

HK>A

**DIGITAL-
BIM FOR
DISPUTES**

Introduction

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In all sectors of the built environment, digitisation and technology adoption have rapidly accelerated in recent years.

Building Information Modelling (BIM) is a significant facet of the digital revolution within the architecture, engineering, and construction industries. In addition to managing risk and preventing disputes in planned and live projects, BIM is disrupting the dispute resolution sector.

BIM is much more than just a 3D model. It can be defined as the “use of a shared digital representation of a built asset to facilitate design, construction and operation processes to form a reliable basis for decisions” [ISO 19650-1 2018].

As BIM adoption increases globally, building information models are being issued in evidence more frequently. HKA has identified an increase in BIM-related issues being discussed in statements of claim and defence when parties are in dispute.

HKA has developed in-house BIM expert witness and expert support services, giving our clients access to cutting-edge technology and support from technical BIM specialists. Our BIM team have assisted our clients in resolving their claims and disputes in multiple jurisdictions and sectors across the world, to support expert evidence in arbitrations, litigations, and adjudications.

Building Information Modelling creates essential contemporaneous evidence that provides greater opportunity for forensic investigation of cause and effect. BIM brings evidence to life.

Building Information Modelling creates essential contemporaneous evidence that provides greater opportunity for forensic investigation of cause and effect by our technical experts.



Gerry Brannigan

Partner,
Forensic Technical Services Growth
Development Lead, EMEA



Sarah Keyte

BIM Discipline Lead

HKA in numbers

people



1,000+
people

including

500+
consultants & advisors

500+
quantum, engineering,
architecture and technical,
delay, disruption, damages and
government contracts experts

reach



45+
offices

across

17
countries

experience in

100+
countries on all

clients



6,500+
clients worldwide

including government agencies, local
authorities, investors, developers, owners,
operators, architects, engineers, project
& construction managers, contractors,
specialist suppliers, manufacturers, banks,
lawyers and insurers

Instructed by

100%
of the world's

top 20

law firms (by revenue)

impact



100,000+
project disputes
resolved

valued in excess of

\$250bn

2,000+

engagements per year

40+ years' experience

30+ of the world's most spoken languages

250+ first-of-a-kind global megaprojects

BIM services

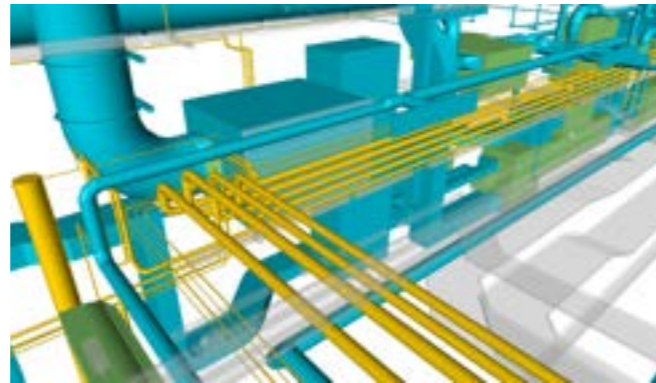
As expert witnesses, our team can utilize models, contracts, and BIM-related data provided as evidence in a claim or dispute. Where projects do not have models, HKA can create 2D Plans, 3D models, and 4D visualisations using project data. This can help clients, lawyers, and experts explain claims visually.

These capabilities allow HKA to support and present complex technical evidence and issues in a comprehensive, cohesive, and understandable way to give the decision-makers the best possible opportunity to quickly understand the expert evidence.

HKA has extensive experience involving all types of building projects. We use BIM to support clients in a variety of ways.

Our buildings experience covers commercial offices, education, government-owned buildings and facilities, healthcare facilities, hotels and resorts, public sector buildings and facilities, real estate, residential housing, retail complexes, and sports and leisure facilities.

