ISO/TC 59/SC 13 "Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM)"
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ISO/CD 19650-6 for comments

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Description

Dear all,

Please study **ISO/CD 19650-6** *Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) — Information management using building information modelling —Part 6: Health and Safety.*

developed by WG 13.

Please submit your comments by 2022-11-15.

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Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) — Information management using building information modelling —

Part 6:
Health and Safety

ISO copyright office
CP 401 • Ch. de Blandonnet 8
CH-1214 Vernier, Geneva
Phone: + 41 22 749 01 11
Fax: + 41 22 749 09 47
E-mail: copyright@iso.org
Website: www.iso.org

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see the following URL: www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee ISO/TC 59, *Buildings and civil engineering works,* Subcommittee SC 13, *Organization and digitalization of information about buildings and civil engineering works, including building information modelling (BIM)*.

A list of all parts in the ISO 19650 series can be found on the ISO website.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found atwww.iso.org/members.html.

Introduction

At the heart of this standard is the requirement to identify, record, use and share information on health & safety risks which may eventuate in harm to any person involved in the pre construction or construction phase of a building, structure, or asset, or when the asset is in operation, during cleaning, maintenance or repair, or during any subsequent repurposing, decommissioning and demolition. Information captured at the earliest stages of a project should include any site wide risks associated with location, previous use, or the sites physical characteristics.

Risk information becomes meaningful when interpreted in the light of the history of events and accidents associated with risk, and in the context of the immediate and underlying circumstances in which the risk is identified. The information structure therefore includes a data structure for recording contextual information and incidents. One important use of incident information is to link incidents to design factors, so that designers can learn about how their designed assets perform in use.

During pre construction risks should be progressively defined and linked to the context in which the harm may eventuate. Organisational Information Requirements developed by the Appointing Party or by other organisations on behalf of the Appointing Party should encapsulate the risk environment, the level of integration of health and safety and modelling and sharing of data across supply chain actors. This contextual information shall include data to identify characteristics of location, product, systems, building element or plant or equipment, and scope of construction work activity to be carried out, which are associated as sources of the risk. Risks so defined shall be linked where appropriate to treatments which prioritise the production of an inherently safer design.

During the construction phase the same risk information shall be used to identify, record use and share risk information in order to provide barriers and controls to prevent any residual risk accepted from the design phase, resulting in injury or harm to any person affected by the construction work.

During handover and close out of the project the same risk information shall be used to ensure that the Project Information Model is used to update the Asset information Model, and the risk information is handed over to those who will be responsible to manage and assess risks during the operational phase of the Asset.

During the life cycle of a project there are various opportunities to reduce risk to health and safety and improve outcomes through integrating the following knowledge domains:

1) Scenario planning

2) Requirement Briefing

3) Risk Management

4) Education and Training

5) Monitoring and Assurance

6) Reporting and Analysis

Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) — Information management using building information modelling —

Part 6:
Health and Safety

1 Scope

This Document outlines the concepts and principles to ensure that Health and Safety information is developed, shared and delivered collaboratively, ensuring the economic, environmental and social benefits are secured.

This Document;

a) specifies requirements for the collaborative sharing of structured Health and Safety information throughout the project and asset life-cycles.

b) supports the development of structured Health and Safety information for all construction projects progressively from the outset.

c) provides guidance on how Health and Safety information is produced, flows and can be used throughout the project and asset lifecycle. Whilst all Health and Safety risk information can be included within an information model, this document requires the contextualization and filtering of hazards and risks to prioritize the elevated risks and aspects that are safety critical.

d) sets out a framework (risk information cycle) for the application of Health and Safety information-use through BIM processes and applications.

This document specifies how to use Health and Safety information in order to:

— provide a safer and healthier environment for end-users;

— mitigate the inherent hazards and risks across the asset lifecycle;

— result in improved construction Health and Safety performance, fewer incidents and associated impacts;

— provide for clearer, more assured and relevant Health and Safety information to the ‘right-people’ at the ‘right time’;

— reduce construction and operational costs.

The exchange and use of Health and Safety information is intended to support:

— representation of the nature and characteristics of the project, site and built asset;

— representation of Health and Safety hazards, risks and associated factors;

— the generalization, dissemination and re-use of Health and Safety knowledge and experience.

This document is applicable to individuals and organizations that contribute to and influence the design, construction, use (including maintenance) and end of life of a built asset.

This standard is intended to address information management at a stage of maturity described as " building information modelling" (BIM according to the ISO 19650 series. However the principles and requirements of this document can be applied equally to non-BIM projects.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN ISO 19650-2:2018:2019, *Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) - Information management using building information modelling - Part 2: Delivery phase of the assets (ISO 19650-2:2018)*

EN ISO 19650-3:2020, *Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) - Information management using building information modelling - Part 3: Operational phase of the assets (ISO 19650-3:2020)*

EN ISO 19650-5:2020, *Organization and digitization of information about buildings and civil engineering works, including building information modelling (BIM) - Information management using building information modelling - Part 5: Security-minded approach to information management (ISO 19650-5:2020)*

3 Terms and definitions

The Terms and definitions clause is a mandatory element of the text.

For rules on the drafting of the Terms and definitions, refer to the ISO/IEC Directives, Part 2:2018, Clause 16.

To insert a new terminological entry, go to the *Structure* tab and click on *Insert Term entry*.

For the purposes of this document, the *terms and definitions given in ISO 19650-1, ISO 19650-2, as well as the following* apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

3.1
Health & Safety information
information used to help deliver against Health & Safety requirements (including but not limited to risk, treatment and incident capture)

4 Health and Safety Information

To deliver effective Health & Safety outcomes, information shall be documented, stored, shared and presented with this purpose as outlined in the subclauses below.

4.1 Information Requirements

The appointing party shall adopt a single common information representation for the context, risks, incidents, and opportunities for treatment to support the managment, identification, sharing and use of information and evidence relating to:

1) risk management

2) hazard and incident management

3) optionally the recording of previous states of the risk information

The appointing party in adopting an information representation, shall consider the need to support use of the risk information by all parties for:

4) Identification

5) Sharing

6) Use including formal reporting; and

7) Generalisation

The appointing party in determining the expectations in clauses 4.2 to 4.N shall consider the legal, regulatory, supervisory and management concerns.

