

PAS 1192-6 : 2018

Specification for collaborative sharing and use of structured Health & Safety information using BIM

An OVERVIEW

Peter Nicholas
Associate Director | Energy



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Key Note

Sponsored, Supported and Endorsed By

Steering Group - AEC3; Arup; Association for Project Safety; Balfour Beatty; Chartered Institute of Architectural Technologists (CIAT); Construction Industry Council (CIC); Construction Products Association (CPA); Costain PLC; Centre for the Protection of National Infrastructure (CPNI); EDF Energy; Environment Agency (EA); ISAECOM; Health & Safety Executive (HSE); Institute of Civil Engineers (ICE); Ivan Hurst Consulting; MACE; Mott MacDonald; National Grid; Structural Safety Ltd (SCOSS); The PUBLIC 500+; **Funders** - AP5; BIS; and Digital Built Britain; Costain; EDF Energy; EA; HSE; Mace; Mott MacDonald; National Grid; PCSG Ltd; **HSE Working Group** - HSE; Mace; MottMacD; Costain; Jacobs; Cal Unriv; SCL; Arcus; Skanska; CITB; EDF; SEC Group; NBS; N.Grid; Arup; AEC3; Arcadis; TIL; Infomarch; CH2M; Premtech; JK Ltd; ECStrategies; Berkeley; AECOM; AMEC; IHurstCon; plus guest contributors.

clients - client representation - architects - designers - contractors - facilities - operators
utilities - infrastructure - energy - structures - professional bodies - educational bodies

BIM Level 2

- is an evolving definition - will be redefined
- Steering Group sought compliance with 1192 suite and other standards
- ISO 19650-1&2 - collaborative working over the Asset Lifecycle
- PAS1192-6 is about collaboration over the lifecycle - use and share

PAS1192-6 is level 2 suitable

Dovetails with CDM & MHSWR

- UK is risk averse
- PAS1192-6 Asset/Project risk averse
- facilitates the duties of the PD and PC
- facilitates client duties
- identify, assess, mitigate, control - suitable and sufficient
- identify, assess, mitigate, control - accepted level of risk
- identify, use and share risk information - mitigate collaboratively
- H&S risk management arrangements - information provisions



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PAS1192-6 – the Origins

- UK Government BIM Strategy
Strategy Paper for the Government Construction Client Group From the BIM Industry Working Group – March 2011
increase BIM take-up over a 5 year horizon to improve - cost, value and carbon performance
- CIC Building Information Model (BIM) Protocol – first edition 2013
- Construction Industry Council – BIM initiatives
- Planning and Building - Software - Fire - H&S Legislation
- Early 2014 – HSE's BIM 4 H&S working committee
- January 2016 – funding sought - obtained
- October 2016 – BSI project start
Bhavisha Berry, BSI - Matt Blackwell, Costain
Peter Nicholas, Arup - Nick Nisbet, AEC3
BSI Steering Group – Gordon Crick and Gavin Bull, HSE
- February 2018 – PAS 1192-6 published
500+ downloads first 3 days > ~4,000 downloads first two months



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Appropriate Application

Specific to

- ✓ the project
- ✓ own management systems



Proportionate to

- ✓ nature of the works and risks
- ✓ scope of work



Strong on

- ✓ participation
- ✓ inclusion



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Focus of Development

- i_{h&s}** for Asset Use
- i_{h&s}** for Project Use

- Collaboration
 - using H&S and risk information in context
 - applying a risk information framework
 - right information right people right time

- Applicable to different
 - industries and cultures
 - contract, project and commercial strategies
 - project types, sizes and risks

Phase	Key Activities
1.00	Strategic Definition
2.00	Feasibility Studies
3.00	Concept Design
4.00	Develop Design
5.00	Construction and Commissioning
6.00	Operation and Maintenance
7.00	Decommissioning and Rehabilitation

BASIC LIFECYCLE

Initiate, Design, Construct, Commission, Use
Client, Designer, Constructor, Commissioner, End-User
 principles applied appropriately