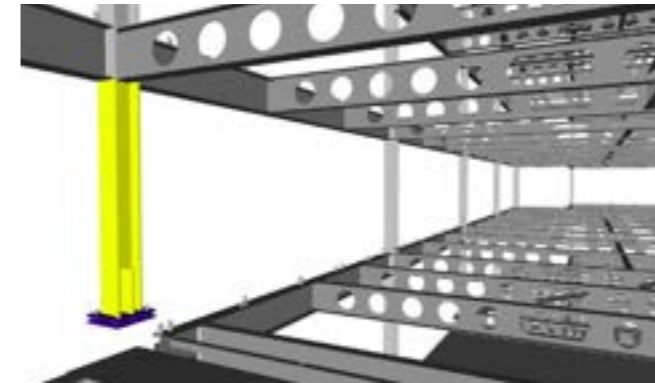
The following is a representative selection of recent projects where HKA has provided a range of expert or consulting services.



Data Analysis

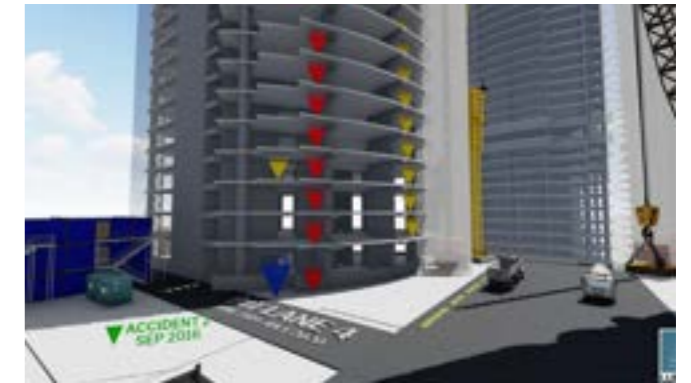
Analysis to consider design data contained in models, contracts/BIM Execution Plans, and common data environments (CDEs).

See case study 4.



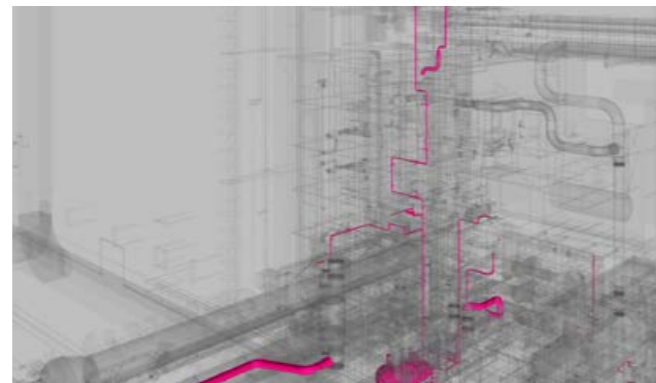
Data Validation

Analysis to identify whether models, and information management are compliant with contract obligations, for example LOD and LOI requirements.



Issue Visualisation

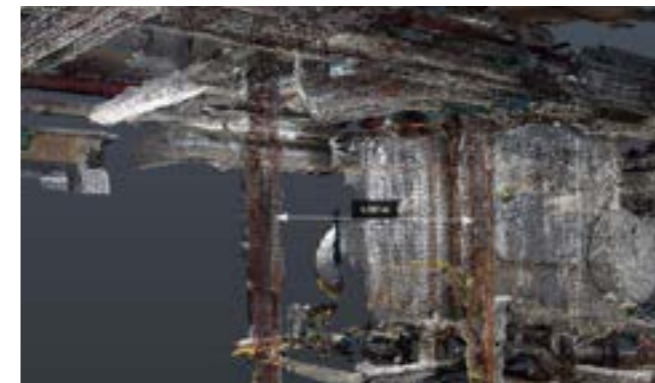
We create visual assets for reports and presentations which help explain complex technical issues relating to design, delay and quantum.



Level of Effort Analysis

Analysis which considers the level of effort to implement a change order/variation.

See case study 2.