4.1.1 Scope

The Scope of the risk management environment shall include sufficient information to manage collaboratively the hazards concerning:

1) health, safety and well-being.

2) environmental and/or

3) social/community interest

4.1.2 Context

Context shall be documented in terms of:

1) the site and any exceptional spatial zones or space-types or activities

2) the facility and any exceptional physical systems or product types

3) the project/programme and any exceptional work-package or method-statement

4.1.3 Elevated Risks

All known or perceived risks shall be documented. Those considered elevated/signficant risks shall be designated:

1) before consideration of the opportunities for treatment

2) given the agreed opportunities for treatment

The purpose for elevated/signficant risks is to highlight those that need enhanced scruinty to ensure the correct treatment is proposed.

4.1.4 Treatment

Opportunities for treatment of a risk given the context shall be documented shall include those identified as:

1) agreed for the identified risk

2) optionally those identified as relevant but not agreed

4.1.5 Incidents

Incidents to be recorded shall include

1) formal reportable incidents,

2) other incidents and

3) near misses.

4.2 Schema

Context, Risks, Opportunities and Incidents shall be described using

1) identification

    1) unique name or identifier

    2) description

    3) associated documentation and actor roles

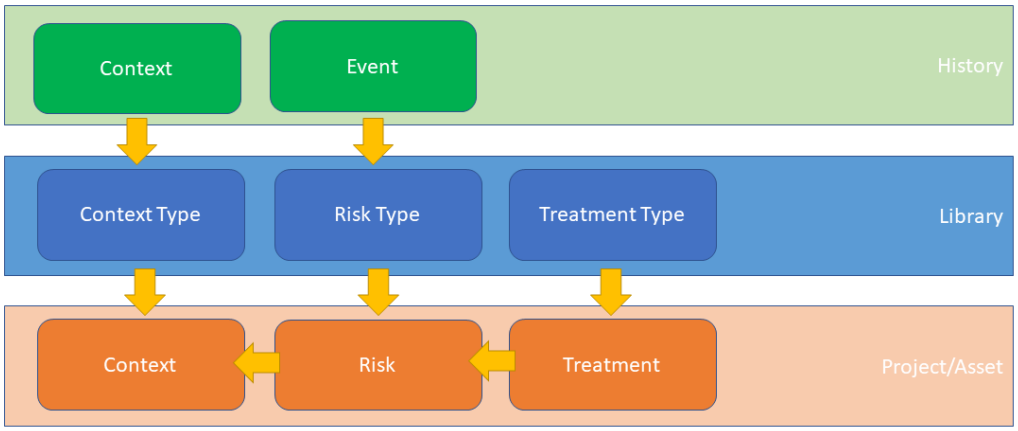


Figure 1 — Relationships between context, risks, treatments and incidents

Figure 1 illustrates the relationships between context, risks,treatments and incidents

4) associations to the most relevant entities

    1) spatial, including the site, zones, space or location types and spaces and locations

    2) physical, including the facility, systems, product types and products and

    3) process, including the project/program, work-packages and duties, method statements and tasks and events.

4) A common assessment method using non-numeric enumerations for

    1) Likelihood

    2) Consequence

    3) Overall Priority according to Level of Risk

4) generic classification or type information

    1) Hazards and events

    2) Spatial, physical and process entities

Note: Annex A contains a UML schema to achieve these requirements which supports the tracking past states of the risk register.

Note: Annex B suggests an implementation using IFC 4.3 which supports the documentation of the risk situation at a specific time.

The following context, risk, treatment and incident data schema for all assets shall be adopted as a minimum:

4.2.1 Risk schema

Table 1 — Risk schema

Title	Measure	Description	Notes
Risk Identifier	Alphanumeric with dash delimiter.	Unique identifier outlined in 4.3.1	
Risk Category	enumeration	Classification of the risk against structure in 4.2.6	
Risk Application Date	enumeration a) Planning b) Design c) Construction d) Operation e) Demolition	The stage to which this risk applies	
Risk Description	Text	Detailed descrition and narrative of the risk.	
Associated Product	Text	Product, material, type, Component, System or Family associated. This may be a name, category, description or spec/bill or model entity reference	
Associated Activity	Text	Activity, Process, Task, Job type, Package or Project associated. This may be a name, category description or plan/Gantt or model entity reference	
Associated Location	Text	Space, Location, Zone or Site associated. This may be a name, category	

Title	Measure	Description	Notes
		description or model entity reference	
Contextual Location	X,Y,Z coordinates	Cartesian coordinate system based location.	
Risk Likelihood	Enumeration — Very Low — Low — Moderate — High — Very High — Unknown — Not Applicable	Grade of the likelihood	
Risk Consequence	Enumeration — Very Low — Low — Moderate — High — Very High — Unknown — Not Applicable	Grade of the consquence	
Level of Risk	Calculation — Very Low — Low — Moderate — High — Very High — Unknown	Assessment based on consideration of the Risk Likelihood and Risk Consequence combination matrix in Table 4	

Title	Measure	Description	Notes
	— Not Applicable		
Review Date	Date	Date review is due or has been carried out	
Risk Documentation	File reference or URL	Documentation of any detailed risk analysis on which the entry is based	
Raised by	Text	Name of individual who raised this risk	
Owned by	Text	Name of individual who is responsible to determine the appropriate treatment	

4.2.2 Treatment schema

Table 2 — Treatment schema

Title	Measure	Description	Notes
Treatment identifier	Alphanumeric with dash delimiter.	Unique identifier outlined in 4.3.2	
Treatment category			
Treatment description	Text	Detailed description and narrative of the treatment.	
Linked Risk Identifiers	Alphanumeric with dash delimiter.	Identifer outlined in 4.3.1 which exists as a (set of) risk(s)	
Residual Likelihood	Enumeration — Very Low — Low — Moderate — High — Very High — Unknown	Grade of the residual likelihood	