PAS 1992-6 Structure

- Prefixes, 1, 2 and 3 – normal document content
foreword, introduction, scope, references, terms & definitions

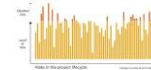


- 4 and 5 – Applying the PAS and Risk information cycle



- 6 – Participant implementation strategies

- 7, 8, 9 and 10 = Information requirements and Representation



Applying the PAS - General

4.1 Invocation – 4.2 Operation – 4.3 Risk Management

- Client through the EIR – others through the BEP
- each Participant adopts a H&S risk management strategy

identify – use – share > H&S information



Risk Information cycle

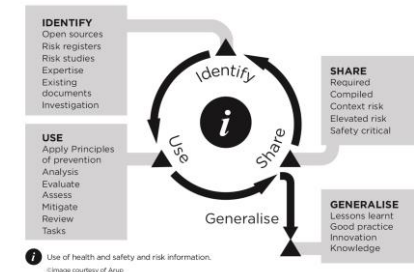
5.1 Overview – 5.2 Identification – 5.3 Use – 5.4 Sharing – 5.5 Generalisation

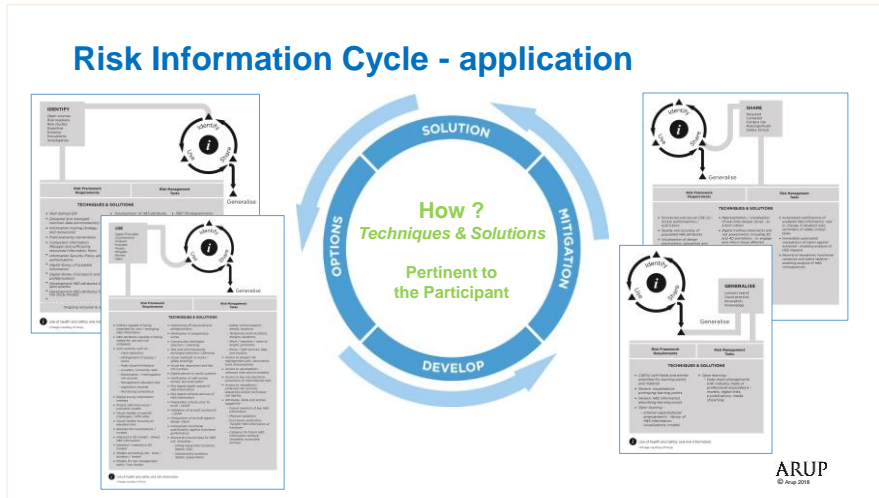
Four components – foundation & structure ~ collaborative use of H&S information

- Identify
- Use
- Share
- Generalise

progressive iterative sharing basis

- Apply
 - interface across each other
 - to all associated to project
 - throughout





- ### Key Principles
- Effective Common Data Environment (CDE)
 - enable sharing and use of H&S information
 - access to subsequent legitimate users – available / accessible / archive
 - requirement to embed H&S attributes – automated queries and manual interrogation
 - Strong focus on process that promotes Collaborative working
 - inter-related strategies and processes – collaboration between people, roles, teams
 - I am a designer, what do I have to do?
 - Emphasis on commissioning – soft landings
 - importance of build validation and functional verification
 - correct, required and pertinent information handed over for asset use – incl CDM HSF
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- ### Key Principles
- Elevated risk - term adopted to differentiate
 - exceptional, raised level, mitigation uncertainty
 - keeping risk in context – routine, through skill and competence
 - all risk?? ~ saturated risk information ~ key H&S messages lost
 - H&S risk requirements threaded throughout the PAS
 - PHASR, DRM, CRM, T&CRM, Reviews (x4) > identify, apply PoP, share
 - recognises risk - focus, perceptions, mitigation - change throughout lifecycle
 - risk sources Product/Process, Activity, Location, Legislation, Emergency – PALLE
 - risk rating, ranking, elevated risk shared
 - attributes for H&S and risk
 - take responsibility for risk ~ 'own the risk'
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Key definitions

