

Legal, Contractual Considerations with BIM – 360° Review

BIM is now extensively used in the design, construction and operation of buildings including many different building types in both the public and private sectors.

Whereas great advances have been made in the technology and systems, the legal and contractual issues need to catch up.

The legal and contractual issues may vary depending on the client brief and procurement process.

The typical scenarios are as follows:

- a) Early engagement with a Prime Contractor to deliver a public sector project.
- b) Novated to Main Contractor in private sector at RIBA Stage 2 to deliver a Design and Build project.
- c) Traditional procurement in private sector to tender to Main Contractor and Sub-contractors at RIBA Stage 4. Contractor to complete the design.

There are of course many variations and hybrid methods. However, the following issues are considered:

1. Definitions: 3D, Revit, BIM Level 1, 2 and 3
2. Fees
3. PI Insurance
4. Split responsibility – Consultant/Contractor
5. Consultant's Appointment
6. Building Contract
7. Who owns the model
8. Procurement – optimise and options
9. FM & CAFM
10. Industry engagement
11. Readiness
12. Process/workflow
13. CDM

Philip King, Hilson Moran – CIBSE BIM Steering Group - 360° Review

14. Pre-qualification questions PAS 1192/1
15. BIM Execution Plan
16. Risk
17. Security

Due to the many variations this document does not provide definitive advice for each of the above. It is intended to identify the issues to be considered.

The following table explores these issues:

This article is a summary of the full document that can be found on CIBSE – BIM TALK

	Issues/Comment	Early engagement with a Prime Contractor to deliver a public sector project.	Novated to Main Contractor in private sector at RIBA Stage 2 to deliver a design and build project.	Traditional procurement in private sector to tender to Main Contractor and sub-contractors at RIBA Stage 4. Contractor to complete the design.
1.	<p>Definitions / should be the same for all procurement options and industry wide</p>	<p>Level 0 Unmanaged CAD, in 2D, with paper (or electronic paper) data exchange.</p> <p>Level 1 Managed CAD in 2D or 3D format with a collaborative tool providing a common data environment with a standardised approach to data structure and format. Commercial data will be managed by standalone finance and cost management packages with no integration.</p> <p>Level 2 A managed 3D environment held in separate discipline ‘BIM’ tools with data attached. Commercial data will be managed by enterprise resource planning software and integrated by proprietary interfaces or bespoke middleware. This level of BIM may utilise <u>4D</u> construction sequencing and/or <u>5D</u> cost information. The Government’s BIM Strategy Paper (http://www.bimtaskgroup.org/wp-content/uploads/2012/03/BIS-BIM-strategy-Report.pdf) calls for the industry to achieve Level 2 BIM by 2016.</p> <p>Level 3 A fully integrated and collaborative process enabled by ‘web services’ and compliant with emerging <u>Industry Foundation Class (IFC)</u> standards. This level of BIM will utilise <u>4D</u> construction sequencing, <u>5D</u> cost information and <u>6D</u> project lifecycle management information.</p> <p>The UK Government development to enable Level 3 maturity BIM is reported on in the <u>Digital Built Britain initiative</u> (http://digital-built-britain.com).</p>		

