

PAS 1192:6 GUIDANCE NOTE

NHSScotland

[Abstract](#)

Brief status of PAS 1192:6 Specification for collaborative sharing and use of structures Health and Safety information using BIM and what should go into the Employers Information Requirements.

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1 Introduction

Despite the best efforts of all involved, too many people are killed and injured in the construction industry each year. The uptake of BIM in has increased in recent years, partly as a result of Government policy, but also due to advances in technology and digital information. This presents new opportunities to look beyond efficiency gains and increased productivity but to spot and foresee risks and hazards earlier and more effectively mitigate them.

Aside from the moral obligations of striving for Health and Safety excellence, the UK construction is obliged to manage and protect the occupational health and safety of its workers and the public affected by its activities and apply the principles of prevention and mitigate inherent H&S risks of the design through the requirements of the UK Health and Safety at Work Act and CDM regulations

The traditional tools of risk management used by health and safety professionals, documenting safe systems of work through method statements based on risk assessments, are often variable in quality and generic in nature. There is a theory gap in the understanding of how to develop, use and apply these tools within information systems and digital processes.

In essence, BIM provides greater opportunities to identify “foreseeable risk” much earlier, and continuously, throughout a project’s lifecycle, and to communicate the risks more clearly for use by others. PAS 1192:6 aims to integrate Health and Safety information into BIM models, processes and applications. As part of the collaborative nature of BIM, all stakeholders can contribute to management and mitigation of H&S risks and improve outcomes. The opportunity also exists for the output of a health and safety file as part of the BIM information that can be transferred to the NHSScotland estate team in an electronic format.

1.1 What does the PAS cover?

The PAS sets out how H&S information can be identified, shared and used by the key players in the construction process throughout the project and asset life cycles. A key aim is that H&S information is considered from the outset. The PAS builds on current practices in the UK construction industry, where the most advanced digitally enabled projects are using modelling tools and information systems to improve the design and construction; whilst recognising there are very few examples yet where feedback shows that management of the built asset has equally benefitted.

The document sets out a frame work referred to as the ‘risk information cycle’ for applying H&S information through BIM processes and applications.

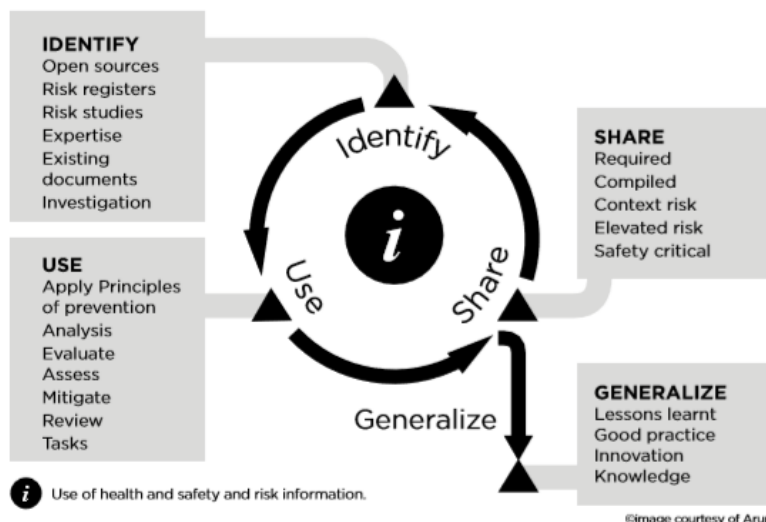


Figure 1-1 Risk information cycle: Source BSI

1.2 What are the benefits to using the PAS?

1. Consistent documentation, management and communication of H&S hazards and risks
2. Improved tools for the detection, evaluation and an of H&S hazards and risks
3. Reuse of beneficial H&S knowledge and experience through good information management and development of relevant data attributes.
4. Fewer costs and delays rising from data loss transcriptions

1.3 How does the PAS apply to me?

The standard applies to a number 'Participants'. A participant is a person or an entity (Such as an NHS Board) that is fulfilling an active role in the use and sharing of H&S information and the risk management process. Depending upon the procurement route, an NHS Board may cover a number of different participant roles.