Title	Measure	Description	Notes
	— Not Applicable		
Residual Consequence	Enumeration — Very Low — Low — Moderate — High — Very High — Unknown — Not Applicable	Grade of the Residual consquence	
Residual Level of Risk	Calculation — Very Low — Low — Moderate — High — Very High — Unknown — Not Applicable	Assessment based on consideration of the Residual Risk Likelihood and residual Risk Consequence combination matrix in Table 4	
Treatment Documentation	File reference or URL	Documentation of any detailed treatment analysis on which the entry is based	
Raised By	Text	Name of individual who raised this treatment	
Approved By	Text	Name of individual who approved this treatment	

4.2.3 Incident schema

Table 3 — Incident schema

Title	Measure	Description	Notes
Incident Identifier	Alphanumeric	Unique identifier outlined in 4.3.3	
Incident Category			
Linked treatment identifier	Alphanumeric with dash delimiters.	Identifier outlined in 4.3.2 which exists as a (set of) treatment(s)	
Raised By	Text	Name of person who raised this incident	
Affected individual	Text	Name of person affected by this incident	
Incident Description	Text	Detailed description and narrative of the incident.	
Resulting Action	Multiple choice — Stop work — Legal action — Insurance claim — Feedback to Appointing Party — Feedback to Appointed Party — Site Health and Safety workshop —	Set of actions were taken as a result of this incident.	
Resulting Action Description	Text	Description and narrative of the resulting actions taken. If work was stopped, for how long? If feedback provided, how and what?	

4.2.4 Schema rules

The following rules must be included as part of adopting the schemas:

a) All risks, treatments and incidents shall be timestamped for creation and updates.

b) Erroneous entries shall not be deleted and instead branded as VOID as stipulated in 4.3.

c) Historical risks, treatments and incidents records shall not be deleted if less than 10 years old unless this is less than local legislation requirements.

d) When sharing risk, treatment or incident information outside of projects, each party shall generalize these for future use and lessons learnt.

e) For incidents, any subsequent investigation findings, corrective actions and lessons learnt shall be recorded.

f) All treatments must have an assigned risk and all risks must be assigned to a treatment.

g) A treatment must be assigned to an incident. Multiple treatments can be assigned to an incident.

NOTE A treatment can be the risk is accepted/no action is required

4.2.5 Attributes

Attribute requirements necessary to enable Health and Safety risk information to be inputted shall be documented throughout the asset lifecycle. Automated assessment queries, risk related studies and the specified risk tasks to be undertaken shall have attributes incorporated.

Attributes linked to 3D and 4D models can also enable engineering analysis, support judgements on risk factors such as deflection limits, load capacities and inform decisions on compliance checking, as well as enabling active real time digital monitoring techniques.

4.2.6 Risk Category

- Health issue
    - Material effect
        - Asbestos effect
        - Lead effect
        - Hazardous dust
            - Wood dust
            - Silica dust
        - Chemical effect

- Mechanical effect
  - Noise
  - Loss of control using hand or power tool
  - Vibration
- Welfare issue
  - Poor well-being
  - Poor hygiene
  - Poor self-care
  - Stress
- Safety issue
  - Fall
    - Fall from ladder
    - Fall from open edge
    - Fall from scaffold
    - Fall through fragile material
    - Slip or trip on the same level
  - Trapped
    - Confinement
    - Crushed by excavation
    - Unintended collapse
    - Drowning and flooding
    - Asphyxiation
  - Event
    - Electric shock
    - Fire or explosion
    - Machinery Guarding

        - Loss of control
    - Handling
        - Materials handling including manual handling
        - Mechanical lifting operation
        - MEWP (mobile elevating work platform) operation
        - Working overhead
    - Struck
        - Struck by falling object
        - Struck by moving vehicle
        - Struck by machinery or part
        - Overturning plant or moving machinery
    - Public protection issue
- Environmental issue (not in scope)
- Commercial/Economic/Insurance issue (not in scope)
- Operational issue (not in scope)
- Social issue (not in scope)
- Other issue (not in scope)
- NOT KNOWN
- UNSET

4.2.7 Level of Risk

The level of risk should be determined by considering likelihood and consequence, as seen below:

Table 4 — Level of Risk auto-classification

Likelihood						
Very High	Moderate	Moderate	High	Very High	Very High	
High	Low	Moderate	High	Very High	Very High	
Moderate	Very Low	Moderate	Moderate	High	Very High	
Low	Very Low	Low	Moderate	High	High	
Very Low	Very Low	Low	Moderate	Moderate	High	

Likelihood						
	Very Low	Low	Moderate	High	Very High	Consequence

4.3 Risk, Treatment and Incident identifiers

Risk, Treatment and Incident identifiers shall be used to provide a unique identifier for risk, treatments and incidents. These identifiers shall follow the structures in 4.3.1, 4.3.2 and 4.3.3.

VOID shall only be used where a risk, treatment or incident has been entered incorrectly.

4.3.1 Risk identifier

Project-Originator-RiskCategory-SequentialNumber-[VOID]

4.3.2 Treatment identifier

Project-Originator-TreatmentCategory-SequentialNumber-[VOID]

4.3.3 Incident identifier

Project-Originator-IncidentCategory-SequentialNumber-[VOID]

4.4 Using Information

4.4.1 Sharing information

A CDE shall be used prior to the creation of an asset and maintained throughout its lifetime to host and manage the Health and Safety information. Where it does not already exist in maintaining an asset, it shall be created by the appointing party or a representative on their behalf. In both situations, it is recommended this is prior to any other appointments.