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2.	<p>Fees / the fee should increase as the scope and extent of the works increases. Employers Information Requirements (EIR) to be defined.</p> <p>To agree whether Consultant and/or Contractor creates Level 2 BIM model.</p> <p>Fee naturally should increase in line with the scope of work but much of this increase now is due to additional attendance at meetings for model analysis and entry of non-graphical data into models. The development of the design using 3D software for some is becoming more cost efficient now comparable to a 2D delivery due to the efficiencies 3D design provides particularly in the latter design stages.</p>	<ul style="list-style-type: none"> • With early appointment of MEP sub-contractors and major equipment suppliers it is likely that the Contractor would produce the BIM model based on actual equipment procured. • In this situation the Consultant would not charge for the additional fee of producing the BIM model. • One issue here is the capability of the MEP Sub Contractors and supply chain re: their ability for 3D design delivery and production of concept and detailed designs. Even with this procurement route transfer of the model between parties is likely resulting in additional fees borne by the client. • An option would be for the MEP Consultant to deliver the design to RIBA stage 4a and then if able and willing be novated over to the MEP Sub Contractor if the Prime Contractor wants to offload design responsibility, also reducing 	<ul style="list-style-type: none"> • In this scenario the Consultant may produce a BIM model identifying zones and volumes only – the fee should reflect this. • At novation, the Consultant may produce the BIM model or the Contractor and/or MEP sub-contractors may produce the BIM model – the fee should reflect this. • Rather than identify a zone it is often better to draw a length of duct/pipe/containment etc. to determine spatial requirements, this representation is often easier for Architects to understand. Different businesses will have different views on whether this should incur additional fee. • Novation would allow the same MEP Consultant to manage the model on behalf of the Contractor but Clients often like to have representation retained to manage check and validate the Contractors design/installation and there may 	<ul style="list-style-type: none"> • In this scenario it is likely that the Consultant produces a Level 2 BIM model and then converts it to 2D drawings and specifications for tender – the fee should reflect this. • The Contractor and sub-contractors would then produce a working drawing model with installation details based on actual equipment procured – the Consultant would review and comment. • 2D drawings are in essence a by-product of the 3D model, A 3D model is in essence created to produce 2D deliverables, Again business specific but the process of producing 2D plans and sections and adding title blocks and notes must be allowed for. • There is a cost associated with the implementation of 3D software and different size businesses will have different challenges but the actual production of this information, assuming this implementation has

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		<p>duplication of design, transfer of models and therefore reduction in fee to the client.</p> <ul style="list-style-type: none"> The ideal scenario is one MEP Consultant/Contractor developing the model from inception to completion, this then allows the design process to be undertaken and managed much more easily. 	<p>be a conflict of interest in this scenario.</p> <ul style="list-style-type: none"> In addition, if novation is chosen the MEP consultant would need experience in delivering coordinated working drawings and this is not something all Consultants can/want to do. Therefore change in ownership of the model is still likely. Fees would be appropriate to the scope of work but the client would incur additional cost due to the change in ownership as inevitably some duplication of design flow will be introduced. 	<p>taken place, can be very efficient particularly in the latter design stages.</p> <ul style="list-style-type: none"> There is still a change in ownership here as the Contractor is producing a working drawing model. The design model will have all the initial Consultants naming conventions, families etc. and the Contractor will then need to construct their own model in line with their own QA procedures, resulting in duplication of fee. There is a validation exercise to go through and fee associated with this and again duplication in work to some extent.
3.	<p>PI Insurance / insurers should be notified where additional services are provided.</p> <p>PI Insurance needs to be considered within house QA procedures also e.g. if one PI insurance provided cover for all parties to work on model it maybe in house ISO 9001 procedures and</p>	<ul style="list-style-type: none"> More likely to use “Integrated Project Insurance” (IPI) for a holistic and integrated project team. 	<ul style="list-style-type: none"> As with any new service, if BIM Level 2 is a new service, then the insurers should be notified to ensure that the PI Insurance Policy provides the cover. “Refer to” Best Practice Guide for Professional Indemnity Insurance 	<ul style="list-style-type: none"> As with any new service, if BIM Level 2 is a new service, then the insurers should be notified to ensure that the PI Insurance Policy provides the cover. “Refer to” Best Practice Guide for Professional Indemnity Insurance

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	individual company working practices would require a new model to be constructed if there was a change in ownership.		when using Building Information Models CIC/BIM INS”.	when using Building Information Models CIC/BIM INS”
4.	<p>Split Responsibility / ideally this should be defined at RFP and fee proposal stage as well as the appointment documents and building contract and reflected in the BIM execution plan.</p> <p>BG6:2014 is a very good document which identifies deliverables and responsibilities there is still a lot of confusion in the industry generated by the different work stages particularly moving to the new numeric RIBA stages which even now the old stages are still being referenced.</p>	<ul style="list-style-type: none"> • Suggest use BSRIA BG 6/2014 to define responsibilities • Greater opportunity for early engagement with whole team to agree the most efficient split of responsibilities. • Early appointment of Supply Chain and Contractor will facilitate efficiencies described only if continuation of these is maintained. 	<ul style="list-style-type: none"> • Suggest use BSRIA BG 6/2014 to define responsibilities • After novation it is especially important to agree responsibilities for each party in order to avoid gaps and duplication. 	<ul style="list-style-type: none"> • Suggest use BSRIA BG 6/2014 to define responsibilities • Clear demarcation to be identified in contract documents.
5.	<p>Consultants Appointment / should be defined at RFP, fee proposal, BIM execution plan as well as contract documents to enable Contractor to understand Consultant’s responsibilities.</p> <p>The most efficient designs and reduced risk to the client are born from Consultants providing robust RIBA Stage 3 designs for Contractors to review from</p>	<ul style="list-style-type: none"> • Would most likely produce the most efficient design, procurement and construction due to the early appointment and engagement with the whole team and potentially the supply chain. • To maximize this advantage it would be beneficial to ensure that each parties appointment document is 	<ul style="list-style-type: none"> • Suggest use BSRIA BG6/2014 to define responsibilities. • After novation it is especially important to agree responsibilities for each party in order to avoid gaps and duplication. 	<ul style="list-style-type: none"> • Suggest use BSRIA BG6/2014 to define responsibilities. • Clear demarcations to be identified in appointment documents.