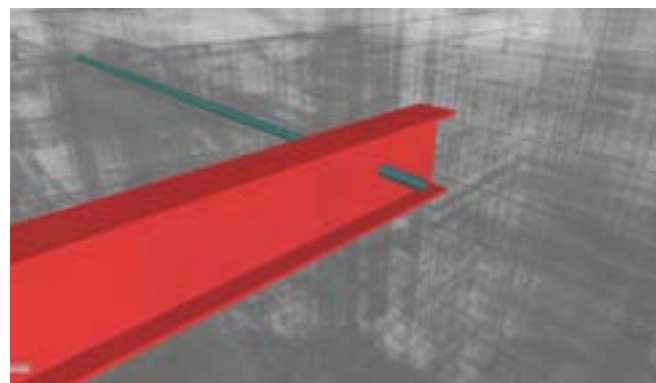
Point Cloud Model Analysis

Analysis using Point Clouds of Built Assets. Our in-house team have also created point cloud models.

See case study 5.

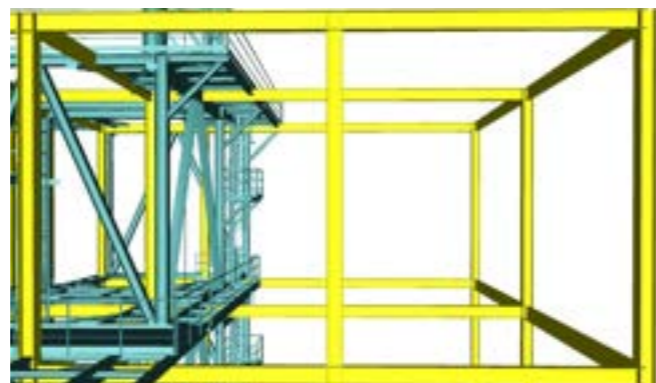


Drawing Overlays



Clash Detection

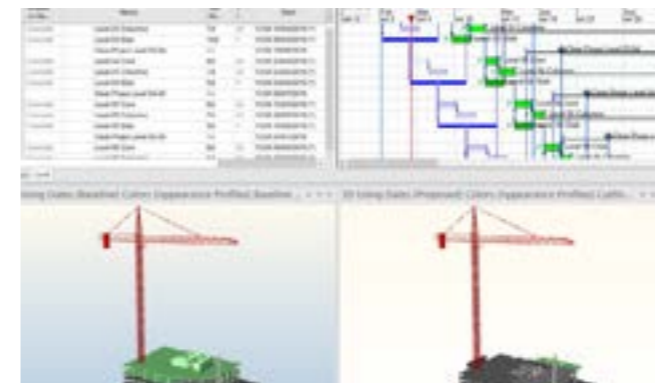
Analysis to identify coordination issues within models.



Design Change Analysis

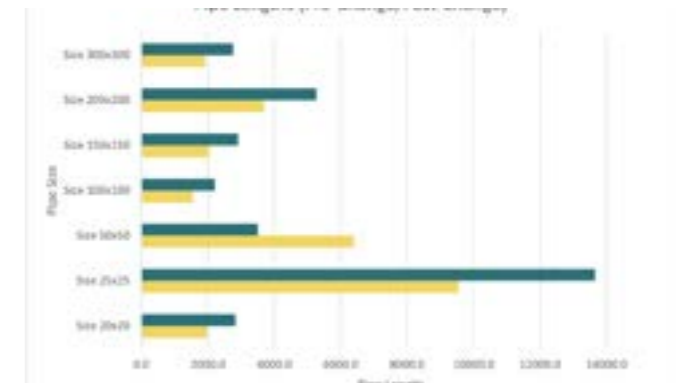
Analysis to consider design changes between model revisions.

See case study 1.



4D (BIM + Schedule Data)

Using models and schedules, we can create build sequences, time slices, and visualisations. This service brings delay claims to life.



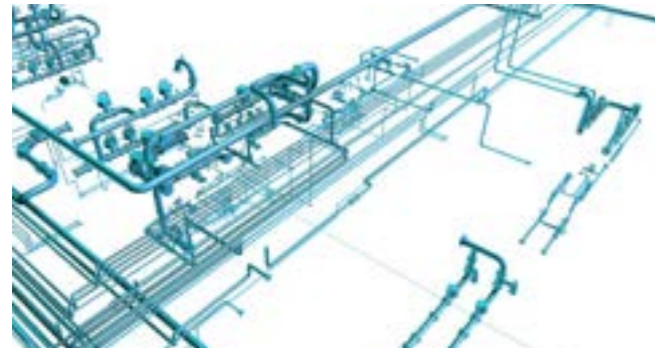
5D (BIM + Quantities/Cost)

Models can help generate Bills of Quantities faster and more accurately than using traditional take-offs. This makes significant cost-savings when quantifying design changes and scope increases.

