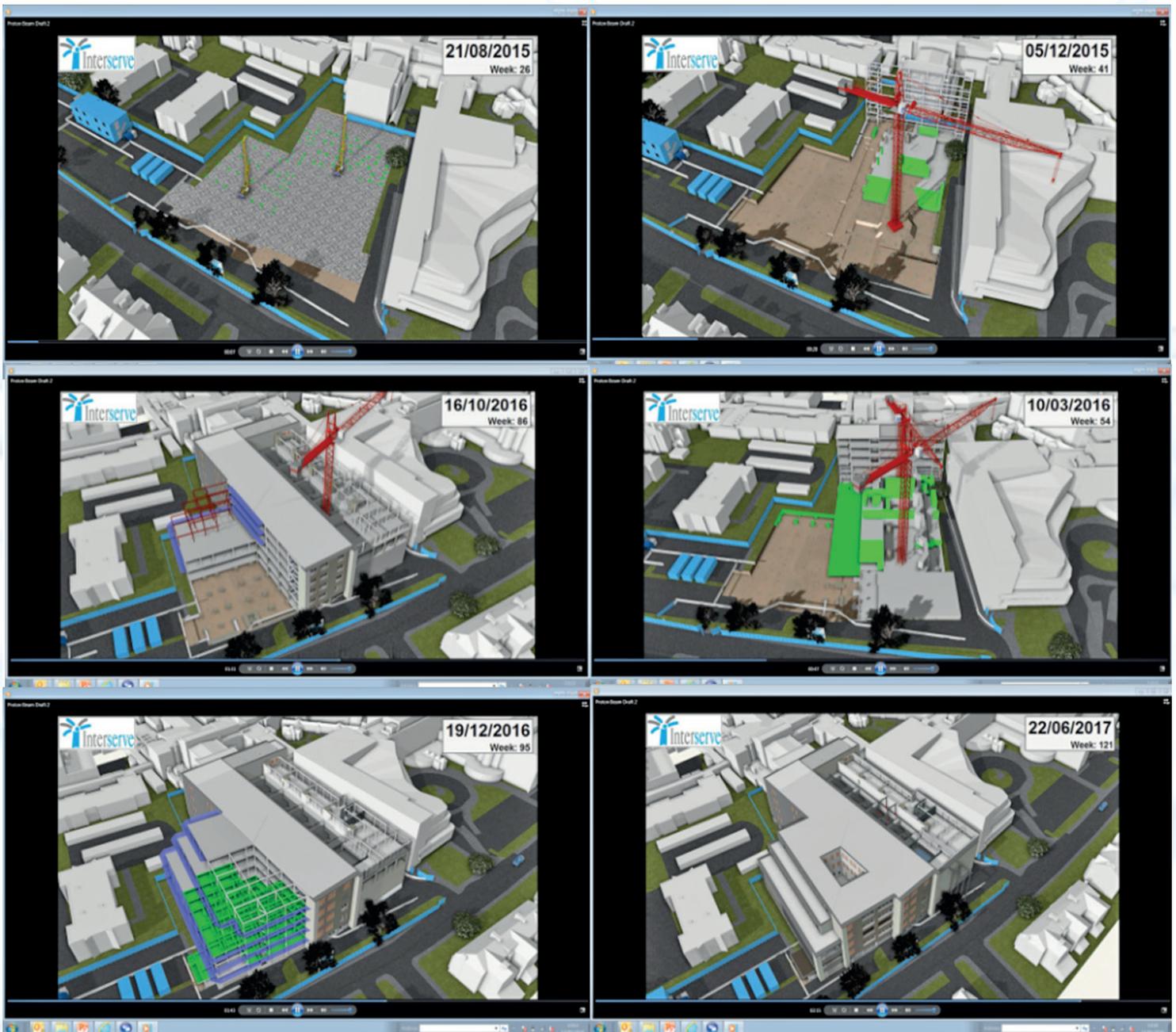
The federated model was used to support the two-weekly Design Review and Clash Detection process; this initially identified 10,282 clashes using Revit and Solibri.

An example of an identified issue was with the treatment gantries that were designed to rotate 3600 around the patient. The model identified that external cabling clashed with the bunker wall. By identifying this in the model, this was easily rectified at design stage. Services in walls positioned correctly using federated models. Construction of the bunker and embedding the large volume of services in the concrete would not have been possible to get the co-ordination right first time without BIM models. Using BIM models the team developed 3D sequencing drawings splitting the concrete, reinforcement and conduit within the treatment room structures into a series of manageable pours.