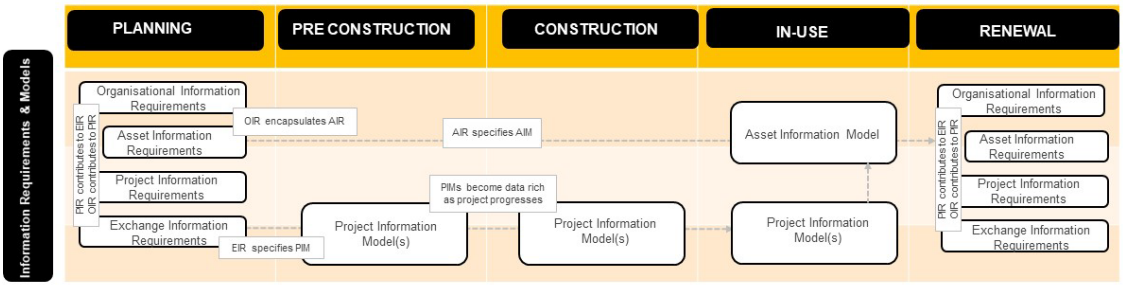
Each party shall:

1) undertake an analysis of the Health and Safety risks at the start of their appointment or upon initiation of the project, in the case of the Appointing Party;

2) input Health and Safety information (3.1) into the CDE for use by other participants throughout the asset lifecycle; and

3) expand, populate and utilize the attributes within the CDE to mitigate, manage and communicate Health and Safety aspects, elevated risks, treatments and incidents;

Each participant shall use the CDE to ensure that the risk information is SHARED with other participants. Formal deliverables shall be PUBLISHED. Superseded information shall be automatically held as ARCHIVE.



4.4.2 Presenting Information

When required, elevated risk, treatment and incident information shall be exchanged and shared in open standard structured forms.

Risk sources shall be included wherever Health and Safety risks are documented:

a) By use of structured tables and/or

b) By adding the risk information to physical, spatial and/or process entities or types in the model or to annotation entities in close proximity.

4.4.3 Sequencing

3D or 4D construction sequencing model(s) shall be used to support the development and visualization of safe methods of access and working, including implications of working at height, temporary works, exclusion zones, restricted areas and works with a permit system.

4.4.4 Learning

Each participant shall ensure that the Health and Safety risk information held is available throughout the asset lifecycle and is used to support planning, training, Health and Safety inductions and risk awareness of those at risk, whilst complying with any security policy for sensitive assets.

Each participant shall release generalized information on lessons learnt, innovation and improved practices associated to significant matters of Health and Safety and risk management for continued learning through their management system arrangements or information sharing protocol.

Each participant shall develop outputs that realise the benefits of an information model relating to Health and Safety risks.

NOTE Documenting all known or perceived risks helps to provide a learning platform for more junior members of the industry, capturing tacit knowledge and sharing amongst a wider community

4.4.5 Change management

Health and Safety information is derived from the need to change or create an asset. For any component, part or area of an asset that is subject to change, the appointing party and appointed party shall create processes that require any linked risks and treatments to be reviewed. Where no risks exist, the change shall require a review as to whether risks and treatments are created.

5 Appointing Party Information Requirements

5.1 Organizational Information Requirements

Each organization shall develop a set of Health and Safety Organizational Information Requirements (OIR). These requirements shall be included alongside any other information requirements and not documented separately . These Health and Safety OIR shall include:

1) An agreed data schema capturing the categorisation of Health and Safety information with 4.2.1, 4.2.2 and 4.2.3 as a minimum using a record/database structure.

2) Connections required to facilitate use of the Health and Safety data with other project or organisational datasets

3) A Health and Safety risk management strategy, which includes:

    1) Information capture and sharing processes

    2) Consistent and open information exchange formats

    3) An open learning system

5.2 Asset Information Requirements

An organization that owns and/or is responsible for assets shall prepare the Asset Information Requirements (AIR). As part of this, the Health and Safety elements will include further beyond 4.1:

1) To meet the regulatory requirements on the management/development of an asset.

2) To support the development/management of an asset.

3) To ensure information generated by a Construction project is used to update the assset information model and provide Health and Safety information which may be needed by a subsequent construction project.

4)

Where there are two organizations separately owning and managing the asset, any discrepancies in information requirements will be resolved by the asset owner.

NOTE The responsibility of documenting an AIR can be delegated to an appointed party

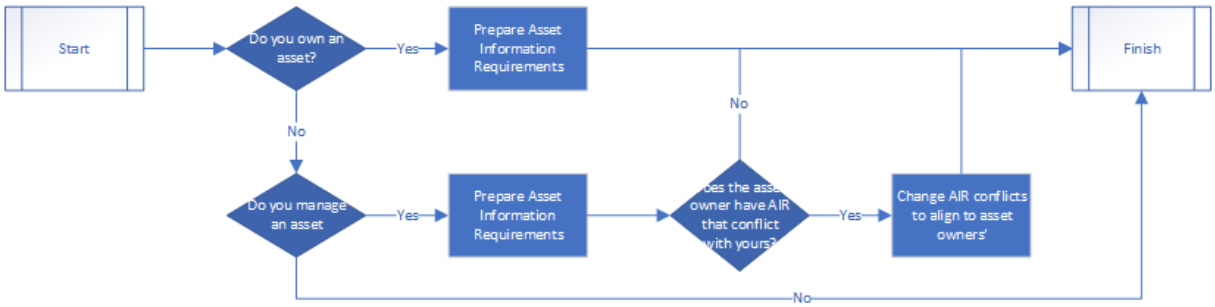


Figure 2 — AIR conflicting requirements resolution

5.3 Project Information Requirements

An organization that carries out construction Projects shall prepare Project Information Requirements (PIR).

PIR are a set of high-level information requirements defining the project needs, partially created from Organisational Information Requirements (OIR) (if building a new asset) or partially created from OIR and Asset Information Requirements (AIR) (if maintaining or adding to an existing asset). OIR provide a high level description and purpose (including any tolerances) to the PIR, whereas the AIR provides the specific asset information for the project.

The PIR's focus on information that the Appointing Party requires at key decision points during a design and construction project. This information enables timely evidence-based decisions for the Appointing Party to manage the project based on information provided by the delivery team. This information also enables the delivery team to understand the need for timely decisions to treat risk . While creating PIR, the Appointing Party should take into consideration the project needs, plan of work and the key decision points into the delivery programme

The Appointing Party should develop PIR's for Health & Safety in collaboration with their Nominated Individual for Health & Safety Information and the Lead Appointed Party for Co-ordinating Health & Safety Information in design. PIR's should be established that meet the needs of the hazard and risk profile of the project. These can include PIR's relating to specific hazard risk topics such as Asbestos, Fire Safety, Temporary Works, Structural Safety and Lifting Operations.

