Q&A session for BIM, CDM and Design Matters with NEC webinar 17 September 2015

Does BIM allow the visual health and safety message to appear in the model?

A: Definitely, fire strategies and health and safety project and site considerations can be clearly viewed from 3 models and can be used as part of the health and safety instruction plan.

As a supplier and manufacturer we want to be prepared to support our clients. We need clear guidance from the Principal Contractors to ensure we do not invest in the wrong solutions. Feedback is the key, we have had limited feedback so far.

A: There is no mandated common data environment but most major contractors are using Revit and Navisworks software models – training would be good to understand how these work and output into CGIs may be all you are required to review and consider. Unless there is a clear requirement for you to invest, it may be better to invest in training and utilise the contractor systems on site.

Can the Principal Contractor take on the role of Principal Designer?

A: In short, yes. The various roles should be taken on by those best placed to manage risks at that stage of the project, but must be made in writing by the client. Until the appointment has been made, the responsibility for undertaking those duties rests with the client.
HSE's website states '*Organisations or individuals can carry out the role of more than one dutyholder, provided they have the skills, knowledge, experience and (if an organisation) the organisational capability necessary to carry out those roles in a way that secures health and safety.*'

Is the Principal Designer the same as the architect in a design & build contract? If so, how does the client appoint him as he is a subcontractor of the builder?

A: The Principal Designer can be any party to a contract, or out with the contract, provided they are capable of carrying out the role, and have been appointed in writing by the client. CDM 2015 requires co-operation, duties and specific actions from CDM duty holders and compliance with those is enforceable under the Health and Safety at Work etc. Act 1974. That is criminal law which generally takes precedence over contract law.

Do NEC3 contracts align with Green Buildings?

A: NEC3 contracts, BIM and CDM all align with Green Buildings insomuch as Green Buildings promotes use and re-use of sustainable products in efficient buildings. NEC3 contracts are a mechanism for procuring what a client requires, which can be a green building. BIM can be a system of using, storing and retrieving information on materials used which can aid analysis and inform subsequent decisions, and CDM encourages consideration of material properties and storage of details which also informs future evolution of structures to meet new uses, or maximises redevelopment potential.

Can BIM be achieved using 2D?

A: It can, but this is really just CAF output and the real benefits lie in the 3D modelling hence the requirement to reach level 2 by 2016.

Are we 'required' to meet Level 2 BIM by 2016 for all projects above a certain value?

A: Yes, the UK Government has set a minimum public sector threshold of £5m but some clients may request level 2 for complex schemes below this value as part of tender process.

If we have a theoretical virtual construction, how does this adapt to unknowns such as geotechnical issues change in clients requirements?

A: Geotechnical information can be loaded into BIM software and any changes such as moving the building orientation would require additional surveys and fees and would be subject to a change in the Works Information therefore would become a compensation event.

What is the rough cost of implementing BIM in terms of % of project cost, for example on a rail project around £100m?

A: To properly answer this we would need more detail such as is this a rail structure? The cost is dependent on the level of design BIM is the physical output into the 3D model therefore (post investment of software) the cost could be relatively similar to standard design development in terms of fees.

Is there an example of the platform this modelling is done within?

A: The most common data platforms are Revit and Navisworks.

What does CE and FM refer to?

A: 'CE' refers to compensation events and 'FM' refers to Facilities Management.

Do you think that the with greater adoption of BIM will lead to a move more towards using Option B/D contracts choice over Option A/C?

A: Probably not. You should use the right pricing mechanism for a project, regardless of BIM.

Do you think BIM will offer more advantages with different main Options?

A: Definitely with regards to achieving robust programmes and cost integrity for target cost Option C for example and A for achieving fixed price surety; the benefit is building the scheme first in the model to design out risk and cost inefficiencies and programme delays due to poor design that is essentially not buildable.

I see that a lot of modelling (3D BIM software) will be needed to implement BIM. This seems worthwhile for large projects, but how does the industry prevent a disproportionate cost on small projects, is it needed for all projects? Is this a client's decision?

A: It is a client's decision and we should be considered as part of option and business case appraisal, the main driver however is to recover such cost from designing out inefficiencies therefore the payback from investment should be achievable over a period of time but needs to considered much the same as whole life assessment.

Should the BIM 'owner' during design & construction stage be the Principal Designer?

A: This would seem sensible particularly for complex multi discipline schemes and aligned to the design responsibility matrix.

If the designer is to eliminate the most likely risks to cause harm does this mean a pre-design risk assessment must be carried out?