Participant	Description
Client	An individual or organisation commissioning a built asset. It is important to know that the client may not necessarily be the end user.
Designer	Any person who prepares or modifies a design relating to the construction, commissioning and use of the proposed built asset.
Design Team	Designers working in an integrated and collaborative approach to assure the constructability of an inherently safer design and safe functional performance of the asset. This would also include design management, coordination roles and the CDM Principal designer.
Contractor	Any person who carries out, manages or controls construction work
Construction Team	Contractors working in an integrated and collaborative approach to assure the safe build and functional performance of the asset
Commissioner	Responsible for the test, testing and commissioning of the built solution to ensure the completed asset functions as the design solution intended
Commissioning Team	Contractors and selected manufacturers and/or suppliers working in an integrated and collaborative approach to ensure the safe testing and commissioning of the built asset
End-user	User of the built asset, including those who operate, maintain and clean

1.4 How does it apply to BIM?

The principles and requirements set out in the PAS can and should be applied to projects regardless of BIM may also be applied in conjunction with NHSScotland’s own management systems, policies and arrangements.

The use of a Common Data Environment (CDE) is pivotal to the standard. All participants, including the client are required to set up a system so that H&S information can be recorded. The system is required to be able to make available H&S information, models and documents to other participants, both during construction and when construction is complete. The CDE also provides a way of meeting some of the duties CDM 2015 places on duty holders. For example, the CDE enables the co-ordination for the purposes of planning, managing and monitoring H&S on a project

The Common Data Environment (CDE) becomes the place where H&S information should be inputted, mitigated, managed and communicated with others. The sharing of information from the outset leads to better design decisions, better decisions about temporary works and less uncertainty in the construction phase. Information is then centralised should any party need to re-use it for the project or future operation and maintenance requirements. The CDE H&S File can also be incorporated into the CDE.

Even if a CDE is not in place, it is good practice to use an existing document management system, but apply the CDE process of using SHARED, PUBLISHED and ARCHIVED folders and work flows.

1.5 How do I apply the PAS as a client?

As a client, the NHS Board should invoke the PAS via the Employers Information Requirements (EIR). This is done by way of a simple instruction. Below is an extract from the NHSScotland EIR Template.

4.7 Health and Safety/ Construction Design Management

The Employer expects the utilisation of BIM to support the project H&S/ CDM management process as required under the Construction (Design and Management) Regulations 2015.

With reference to PAS1192-6:2018 a 5 phase H&S risk management strategy will be established across the project lifecycle, with required tasks, responsibilities and information requirements clearly identified and recorded within the BEP for delivery within project information exchanges.

Utilising PAS1192-6:2018, Section 5 guidelines, the supply team shall adopt the 4-step Risk Information Cycle approach to ‘Identify, Use, Share and Generalise’ project risk information.

Project H&S information should be integrated in the models, BIM process and applications, thus enabling wider stakeholder engagement and collaboration in relation to optimum design and operational risk identification, mitigation and management.

The integration of H&S and BIM shall enable the output of the Health & Safety file (HSF) as part of the Asset Information Model (AIM) transferred to the Employer or Operator at project handover.

It is important to state within the EIR, what is expected of the supply chain. This involves explaining within the EIR, what the supply chain BEP should cover in this regard. This is then accepted and specified in the project BEP.

The BEP shall include the following to demonstrate the projects agreed approach:

- *Schedule of work stages and overview of key H&S deliverables and responsibilities against each stage*
- *Confirmation of how H&S information shall be captured, shared, and stored.*
- *Approach to coordinated H&S design and construction risk management including identification, communication, mitigation and recording of related information.*
- *Strategy for H&S commissioning and operational risk management including the requirements for disaster planning*

1.6 What should I do first? Set out a Strategy

The NHS Board should set out the H&S information and risk management strategy at the start of a project, along with the H&S information they need at each phase. When considering your information needs to help you collaborate and share information, it is important to identify these on a project to project bases. The idea is to not just generate information, for information sake, but rather make sure that the information is relevant. A new hospital complex will have different information needs to a Hospital Ward refurbishment.

The five phase approach to the project lifecycle, allows for the application of H&S information across different and varied strategies that are applied to projects. The Table below shows how the five phases of Need, Design, Construction, Commissioning and End-use relate and align to the RIBA Plan of Work 2013 and the SCIM Stage.