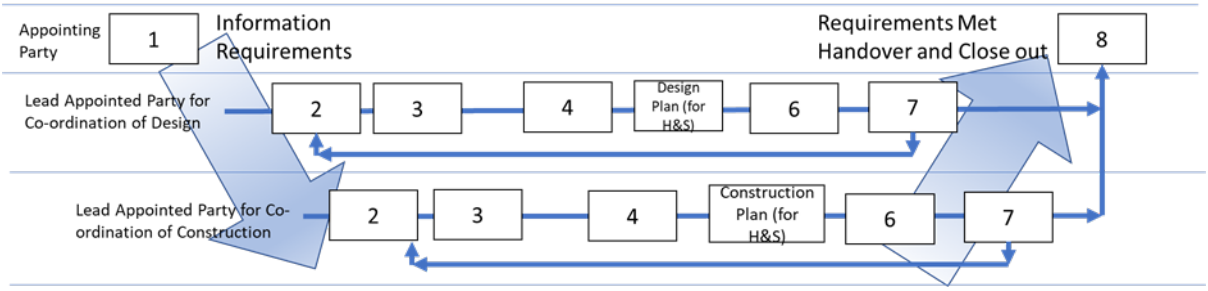
These PIR's set out, at a high level, and at the beginning of the Pre-Construction Phase, a framework for managing risk information throughout the Project, from inception to completion and handover.

6 Process

This process adds to the processes outlined in EN ISO 19650-2:2018:2019 and EN ISO 19650-3:2020 which shall be followed alongside this standard.

For the purpose of this standard, it is assumed that Asset maintenance activity's Health and Safety requirements are smaller instances of Projects, therefore, their Health and Safety Information Requirements are synonymous.

The Health and Safety information management process (Figure to be included) shall be applied throughout each appointment, regardless of the asset lifecycle stage.



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6.1 Assessment and Need

The purpose of this step is that the appointing party shall confirm that the appointment is necessary, the Health and Safety information requirements are developed and the appropriate information exists on the right infrastructure to successfully request an appointment.

In doing this, the appointing party shall consider:

a) The scope of work;

b) The programme, gateways, permits and other external engagements;

c) including arrangements for timely involvement of subject matter experts and specialist suppliers to ensure design processes benefit from construction knowledge.

d) The appointing party's risk, treatment and incident management data schema;

e) include details of Appointing Parties Information standards, and Include Appointing Party directives on design risk objectives, acceptance criteria and level of information need required by EIR's.

f) What existing information is available and whether it follows the information requirements;

g) An initial hazard anaylsis; To include a functional analysis of the asset need, decisions made based on cost/benefit analysis involving risks, and any known process or other requirements or features of the site etc, that entail hazardous conditions or known risks.

h) The frequency of analysis/reviews;

i) The quality of analysis required should also be addressed, it needs to happen at the right stage, ie early enough, and it needs to range across the various specialist domains of risk in the project. The findings need to be integrated into the inherently safer solution proposed by the design team.

j) The process for managing change including co-ordination of risk information between parties

and

k) How risks, treatments and incidents are going to be stored, managed, shared and used.

6.1.1 Appoint individuals to undertake the Health and Safety information management functions

The appointing party shall nominate an individual to manage and maintain the Health and Safety information on behalf of the Appointing Party. This individual shall have experience in:

a) Risk management;

b) The asset category; and

c) Phase of the asset.

The appointing party can delegate the function but not the accountability to an appointed party as detailed in 5.1.1 in EN ISO 19650-2:2018:2019.

6.1.2 Establish the project's Health and Safety information requirements

The appointing party shall establish the project's Health and Safety information requirements within the project's information requirements documentation.

The appointing party shall place a requirement for each appointed party to collate and record lessons learnt, innovation and good practices to facilitate the release of generalization of Health and Safety information and risk management for sharing, learning and the benefit of future use.

The appointing party’s rationale about what risks are acceptable for end-users to inherit shall be set out in the information provided.

The appointing party shall determine and set out the Health and Safety information required to:

a) monitor the performance of the asset in use; and

b) Maintain the asset safely using safe equipment and methods.

Where the asset relates to a business use, the appointing party shall determine and set out the Health and Safety information needed to manage and support business performance, equipment and material assets, and building and land assets.

Where the asset is available to other end-users (not the business’ workforce), the appointing party shall determine and set out the Health and Safety information needed to manage and support end-user activities, equipment and associated assets.

The appointing party shall consider all aspects of the asset lifecycle when considering the Health and Safety implications. This includes the construction/maintenance specific activities as well as operations activities and how these can be addressed.

The appointing party shall pursue contractual agreements that engage parties throughout the lifecycle of an asset.

The appointing party shall propose the following forms/formats for use:

5) Document table or spreadsheet; and

6) IM authoring and project planning applications.

Where Health and Safety information relates to providing sensitive information, the correct authorization procedures and processes will need to be adopted from EN ISO 19650-5:2020.

The appointing party shall determine and set out the Health and Safety information and evidence, to accept:

7) the functionality of the built asset and the proposed construction methods;

8) Demonstrate risk mitigation across the asset lifecycle;

9) safety critical systems and equipment are working properly;

10) monitor Health and Safety performance and standards;

11) ensure effective risk management and control;

12) compliance with the brief and objectives; and

13) compliance with legislative obligations and duties.

Using the OIRs, AIRs and PIRs, the Appointing Party shall develop an EIR that accurately reflects the contractual commitment of the proposed Appointed Party. This should include:

14) where or how Health and Safety information is to be used;

15) what Health and Safety information is to be provided or communicated;

16) the risk management tasks relating to elevated risks or critical treatment.

6.1.3 Establishing Health and Safety Information exchange protocols

The risk, treatment and incident data shall be stored as records within the CDE in an open format where this can be openly connected to by parties that have access.