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	<p>a build-ability perspective, offer VE and agree a way forward. The transition from Consultant to Contractor can happen at different stages of the design.</p> <p>This is not always achieved though, with single design team philosophy which appears to suit the BIM workflow in term of maximising efficiency of the model by negating the need to transfer ownership.</p>	<p>back to back with no gaps or overlaps and each party is aware of the other appointments.</p>		
6.	<p>Building Contract / should be defined at procurement stage, in contract documents, in BIM execution plan, be back to back with Consultants appointments to avoid gaps and duplication. EIR's to be defined for each stage.</p> <p>BSRIA BG6 can be used to define responsibilities.</p> <p>The most efficient designs and reduced risk to the client are born from Consultants providing robust RIBA Stage 3 designs for Contractors to review from</p>	<ul style="list-style-type: none"> • BIM protocol to be appended to contract. • One stop shop • BSRIA BG6/2014 can still be used to define responsibility within the contract team for each party. 	<ul style="list-style-type: none"> • Suggest use BSRIA BG6/2014 to define responsibilities. • After novation it is especially important to agree responsibilities for each party in order to avoid gaps and duplication. 	<ul style="list-style-type: none"> • Suggest use BSRIA BG6/2014 to define responsibilities. • Clear demarcations to be identified in appointment documents.

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	<p>a build-ability perspective, offer VE and agree a way forward. The transition from Consultant to Contractor can happen at different stages of the design.</p> <p>This is not always achieved though, with single design team philosophy which appears to suit the BIM workflow in terms of maximising efficiency of the model by negating the need to transfer ownership.</p>			
7.	<p>Who owns the model / refer to BIM protocol, CIC/BIM Pro.</p> <p>It is suggested that copyright and intellectual property remain with the author, however, the client ultimately owns the model as they are paying for it. The client owns what he has paid for, but this is only the output of the model, geometry, drawings and resultant data. The methodology of how this information is compiled is still the IP of the designer. For example, the filter/visibility settings used, off-line process maps and scripts for advanced</p>	<ul style="list-style-type: none"> • The Prime Contractor with each party being responsible for their individual inputs • As long as the MEP consultant can develop the model all the way through to RIBA Stage 5 then the benefits of this procurement route by engaging the team early on in the process can be realised. If not then there is still likely to be a transfer of model and thus re construction or part thereof. 	<ul style="list-style-type: none"> • Ownership transferred to the contractor when the contractor is appointed. • The protocol to allocate responsibility to each party. • The benefit with this procurement route is that the initial consultant will be preparing a “spatial fit” model rather than producing any actual services design in the model therefore novation at an early stage reduces design duplication as the Contractor is therefore developing 	<ul style="list-style-type: none"> • Ownership transferred to the contractor when the contractor is appointed. • The protocol to allocate responsibility to each party. • With this route as long as design responsibility remains with the Consultant the design model may be able to be coordinated by the Contractor without significant re construction.

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	<p>geometry creation providing these are not essential for future remodelling. The ideal BIM process is for one model to be used from inception to completion the non-graphical data populated along the way in line with project requirements including FM needs.</p> <p>Unless the initial Consultant is able and willing to take the model from inception to completion then inevitably there will be change of ownership of the model and in essence a re-construction of the model at the determined stage for the following reasons:</p> <p>1. Validation In order for a Contractor and/or their design team to take ownership of a model a validation process needs to be undertaken to ascertain the quality and content of the model relevant to the respective design stage. This has an impact on Construction program and is often not factored in to time scales. In addition there may also be a resolution</p>		<p>the MEP design from scratch based on a model that has been considered spatially and a set of ERs which will comprise Specifications RDS and supporting 2D information such as Schematics etc.</p>	<ul style="list-style-type: none"> • That said this will depend on the quality of the model at Stage 4 and whether any VE or Contractor Procurement will invoke any re construction, this though could be undertaken by the Consultant.