PAS Phase	RIBA Plan of Work 2013 Stage	SCIM Stage
Need (Initiation)	0 Strategic Definition	Strategic Assessment
	1 Preparation & Brief	Initial Agreement (IA)
Design	2 Concept Design	Outline Business Case (OBC)
	3 Developed Design	Full Business Case (FBC)
	4 Technical Design	
Construction	5 Construction	Construction & Commissioning
Commissioning	6 Handover and Close out	Project Monitoring & Evaluation (PMS)
End-Use	7 In Use	

H&S information is progressively developed at each of the five phases using the collaborative processes in the CDE as shown in figure 1-2.

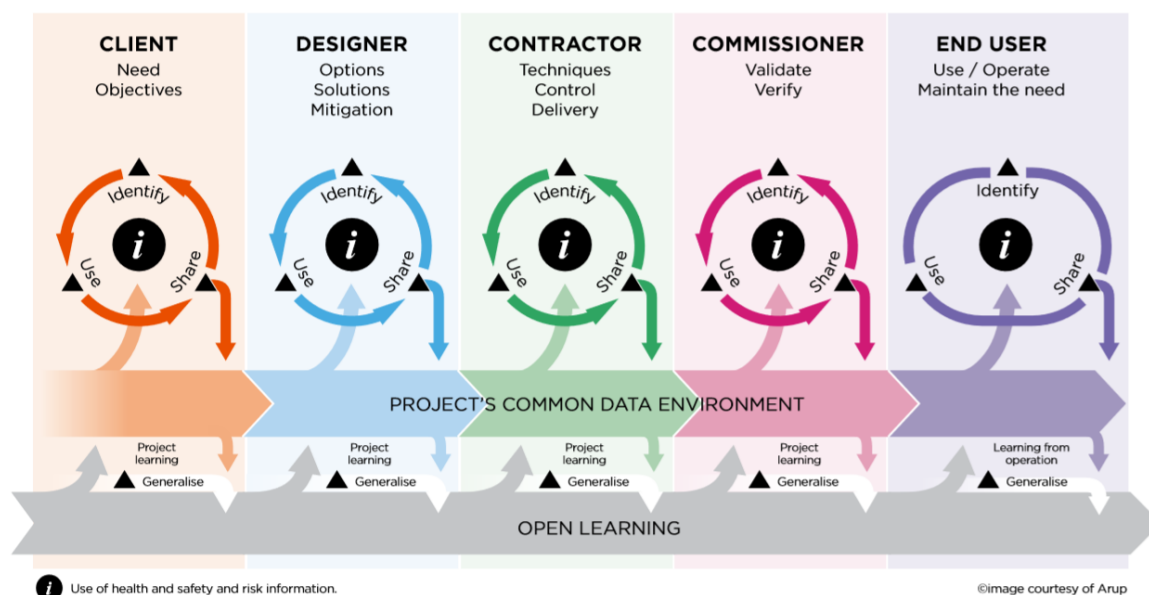


Figure 1-2 Progressive development of H&S Information. Source: BSI

When thinking about Hazards and risks, it is useful to reminder to understand the difference between the two terms. A **Hazard** is something that has the potential to cause harm including ill health, injury, loss of product and/or damage to plant and property, where as a **Risk is the likelihood of harm occurring and its severity. (Severity x likelihood)**. When thinking about Hazards a simple acronym 'PALLe' can be helpful. (Figure 1-3)



Figure 1-3 Thinking about Hazards. Source: Peter Nicholas

Process - to understand this think chemical plant – the product of the business. The integrity of the plant, equipment, machinery, pipework, vessels and systems needs to be assured – risk of failure is unacceptable. What are the hazards associated to processing and production – what are the risks? In a low risk office process hazards are harder to determine and may not even be applicable.

Activity - what are the foreseeable activities and tasks required – for construction – for end-user

operation – to fulfil business functions? What are the hazards and risks associated to the activities and tasks?

Location - what are the hazards and risks at the location – at the workplace as a whole or at the place of work for a task? Is the work at height next to a vent, is it on soft ground making plant potentially unstable, is there little room to place tools, spares and materials?

Legalisation - what are the hazards set out in law that must be considered? Ionisation, asbestos, substances, Part 4 CDM activities etc. Notwithstanding, a noise (as an example) may fall under process, activity and location – but from different perspectives.