The appointing party shall maintain a consistent approach of exchanging Health and Safety information across all appointments.

6.1.4 Initial hazard evaluation

The appointing party shall source any existing hazard information including previous risks, treatments and incidents for the site. The appointing party shall consider the scope of work and undertake an initial hazard evaluation through the completion of a hazard register. The appointing party will highlight the hazards that exist for the site based on the context of the work. The appointing party shall also draw on their knowledge of difficulties and risks encountered in the functional use and maintenance of existing or similar business assets; and shall determine, contextualize and set-out the Health and Safety aspects and risks to be avoided or reduced.

The appointing party shall use the generated information to make key decisions on the elimination of risk, or the acceptable level of risk, at the initiation stage of the project. The decisions and any required management of the risks shall be included in the contract documentation as specific requirements.

Any adjustments to the hazard register shall require a revisit of the plan and scope of work.

6.2 Invitation to tender

The purpose of this step is that the appointing party shall clarify what is needed for the appointed party to be deemed successful in the procurement process. Where this is not needed, this step can be skipped.

6.2.1 Assemble reference information and shared resources

The appointing party shall supply all health and safety information available on the project through the CDE. This may include lessons learnt that can be hosted on separate CDEs. This sharing of information will be without prejudice except when this information cannot be shared due to legislative requirements.

6.2.2 Develop Health and Safety brief

The appointing party shall develop a Health and Safety brief which shall include:

— The scope of work;

— The plan of work;

— The number of key decisions and their gateways;

— The points at which Health and Safety information must be shared with external parties for regulative, approval or permit purposes;

— The appointing party's internal processes;

— The structure of Health and Safety information;

— The manner in which Health and Safety information is presented for review;

— How the impact to Health and Safety is managed during changes to the Asset or Project;

— Expected standards for Health and Safety; and

— Expected performance criteria.

The appointing party shall provide a brief scope of the purpose and objective for the specified design risk management tasks within the contract documentation.

The Appointing Party required design risk management tasks shall be retrievable from the project's CDE.

6.2.3 Establish tender response requirements and evaluation criteria

The appointing party will develop a tender response requirement that demonstrates the appointed party's ability to deliver against the appointing party's information requirements. Preference shall be given around:

a) Open sharing of Health and Safety information;

b) Use of insights; and

c) Collaborative behaviours.

The appointing party shall ask for a demonstration of capability in relation to managing, sharing and using risk, treatment and incident data. Where possible, this should request the appointed party to submit an updated risk/hazard register to demonstrate this capability in practice.

The Lead Appointed Parties response requirements shall include

17) Requirement for the Lead Appointed Party for design to co-operate with the appointing party in creation of all necessary pre construction information which will guide the process of design and ultimately be exchanged with the Lead Appointed Party for Construction

18) Requirement for the Lead Appointed Party for Construction to co-operate with the appointing party to check for completeness, and use all the health & safety pre construction information from the design phase, to mitigate construction phase risk at source, and to control risks in construction work activities to an accepted level.

6.3 Tender response

The purpose of this step is that the appointed party shall demonstrate it is able to fulfil the needs of the appointing party. Where this is not needed, this step can be skipped.

6.3.1 Nominate individuals to undertake the information management function

The appointed party shall nominate an individual for Health and Safety information who shall manage the processes relating to the inclusion of Health and Safety information within the project's agreed approach (BEP), and the information exchange requirements. The nominated individual shall need to demonstrate competence of the job as well as how risks related to that job impact

The Lead Appointed Parties response requirements shall include

1) Requirement for the Lead Appointed Party for design to nominate an individual to be responsible for delivery of health & safety information in the design phase. This appointment recognises the fact that no one individual will normally have the capability to supervise the technical scope of the design risk information required in a large project, so this appointment should be to a co-ordinating role between subject matter experts.

2) Requirement for the Lead Appointed Party for construction to nominate an individual to be responsible for delivery of health & safety information in the construction phase. This individual will be responsible for collating, using and sharing health & safety and risk information during the construction phase and in handover.

These appointments of individuals do not replace or reduce any responsibilities any appointed parties may have as organisations to identify, create, produce, use or share risk or health & safety information. Such appointed parties must co-operate with the nominated individuals.

Each representative from the appointed party shall be responsible for incorporating the Health and Safety processes when fulfilling their duties.

6.3.2 Establish the delivery team's (pre-appointment) BIM execution plan - Health and Safety

Each party shall conduct a gap analysis between their internal management systems, the specific information requirements of the project and the information provided. The party shall use the findings of the gap analysis to adopt or develop bespoke delivery strategies, procedures, processes or applications that fulfil and comply with the requirements of the project.

Each appointed party shall:

1) undertake a critical examination of their contract documents, the EIR, the CDE and information models, and identify and schedule the Health and Safety information wanted, needed or required by other participants;

2) determine the type and purpose of the Health and Safety information wanted, needed, or required by other participants;

3) develop and implement information management processes that provides accurate and pertinent Health and Safety information.

Each participant shall implement a process that enables Health and Safety information to be inputted, maintained and extracted through the CDE and/or information models throughout the project lifecycle.

Each appointed party shall examine the Health and Safety information requirements set out in their contract and the EIR to:

4) identify and include the stated and apparent hazards and risks in their approach to risk management;

5) identify and include the appointing party specified risk management tasks in their approach to risk management;

6) identify and schedule the Health and Safety information required by the appointing party; and

7) determine the purpose of the Health and Safety information required and the criteria for providing such information to the appointing party.

The appointed party shall produce an inherently safer solution that can be built and will function to meet the objectives and needs of the asset in use. The appointed party shall proactively treat the risks associated with end-use and the built asset assisting end-users to comply with their Health and Safety obligations and duties.

The appointed party shall identify, treat and record Health and Safety risks related to, and provide Health and Safety information on:

8) functional performance;

9) equipment and systems;

10) materials and substances; and

11) fixed assets, property and land.