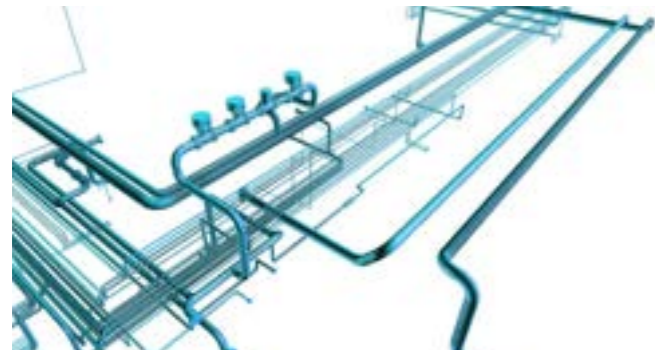
ENQUIRIES@HKA.COM

Design change analysis

Case study 1



Pre-change



Post-change

Industry: Oil & gas

Digital services: BIM data analysis, design change analysis

HKA analysed and compared a variety of models issued in evidence for a high-value energy dispute.

Using the models, we considered how the design contained within the models changed over time throughout multiple design stages. This was then compared to contract obligations of parties involved in the dispute.

To conduct this analysis, our in-house BIM team used specialist software to collaborate with our engineering experts and identified the relevant data to the claim. The changes to scope, specification, and layout were then considered.

Extracts from the analysis were included in the expert report, as well as presentations to the tribunal. The images showed clearly how the design developed and changed over time.

Results and benefit

Without the model, software, or expertise, change analysis would have been a laborious process involving thousands of drawings. Instead, we were able to complete the change analysis quickly. This generated cost savings for the client, allowed HKA experts to spend more time on our report, and improved clarity of the expert evidence.

“As an Expert Witness, when I am asked to consider design change in a dispute where models are available, the information from models can provide incredible insights that are not possible to see through drawings alone.”

Zaffer Khan, HKA Technical Director, Expert Witness

Level Of Effort (LOE) analysis using BIM

Case study 2

Industry: Architecture & MEP design

Digital services: BIM data analysis, design change analysis, level of effort analysis, 5D

HKA experts were appointed in a multi-disciplinary dispute concerning claims for additional cost, delay, and design involving BIM-related claims.

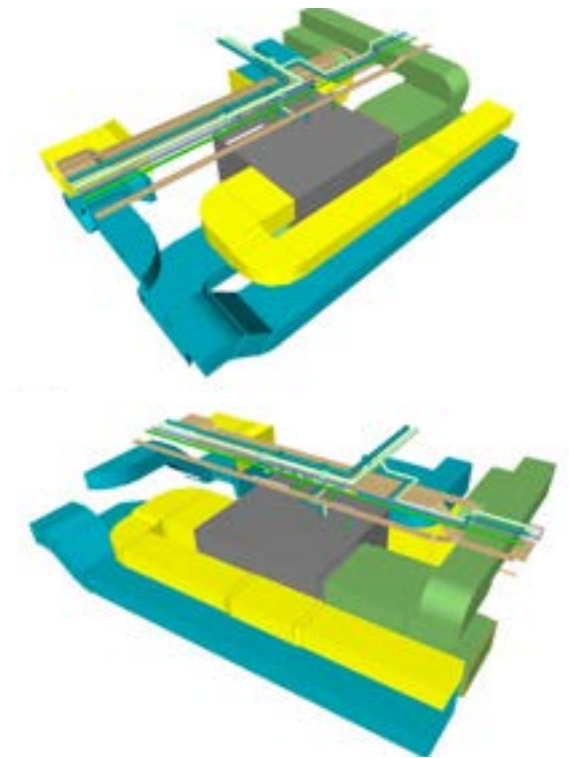
HKA used models issued in evidence to consider the claims regarding extensions of time (EOT), and the level of effort (LOE) required to implement design changes.