Emergency no ‘e’ for low risk businesses or environments. A little ‘e’ where an unplanned event may have an impact. Big ‘E’ where the consequences of an incident are catastrophic and/or unacceptable. What are the emergency scenarios and within such what are the hazards and risk within the emergency occurrence? Bearing in mind an emergency event is a workplace for the responders and the hazards and risks they face should be considered and mitigated as well.

What goes into the EIR?

As a client, NHS Boards have a duty under CDM to make arrangements to manage a project in order to ensure H&S and to provide H&S information. An effective EIR should focus on the right level of H&S information, who is to provide it and at what point during the asset lifecycle, essentially specifying the information NHS Boards need, including the information prescribed by the CDM regulations.

It is important that with your EIR you provide existing documentation, risk registers and risk studies to communicate risks so that identified elevated risks and associated H&S information can be recorded. There should also be a focus on the operational phase and any future health and safety considerations.

You should clearly set out, document and agree the specific requirements you need within the EIR and consider the following:

- Where or how H&S information is to be used
- What H&S information is to be provided or communicated
- The risk management tasks relating to elevated risks of critical mitigation.

Example PLQs

Question	What do I have to do?	Key Clause
What early project decision will have H&S implications for the operational & end use of the asset?	Carry out an initial preliminary Hazard Analysis & Safety review (PHASR) to identify hazards and risks, including the asset in use. Record information for others to use and share within the CDE. Are there any high uncertainty, significant hazards identified that require additional support?	6.1 & 6.2
How will the use of a CDE be used to share H&S information through the project lifecycle and	Specify within the EIR appropriate and accessible IT tools that shall be used to share information. You	5

Question	What do I have to do?	Key Clause
make information available to stakeholders and affected parties beyond the project?	should specify who will have access to information and also outline the format and structure of the H&S file.	
What relevant H&S information (pre-construction Information) will be provided to the project team?	<p>You should draw upon the knowledge of the estate team and existing projects to understand any risks in similar projects. Areas to consider may include maintenance access restrictions, system defects, equipment risks, incident reports. It is important that you record and provide information on the major hazards and risks that you identify during this process.</p> <p>Due to aging nature of the NHSScotland estate, existing information may be limited, however you should determine and set out known significant H&S hazards and risks, and dangerous conditions that relate to existing assets, locations and proposed site locations including any pertinent H&S information about existing services and materials. This information shall then be collated and listed.</p> <p>To add retrieval the information should include information such as titles, versions, dates, reference numbers, type, format and a brief description.</p> <p>Early hazard identification</p> <p>Design risk management tasks</p> <p>Function performance</p> <p>Asset as a workplace</p> <p>Commissioning</p> <p>Client requirements for/from construction</p> <p>Client requirements for/from design</p> <p>Specification for sharing H&S information</p>	6.2.1-6.2.8
Have you specified reviews at key stages to enable collaborative working and feedback on risk management?	Specify the essential reviews required at key stages along with brief terms of reference developed for the reviews. These reviews can be led by the CDM PD or PC and should include key participants and early contractor engagement.	6.3
What are the design risk objectives for the project?	NHS Boards should clearly state the hazards and risks that are to be eliminated by the design, along with setting out what H&S risks they need information on. Within the EIR, you should request that designers	6.3

Question	What do I have to do?	Key Clause
	explain within the BEP, how BIM methods will be used to aid H&S in design.	
Has a design plan been requested, inclusive of design risk management & design risk objectives?	You should specify that a design plan is to be produced with design risk management included. The plan is to identify all design participants and include design risk objectives.	6.3.4
How are discipline models combined and coordinated so that H&S objectives can be met and recorded?	<p>You should specify that the supply chain is to explain within the BEP how models are to be segregated and federated to support H&S. It is important that risk information is clearly identified and that H&S information is made available through the CDE.</p> <p>As part of developing project information, the H&S risks should be associated with the relevant elements within the 3D model. This information needs to be exchanged and shared in an open standard such as COBie.</p> <p>The necessary attributes should be included in the objects and defined in the EIR as the LOI requirements for each project stage. Clause 10 provides further information regarding the representation of H&S risks in BIM.</p>	7
What arrangements have been put in place at this stage to ensure that testing & commissioning is carried out safely and effectively?	Identify what tests and commissioning tasks are required, who is responsible together with how this are to be recorded and the results integrated into the asset models and H&S file. It is important that this information is available within the CDE. You should also be clear on what information is required for the asset to be signed off.	6.5
What arrangements are in place to ensure CDM H&S file information is progressively developed for the end user and completed version made available at handover?	You should specify the content of the H&S file and who contractually is responsible for its compiling and handing over. You should consider what information, evidence and inspections are needed before the responsibility for the H&S file transfers to those responsible for the asset in use. (This includes a phased handover)	
How will H&S lessons be learned from the project and shared?	You should consider an Action Plan & process to be in place and implemented to capture new lessons learnt, best practices, innovation and proven new techniques adopted.	5.5