Risk
combination of the probability of occurrence of harm and the severity of that harm

Elevated Risk
risk whose information is shared because of its exceptional nature or raised level given the agreed mitigation and context of the project

This includes risks judged to:

- have potential consequence of single or multiple fatality, life changing or serious injuries, long lasting detriment to physical health, mental health and well-being
- be not obvious to a competent and experienced participant or outside of normal expectations
- remain a concern because of its potential occurrence within the asset lifecycle

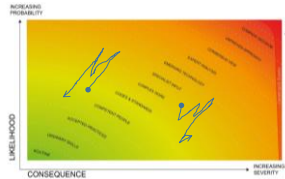
© Image courtesy of Arup 2018 A&C

The definitions of Risk compliant with
 ✓ ISO / EIC Guide 51:2014(E) Safety aspects - Guidelines for their inclusion in standards
 ✓ PD ISO Guide 73:2009 Risk management - Vocabulary

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Risk Ranking Effectiveness

- Risks need to be filtered / ranked – properly & consistently – not a debate about where on the matrix
- Risk acceptance is complex – influences change
- Ranking changes – inputs, actions, decisions, mitigation – point in time
- Risk reintroduced through failures – mitigation, control

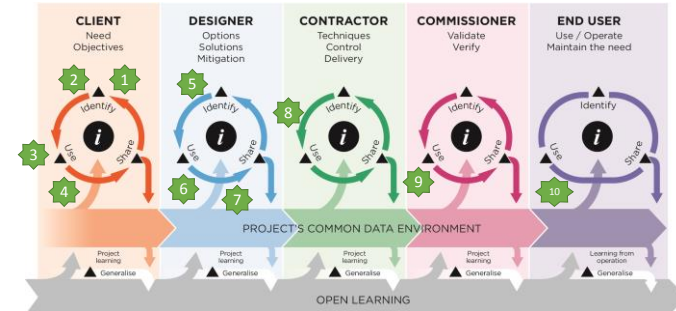


Risk Continuum for design

PAS 1192-6
examination of risk in context
consistent agreed matrix throughout ~ 5x5
sharing elevated risk



Key Points

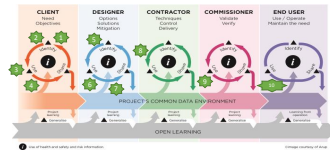


1 Use of health and safety and risk information
1 Providing information - the Asset Need 2 Providing Information - Known & Wanted 3 Preliminary hazard analysis & safety review 4 Design Risk Objectives
5 Design Plan - incl design risk management 6 Collaborative design 7 Constructability reviews 8 Construction Planning 9 Commissioning 10 The End User
©Image courtesy of Arup



Expectations

- | | | |
|---------------------|--|--|
| Client | - enabler - requirements, sponsor, tone | - set expectations, goals |
| Designer | - primary enabler - user, creator, mitigator, generator
- primary provider - for use, facilitator | - meet expectations
- ensure expectations |
| Contractor | - user - plan, control, manage | - deliver expectations |
| Commissioner | - user - plan, validate, verify | - verify expectations |
| End User | - user - SMS, RAs, SSoW | - fulfil expectations, goals |



Implementation

- Ensure clear data conventions - for inclusion and use
- Share context and elevated risks - in a consistent, re-useable and non-proprietary form
- Agreed mitigation to be included - and level of risk re-assessed

a) table/spreadsheet ~ b) COBie ~ c) BIM & project applications

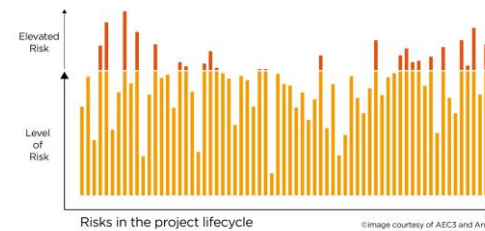


Figure 8 – Context risk and elevated risk



4D with risk associated to location and activity

buildingSMART UK BS PAS 1192-6 Property Set

Property Set Definition

Property Set Name: H&S_Book_UK

Applicable Entities: [Submittals](#) [BIM](#) [Common Data Dictionary](#) [BIM](#) [Common Data Dictionary](#) [BIM](#) [Common Data Dictionary](#)