6.3.3 Risk management

The Appointed Party shall develop, implement and adhere to an approach to design risk management that is applicable to the project and the different elements of design. The approach shall ensure design elements interface, design team collaboration and coordination is enabled, and Health and Safety information and risks are shared through the CDE and information models.

Each Appointed Party shall establish and implement an approach to design risk management as an integral part of their own design strategy.

Each Appointed Party shall evaluate their design element as it develops to identify, assess and mitigate any risks that evolve. The Appointed Party shall incorporate the elevated risks and associated Health and Safety information into the CDE, relevant information models and notify those affected.

The design team shall, based on their skills, knowledge and experience, as well as the Health and Safety information provided in the contract, determine and set out the design risk management tasks and other suitable design applications necessary to develop an inherently safer design solution.

In both an iterative and progressive manner within the approach to design risk management the design team shall identify and evaluate the:

— process and/or product hazards;

— activity hazards;

— location hazards;

— hazards arising from temporary works, or permanent works in a temporary vulnerable state;

— hazards which may give rise to ill health, either on immediate exposure or after along latency period;

— hazards referenced by legislation; and

— hazards during an emergency event.

The design team shall identify the hazards and risks that arise during an emergency event in construction, commissioning or end-use, and mitigate them through the approach to design risk management.

6.3.4 Provisional Risk Analysis

As part of the tender response, the appointed party shall engage in an initial Health and Safety risk analysis. This analysis will build off the appointing party's hazard assessment. The Health and Safety risk analysis shall outline high level risks and potential treatments demonstrating both an understanding of the problem being faced as well as capability to deal with these issues.

6.4 Appointment

The purpose of this step is that the lead appointed party shall confirm processes, responsibilities and deliverables with all appointed parties. Where this is not needed, this step can be skipped.

This includes:

— Ensuring the risks are consistently referenced and collated; and

— Confirming the risks and ensuring they do not conflict with one another across appointed parties.

Each participant shall determine, agree and document with the information manager (or Appointing Party) the specific requirements they need to be included within the EIR and/or the CDE with regard to:

1) where or how Health and Safety information is to be used;

2) what Health and Safety information is to be provided or communicated;

3) the risk management tasks relating to elevated risks or critical mitigation.

Each participant shall implement a process that enables Health and Safety information to be inputted, maintained and extracted through the CDE and/or information models throughout the project lifecycle.

6.5 Mobilization

The purpose of this step is that the lead appointed party shall undertake activities to mobilize.

Activities include:

— Sharing information from appointing to appointed party;

— Appointed source lessons learnt from own repository, industry repository or appointing party;

— Gap analysis and further development of information; and

— Plan for subsequent phases.

The Health and Safety aspects, risks to be treated, asset and site conditions shall be retrievable from the CDE.

The appointing party shall make available all pertinent Health and Safety information relating to existing assets, services and materials affected by the proposed project. These shall be collated and listed.

The available Health and Safety information and list shall be retrievable from the project's CDE.

The appointed party shall examine and evaluate the available information on the CDE for completeness and identify Health and Safety information shortfalls and gaps that prevent or compromise effective design delivery and design risk management. The appointed party shall seek instruction from the appointing party, typically through a query process, with regards to the actions necessary to address such Health and Safety information shortfalls or gaps.

6.5.1 Mobilization plan

Lead Appointed Party for Co-ordination of Information At Pre Construction phase (LAP – Design)

The (LAP -Design) shall develop, implement and adhere to a project specific Design Plan that sets out the management and technical aspects that will deliver an optimal approved inherently safer solution.

The appointing party shall develop, implement and adhere to a project specific plan that sets out the management and technical aspects that will deliver an optimal approved inherently safer solution.

The plan shall embed the project's required approach to risk management to enable hazard and risk identification, use, sharing and generalization.

The plan shall embed the risk objectives including those in the appointed party responsible for fulfilling them.

The plan shall be accepted by the appointing party and be periodically reviewed to ensure it remains relevant to the delivery strategy and objectives.

The plan and any subsequent updates shall be issued to each appointed party during their mobilization.

The Design Plan shall;

1) Identify any design risk objectives set by the Appointing Party and set out how these will be achieved, who will be responsible, and where 3D or 4D models may be needed to satisfy engineering analysis or risk management

2) Set out the approach to design risk management to be used, i.e. how risk will be progressively eliminated, reduced or controlled through design

3) Set out the key design risk tasks to be carried out by the design team, including any additional tasks where subject matter experts may need to be engaged

4) Ensure any work requiring temporary works or particularly hazardous operations are scrutinised to ensure risks are engineered out where possible

5) Identify when formal reviews will be carried out including an early preliminary hazard analysis and safety review, and constructability reviews as the design progresses – including need for 3D or 4d models.

6) Clearly set out any residual risks identified by the design team which have not been eliminated by design, where the construction team need information

7) Set out arrangements for change control, so proposals to change the design at a late stage are properly reviewed in the light of the original design intent.

Lead Appointed Party for Co-ordination of Information At Construction phase (LAP – Construction)

The (LAP -Construction) shall develop, implement and adhere to a project specific Construction Plan that sets out the management and technical arrangements that will deliver an optimal approved inherently safer solution.

The plan shall embed the project's required approach to risk management to enable hazard and risk identification, use, sharing and generalization.

The plan shall embed the risk objectives including those in the appointed party responsible for fulfilling them.

The plan shall be accepted by the appointing party and be periodically reviewed to ensure it remains relevant to the delivery strategy and objectives.

The plan and any subsequent updates shall be issued to each appointed party during their mobilization.

The Construction Mobilisation Plan shall:

8) Use the Health & Safety information provided by the design team and the Appointing Party to identify, treat mangae and control the risks in the Construction phase, and to develop safe systems of work and produce effective Method Statements

9) Ensure that specialist suppliers, such as those constructing temporary works or carrying out any other hazardous operations are provided with necessary health & safety information and co-ordination

10) Set out any construction phase tasks necessary to identify, generate, validate or verify and record health and safety information required by the Appointing Party

11) Ensure those responsible for commissioning and testing the completed asset are included in risk co-ordination in the construction phase

12) Identify any required visualisations, 3D or 4D models which may be needed for induction or briefing at the construction stage

6.6 Collaborative production of information

The purpose of this step is that the lead appointed party shall deliver the work in line with the Health and Safety information requirements. This includes:

— Hazard analysis based on options; and

— Iterate decision-making with update to risks, treatments and incidents.