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	<p>period where difference of opinion needs to be discussed and a way forward agreed. Therefore invariably the model will need to be rebuilt by the incoming Consultant to keep the design flow moving forward concurrently with the resolution process.</p> <p>2. <u>PI</u> Individual business insurance policies may prohibit the adoption of an incoming model.</p> <p>3. <u>QA/Internal Processes</u> Companies will need to identify author and prove validation of work produced within their businesses to satisfy ISO 90001 or other QA procedures to ensure they are delivering a consistent product in line with their business policies. By nature an incoming model will have been developed differently to these and therefore would require re construction.</p> <p>4. <u>Naming Conventions</u> Internal working practices and naming conventions of systems and families will</p>			

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	<p>all need to be changed.</p> <p>5. <u>Design interpretation</u> By nature a model changing hands from Consultant to Contractor will result in a fresh pair of eyes looking at the design, new ideas and methods of installation often resulting in re coordination of some or many parts of the model which can be more efficient to implement if the model is re constructed</p>			
8.	<p><u>Procurement – Optimize & Options</u></p>	<ul style="list-style-type: none"> • Ideal, most efficient process because project team and supply chain are engaged early. • The Client/ QS will still wish to see competitive pricing • The BIM L2 is procured once only. 	<ul style="list-style-type: none"> • Early engagement with consultant and contractor may lead to procurement of plant and equipment with the advantage that the BIM L2 is procured once only. 	<ul style="list-style-type: none"> • More likely that plant and equipment will be procured by the contractor. • More likely that the consultant will produce a BIM L2, then converted to 2D drawings and specifications for procurement.
9.	<p><u>FM and CAFM</u></p> <p>FM and CAFM can result in clients paying for non-graphical data, LOD to 500 specified in BEPs that have failed to meet the end goals. Non graphical data for the time being should be kept</p>	<p>PAS 1192-2 defines the common data environment as a:</p> <p>“single source of information for any given project, used to collect, manage and disseminate all relevant approved project documents for multi-disciplinary teams in a managed process”</p>		

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	<p>entirely separate from the production of a geometrically correct coordinated model expected for BIM L2 until the FM Team are engaged and the level of non-graphical data is determined.</p>	<p>This single source of information is vital to maximise the potential benefits of collaborative working, with all information generated being managed and, when validated and verified, made available for future use. The validation and verification process is a key function of the CDE, and ensures the quality of the information for onward use.</p> <p>The CDE process described in BS 1192, and developed further in PAS 1192-2 and PAS 1192-3, consists of four stages:</p> <ol style="list-style-type: none"> 1. Work-in-progress – where each company or individual works 2. Shared – output from a company or individual is approved and shared with the wider team 3. Published – verified and validated information is authorised by the client for contractual use 4. Archived – information or data superseded by a later version, or which is incorrect <p>Traditionally this function has been carried out with tools provided by the main contractor to manage their supply chain, from the time of their engagement on the project until practical completion or soon after. However, this information source is lost to the client once the contractor has finished on the project and the client is left with only the information provided at handover. It can be viewed as a further development from an electronic document management system, with the increased facility for verification and validation of data and information received.</p> <p>In cases where a client has a portfolio of assets, a central common data environment covering all of the assets would generally be the most effective way of managing information and data. This environment would be a repository for all information generated covering all aspects of the asset’s history and operation. During design it would act as an interface between the client and the design team, capturing documents and data related to the design intent including client requirements, scheme design reports and the final design solution in the form of 3D models and specifications.</p> <p>In the construction phase, the CDE is used by the constructor as the route for information exchange, in programme with the exchange points agreed in the employer’s information requirements (EIR). The in-built validation and verification process ensures that all information received into the CDE is processed and controlled, with only the ‘acceptable’ information or data being passed to the ‘published’ area and made available for wider use.</p> <p>The CDE has an information use wider than the 3D model is able to deal with. Whereas the 3D model represents the designed solution for an asset, the CDE will contain the information that led to that design solution. So, if at some stage in the future some major works are required to an asset, the CDE could provide the information that led to the original design. A soils report</p>		