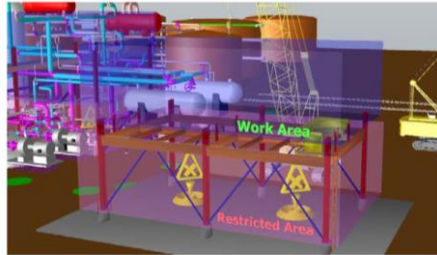
Applicable Type Names: 1070121000

Subclasses: Documentation of a potential hazard, likelihood and consequence aligned with BS PAS 1192-6:2017, which can be assigned or associated to a product, activity or location. Alternatively it may be assigned to or be BS 100-2004 assessment option.

Property Definitions:

Name	Property Type	Data Type	Definition
Risk Name	BSPropertyGroupValue	Text	It is a risk control identifier for an item that can be used to track the origin and categorization of the risk through project life cycle.
Risk Type	BSPropertyGroupValue	Text	Specifies the risk level type, which the type required may be:

- BUSINESS
- FINANCE
- HEALTH AND SAFETY
- PERFORMANCE
- Health Issue
- Material effects
- Assessment effects
- Asset effects
- Financial cost
- Visual asset
- Other asset
- Chemical effects



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Compatibility – H&S and BIM

- H&S does not require compatibility with any BIM level
- H&S is a UK legislative requirement – compliance at all times
- UK is risk averse
 - identify, assess, mitigate, control – suitable and sufficient

- H&S will benefit from BIM applications and processes
- Project risk / Asset risk
 - identify, assess, mitigate, control – accepted level of risk
 - right H&S information to the right persons at the right time
- H&S will benefit from BIM outputs



- Communication effectiveness – 7% verbal : 38% vocal : 55% visual > > > visualisations / models

good H&S > without - BIM - with > H&S better

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Opportunity

- Preliminary Hazard Analysis and Safety Review
 - the UCDRs - key decisions - the strategies
- Promote / convince the Investing Client of the benefits of H&S data
 - throughout the project lifecycle to the Value of the Asset
 - securing their investment / objectives / certainty
 - supporting explicit client CDM duties
- Build Asset & Information Asset ~ are both durable
 - connects clients to the benefits of BIM and H&S – not just the benefits of asset data
- Industry Knowledge Base
 - internal / external – body of knowledge

Asset information requirements informs the EIR – informs EIR_{H&S}

BIM_{H&S} = opportunities to inform and support the Asset & Project

Client buy-in enables EIR_{H&S}

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Opportunity

- more collaborative
 - share early and share often
 - development of consensus and understanding
- more efficient
 - standard formats and representations
 - standard tools and methods
- more visible
 - integrated into documents, 2D drawings and 3D models
 - opportunities to exploit 4D: integrated BIM and construction program
- more reusable knowledge
 - build-up of corporate capability
 - potential for industry-wide knowledge bank

--- through BIM_{H&S}

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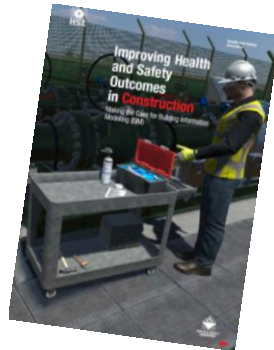
Thank you

Nick Nisbet, AEC3 – co-author
Gordon Crick, HSE – and Working Group
BSI Steering Group



improving health and safety
outcomes through
the use of BIM

[bring to life the benefits
of BIM in practice](#)



http://bim-level2.org/standards?utm_source=social&utm_medium=tweet&utm_content=BIMLevel2Website&utm_campaign=BIM+Level+2+Website

<http://www.hse.gov.uk/construction/lwif/assets/downloads/improving-health-and-safety-outcomes-in-construction.pdf>

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