6.6.1 Generate information

As project and asset information is enhanced/modified/created, Health and Safety information shall be reviewed to see whether changes or additions must be made across the affected parts, their interfaces and dependencies.

The appointed parties shall share all generated Health and Safety information with all parties.

Each participant shall access and reference publicly available information and be familiar with Health and Safety and risk issues being communicated from within their own organization, industry, professional and statutory bodies, and evaluate the relevance and benefit with regard to the nature of works.

Each participant shall provide Health and Safety information for other participants and design and construction teams to assess and manage the:

— provisions, arrangements and controls designed-in;

— key features designed-in;

— design assumptions, including design required sequences and techniques; and

— zones, areas and allocated spaces.

Each appointed party shall review whether their proposals are constructable and maintainable to identify and evaluate the:

1) hazards to be eliminated by informed decisions;

2) the hazards that require the risks to be reduced through proactive risk management; and

3) key Health and Safety information and risks to be shared with others.

6.7 Information model delivery

The purpose of this step is that the appointing party shall approve Health and Safety information. This includes:

— Approving Health and Safety information

6.8 Close-out

The purpose of this step is that the appointing party shall close-out the appointment. This includes:

— Archive

— Lessons Learnt

— Transfer of information

— Submission to external bodies.

The appointed party responsible for the asset maintenance shall maintain a historic record of maintenance activities, failures and defects, and Health and Safety related events, for analysis, improvements and future learning.

The appointed party responsible for the asset maintenance shall also maintain the CDE and AIM, and implement processes that allow designated end-users to appropriately access, update and input Health and Safety information associated to their use.

The appointed party responsible for operational use of the asset shall:

1) ensure all Health and Safety recommendations are assessed, acted on and monitored for effectiveness;

2) evaluate the Health and Safety information handed over from the Lead Appointed Parties in the project phase to ensure information is included that 1) may be needed to assure health & safety during any subsequent construction project, and 2) to enable skills, training and safe work practices to be developed to maintain, clean and operate the asset;

3) use the Health and Safety information to develop, implement and maintain arrangements for the management and control of Health and Safety relating to their use of the asset and the use of the asset by others;

4) verify the functional performance, pertinence of the Health and Safety information and effectiveness of the risk controls throughout their duration of use of the asset;

5) identify and record any additional elevated risks that arise throughout the life and use of the asset, using the information to implement treatment measures and Health and Safety improvements;

6) update and maintain the Health and Safety information associated to their use, and input new Health and Safety information they generate.

Annex A

Generic schema

A UML model is offered:

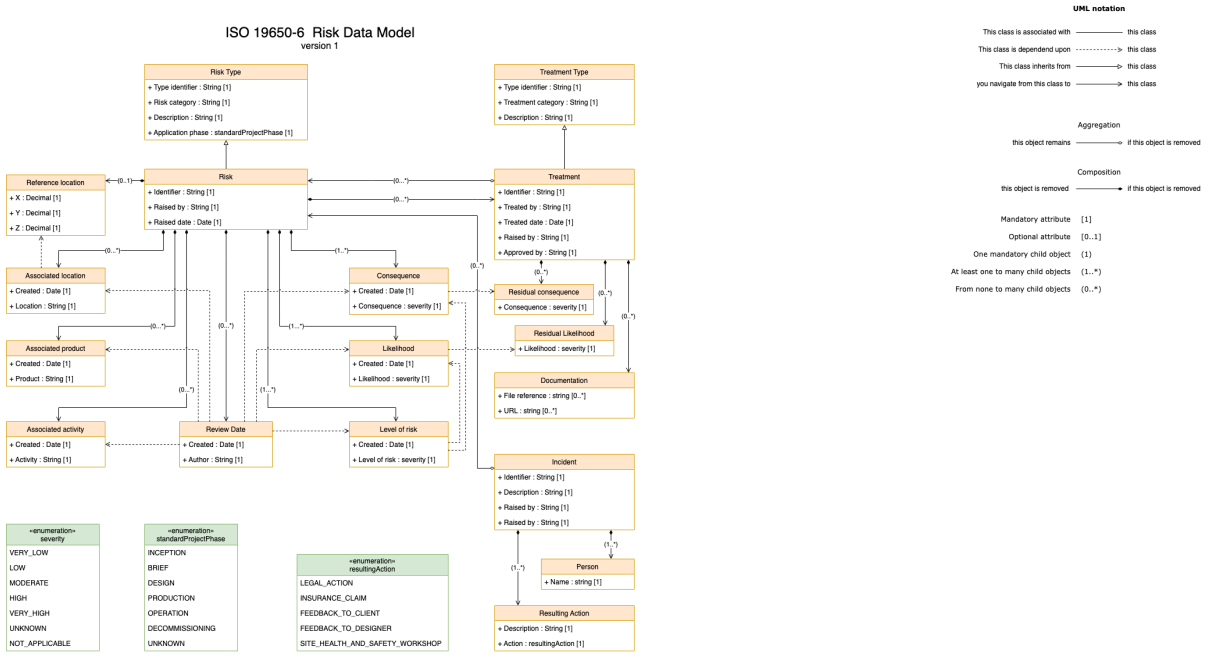

Figure Annex A.1 — UML of Risk data model

Annex B

IFC representation

A mapping of the schema in Annex A (omitting change tracking) to ISO 16739-1:2023 IFC4.3 is offered:

Table Annex B.1 — IFC representation

	Common	Spatial	Physical	Process
Context		IfcSite, IfcZone	IfcFacility, IfcSystem	IfcProject, IfcWorkPackage
Risk	Pset_Risk			
Treatment		IfcSpaceType	IfcElementType	IfcTaskType
Instance / Incident		IfcSpace	IfcElement	IfcTask