A: Regulation 9.-(2) requires the designer to 'take into account the general principles of prevention and any pre-construction information to eliminate, so far as is reasonably practicable, foreseeable risks to the health or safety of any person'. The Regulations don't prescribe whether this is achieved by starting with a 'pre-design risk assessment' then eliminating hazards and reducing risks, carrying out periodic risk reviews, or maintaining a Hazard Register as a live document throughout the

design period. A combination of these is often appropriate to achieve the required outcome.

You mention the most 'likely' risks should be designed out. What about the most severe hazards, where do these fit into this?

A: The CDM 2015 Regulations require designers to eliminate hazards and reduce the risks from those remaining so far as reasonably practicable. To achieve this, most effort should be focused on those hazards with the highest severity, where that is a combination of probability and consequences of occurrence. BIM places these, the opportunity to build the project first in the model should consider all options and opportunities to address such issues before construction commences.

Q: How does this work in small domestic projects, e.g. a wall being knocked through?

A: CDM applies to all construction work undertaken in the UK, and its equivalents under the root European Directive apply elsewhere in Europe. CDM 2007 already applied to work undertaken for domestic clients, though the clients themselves were given exemption. Designers and Contractors were not. Under CDM 2015 the domestic client exemption has been removed and the applicability to designers and contractors has been emphasised more. The CITB has launched an app to help SME builders meet the requirements - see **www.citb.co.uk/cdmregs**. BIM would not be deemed best value for such a small scheme.

Q: BIM - does CDM2015 apply to structural inspections? The CDM2007 ACOP used to exclude from the definition of construction "examining an structure for faults" the definition of what is not construction didn't make it into the CDM2015 Guidance?

A: The CDM 2015 Regulation 2 defines what is 'construction work', and runs to five paragraphs, so I won't repeat it here. In summary, construction temporarily or permanently changes the shape of the ground, or a building on it, by making holes, moving the ground, or erecting structures. For CDM to not apply you would need to be doing something different. If you are looking at a structure, or are measuring it, that would not be construction, but if you are fixing demec studs around cracks, or taking core samples for testing, that would be.

If a lead designer is Principal Designer, how can they practically instruct and ensure that all designers (designer, contractor, subcontractor, client, anyone who makes a design decision) avoid and reduce risk?

A: This is like all contracts where co-operation is required. Initially it should be obtained through discussion, direction, review, persuasion, with appropriate contract correspondence to instruct and record, but if that fails to reach the required position the contract and health and safety law allow escalation to resolve disputes. CDM 2015 is empowered under criminal law and no parties to a contract should allow contractual disagreements to promote illegal acts that could compromise the health and safety of themselves or others affected by their actions or inaction. NEC3 contracts have a well-established process for dispute resolution in any case, which is intended to prevent different contractual interpretations miring a whole contract. This should also form part of the BIM Execution Plan (BEP), we can provide examples if this will assist and the design responsibility should be clearly detailed within the BEP – refer also to COBIe.

Could there not be a potential conflict of interest if the Principal Designer is part of the company producing the design?

A: The main duty of the Principal Designer during the pre-construction phase is to appraise the sufficiency of the client's pre-construction information, and to co-ordinate the exchange of information between the various designers. In many instances that role is best undertaken by the lead designer organisation as they are already co-ordinating the technical cohesion of the various design packages being produced. Conversely, if there is only one designer, they are also probably best placed to co-ordinate their own design efforts.

Earlier on the different stages of BIM were discussed - from 3D through to 7D. Can hazards and risks identified in the H&S risk assessment be incorporated into any of these stages?

A: Yes, the model can be reviewed to consider any end user/operational and construction activity, the fact the model is 3D should assist with prompting such reviews. Refer also to COBIe.

Can the client hand over his responsibility for appointing a Principal Designer to a more skilled person or organisation? The 'client' may have lots of ideas and money but no knowledge of the process. If so, how is responsibility properly handed over?

A: It is accepted in the CDM 2015 Regulations that clients may need competent health and safety advice, and that is also a requirement of the Management of

Health and Safety at Work Regulations. Whilst the CDM Regulations allow clients to have agents who undertake duties on their behalf, that does not remove the overarching requirement that the client "carries them out". Provided the client could demonstrate that reasonable steps had been taken to consult with appropriate experts and verify the required actions were in fact happening, that might be expected to provide some defence in Court if events turned out badly. The BIM Execution Plan (BEP) clearly details the design responsibility within each o the RIBA stages, this supports a design responsibility matrix such as already produced at RIBA Stage 4. Template BEPs can be provided if requested.