4D Digital Rehearsals

4D Digital Rehearsals were used to interrogate and optimise the programme and illustrate the effect of changes to the positioning of cranes and phasing of works. The ability to virtually represent the build sequence, and instantaneously see the impact of any changes to this, provided a clear means of checking the buildability. We were able to rationalise the number of pours and optimise the sequence to the treatment rooms reducing the initial Heyrod programme by 5 weeks. This also demonstrated programme certainty to the Trust, giving confidence that the programme was achievable.

Alongside this, the 4D model was used for client and stakeholder engagement meetings and resident open evenings to articulate the design and to visually represent the construction methodology. The 4D model was also used at site inductions with supply chain partners and operatives.

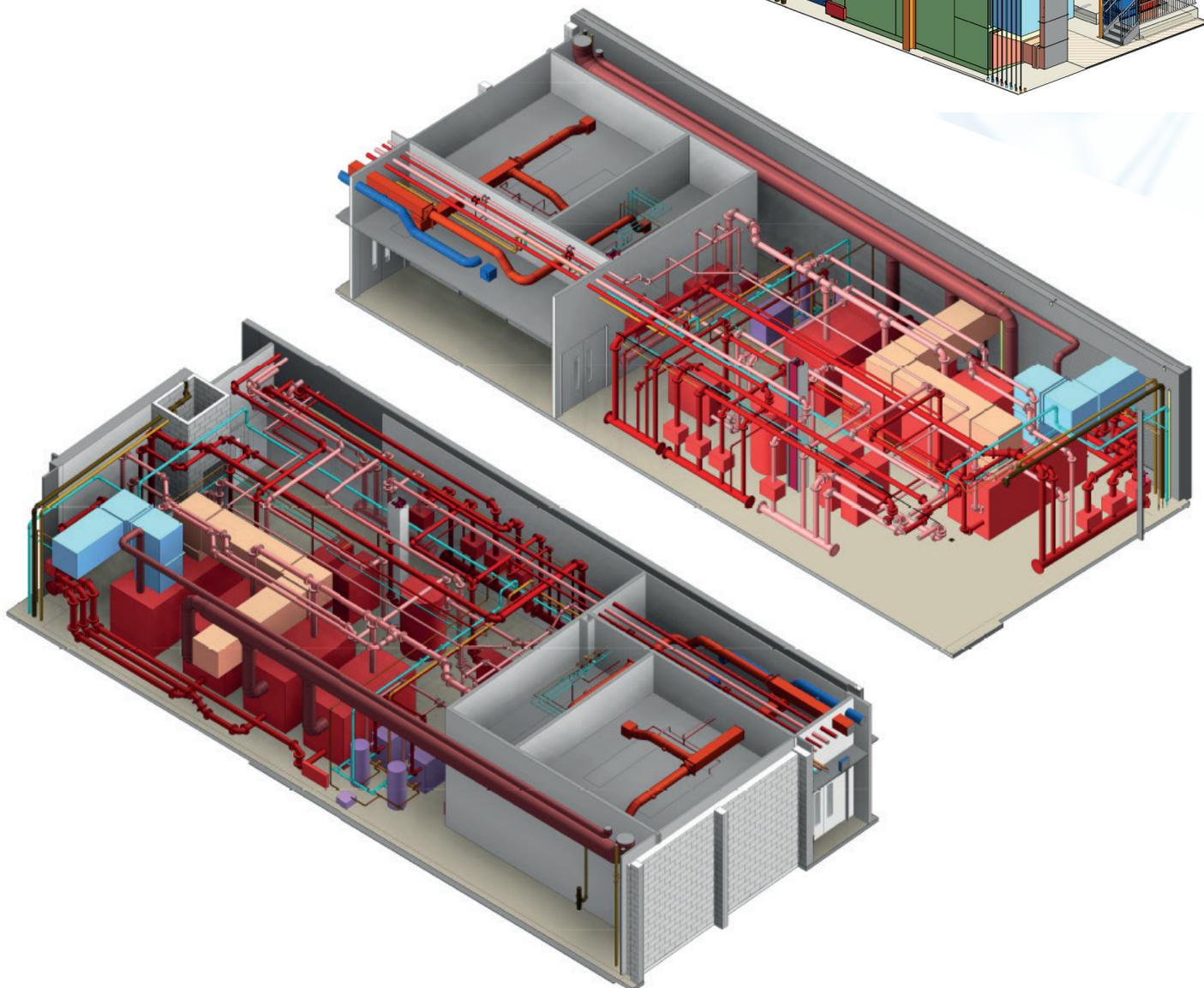
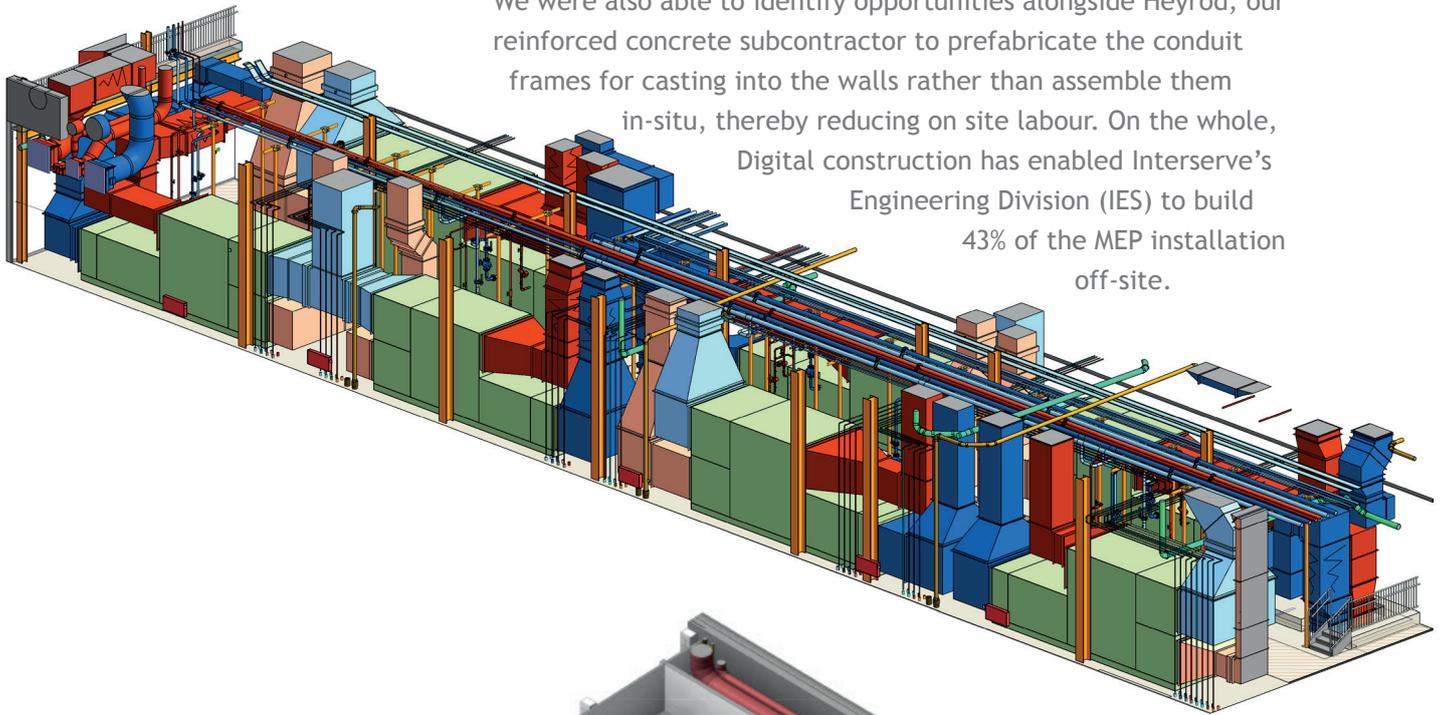