Working with our multidisciplinary expert team, we were able to give a detailed level of effort assessments to consider whether claims were reasonable.

As part of the level of effort analysis, our experts were able to generate take offs using the models, (an example of 5D analysis). This allowed experts to quantify the amount of change for specific claims and helped form reasoned and reliable expert opinions.

Results and benefit

Extracts from the analysis were included in the expert report. 5D analysis helped quantify the cost of changes quickly and visually. The BIM analysis highlighted duplication of effort between claims, which was used in expert evidence.



“Building Information Modelling creates essential contemporaneous evidence that provides greater opportunity for forensic investigation of cause and effect by our technical experts.”

Paul Mansell, HKA Partner, Expert Witness

Use of intelligent 3D models improves project understanding



Improved understanding of design & delay issues



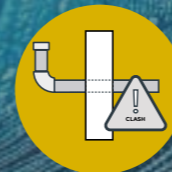
Clearer expert discussions, reports, & presentations



Improved expert analysis



Identification of coordination issues



4D visualisation can explain delay



5D analysis can support quantum claims

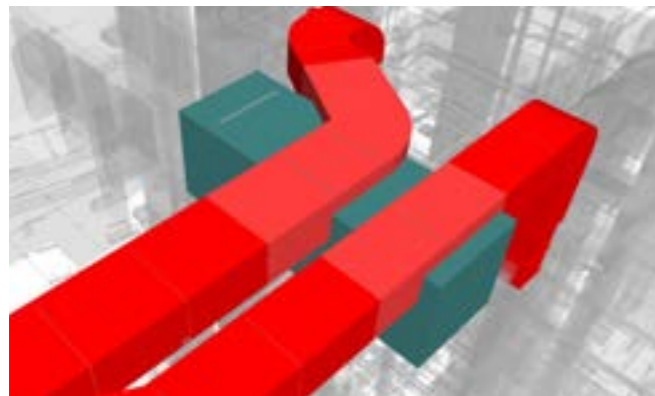
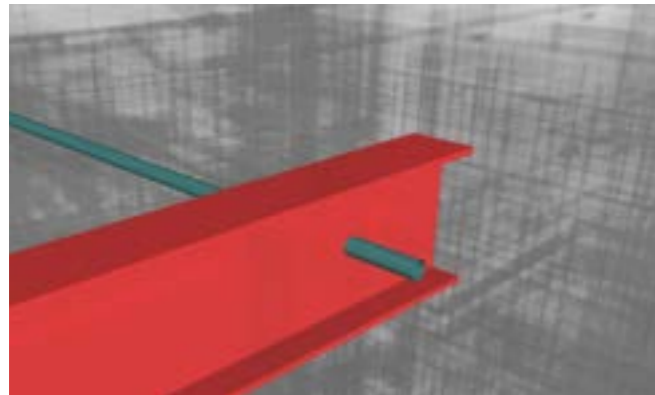


BIM-related issues may be relevant to breaches of contract



Clash detection & coordination

Case study 3



Industry: Structure & MEP design

Digital services: Data analysis, clash detection

HKA analysed and compared a variety of models issued in evidence for a breach of contract claim.

The ability to detect clashes between objects in models is one of the most useful functions of using 3D models in a BIM environment.

HKA experts performed clash detect analysis using historic models to highlight uncoordinated issues in the design. This was used to generate a register of clashes which later caused delays on site.

Results and benefit

Clash detection checks highlighted a variety of hard clashes, whereby two components shared the same place, as shown to the left (1a).

The clash detection analysis also highlighted soft clashes, where objects such as generators were not given the spatial or geometric tolerance they require for maintenance. This was used to evidence breaches to Construction (Design and Management) Regulations 2015 (CDM 2015).

By creating a register of clashes which caused delay and disruption, HKA experts were able to provide opinion based on reliable, contemporaneous evidence.

The ability to demonstrate the point in time where coordination errors were foreseeable in models was critical evidence in the claim.

HKA experts were also able to compare the coordination issues against obligations in contracts and procedural documents such as BIM execution plans.