From the contractor's point of view, could BIM become a cumbersome process to go through when an unforeseen change is required mid-construction? Construction may have to be halted too frequently, until every involved party updates the model (I'm a designer).

A: A very good point and should be considered as a compensation event and therefore the cost implication weighed against the benefit.

Who should be in charge of using BIM to advise the design team - the architect , civil engineers, contractor or other?

A: The design team should surely make the collective decision and the approval process governed by the contract process agrees during procurement – refer also to COBIe.

Is there training programme organised by ICE on BIM level2?

A: Yes - ICE Training delivers two training programmes specific to BIM Level 2: ICE BIM for Infrastructure and BIM Implementation – Putting People First. When you attend and complete both training programmes, you achieve the ICE Certificate for BIM. Find out more by visiting icetraining.org.uk/courses/bim.

How do you manage change control in a BIM environment?

A: This is detailed within a BIM Execution Plan (BEP) and recorded as to how this will be adopted and implemented, for NEC3 projects it would be presented as part of the change to Works Information and a compensation event – refer also to COBIe.

In a typical project, both engineers and architects are involved, both of which could be described as designers. This being the case, who becomes the Principal Designer?

A: This is a decision to be taken by the client during the early stages. It does not have to remain with one organisation as the team evolves, but is best placed with the organisation best able to manage the exchange of design information at that stage. There should be formal hand-over procedures when the role holder is changed to ensure there is clarity of who takes responsibility for what.

Can you briefly describe/summarise the BIM process?

A: Please refer to Government Task Force presentations please on BIM or the slides presented on the day.

Is BIM software compatible with MS Project (for 4D modelling)?

A: Not as far as we are aware, they will need a compatible programme to interface such as ASTA.

Can you envisage how BIM and contract management software would allow greater co-ordination and knowledge sharing? Do you think this would work?

A good question. BIM can be used as portal for much contract documentation, removing the need for duplicated systems in many cases but this should be clearly laid out at the earliest opportunity and access and document control measures documented.

Can you clarify the relationship between European Temporary works directive and the CDM regs?

A: The Temporary & Mobile Construction Sites 92/57/EEC European Directive lays down minimum construction health and safety standards required within the European member states, but that directive has to be transposed into specific UK Legislation to become effective in UK law - see https://www.gov.uk/government/publications/implementing-eu-directives-into-uk-law.

The CDM 2015 Regulations (and previous CDM 2007) are a convenient means of achieving this, as giving them the status of Regulations empowered under the Health and Safety at Work etc. Act allows speedier enactment with limited debate in the House.

Is there a list of suitable qualifications/experience that makes a "competent" Principal Designer?

Suitability is dependent on the nature of the project, but guidance is provided in the HSE L Series ACoP and the CITB Industry Guidance, as well as more specific advice form the Consultants Health and Safety Forum.

Most of BIM presentations are on examples of building projects. How does BIM apply to water projects including pipeline schemes and are there any examples we can refer to?

A: We are not sure that BIM is advanced here as it faces the same issues as highways/rail in that it's a long geographical structure being built whereas most BIM models currently are based on single location structures.

Versioning and co-ordination of drawings is difficult, even with 2D paper drawings. How will this work with 3D BIM when the model is continuously updated?

A: COBie provides the instructions for how the document control process between all companies and disciplines works. This is further supported by the BIM Execution Plan (BEP) compiled for each scheme

There has been a lot of resistance from design organisations when being asked to become Principal Designer. Do you have a comment on this?

A: We are not aware of resistance, though that would raise the question in our mind whether they are a designer we would want working on our project if they feel unable to work collaboratively with other designers and the Principal Contractor.

Occasionally multiple designers are appointed by the client. Designers do not necessarily have contractual relationships between each other. Under CDM & NEC, it is accepted that all parties must collaborate - can this work without contractual relationships?

A: CDM 2015 Regulation 4 requires: 'A person with a duty or function under these Regulations must cooperate with any other person working on or in relation to a project, at the same or an adjoining construction site, to the extent necessary to enable any person with a duty or function to fulfil that duty or function'. Collaboration is a facet of co-operation, so it should not be necessary to have a contractual requirement that duplicates a specific requirement under Criminal Law.

Note the BIM Execution Plan (BEP) should record this – we can provide template BEPs to help.