1.7 Recording and representing H&S information

It is important that NHS Boards, share H&S information in a form that is consistent, in that it follows the same structure, can be re-used in that entries are editable and transformable, and non-proprietary, in that information can be viewed and edited using open formats without the need for licenced applications.

This means using forms and formats such as:

- Document Table of spreadsheet
- Construction Operations Information Exchange (COBie)
- BIM Authoring and project planning applications

1.7.1 Document Table of spreadsheet example

Risk Name	Hazard Category	Risk Description	Associated Product	Associated Activity	Associated Location	Agreed Mitigation	Risk Likelihood	Risk Consequence	Level Of Risk	Risk Documentation	Date Raised
AAM05	Falls	Falling from height / Damage to building	roof light	cleaning and maintenance	atrium	A detail cleaning and maintenance strategy for the building is being developed with specialist consultant. The atrium roof will be designed to be walked on and appropriate access, drainage and slip resistance will be considered.	High	Very High	Very High		2013/05/14
AAM03	Falls	Falling from height; Items falling from height	Internal and external façade glazing	replacement	cut back areas of the building	A detail cleaning and maintenance strategy for the building is being developed with specialist consultant.	Low	High	Moderate		2013/05/14
AAM06	Falls	Falling from height / Damage to building	glazing, feature lighting	cleaning and maintenance	roof, bridges,	A detail cleaning and maintenance strategy for the building is being developed with specialist consultant. A travelling beam and demountable cleaning cradle are being considered to allow safe access to all areas.	High	Moderate	Moderate		2013/05/14
AAM07	Falls	Falling from height / Damage to building	glazed screens	cleaning and maintenance	scenic lifts	A detail cleaning and maintenance strategy for the building is being developed with specialist consultant. The cleaning strategy for these screens in close proximity of the lifts will need to be developed further and co-ordinated with the lift subcontractor in due course.	High	Very Low	Moderate	AAM_DRA_07.pdf	2015/08/15
AAM08	Falls	Falling from height / Damage to building	equipment such as Photovoltaic cells, Satellite dishes	cleaning and maintenance	roof	A detail cleaning and maintenance strategy for the building is being developed with specialist consultant.	Moderate	High	Moderate		2013/06/24

Figure 4 Use of tabular risk information: Source BSI

1.7.2 Construction Operations Information Exchange (COBie)

COBie is one standard layout and mechanism that can be used to add risks to a shared risk register. The 'Issues' tab implements the buildingSMART recommended risk model for example, the Risk (Risk Rating), Chance (Risk Assessment), and Impact (Risk Consequence) in tabulated in rows.

It is important that the name of objects are cross referenced so that any issue are tied and associated to a particular object. Information within COBie is not a predefined list of what information is required. What it does define is how information is to be structured and what the minimum data fields are. It is a data format, not a standard on what information is to be provided for FM.

Example

Column	Issue
Name	Fall1
CreatedBy	Stefan.mordue@aecom.com
CreatedOn	2017-11-04T11:08:38
Type	Struck by falling object
Risk	moderate
Chance	Low
Impact	High
SheetName1	Space
RowName1	Roof Terrace
SheetName2	Type
RowName2	Large feature planter
Description	Falling branches from height in heavy wind
Owner	role@company.com
Mitigation	Wind protection and ensure distance from edge
ExtSystem	HS_Risk_UK
ExtObject	
Extidentifier	

1.7.3 BIM Authoring and project planning applications

Figure 5 shows the use of a simple ‘explanation mark’ 3D object to clearly show the location of known asbestos. Figure 6 shows how risks have been identified within the site model by way of a Symbol marker. This marker object has a hyperlink to other sources of information such as the supply chain CDM register and site photographs.