Without the model, software, or expertise, clash detection analysis would not have been possible.

“ In a dispute concerning coordination and design defects, we used historic models which were available in evidence to conduct clash detection checks. This helped identify the exact point in time where clashes were identifiable and foreseeable in the design data, and which designers could have identified the issues.

This was critical evidence in a breach of contract claim.

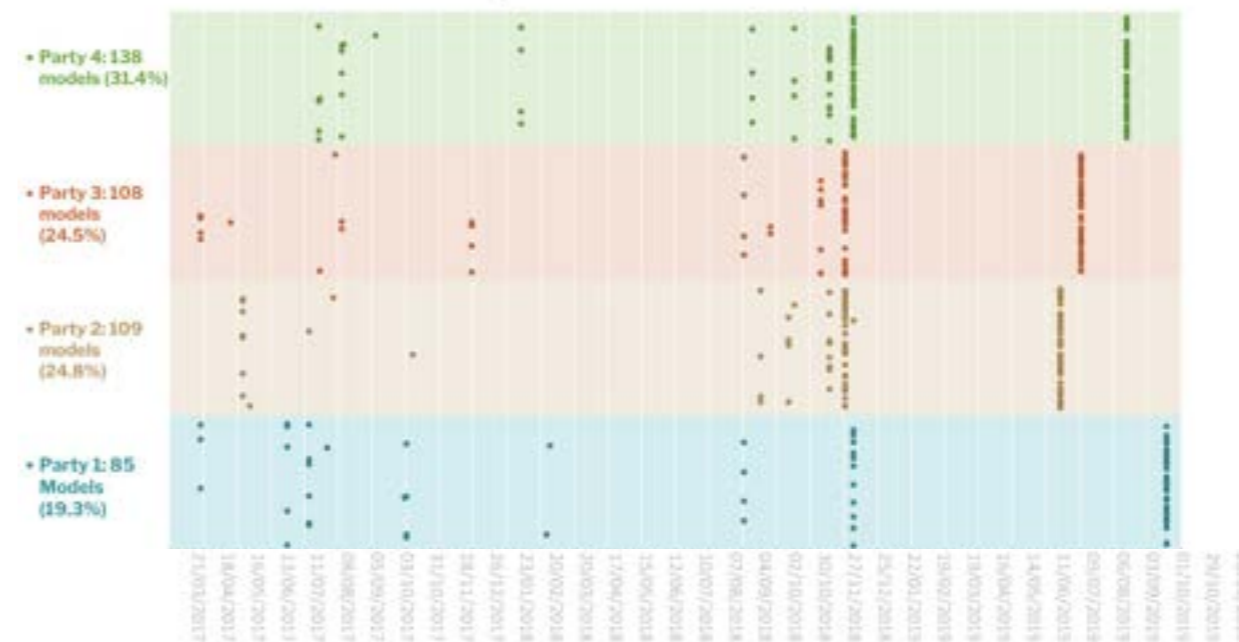
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Sarah Keyte, HKA Associate Director, Expert Witness

Data analysis including BIM contract analysis

Case study 4

Model Uploads to the CDE Over Time



Digital services: BIM contract analysis, data analysis

In addition to models, HKA also analyses data from Common Data Environments. These give insight into information management processes in a project.

Construction projects produce a massive amount of data, which is generated by and distributed across a large number of stakeholders. As architecture, engineering, and construction (AEC) teams seek ways to reduce rework and waste, they often find that using a common data environment is key.

A common data environment is the agreed source of information for any given project or asset, for collecting, managing, and disseminating information through a managed process. When used appropriately, they aid information management.

The graph above visualises information management by four parties throughout a project. Data visualisations can be produced using records generated from common data environments.

Results and benefit

The records allowed our team to forensically analyse how information was shared and managed on a project. This was critical to the claim.

Data visualisations can help demonstrate how information was managed in a project, and whether it was compliant with terms and conditions stated in contracts.

“ ...Common Data Environments (CDEs) can provide valuable insights into information management practices in projects. We can see how information was shared, approved, and managed.