The CDM Co-ordinator role has been removed in the new legislation. As 'more knowledgeable' clients become involved do you find they hire specialists to fill this role once titled as the CDM Co-ordinator? Who is then responsible, the client?

A: Clients and design organisations are making use of staff who gained highly relevant skills acting as CDM Co-ordinators as defined in the previous version of the regulations. Under the CDM 2015 Regulations the duty holders are defined and whilst they can employ agents to carry out specific tasks on their behalf that does not remove liability from the duty holder. If the former CDM-C is now an employee, they are acting as a part of the client/design organisation as applicable, and would normally be expected to exercise due skill, care and diligence in their work.

Should file formats, software and data exchange policy be written into the NEC3 contract?

A: Yes but using the BIM execution Plan as the key reference document, perhaps detailed under a Z clause or forming part of the works Information requirements.

Who should be leading the production of the BIM model in a design and build contract? The designer, who produces and owns the original coordinated 3D model, or the supplying contractor, who holds all of the as built and asset information?

A: That is best considered during the pre-construction phase so that appropriate requirements may be included in the contract. We suspect the designer but not sure that would apply in all instances.

Who is the Principal Designer on a domestic extension or even a wall being knocked through? Will the client and builder know anything about CDM?

A: The requirements for Principal Designer, Principal Contractor appointment and the client's duties are specifically stated in CDM 2015 Regulation 7, with specific guidance in the HSE's L153 ACoP. It is anticipated that domestic clients shall have a very limited knowledge of construction or health and safety legislation, so the first actions on appointment of Principal Designer or Principal Contractor is critical to informing the client. Appendix 6 to the HSE's ACoP includes a very clear flow chart describing this.

Do the CDM changes involve changes with temporary works such as legal requirements rather than of best practice? This is especially since this is one area of construction with large risks.

A: CDM 2015 does not differentiate between design for temporary or permanent works, other than to emphasise that temporary works design is design as defined in the Regulations. The change introduced with CDM 2015 is the requirement that the Principal Designer ensures sufficient appropriate information has been provided to the temporary works designer, in a useable form, so as to allow the temporary works designer to develop appropriate solutions that eliminate hazards and reduce risk (so far as reasonably practicable). There may still be requirements that the interaction with the permanent works is checked, but that is generally out with the requirements of CDM unless scaffold striking sequences for instance impact the temporary stability of a structure.

Are there any construction projects where CDM regulations do not apply?

A: Yes, those constructed outside the UK territories as defined in the CDM 2015 Regulations, or pre-fabrication works undertaken in a factory. Mining and tunnelling are also covered by separate legislation. CDM 2015 Regulation 3 refers.

Why have the changes been applied for domestic houses?

A: The European Directive does apply to domestic clients and houses, but that omission from the CDM 2007 Regulations prompted the revision and issue of CDM 2015. It was expected that the British Government would have been prosecuted in the European Courts for non-compliance if that action had not been taken. A pragmatic approach has been taken in the CDM 2015 Regulations where the domestic client is expected to have their duties undertaken for them by the construction professionals they appoint.

Do you agree that the sponsor (client etc) has to mandate BIM - 7D modelling and align this with all professional services contracts and construction contracts? This is the norm in the process and oil industry.

A: We have yet to see a scheme in 7D so difficult to comment on this.

Would you consider that a BIM model in essence can be a Health and Safety File?

A: Yes, it can be used to support the Health and Safety File requirements but again this should be detailed for control within the BEP.

DIY is not considered construction work - unless the client then pays someone to do the work. Is this correct?

A: From CDM 2015, "contractor" means any person (including a non-domestic client) who, in the course or furtherance of a business, carries out, manages or controls construction work. Therefore, if you are being paid to do the work it's a business and CDM applies, whereas if you do work yourself then it is not.

Who appoints the Principal Designer?

A: The client will do this.

Has anyone produced CDM documents via data drops?

A: By data drops we assume you mean data exchange through drop boxes such as temporary Ftp web sites. Those can be an effective way of exchanging large data files, but to manage data effectively, there also needs to be an easy means of recording who has what so that changed data can be brought to the attention of those who need it. Depending on the size and complexity of the project, a simple register on an A4 sheet of paper, one of the bespoke secure online collaboration solutions for the building and infrastructure sectors, or inclusion of the data in a BIM model with version control and archiving of superseded data could be appropriate.

I'm not sure about the 3D, 4D ...7D you've been talking about. Where can I go to find more about this?

A: The UK Government Task Force on BIM has some excellent presentations simply Google this.