Offsite Fabrication

The model also helped identify elements for prefabrication offsite. This resulted in a faster construction period, reduced labour cost and safer working, getting it right first time with no subsequent reworking.

One example is where we introduced prefabricated service modules with all items placed at correct levels and pre-tested, allowing smaller installation teams with quicker install times than traditional construction.

We were also able to identify opportunities alongside Heyrod, our reinforced concrete subcontractor to prefabricate the conduit frames for casting into the walls rather than assemble them in-situ, thereby reducing on site labour. On the whole, Digital construction has enabled Interserve's Engineering Division (IES) to build 43% of the MEP installation off-site.



Exemplar Methods of Delivery - Proton Beam Therapy

Completed Chiller Pump Room Plant Fully Pre-Fabricated Off Site utilising lightweight thin bodied True-Bore Stainless materials and Plant Skids.

Chiller Pump Room for Proton Equipment Working Model Render (ENSCAPE)

Design Stage Model to Finished Product – Exemplar BIM

Design for prefabrication the use of SysQue

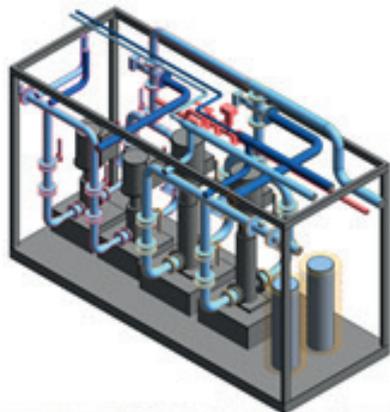
Early accurate design enables Interserve to maximise fabrication opportunities off site which a wealth of benefits using BIM enables all elements of the building where required to be constructed off site. Interserve utilised the software called SysQue which is a Revit bolt on to use actual components that you can buy. Once the design is complete you can easily just schedule your order or prefabricate knowing items ordered are as per your model.

Exemplar Methods of Delivery - Proton Beam Therapy

Fully Pre-Serviced and tested Corridor Modules – Special Partners

Benefits:

- Reduction in Labour
- Improved Quality of Installation
- Improved Health and Safety
- Improves sustainability
- Program reduction

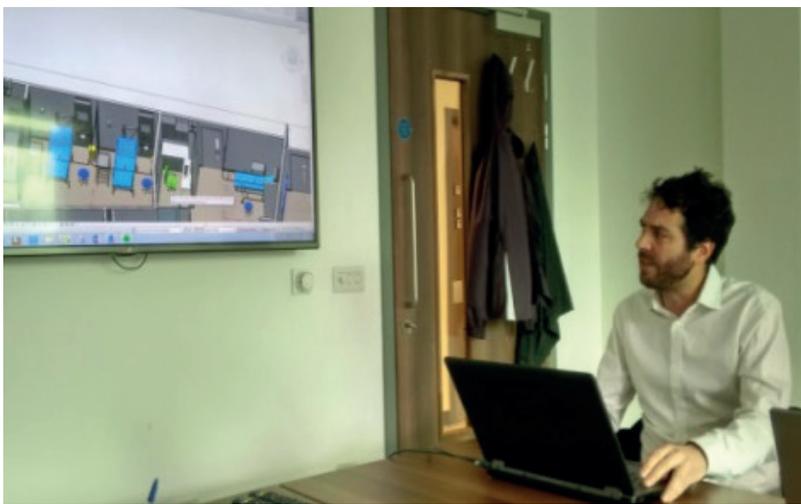


QR coding for drawings

All drawing issue sheets have QR codes which enable instant access to the model view by smart phone or tablet allowing quicker signoffs and effective stakeholder engagement.



QR Code on every "C-Sheet"



Blue Jeans Video Conferencing

- Allowed the project team to communicate simultaneously using multiple screens in multiple locations on multiple devices, allowing efficient and effective coordination of disciplines. Meeting minutes produced incorporating visual extracts from BIM model to enhance understanding and coordination.

Taking the accuracy to the field

By using the Trimble station (survey and setout instrument) linked to the BIM model Interserve Engineering team were able to set out on site from the model with pin point accuracy, greatly reducing the risk of errors.

Using a Trimble robotic station to set out from the BIM model ensured exceptional accuracy of installation. For example the 30m beam line incorporated a 165mm diameter high pressure pipe, cast in-situ which was accurate to within 12 mm. This use of Trimble robotic setting out also allowed us to mark up and position hangers for prefabricated services modules 6 weeks prior to installation, eliminating trade downtime.

Item	Minute	Action by and When	Action Completed
	13.90m overall)		
2.6	Louvre L03 (southern one) clashes with parapet wall so needs reducing in height		
2.7	Louvre L03 (northern) can also be reduced in length to avoid unnecessary span across steel columns - reduce to 6000mm		



Digital Handover

As a means of engaging with the Trust's FM team, the team worked to bring EndBIM on board which allowed the complex 3D models of maintainable assets to be displayed on portable devices using a secure web platform linked to O&M documentation. EndBIM Solution gave the capability to combine the graphical model and all the non-graphical data i.e. schedules, drawings, O&M documentation, H&S files, etc. into a data rich digital asset which will provide long term value and benefits for the Trust in operating their assets across their lifecycle. This gives the Trust FM team and supply chain instant access to any maintainable asset, complete with commissioning information, manufacturer's literature and other relevant information all available in an easy to use format.