”

Hamish Clark, HKA Architect

Modelling from Point Cloud Scan Data

Case study 5

Industry: Fire engineering / architecture

Digital services: BIM data analysis, design change analysis

HKA Experts were appointed in a high-value dispute relating to fire engineering in a heritage site which suffered extensive fire damage. Experts were asked to consider the liability for the fire spread.

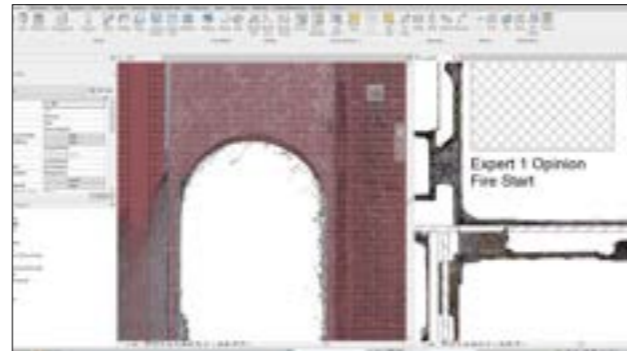
Site drawings were not to scale and were not accurate at the time of the fire. To facilitate clear explanation of how the fire spread, and how the fire was tackled, experts asked for a 3D model to be created which showed the layout of the building prior to the fire.

Using a point cloud scan taken by drones after the fire which showed the layout of surviving walls, our in-house BIM team built a 3D model to show all parts of the building which had been destroyed in the fire. Where available, the model was linked to photo evidence which pre-dated the fire.

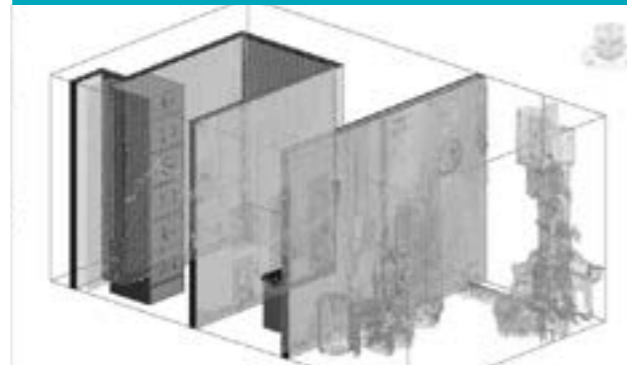
Results and benefit

The process of building the model highlighted particular areas of the building which had few or no accurate records. This highlighted areas where experts needed to caveat opinion to consider their level of certainty.

The model ensured all dispute resolution stakeholders understood the factual evidence and were not confused using outdated or inaccurate data. The integration of contemporaneous evidence such as site progress photos into the model increased confidence in the accuracy of evidence.



Work in progress model development



Model with point cloud overlaid



Using 3D models to visualise complex issues such as fire spread helps ensure our evidence is understood.



Gerry Brannigan, HKA Partner, Forensic Technical Services Growth Development Lead

4D model creation for delay analysis

Case study 6

Industry: Construction, delay

Digital services: Delay analysis, 4D

In a dispute concerning significant delays to a large, complex construction project, HKA created a 4D visualisation which highlighted the difference of opinions between opposing experts.

To do this, our in-house team created a 3D model based on client-issued drawings (the project did not use BIM). Geometry within the 3D model was then assigned to both experts programmes to visualise their expert opinion. A separate layer was created to show each experts opinion on critical activities at each point in time.

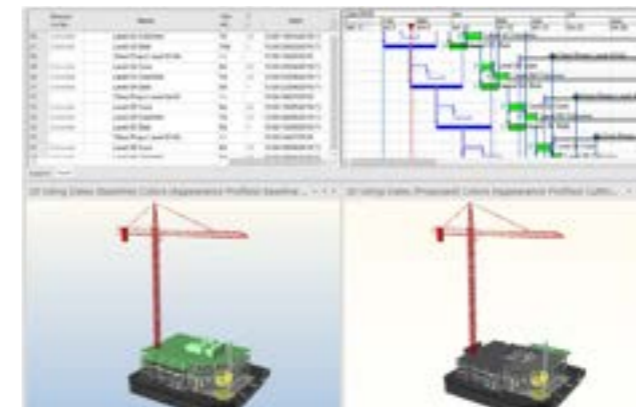
Extracts from the models were relied on by experts to facilitate the conversation regarding the differences of opinion. The HKA expert was able to express their opinion clearly using accurate visualisations linked to the programmes.