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		<p>which had an impact on the design of the foundations, for example, would be very helpful if an extension were being considered. Although the soils report itself would not normally be held within the 3D model, the findings of that report may have been fundamental in determining the type of foundation design which was adopted.</p> <p>The CDE should be available for the whole of the asset’s life, and information it holds may be used for aiding decision making on a variety of aspects of the asset, or wider site, such as providing data to asset databases or other linked enterprise systems. This approach may be new to many clients but having such a managed approach to information will greatly increase efficiency in managing assets. It may be that existing processes or tools can be adapted to provide the CDE, or a new CDE tool can replace some existing systems and provide further benefits in the process.</p> <p>Design stage CDEs generally are too complex for the needs of an End User, FM teams prefer simplicity and any means of reducing the need for extensive training are welcome. An option of “keeping the model alive” which is an intermediary platform developed by a software provider which allows the model to be used as a mini CAFM platform post practical completion at a relatively reasonable cost.</p> <p>As well as providing information for daily maintenance activities on plant and systems, the CDE should also be the source of information used in linked enterprise systems such as enterprise reporting, asset utilisation and SCADA (supervisory control and data acquisition).</p> <p>Planon are developing their own COBie add in for Revit which will allow the data in the model that they require to be extracted and entered into their system, this is a closed loop system and therefore if Planon is modified to suit the replacement of an AHU for e.g. then Planon will in turn update the model. Again Planon offer a very valuable insight to developments to date and demonstrations can be arranged if this would be beneficial.</p>		
10.	<u>Industry engagement</u>	<p>The need for training has consistently been highlighted; some parties feel that BIM was something imposed on them, holding limited benefits but costing time and money. The research suggests there is still a considerable way to go before the industry can say it is BIM ready. Although main contractors and to some degree sub-contractors and consultants appear enthusiastic to improve their BIM capabilities, there is still a view that BIM is optional, or that it only applies to those who work in the public sector or on larger jobs.</p>		

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		<p>The point that the industry is missing is that BIM needs 3D design, 3D design does not need BIM, and delivering designs in a 3D platform is as natural a progression as was the drawing board to CAD. And to a large extent the uptake of 3D design delivery is being held up by the expectation that BIM will facilitate and possibly fund this development. A great opportunity for the early adopters but perhaps a lot of missed opportunities for some.</p>		
11.	<u>Readiness</u>	<p>The UK government has mandated that all centrally-funded work is to be undertaken using BIM by 2016. The deadline is now less than a year away, and those organisations that haven't yet jumped on the bandwagon are feeling the pressure.</p> <p>Recent research conducted by UK Construction Week in partnership with BRE, which questioned more than 1,200 architects, contractors, developers, engineers and product manufacturers about their experiences of BIM, revealed a number of uncertainties throughout the industry. The study suggested that three quarters of construction professionals do not believe the industry is ready to meet mandatory BIM Level 2 requirements by 2016, and that a further 62 per cent of respondents replied that they do not understand what is needed in order to meet the requirements of BIM Level 2. The results also uncovered a tension between the expectations of the specification community and the perceived demand for BIM-compliant products by manufacturers and suppliers.</p> <p>Another study, conducted by CONJECT, highlights the significant leaps forward needed to attain BIM Level 2 compliance by 2016. The survey sample consisted of 813 respondents with 70% from the CONJECT database and 30% from third party sources. Whilst 85% were from the supply chain, the asset owner functions were also represented in the research.</p> <p>The need for training was consistently highlighted throughout the results of the survey, and from those who answered; some felt that BIM was something imposed on them, holding limited benefits but costing time and money. The research suggests there is still a considerable way to go before the industry can say it is BIM ready. Although main contractors and to some degree sub-contractors and consultants appear enthusiastic to improve their BIM capabilities, there is still a view that BIM is optional, or that it only applies to those who work in the public sector or on larger jobs.</p> <p>Overall acceptance and adoption of BIM does appear to be on the increase, with 85 per cent of respondents for the UK Construction Week study claim that its introduction is a positive development for the industry. Only 16 per cent of the sample</p>		