Example

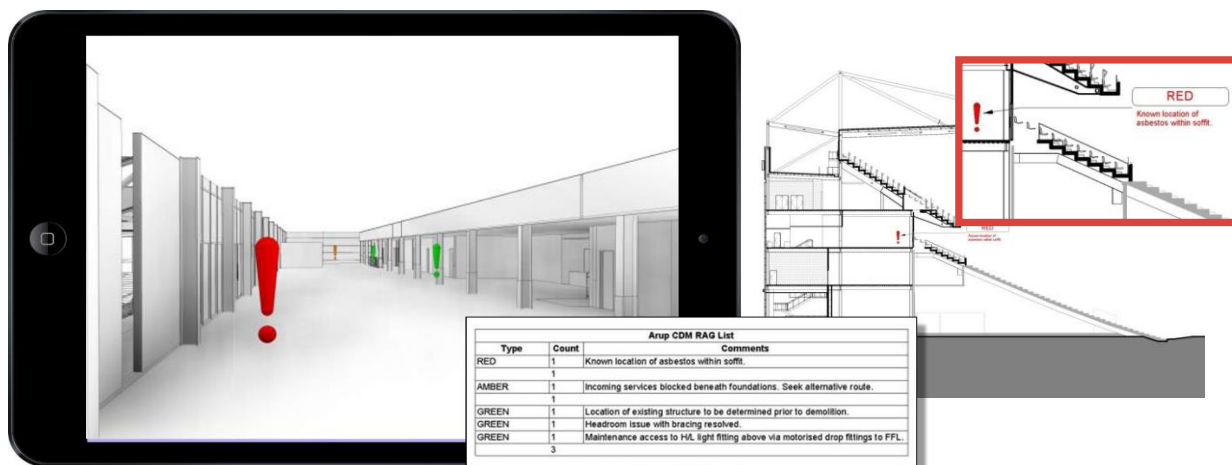


Figure 5 Visualization of Risks. Source: ARUP Associates

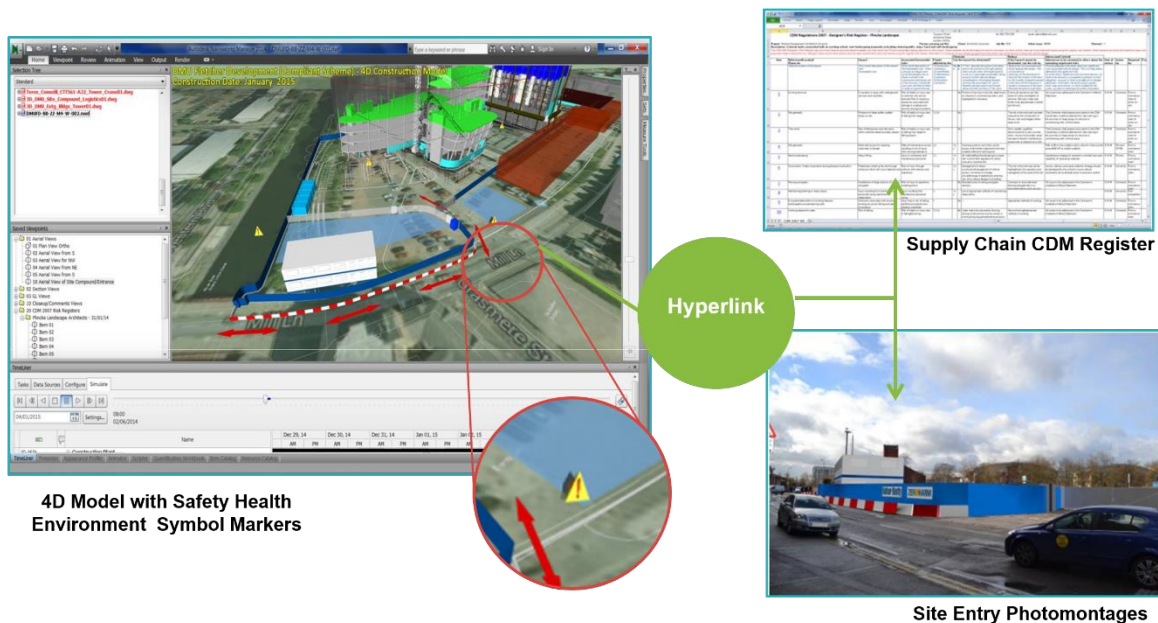


Figure 6 Visualization of risks. Source: Balfour Beatty