Results and benefit

The model ensured parties to the dispute were able to describe the delays and the factual evidence clearly, despite language barriers.

Differences in opinion of as-built progress and the critical path were shown visually.

The model made the evidence concise and coherent, leading to better client outcomes.



4D Visualisation comparing opposing expert opinion



4D Visualisation showing As planned v As Built

“ In a complex dispute involving delay, with significant differences in opinion between the experts, evidence in the 3D model provided the persuasive means to communicate my expert opinion. ”

Michelle Metz, HKA Partner, Delay Expert Witness

Why HKA?

- › HKA has a team of in-house BIM-specialists with experience of BIM-related claims and disputes globally.
- › Our in-house team can collaborate with Experts from a variety of disciplines with significant experience in using BIM. Expert disciplines include Architecture, MEP, Structural and Civil Engineering, Oil & Gas, Process & Chemical Engineering, Utilities, and more.
- › We have significant experience of using BIM in a variety of claims and disputes.
- › In addition to models, we have experience of using Common Data Environments and data analytics.
- › We retain a variety of BIM-related software packages which can assist in claims and disputes.

Common causes of claims & disputes involving BIM



Design overruns/late provision of information



Issues with BIM in contracts



Design change/variations



Standard of care/negligence claims



Design change/variations



Lack of co-ordination in design information



Level of effort claims



Lack of agreement of deliverables

BIM Contact



Sarah Keyte, MSc, MCIOB, FCI Arb

BIM discipline lead

Sarah Keyte is a chartered construction manager with over 10 years building information modelling (BIM) experience across the Architecture, Engineering, and Construction (AEC) industry. Sarah has worked on projects in the UK, Europe, the Middle East, and North America.

After graduating from an architecture degree, Sarah worked as a CAD & BIM technician, drafting 2D drawings and 3D models using a variety of software packages (including AutoCad and Revit), among other software packages.

Sarah trained as a construction manager, where she used BIM to prevent and resolve on-site delays in residential, commercial, and mixed-use projects in the UK and central Europe.

Prior to joining HKA, Sarah was a construction planner. Her role was to create and manage construction schedules, using BIM and 4D to ensure projects were delivered on time, and on budget.

Sarah has used Revit, Navisworks and other specialist 3D modelling software to analyse BIM assets on construction and engineering claims as part of integrated HKA QED+ teams.

Sarah has authored reports for a variety of disputes and has been appointed as an expert.

Sarah is proficient in a variety of BIM-related software packages.

She has an MSc in Construction Law and Dispute Resolution from King's College London. She is an Affiliate Member of the U.K. BIM Alliance, BIM4Legal. She is a Chartered Construction Manager through the Chartered Institute of Builders. Sarah is a Fellow of the Chartered Institute of Arbitrators.

“ We view and analyse design and developments within models. We consider information management practices using CDEs. We create models to visualise complex issues. We use BIM to Decode Complexity. ”

Sarah Keyte, BIM Discipline Lead & Expert Witness

Contact
sarahkeyte@hka.com, +44 7990 587 322

Our Sixth Annual CRUX Insight Report, Forewarned is Forearmed, quantifies the damage done to engineering and construction projects worldwide, and the recurrent causes, which are often predictable and avoidable.

Find out more about our CRUX research

As infrastructure and capital projects around the world are hit hard by higher financing costs and inflation, promoters and contractors can relieve the pressure by curbing the significant losses of money and time routinely incurred across market sectors and the world.

The massive scale of these disputed costs and overruns, and their often-controllable causes, are revealed in the Sixth Annual CRUX Insight Report, Forewarned is Forearmed, and its analysis of 1,800 projects in 106 countries.

www.hka.com/crux

Please feel free to contact a member of the CRUX team should you be interested in collaborating with us.



FOREWARNED IS FOREARMED

Anticipating challenges, mitigating risk



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