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		<p>have never used BIM and have no plans to do so, while the remainder are already active or are preparing to embark on BIM projects in the near future.</p> <p>BIM4M2 also hold a more optimistic view, and believe now is the optimum time for product manufacturers to start their BIM journey (if they haven't already) as the optional tools to support manufacturers' BIM adoption will be launched at their event on 28th July. They also state there is increasing clarity on what is required from product manufacturers, making it easier to provide the right information at the right time, to the right people.</p> <p>It seems that there is still a long way for the requirements of the 2016 BIM mandate to be met, even though the industry is moving towards this goal. There is a lot of help available for those struggling to implement the required level, however, it also seems that education on the requirement and its optionality is required. The important thing to remember is that no one is alone.</p> <p>Several surveys have shown surprising results. BIM appears to be considered as a reason for companies to move to a 3D design platform and due to the amount of information, documents, and standards and un-certainty around 2016 a lot of companies appear to be sitting on the fence.</p> <p>Whereas if the efficiencies of working in a 3D platform in their own right were considered it may be that the business case be satisfied internally prior to 2016. For example a medium sized practice may undertake 70-80% of work in 3D platform naturally collaborating with the Architect and Structural Engineer very much in the spirit of level 2, however only 20% - 30% of this is delivered under a formal BIM process.</p> <p>If you provide Engineering talent today with the latest software and tools at their disposal they will naturally collaborate ask for the latest models from their peers and information and host the information on one of the myriad of web sites that are available and deliver cost effective design solutions. However, the need for Protocols, BIM Execution Plans is paramount to protect clients, design teams and provide common standards and industry practices to work to.</p> <p>In essence why wait for 2016 to make these decisions. Implementation by nature is different for larger organisations and is obviously more complex and costly, but at the same time there is huge opportunity at the moment which may be missed.</p>		

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12.	<p>Process/ Workflow / split into three layers:</p> <p>It is envisaged that the digital plan of works will provide a workflow in line with the RIBA work stages.</p>	<ul style="list-style-type: none"> • Industry practices: these are typically practices or procedures which are used throughout particular industries, and are bought “off the shelf” for a particular function rather than an organization producing their own bespoke version. Examples in this context would be forms of contract for construction, or defined scopes of services for construction professionals such as the RIBA Plan of Work 2013. • Corporate practices: these are typically practices or procedures which are set by an organization for use across its operations, and which may apply in many cases. An example in this context may be a standard procurement process for capital works where the organization has a large portfolio or estate. A basic example is the everyday coordination between MEP Engineers and then with the Architect and Structural Engineer. <p>Project practices: These are typically practices which deal with varying or supplementing the corporate procedures to cover more local issues. In this context it may be varying the stakeholders for engagement depending on the particular type of facility being constructed.</p>		
13.	CDM	<ul style="list-style-type: none"> • No changes envisaged except for the method of providing information. 		
14.	Pre Qualification questions PAS 1192/1	<ul style="list-style-type: none"> • It is envisaged that each party/organization will produce answers based on their particular role and expertise provided. 		
15.	BIM Execution plan	<ul style="list-style-type: none"> • The ‘team’ needs to develop a detailed BIM execution plan to define the project intent, how the work will be implemented at the earliest possible stage. It should define the process scope, level of information, information exchange between parties, describe the project, goals, roles and responsibilities, business practices and work flow, additional resources, training and future participants to join the project. 		

This article is a summary of the full document that can be found on CIBSE – BIM TALK

	Issues/Comment	Early engagement with a Prime Contractor to deliver a public sector project.	Novated to Main Contractor in private sector at RIBA Stage 2 to deliver a design and build project.	Traditional procurement in private sector to tender to Main Contractor and sub-contractors at RIBA Stage 4. Contractor to complete the design.
		<ul style="list-style-type: none"> In particular PAS1192-4 Organisational Information Requirements (OIRs) need to be determined to form part of the Employers Information Requirements (EIRs) which will determine the level of non-graphical data that is required. 		
16.	<u>Risk</u>	<ul style="list-style-type: none"> Risk is fundamentally a major factor in the construction industry and the main method of reducing risk is still for all parties involved to discuss, review, agree and coordinate. 		
17.	<u>Security</u>	<ul style="list-style-type: none"> With BIM Level 2 and the potential for “smart buildings” and the “Internet of things” there is a huge scope for sensitive and confidential information to be shared with many parties and this may not be desirable – further work is required here. 		